

Contents

categories	name	title	
Original Article	Song, Yoomee	A Study of Changes in Nature of Age-specific Design Methodology	5
Art Paper	Makiko Hardada	Visualization of Web Application for Archiving Views of Railway Stations' Experiences for Strollers	21
Art Paper	Seokjin Kim	Space Design of City Home Indoor Plant Module for Relaxing Space of Home Environment in East Asia Region	27

Categories for paper

· Original Article	A paper in this category has to be a logical and empirical report of the study, the review and the proposal by the author on the issue of digital art and design based on media technology. It also has to include the novelty and academic values which can be shared with ADADA members or the people who study digital art and design. Number of pages: 6 -10
• Art Paper	A paper in this category has to consist of the author's practice, result and expository writing on the field of digital art and design. It also has to have the originality in its concepts, methods, expression techniques and making process, and the result should have some values which can be shared with ADADA members or the people who study digital art and design.

Number of pages: 6 -10



A Study of Changes in Nature of Age-specific Design Methodology

With a focus on digital media

Song, Yoomee Ewha Womans University yoomself@yahoo.com Yu, Hyunjung Ewha Womans University hyunjung@ewha.ac.kr

Abstract

There has been a tendency that the history of design is described with focus on design outputs rather than on what lies behind the outputs. This study examines the history of design thorough the changes in nature of 'design methodology' used by designers in each age, instead of focusing on design outputs. First of all, assuming that the design methodology evolves around certain change factors such as a product, a user and a designer from the diachronic perspective reflecting social phenomena of the age, we analyze how it has evolved through the ages and research into the related cases.

As the concept of the product is changed from an industrial product of physical properties to a digital product of virtual properties or a product combined with environment, more items need to be taken into consideration when selecting a design methodology such as usability, target user, service contact, platform, and ecological perspective. In addition, as the users have become active and positively involved in design and equipped with their own design capability, the design methodology that utilizes collective intelligence or involves the user directly into the design process has been devised. As for the designers, the scope of design has become wider to an extent that they have to design the concept of a product, its interaction, contents, service contact and system in general, not to mention its physical appearance. Therefore, integrated thinking and decision-making have become an inevitable part of design and the scope of the designer's work has been expanded to the overall product development process. This study aims at analyzing and summarizing the age-specific characteristics and evolution of the design methodology within the context of correlation between the design methodology and change factors. It is expected that this study can help find useful design methodologies for the future, as a basic research on the development of the design methodology from the historical dimension.

Keywords: digital media, design methodology, design development, design history

1 Introduction

1.1. Background and Purpose

Most design history tends to be summarized with focus on design outputs rather than on the story behind the outputs. For example, purpose and features of a product, its significance in the design history, social background that has brought force the product, and the designer's intention are recorded in various ways. However, the production process and methodology that designer who created the corresponding product is relatively unknown. Also, even though the researches and proposals about individual methodologies are actively made, researches and resources for analyzing the overall evolution are lacked due to tacit-intellectual characteristics of the methodology.

This study focused on research into the process of change in the 'design methodologies' used by designers, who are the subjects of design, rather than on design artifacts that have made the design history. It is expected that this study can be used as a basic research for designers from which they can select better methodologies and develop them further, by reflecting on the design environment in which their senior designers have worked and trials, errors and efforts they have made.

1.2. Methods

For this study, it is assumed that the design methodology reflects the contemporary social phenomena and evolves around certain change factors from the diachronic perspective such as products, users and designers. Also, this study aims at analyzing how the design methodology has evolved in each era from the perspective of the change factor and finding relevant cases.

In order to study the evolutionary aspects of design methodology, the development phase of the design methodology was summarized in connection with the design paradigm, and change factors were selected. The change factors were selected by observing what factors the previous researchers took into account when they introduced design methodology, and the articles of those who studied the changes in these factors were analyzed.

1.3. Scope

The scope of this study is limited to the methodology related

to digital media. The information revolution Alvin Toffler predicted in 'The Third Wave' had a significant impact on the design and human life in the 21st century. As the design media become popular, objects of design, design environment and user environment have changed. Beyond the traditional design such as architecture, industrial design, visual design and fashion design, the design area has expanded to web, multimedia, motion graphic, virtual reality, and video games. Also, compared to the analog media, the digital media has developed centering on its unique characteristics such as interactivity, hyper-textuality, networking, and virtuality.

We note that this study is a research into design history centering on design methodology in digital media and the sequel to the first research 'A Study on Development of Product Design Process based on Design Paradigm Shift'.

2. Design Methodology

2.1. Definition of Design Methodology

Design process is a generic term for the design manufacturing process in general. It consists of a series of steps until a design is completed. Design method is defined as an appropriate technique used for carrying out those steps.^[1] The terms of design process and methodology are often used interchangeably, because the design industry used them interchangeably in the early stage when the design process was established. Studies of design process and methodology started in earnest in Europe and the United States of America when John Chris Johns, a professor at Manchester Institute of Technology, led a conference on design methodology in 1962. At the time, the movement to systemize the design process was first called the design methodology.

Figure 1 shows a structural diagram in which design process and methodology are separated and the design process is described as a series of problem-solving processes while the methodology is defined as a tool used in each steps of the design process. For example, the 4D model developed by the UK Design Council is a design process comprised of Discover, Define, Develop and Deliver. If there is a specific plan like user shadowing or FGI (Focus Group Interview) during the Discover step, this plan is considered a methodology.



Figure 1 Definition of design process and methodology

Donald Norman advises that it is possible to use the design methodology to ensure a quality design but difficult to achieve a great design only with the methodology.^[2]

2.2. Transition in Design Methodology

In the early 20th century, the manufacture industries such as

automobiles and electronics developed. After that, in the late 20th century, the information/communication industries developed and in the 21st century, the convergence industry has developed through the integration of the information technology and various fundamental technologies.^[3]



As the industries evolves, so does its design methodologies. For example, as the industry has become more mechanized and automated since World War II, the designers conducted researches for systematizing the design methods to solve design problems that had become more complicated, and created the design process. Since then, the design methodology have continued changing itself, in order to create products that reflect the latest science and technology requirements and show themselves off to meet the users' requirements.

Therefore, transition of design methodology for digital media is largely divided into analog, product change 1 (digitalization), and product change 2 (convergence). Centering on the 1970s when digital media becomes a commonplace, it is divided into Pre-digital Media Age and Post-digital Media Age. Since the emergence of digital media, based on the change in the properties of products, which are design outputs, the post-digital media age is subdivided into Product Change Phase 1 (digitalization) and Product Change Phase 2 (convergence).

Industry paradigm	Traditional industry	Information industry	Convergence industry
	Conventional product	Product change 1	Product Change2
Design paradigm	Analog	Digital	Convergence
Design method	Design Process	User / Usability	Integrated thinking
	10	70 To	day

Figure 3 Design methodology trend according to design paradigm

2.2.1. Pre-digital Media Age

As more systematic and rational design methods were required in order to solve design problems that had become more complicated since World War II 2, the design process was introduced. The design process of the time was an efficient production process for mass production, and also an engineering-based process that was developed under the influence of cybernetics that Norbert Wiener advocated as the military system science was expanded into the private sector.

However, unlike the engineering process, the design process

could not measure quantitative problems and as a result it evolved into participatory design and speculation-dispute process.^[4] Today's design process has evolved from the process established during this time, and continues evolving as product properties change and various methodologies are added.^[5]

The below processes has something in common. The design problem analysis is followed by the solution generation.

Table	1	Early	studies	on	the	design	process ^{[6}
-------	---	-------	---------	----	-----	--------	-----------------------

Proposer		Design process	
D	Archer(1963)	Programming - Data collection - Analysis - Development - Communication	
esigner / D	Asimo(1964)	The analysis of the problem - Synthesis of solution - Optimization - Revision - Implementation	
esign re	Jones(1981)	Divergence - Transformation - Convergence	
searcher	Flikelstine(1988)	Information gathering organization - Formulation of vale model - Generation of candidate design - Analysis of candidate design - Design	

 Table 2 Design problem solving process by John Christopher Jones
 [7]

Phase	Contents		
Analysis phase	Random list of factors		
: A systematic way of thinking,	Factor classification		
analyze each element	Information provider		
	Interrelationships between		
	factors		
	Specifications / Policy		
Comprehensive phase	Creative thinking		
: Re-assemble the elements	Partial answers		
	Limiting conditions		
	Combined solution		
	Find the solution		
Assessment phase	Assessment method		
: Review whether the solution	Evaluation about operations,		
solve the problem	production, and sale		

 Table 3 Design process inherited from the previous process and advanced to meet the digital media production^[8]

	Proposer	Design process
Con	Design council	Discover - Define - Develop - Deliver
npany / (UPA	Analysis - Design - Implementation - Deployment
Orga	Engine	Identify - Build - Measure
mizatio	Live work	Insight - Idea - Prototyping - Delivery
n	Designthinkers	Discover - Concept - Design - Build -

		Implement
	SNOOK	Discovering - Definition - Designing - Delivery
	IDEO	Observation - Brain storing - Rapid prototyping - Refining - Implementation
	SEREN	Discover - Synthesize - Design - Specify
	Peer insight	Needs findings - Synthesize - Development - Implementation
	InContext	Contextual inquiry - Interpretation session - Data consolidation, Visioning - Storyboarding - Product and system requirements - Paper mockup interviews - Interaction, visual, and industrial design
	Team interface	Discovering - Concepting - Prototyping 0 Specifying - Testing
Designer ,	Moritz	Understanding - Thinking - Generating - Filtering - Explaining - Realizing
/ Design	Russ&Carolyn	Prepare - Understand - Render - Iterate - Test - Enable
res	Jodie Moule	Research - Insight - Concept - Design
earcher	Garrett	Strategy - Scope - Structure - Skeleton - Surface
	Cooper, Reimann & Cronin	Research - Modeling - Requirement & definition - Design framework - Design refinement - Design support

2.2.2. Product Change Phase 1: Digitalization

As industry and technology developed, digital products started to be made. As 17,468 ENIAC vacuum tubes manufactured by the US Department of Defense in 1946 were replaced with a transistor in Computer 7000 produced by Thomas Watson of IBM in 1958, and later in 1971 with CPU (Central Processing Unit) called 4004 produced by Ted Off of Intel, the computer had started to become smaller. In 1974, MITS produced a product named Altair 8800 using a CPU from Intel and influenced by this, Steve Jobs made Apple computer, and Bill Gates founded Microsoft, with which personal computers became popular.^[9] As the users became familiar with digital products, the purposes and usages of products had also become diverse, and the users' requirements had become more complicated. In this situation, the studies of methodology to understand the users begun, and the studies of users and usability were accelerated. Also, the methodologies related to User-Centered Design (UCD) and participatory design were introduced.

Previous methods	UCD
Tech-driven	User-driven
Focus on components	Focus on total solution

Consists of a team with limited	Consists of a team with diverse	
background	backgrounds	
Focus on internal specifications	Focus on external methods	
No user test before production	User test before production	
Defect-centered quality	User-centered quality	
management	management	

Table 5 Qualitative UCD examples^[11]

Focus group	Ethnography	Participatory design
Mini Focus groups	Field ethno.	Development panels
1:1 interview	Digital ethno.	Internal participation
Super group	Photo ethno.	
Online discussion	Persona	

2.2.3. Product Change Phase 2: Convergence

In the 21st century, products began to evolve along with complex environmental factors. iPod was first released in 2001 and iTunes Music Store in 2003, followed by iPhone in 2007. Afterwards, a product cannot be sold as a product itself but in combination with product service and/or ECO system. As the user started to use the product within the ECO system and communicate with others, the designer had to design in consideration of the user, the entire system and the interaction among products. Integrated thinking was required for the designers and the product design was expanded to the service design area and the user's participation in the design process was maximized.

Convergence brought the integration of the customer experience. Thackara(2005) said that current design in networked society is the process to define one system constantly, not the result.^[12] Furthermore, the Copenhagen Institute of Interaction Design(2008) explained that service designers generally design a system and process for providing a comprehensive service to the user, and they introduced service design field as the multidisciplinary field that combines design, management and process engineering.^[13]

The below methodology table shows various approaches from market, stakeholder, user, engineering, etc. to complete the overall system.

Table 6 Stefan Moritz's	design	methodology ¹⁴
-------------------------	--------	---------------------------

Inderetor	Benchmarking, Critical incident tech, Client segmentation, Ecology map, Ethnography, Gap analysis, Experience test, Historical analysis, Service status, 5Ws, Expert interview, FGI, Market segmentation, Mystery shoppers, Insight matrix, Inconvenience analysis, Observation, Probes, Reading,
nding	Inspirational specialists, Net scouting, Shadowing, Thinking aloud, Trend aloud. Trend scouting, User survey, Context analysis, Contextual inquiry
Think	Affinity diagrams, Specification, CATWOE, System thinking, Lego serious play, Think tank, Lateral thinking, Mind map, Parallel thinking, Personality matrix, Priority matrix, Touch

Bu

points, Visual thinking

Generating	Bodystorming, Brainstorm, Brainwriting, Experience sketching, feature tree, (Group) sketching, Idea interview, Open space technology, Parallel design, Randomizer, Think tank, Unfocus group
Filtering	Card sorting, Character profiles, Cognitive interaction, Diagnostic evaluation, Evaluation review, Expert evaluation, Feasibility check, Focus group, Heuristic evaluation, Personas, Pluralistic walkthrough, Retrospective testing, PEST analysis, Sticker vote, SWOT analysis, Task analysis
Explaining	Camera journal, Character profiles, Mock-ups, Role play, Metaphors, Rough prototyping, Tomorrows headings, Mood film, Persona, Social network mapping, Scenario, Storyboarding visioning, Experience prototype, Try it yourself, Empathy tools, Mood board
Realizing	Behavior sampling, Blueprint, Business plan, Guideline, Intranet, Line of balance, Mind map, Performance testing, Post release testing, Role script, Scenario testing, Service prototype, Simulation, Specifications, Templates, Wizard of OZ

3. Change Factors in Design Methodology change factors

3.1. Selection of Change Factors

User experience is one of the important elements in digital media. A considerable number of the latest design methodology studies is focused on user experiences. Nielson Norman group explains, "User experience encompasses all aspects of the end-user's interaction with the company, its services, and its products".^[15] On the other word, designers should consider the whole experience between user and product.

On the other hand, the new media is studied based on the communication framework in the media research field. One of the traditional model is Lasswell model. This model analyze the medium by the framework 'who did what to whom and how'. Schramm added interaction element to the existing models and suggested the 'Encoder - Message - Decoder' model.^[16] In these models, 'who' and 'encoder' can be replaced by the designer; 'what and how' and 'message' can be replaced by the product; 'whom' and 'decoder' can be replaced by the user.



Figure4 Lasswell's communication model



Figure 5 Schramm's communication model



Figure 6 New media analysis framework

It is shown that books on design methodologies generally define the design or design process and introduce the product areas, the designer's roles and the importance of users. It is noteworthy that as shown in Table 7 the recent design books have the design methodology that takes users into account, in addition to the product areas and the designer's roles dealt with the focus in the earlier books on design methodology. In addition, as shown in Table 8, there has been an increase in books that introduce the design methodology associated with the user, starting from the late 20th century.

 Table 7 Introduction of Product, Designer and User

 in the Books on Design Methodology

Book			Perspective		
Pub. Year	Pub. Title Author		Product	Designer	User
1970	Design Methods	John Chris Johns	0	0	
1988	A Study of Design Methodology	Daesoon Park	0	0	
1992	A Study of Design Methodology	Yeonwoong Im	0		
1995	Understanding of Design	Kyoungwoo Min	0	0	
2009	Design Methodology	Haechoon Oh	0		0
2010	Managing the Design Process-Concept Development	Terry Lee Stone		0	
2011	This is service design thinking	Marc Stickdorn, et al.	0	0	0
2013	Lasting UX Design	Juncheol Ban	0	0	0

Table 8 Emergence of	books
introducing the user-centered	methodology

Pub. Year	Title	Author	User-centered methodology
1995	About Face	Alan Cooper, et al.	User observation, interview, focus group, persona
2004	Rapid Contextual Design	Karen Holtzblatt, et al.	Context research, persona, paper prototype
2009	Designing for the Digital Interface	Kim Goodwin	Interview, persona
2012	Universal Methods of Design	Bruce Hanington, et al.	Behavior map, crowd sourcing, cultural

			survey, ethnography, design workshop, focus group, participatory design, persona, role play, usability test, user journey map
2012	Killer UX Design	Jodie Moule	Contextual interview, survey, diary study, prototype, user test, focus group, design workshop
2012	UX Design process understood with a story	Daum Communication UX lab	User survey, usability test
2013	Design Thinking: Design Science I Create	Gun Na, et al.	Persona, customer journey map

Assuming that the design methodology has been evolving under the influence of a product, a user and a designer as described above, this study analyzes how these factors impact the changes in the design methodology.



Figure 7 Change factors of design methodology

- · Object of change: Product
- Subjects of change: User, Designer

From the perspective of interaction between design and society, a 'product' is an output produced as a result of the design methodology, which is an object that connects the design and the society. The design world creates products that have functions and aesthetics required by the society, and the society continues suggesting its requirements forming a certain culture in cycle. With regards to the product, there are two subjects change: one is the consumer who uses the product and the other one is the supplier who provides the product to the consumer. The consumer can be substituted with to the user, and the supplier with the designer. As the environment where the user uses the product and the environment where the designer designs the product also affect the development of the design methodology, these two environment were examined as well in this study.

3.2. Design Paradigm and Change Factors

Design paradigms and characteristics of the design methodology are summarized in Table 9 for each of the three change factors described above. Columns are divided by major event of each age (pre-digital media, product change phase 1, and product change phase 2), and rows are divided into Background, Value, three Change Factors, and design methodology.

	Pre-digital media:	Product change 1:	Product change 2:
	Analog product	Digital product	Complex environment
Background	Mass production	Computer, user	ECO system, platform, service
Value	Effectiveness	Usability, User experience	Overall experience
①Product	Industrial products	Digital products	Environment-combined product
	(Simple)	(Complicated)	(ECO system, Service)
②User	Customer	For user	By user
	(As mass target)	(User-centered)	(User-participating)
③Designer	Exterior design	User-understanding	Integrative thinking
Design methodology	Tech-driven changes	User-driven changes	Convergence-driven changes
	(1) Engineer-centered problem-solving	(1) User context-based methodologies	(1) Platform context added
	process	are studied actively: UCD	methodology: interaction between
			device and environment is evolved
			(2) Service/ECO/Contents - combined
			methodology
Overall summary	Emergence of designer	Emergence of user	Expansion of product

Table 9 Age-specific Changes of Design Paradigm

Overall, before the emergence of digital media, the design process was systematized under the influence of system science and after its emergence, the design methodology started to develop. At first, designs were made to enable mass production of analog industrial products, the designs were technology-oriented but as the digital product emerged, the number of environmental factors to be taken into account for the users increased. As a result, the design methodology has been evolving from the tech-driven design to user and system-oriented design.

3.2.1. Tech-driven changes

As the problem of efficiency and production speed was raised due to the mass production system, specific and systematic design methodologies were needed.^[17] In the tech-driven design environment, designers considered how to make new-function-added products more cheaply.^[18] At that time, the most important design value is effectiveness for mass production.

3.2.2. User-driven changes

As people were using the digital devices such as computer, Smartphone, tablet, etc. and moreover they were using the internet, the importance of the convenient products was increased. We had to shift the industry to user-centered designing.^[18]

3.2.3. Convergence-driven changes

Technology's development speed is getting faster and the industries are getting more connected. Therefore, the spatial constraints and the boundaries between technologies or industries are disappearing. The convergence age makes the usage environment more complicated, therefore the analysis of the business perspective is required for designers.^[19]

New media can exchange the digital information when connected, and it becomes the special domain due to networking and extended time-space.^[20]

Table 10 Characteristics of new media^[20]

Characteristics		Influence
1	Digitization of information	Integration of the info type
2	A single information transferred by various media	Integration of Media
3	Bi-directional information exchange	Interactive feedback available
4	Networked communication	beyond time and space, decentralization, beyond substance, beyond mobility

3.3. Factor 1: Products

Until digital media emerged, products were mostly industrial products manufactured through mass production. Since the 1970s, products with digital features emerged. In the 21st century, products in which tangible and intangible (service) qualities are integrated appeared. Today, products do not remain as physical items any more. Rather, they provide users with valuable user-specific experiences. As the turn of the 1970s, the designers who had mainly designed physical appearance of products began to design the interaction with the user. Also, unlike the past when they designed products with fixed types of usage, they are now designing smart products that change according to the user's taste even after being released. In other words, the designer has to design a product based on understanding of the characteristics of new media and of the system.

Table 11 Product Factors

	Pre-digital	Product	Product
	media	Change #1	Change #2
Product	Industrial	Digital products	Environment-
	products	(Complicated)	combined
	(Simple)		product (ECO
			system,

International Journal of Asia Digital Art&Design

			service)
Product case	Leica 1A	Apple iMac,	Apple,
	Camera (1929)	Nokia mobile	Android, MS
Product	HW	HW + SW	HW + SW +
composition			Service
Design target	Physical	Interaction	Platform +
	appearance	included	ECO + CP
Product	Fixed	Flexible, Evolving	
tendency		(User-depended))
Design	-	Understand	Understand the
consideration		new media	whole
			environment
			(Platform +
			ECO)

3.3.1. Industrial development process and product properties

Figure 4 shows the industrial development process introduced when German Industry 4.0 Report in 2013 suggested the direction of future products. It shows that the products have evolved together with the production process, as technology developed.



Figure 8 Industrial development process^[21]

As the loom and the conveyor belts were invented after the Industrial Revolution, the production process has become mechanized and automated, making mass production possible. On this background, IT technology developed, making it possible to digitalize the production process and the products, connecting necessary devices to interwork with the system. As the interworking with the system was established, the entire industry has become systematized.

These changes in products are similar to the concepts of Web 1.0 / 2.0 / 3.0 that had once been popular. The biggest feature of Web 2.0 is 'movement of power to the user'.^[22] The users, who used to be the accommodating party of contents, started to actively communicate, generate and share information under an open online environment. Web 3.0 is a web environment in which the computer understands and infers information resources and provides services appropriate for the user's usage pattern. As the IoT environment was established and the computer has become intelligent, the expectations for intelligent services have become higher.

	Web 1.0	Web 2.0	Web 3.0
Time	1990~2000	2000~2010	2010~2020
Keyword	Access	Participate, share	Context
User	Manual	Participatory,	Expanded
		open, sharing	
Content usage	Producers:	Users =	Intelligent web
patterns	provide content,	Producers	provide tailored
	Users: use		contents
	content		
Search	Search only in	Open data in	Tailored search
	internal search	multiple sites	
	engines	(Open API)	
Information	Human	Human	Human,
used by			computer
Technology	Browser, Web	Broadband,	Semantic web,
		server	clouding
		management	computing,
			contextual
			awareness
Device	PC	PC+Mobile	PC+Mobile+ α
Overall	Static	Dynamic	Tailored
characteristics	Closed	Open, standard	Intelligent

Ministry of science, ICT and future planning(South Korea, 2013) pointed out that the broadcast service is changing from a one-way communication to interactive, moreover integrated services, because smart devices have come into common use. ^[24]



Figure 9 Evolution of the broadcast service [24]

3.3.2. Subject of product innovation

Joohyun Park(2011) divides the subjects of product innovation, who make it possible to produce cheaper and better, into five categories: price, technology, function, user and design. She claims that these subjects can make products better by strategically reflecting the user and providing new experiences. Here, design is defined as having a role of creating new experiences and values, and a process of transition from efforts to make things cheaper to efforts to make them better.

Table 13 Expansion of subjects that lead innovation^[25]

Price	Technology	Function	User	Design
Efficiency of expenses	Technological development and quality improvement	Addition of new and diverse functions	Strategic reflection of user's need	Creation of new values by providing new experiences

Making things cheaper

Making things better

On the other hand, Dongseok Lee (2013) explains that products are created in order to provide new experiences, applying new business/ECOsystem, services, equipment/ interaction devices, UI, and usability as shown in Table 8. According to him, designers not only design product appearance but also design products in various types such as device concept, interaction methods, ecosystem, and services. As the area of design is expanded from part to whole, the role of designer is also expanding across the design process in general.

New business/	iPod + iTunes, iPhone + Appstore, KakaoTalk
ECO system	+ Game
New service	Netflix, Chomp, FlightCar
New device	Kindle, Flip, JawboneUp
New interaction	iPod - Click-Wheel, MS - Kinect
New UI/Usability	Sony - XMB (Cross Media Bar), Gmail -
	Conversational View, Dropbox, Mailbox

Future IT convergence technology research Council (South Korea, 2010) classified the convergence types based on convergence level. It provides different products in one package or engrafts different products to provide a new value.

Туре	Convergen	Description	Example
	ce level		
Bundle		Provide multiple	iPad+iTune
	Week	products in a single	
$\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$		package	
Overlap		Add the same function	Online Stock
		between different	Trading +
		service	Electronic
\mathbb{U}			Dictionaries
Hybrid		Integrate two or more	All-in-One OA,
		elements to achieve a	Smartphone
		specific goal	
Fusion		Provide new value by	Mp3 player, iPad,
\bigcirc	Strong	combining products	PMP
\bigcirc		and services	

 Table 15 Classification of the convergence^[27]



Feature 10 How to converge [28]

Choonseong Leem(2011) divided into vertical convergence and horizontal convergence. Vertical convergence means the convergence between the processes where the product is consumed in the market and horizontal convergence means the convergence between different technologies that belong to the different industry.^[28]

3.4. Factor 2: User

The concept of user emerged as the concept of design was born after the Industrial Revolution. At first, however, it was more like the target purchaser of mass-produced products or rather close to the stakeholder whose opinion was worthy of being reflected. Then, as the focus of the product shifted from practical and aesthetic values to reflective and hedonic values, the user's need became personalized beyond being subdivided. In order to study the users, studies about usability, cognitive psychology, emotional design and digital culture started. In this process, UCD, user participatory design, crowd-sourcing, and open API, etc. emerged.

	Pre-digital media	Product Change	Product Change
		#1	#2
User	Customer	For user	By user
	(As mass target)	(User-centered)	(User-
			participating)
User needs	Simple	More	Customized
		complicated	(Example: Nest)
Usage		(1) Computer	(1) Mobile
environment		(2) web	device, (2) ECO
Usage value	Practical,	+ Reflective	+ Hedonic
	Aesthetic		
Design theory		Usability,	Digital culture
		Cognitive	
		Psychology,	
		Emotional	
		Design, etc.	
Design		UCD (Survey,	User-
methodology		Focus Group	participating
		Interview,	design
		Contextual	(co-creation),
		Inquiry, Diary	Crowd sourcing,
		study, etc.)	Open sourcing

Table 16 User and usage environment factors

3.4.1. Emergence of user

Production of goods before mass production targeted a limited consumer base and the usage of the goods was relatively simple. Therefore, the cultural and symbolic significance of the consumer wanting to have the goods and the practical value of convenience of using the goods had more importance than the user's needs and usage pattern. Then, after the mass production became possible following the Industrial Revolution, the customer base expanded and the companies began to recognize the consumers. Also, as the market became more segmented, the user's needs and interaction became more diverse. Accordingly, a variety of products were released and even the products customized to individual users, like Nest that learns the user's propensity of use and his environment like ambient temperature and humidity, and the products which evolve based on the user's needs began to emerge.

On the other hand, the environment in which the user uses a product has also gradually evolved. Starting from web-connection in the late 20th century, it has evolved into the online environment, such as inter-user connection, inter-device connection, and crowd connection, in which the user can connect to whatever, whenever and wherever he or she wants. Furthermore, it can evolve into products with functions one needs, thanks to ECO system with which one can purchase contents.

As the society became economically/culturally prosperous, the users' level of knowledge has become higher and their role has also expanded. Recently, centering on the IT sector, new ideas using collective intelligence have been proposed such as crowd-sourcing that receives proposals from users and open API that opens API for developers to develop new ideas from the outside. By this, the users no longer stay as passive user but transform themselves into designers and developers who put forward new ideas and develop new products.

Figure 5 shows the process of transition in the level of users' participation in the design process, as summarized by Jisun Lee (2013). In the 1980s, the users participated in the product test; in the 1990s, they participated in the prototype test; in the 2000, they participated in generation of ideas; and in the future, she predicted that that the users will invent products or be the subject of product innovation.



Figure 11 Changes in users' participation in the process over time^[29]

On the other hand, the concept of user had existed in the past as well, which recognized the user as a being that passively accommodated products. In 1970, John Chris Johns explained the proprieties of communication in the order of sponsor, design team, supplier, producer, distributer, purchaser, user and system operator, while mentioning about the difficulty in communicating with the interested parties in conducting design works. Here, he considered the user merely as the objects whose opinions the designer had to listen to.^[30]

3.4.2. UCD (User-centered Design)

Functions and usage of digital products were complex and

difficult, and the Internet environment was unfamiliar to the users. The users wanted the products to be easy and smart and in this process, experience design and UCD methodology were developed centering on 'user experience', 'usability' and 'user cognitive psychology'. Jesse James Garett defined the elements of user experience as strategy, scope, structure, skeleton and surface, and he explained how these element affect each other in his book 'The element of user experience(2002)'. And Peter Merholoz, et, al. defined UX as strategic activity and they insisted that UX innovates the products as one of the leading management activities in their book 'Subject to change(2008)'.^[31] Representative UCD methodologies are user observation, focus group interviews, usability testing and diary study, which aim at observing and investigating the users to get insights.

3.4.3. User participatory design

While UCD is a method of designing based on understanding the user, the user participatory design is to have the user participate in designing. In the user participatory design, the users actively participate in a variety of design activities such as information collection, idea generation, modeling and evaluation. It is known to be started in Scandinavia in 1970.

Table1 7 Participatory design conducted by Experientia^[32]

Client	Target	Methods	
Sitra,	Apartment	'Low2No' residential environment	
Finland		design project conducted in Helsinki,	
		Finland, in which users created the	
		apartment layout in 3D. In the end,	
		Sitra/SRV decided to make a public	
		sauna for residents.	
Vodafone,	Mobile	Indian rural / low-income urban residents	
India	phone	were to make mobile phones of their	
		own through collage work of magazine	
		pictures, and then do presentation on it.	
		They made prototypes, and did	
		card-sorting for their expectations about	
		the phone functions.	
CVS	Pharmacy	A wide range of national-intellectual	
Pharmacy,		researches were conducted in pharmacies	
USA		in Italy, Germany, England and USA. In	
		the pharmacies, designers worked as	
		staff and idea workshops were held with	
		the CVG creative team.	

3.4.4. Crowd-sourcing

Crowd-sourcing is a compound word of crowd and outsourcing, in which a number of people perform a project by voluntarily responding to public research subjects. Some companies operate the crowd-sourcing for the purpose of listening to the users' voice or for the purpose of finding out more ideas. They invite the external experts and the public to participate in the product development process, and share with the participants the return of the product.

Table 18 Examples of crowd-sourcing ^[33]			
Innocentive	Scientist-centered online R&D community in the		
2001	field of basic science, pharmaceutical, life science,		
USA	etc. When a company uploads a research subject to		
	the community website, the community members		
	suggests ideas. When an idea is selected, the member		
	who suggested the idea is awarded prize.		
Wilogo	Design community with more than 13 thousand		
2006	members, which designs company logos. When a		
France	customer places an order, designers in the		
	community upload more than 50 designs within a		
	week, and its members evaluate/vote for the best.		
Threadless	Online T-shirts production and sales site, of which		
Late 2000	members participate in production.		
Chicago,	When member designers submit designs, the final		
USA	design is selected through verification by Questions		
	and Answers.		
Quirky	Quirky starts to produce products based on general		
2009	users' ideas. When general users submit ideas, the		
New York,	member users vote for the best idea. Once an idea is		
USA	selected, it is produced and sold by the external		
	experts within two weeks.		
Open IDEO	When IDEO creates a challenge topic, anybody can		
2010	suggest a solution. The challenge is developed in		
USA	three steps of 'Inspiration', 'Concepting' and		
	'Evaluation' and all participants can participate in all		
	these processes.		
Ideacream	Ideacream discloses ideas about product		
2010	improvement to consumers, and receives proposals		
Korea	from them. The Here, consumers act as planner,		
	designer, copywriter, and/or storyteller.		

Crowd-sourcing in which a company/organization presents the topic is expanded to crowd-funding in which individual users presents the topic. The user uploads his or her idea to the crowd-funding site, to introduce the idea and raise the funds for production costs. People participate in funding, based on the product idea only and, when the enough funds are raised, the proposer produces the idea, and sends out the product to the people participated in the funding or share profits with them according to the scale of their investments.

Table 19 Examples of crowd-funding ^[34]				
Indiegogo	Recognized as the first case of crowd-funding, and			
2008	known for its motto 'DIWO (Do It With Others)'. It			
USA	also develops public-interest campaigns and thus is			
	known for its nature of public interest. Even the target			
	amount is not reached, the raised fund is delivered to			
	the project coordinator			
KickStarter	Under the slogan of 'Be Creative', it performed lots of			
2009	fundraising activities in its early years to support arts.			
USA	In recent years, as the fields that require fundraising			
	became more diverse such as games, films, design,			
	music and technology, this site has become the most			
	popular funding site for start-up companies. If the			
	target amount is not reached, the product is cancelled			

and the raised fund is returned to the contributors.

An example of crowd-sourcing combined into the design methodology is frogmob by frog. The frogmob asks people all around the world to observe what are popular in their areas, take pictures of them, and upload the pictures. Designers can understand how people live and what certain things mean in each area, with respect to a particular topic.[35]



Figure 12 Frog's Frogmob site^[36]

3.4.5. Open API

Platform companies equipped with ECO system such as Apple and Google form an environment where they coexist with other developers, by disclosing the developer tools to the developers so that they can develop mobile applications that operate on their platforms. In the early 2000s, Amazon and eBay were the first that published product data to the third parties and distributed their profits. In 2005, Google released map API, so that a variety of mash-up services were created. With this as an opportunity, Yahoo, Microsoft, Twitter, Facebook, Delicious, Flicker and many other companies started to support open API and developer tools.

3.5. Factor 3: Designers

The image of designers has changed from artisans, through people who design the appearance of product to look good, to the ones who understand the users and who do integrative thinking. In other words, the designers are required to do a holistic design that takes into account not only formativeness and aesthetics but also the users and the environmental factors.

Table	20 Designer	and des	ign env	vironment	factors

	Pre-digital	Product	Product
Designer	Exterior design	User- understanding	Integrative thinking
Design environment	Maximize efficiency (Design a production- optimized product)	Consider user, buyer, stakeholder, client, etc.	Device- Platform, Service - ECO
Design theory	Efficiency, formativeness, design scientification,	Usability, Cognitive Psychology, Emotional	Integrated thinking

International
Journal of
Asia Digital
Art& Design

Į		design process	Design, etc.		
I	Design	Linear design	UCD	Comico design	
	methodology	process	UCD	Service design	

3.5.1. Designers with analog media

The early design methodology focused on analyzing and solving problems in the industrial phenomena, centering on engineering problems. At the time, the machine produced products and therefore the designer had to be good at drawing (the design) rather than good at making. Until the end of the 19th century, the objects of design were decorative pieces attached to the outside of products and the designers of the time were mainly in charge of decorative design and pattern design.^[37] Also, as the products were simple and the users' needs were not complicated, the designers focused on the study of form. It was this time when the formative researches were active in Bauhaus and Ulm University (Hochschule für Gestaltung Ulm).

3.5.2. Designers of Product Change #1

As the industry and technology advanced, humans began to imagine. In 1984, William Gibson of the USA published 'Neuromancer' that fictionalizes a man in search of the cyberspace and in 1985, Bruce Sterling published 'Schismatrix Plus' that deals with mechanistic world and genetic modification. Products also began to evolve based on the human imagination. In order to meet the people's expectations, designers had to be capable of understanding the users by observing and analyzing them and capable of imagining product concepts, rather than merely capable of drawing well or making well.

3.5.3. Designers of Product Change #2

In order to meet the complex needs of the society, the designers are put into the product development from the product concept planning stage. It is not that they start to design after receiving a proposal from another department but they participate in the product development from the planning process. In addition, the designers carry out the project while listening to the requirements of various people, such as users, clients, company, and other stakeholders. Therefore, they should be able to understand the entire produce development processes including product planning, design, development, marketing, sales, etc., and also should have communication skills for smooth communication with relevant departments.

Recently, some companies organize their design teams with interdisciplinary human resources in order to flexibly solve design issues. People with various backgrounds and knowledge in visual design, industrial design, product design, interaction design, HCI(Human computer interaction), HFE(Human factor engineering), computer science, industrial engineering, cognitive psychology, literature, sociology, etc. proceed with the design work together. For example, Yamazaki Kazuhiko, et, al.(Japan IBM) introduced their UCD team that consists of various experts in their book, 'The Concept and Practice of User Centered Design(2005)'. In their team, an UCD leader, marketing planning specialist(s), user researcher(s), UX designer(s), visual/industrial designer(s) and evaluation expert(s) are the key members of the team. And they said that engineer(s), manual writer(s), sales manager(s), service support staff(s), a product planning team also participate in the UCD activities.^[38] In addition, Jodie Moule also introduced her UX team in her book 'Killer UX design(2012)'. Her team consists of researcher(s), visual designer(s), interaction designer(s) and developer(s). They developed a recipe app for UX project case study.^[39]

3.5.4 Change in the designer's roles

The work of the design department in the product development process within a company has been gradually extended to the front. Figure 8 shows the process of change in the designer's roles, summarized by Yoo-ri Koo (2009). It is shown that the designer's role has evolved from a discriminator limited to the design stage, in a more active and integrated direction. to a passive integrator, to an active integrator role and then to a value creator.



The designer in the past could not participate in major decision-making processes for business but only maintained their positions but recently has been given the role of participating in major decision making processes.

Claudia. B. Kotchka, who is in charge of design innovation in P&G, also introduced a similar type of design development in The Front End of Innovation Conference 2006. She divided the development types into four steps – Stage 1 where design mind is lacked; Stage 2 where style is improved; Stage 3 where functions are improved; and Stage 4 where problems are solved - and the characteristics of each stage agree with the age-specific image of the designer.

Table 21 Development type of designs^[41]

Development type		Description	
Stage 1	Clueless: Lack of design mind	Basic features of the product are focused but the form of the product or the user-friendliness is not considered	
Stage 2	Style improvement	Appearance and packaging of the product are made stylish	
Stage 3	Function improvement	The form of the product is partially modified and its functions are improved, to increase the consumer's satisfaction	
Stage	Problem	Design and company's capability are	

4	Solving	focused on meeting the consumers'
		essential needs

4. Conclusion

So far, this paper has examined how the age-specific properties of the products, users and designers influenced the design methodology. As the nature of the product changed from industrial products of physical type into digital products and environment-related products, factors to consider at the time of selecting a property design methodology have been added such as practicality, user, service contacts, platforms, ECO system, etc. Also, the users have become more active and equipped themselves with development capability, methodologies that utilize collective intelligence or involve the users directly in the design process have been devised.

Also, the designers' roles have been expanded to designing the product concept, interaction, contents, service contact and system in general as well as the physical appearance of the product. As For this reason, the designers are required to do integrated thinking and decision-making and to reflect on the overall product development process. This analysis has significance in that it classifies and summarizes the age-specific characteristics and evolution of the design methodologies within the correlation between the design methodologies and the change factors. The design methodology is one aspect of the history of design, which has evolved together with the development of society and design. It is expected that this study can be used as basic research on the design methodology in the historical dimension. In addition, we hope that this will help designers understand the process of selecting the design method.

References

[1] Min, Kyungwoo, Understanding design, Mijinsa, 1995, p85

- [2] Norman, Don, 2006 Special lecture in Kaist (Daejeon)
- [3] Leem, Choonseong, Techno business design, Cheongram, 2011, p18
- [4] Park, Haecheon, A Study on a Historical Context of the Design Methodology Movement With an Emphasis on Its relations to Cyborg Sciences, Journal of korean society of design science, Vol.67 No.-, 2006, p107,112,116
- [5] Jo, Hyunjae, Design process based on divergent thinking of alternative scenarios(DTAS), Yonsei university, 2010, p68
- [6] Shin, Yookyung, The scenario-based design process for user experience design, Ewha womans university, 2012, p6-7(Im, Yeonwoong, A Study of Design Methodology, Mijinsa, 1992, re-quoted)
- [7] Brigitte Borja de Mozota, Design management(Korean version), Designnet, 2008, p47
- [8] Marc Stickdorn, Jakob Schneider, This is service design thinking(Korean version), ahn graphics, 2012, p131,
 - Unger, Russ, et. al., project guide to UX design :for user experience designers in the field or in the making(Korean version), Wikibooks, 2010, p47-49,

Jodie Moule, Killer UX design, Sitepoint, 2012, p5

Shin, Yookyung, The scenario-based design process for user experience design, Ewha womans university, 2012, p10-21 http://sdip.kr/service/service03.jsp http://incontextdesign.com/contextual-design/

- [9] Kim, Jeongcheol, Hello, D : digital note which ill-informed people also loved, Bookfolio, 2009, p24-55
- [10] Kazuhiko Yamazaki, Minako Matsuda, Ryouji Yoshotake, The Concept and Practice of User Centered Design(Korean version), Sejong publishing, 2005, p25
- [11] Brigitte Borja de Mozota, Design management(Korean version), Designnet, 2008, p53
- [12] Xenia Viladas, Design at your service(Korean version), Viz&Biz, 2011, p28-29
- [13] Marc Stickdorn, Jakob Schneider, This is service design thinking(Korean version), ahn graphics, 2012, p38
- [14] Jo, Bonghwa, Development of service design framework for analyzing user behavior tracking time-geographic information, Sangmyung university, 2014, p20
- [15] http://www.nngroup.com/about
- [16] Jo, Suseon, et al., New media and new communication, Ewha press, 2014, p23-25
- [17] Shin, Yookyung, The scenario-based design process for user experience design, Ewha womans university, 2012, p5
- [18] Kazuhiko Yamazaki, Minako Matsuda, Ryouji Yoshotake, The Concept and Practice of User Centered Design(Korean version), Sejong publishing, 2005, p18-19
- [19] Leem, Choonseong, Techno business design, Cheongram, 2011, p11
- [20] Kang, Inkyung, A study on the process change of spatial design in a new-media environment, Kookmin university, 2009, p8-11
- [21] www.forschungsunion.de/pdf/industrie_4_0_final_report.pdf
- [22] Kimm, Hyoil, A study on extension of information design about change of media paradigm, Dankook university, 2009, p109
- [23] Yu, herim, et al., Evolution of social networking service based on web service changes, Korean society for internet information, Vol.11 No.3, 2010, p55 (EIC 'Web 2.0's evolution, Business strategy using Web3.0', 2007.9), (Song, Yoomee modified)
- [24] www.mcst.go.kr/web/s_notice/press/pressView.jsp?pSeq=13213
- [25] Park, Joohyun, Design values for design-centered innovationbased on innovative digital media, Ewha Womans University, 2011, p31 (Song, Yoomee modified)
- [26] Lee, Dongseok, Strategic Designing for Meaningful Experiences, freelec, 2013, p97
- [27] Jo, Suseon, et al., New media and new communication, Ewha press, 2014, p204
- [28] Leem, Choonseong, Techno business design, Cheongram, 2011, p21
- [29] Lee, Jisun, Idea Sharing Open Platform for Collaborative Creativity based on Design Thinking, Seoul National University, 2013, p20
- [30] Jones, J. Christopher, Design methods (Korean version), Deawoo publishings, 1993, p47-51
- [31] Lee, Dongseok, Strategic Designing for Meaningful Experiences, freelec, 2013, p29-31

International Journal of Asia Digital Art& Design

- [32] http://www.experientia.com/perspectives/creating-togetherbui lding-value-with-participatory-design/
- [33] http://www.innocentive.com/

http://en.wilogo.com/

- https://www.threadless.com/
- https://www.quirky.com
- https://openideo.com/
- http://www.ideacream.com
- [34] https://www.indiegogo.com/ https://www.kickstarter.com/
- [35] Hanington, Bruce, et al., Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions (Korean version), Korea print, 2012, p53
- [36] http://frogmob.frogdesign.com/
- [37] Min, Kyungwoo, Understanding design, Mijinsa, 1995, p59
- [38] Kazuhiko Yamazaki, Minako Matsuda, Ryouji Yoshotake, The Concept and Practice of User Centered Design(Korean version), Sejong publishing, 2005, p204-208
- [39] Jodie Moule, Killer UX design, Sitepoint, 2012, p43
- [40] Koo, Yoo-ri, et al., The effect of a design management environment on the evolution of corporate design, Journal of Korean society of design science, Vol.22 No.1, 2009, p303
- [41] Park, Sohee, SFAT process based on empirical design thinking for the innovation of service industries, Chung-ang university, 2012, p54



Makiko Hardada Graduate School of Tokyo Metropolitan University, Japan Society for the Promotion of Science Research Fellowship DC2 sumakokima@gmail.com

> Yoshiaki Komatsu XING.INC yoshiaki.komatsu@xing.co.jp

Hidenori Watanave Graduate School of Tokyo Metropolitan University hwtnv@sd.tmu.ac.jp Visualization of Web Application for Archiving Views of Railway Stations' Experiences for Strollers



Abstract

Our study in this paper aims to show railway stations' experiences for strollers from the point of users' view. To approach this purpose, we propose a visualizing web application to archive the views of railway stations experiments between stroller users and other people. We create a system to collect the views from Twitter and our own contribution system. We apply language analysis to the views and extract users' sentiment and key phrases. In addition, we visualize these views to overview with sentiment and key phrases simultaneously. We consider that our work will give a better understanding of various inconveniences for stroller users, and propose guidelines of what kind of behavior and understanding are required for each other.

Keywords: Visualization, Social Network, Language Analysis, Strollers

1 Introduction

In Japan, it has been maintenance of barrier-free for passengers by legislation, such as barrier-free law [1]. A railway is the main means of transportation [2], and stroller users are increasing at stations. However, there are many difficulty scenes for strollers at railway stations [3][4][5]. These difficulties are caused by not only the physical scene, such as a structure of barrier-free, but also understanding for the environments for strollers. However, there are different views about strollers at railway stations between stroller users and other people, so that to understand each other is needed to use stations comfortably [7].

The guidelines to improve the railway stations' usability have been published at railway stations. It is encouraged people to have an attention to each other, and shows the appropriate actions in typical case. Although, there are many minor troubles that can see only an interested party, however such minor cases are not discussed in public space. From the above, we should point out that it is needed to share views of strollers at stations between stroller users and other people. We consider that this will give a better understanding of various inconveniences for stroller users, and propose the guidelines of that what kind of behavior and understanding are required for each other. Our study in this paper aims to show railway stations' experiences for strollers from the point of users' view. To approach this purpose, we propose a visualizing web application to archive the views of railway stations experiments between stroller users and other people. We create a system to collect the views from Twitter and our own contribution system. We apply language analysis to the views and extract users' sentiment and key phrases of the context. In addition, we visualize these views to overview with the sentiment and the key phrases simultaneously.

2 Background and Purpose

2.1 Environments for strollers at railway stations

Idei et al. [3] describe that the more people use stroller, stations are more inconvenience. Matsubara's survey[4] reports that guidelines of strollers at public transport are not uniformed and it makes difficult to understand each position between stroller users and the other people. Furthermore, this report describes that to grasp the regular needs of people has not been performed. Tatewaki et al. [5] point out that the influence on stroller users by the station's structure. They suggest that the changing the structure takes time, but it can follow by showing user's experience. All of these papers describe the difficulty scenes for stroller users at railway stations by questionnaire survey for the stroller users, and report the importance of understanding strollers' environments. However, they resolve around railway operators and building contractors, so that we consider that they are not to be shared to the general public.

2.2 Approaches for strollers at railway stations

To follow physical inconveniences, station maps that contain information about barrier-free structures, such as elevators, escalators, stairs, and family bathrooms, are published at every station; however, they do not show the difficulty scene during the process of using barrier-free structures and such a minor trouble is not discussed in public space.

Japan's Ministry of Land, Infrastructure and Transport have published the rules to get well understanding for strollers. The ministry have also designated a priority mark for strollers to paste at barrier–free structures [6]. It is encouraged people to have an attention to each other, and shows the appropriate actions in typical case – namely, the actions is left to users, but the guideline for the minor troubles has not been regulated.

Okuyama and taniguchi [7] survey the dependency on measures of administration for strollers, and report that more younger people are, the dependency become higher. It means that there are the generation gaps about the views of strollers. However, the approaches to eliminate the distinction have not been done.

From above, it is concerned that resent approaches cannot follow to get smooth communications if there are different understandings between both.

2.3 The purpose of this study

From the above, we consider that it is needed to exchange the views of railway stations experiments for strollers between stroller users and the other people, so that the purpose of this study is to show railway stations' experiences for strollers from the point of users' view. We make an attempt to get the views from stroller users and the other people, and compare them. To approach this purpose, we create the web application to archive the views of strollers and visualize the results.

3 Recent researches and our visualization approach

3.1 Exchange of views about stroller on the web

Women's Park[8] is one of the most famous SNS(Social Network Service) to exchange information, conversation, and

discuss for mothers. In the content, there are many discussions about experiences with strollers at stations. However, only the membership (expectant and nursing mothers) can access it, so that it is impossible to share the views of stroller users to the other people. "Rakuraku odekake net"[9] is presented as the web service to search the station's barrier-free information. Everyone can access the information, but it doesn't show the users' view. On the other hand, "Mamaspert"[10] is characterized by stroller's usability for mothers and this content gives station's usability for strollers with message of users' experiences. However, the contribution is limited only mothers. [8][9][10] are seen to be of use to share the information related to strollers, but it is difficult to compare the views of strollers between the stroller users and the other people, so that they don't follow this study's purpose.

On the other hand, some topics [11] about strollers' experiments on the FAQ site are opened to everybody. They are of great value to show the environments of stroller, however it is needed to have an articulate context to post the message. We should point out that the vague messages should be focused on to understand strollers' environments. Furthermore, we consider the experiment for strollers are not always necessary for the answer.

Considering the recent approaches, we consider that there are experiments to discuss about strollers at railway stations, however the approach to compare the views of strollers at railway stations between stroller users and the other people have not been designed.

3.2 Collective intelligence and visualization

Collective intelligence is shared or group intelligence that emerges from the collaboration, collective efforts, and competition of many individuals and appears in consensus decision making. Tom and George [12] said that collective intelligence has an ability to form a reference for selecting the appropriate action. Due to the expansion of the Internet, it became possible for ordinary people to post their own opinion and Collective intelligence has been constructed on the web.

Especially, Twitter, which is one of the most popular SNS, has been gathering attention as to get the recent environment by user's experiences [13]. Yamanaka et al. [14] and Sasaki et al. [14] add tweets which includes geo location data on the map. Ree et al. [16] proposes a method to gather crowd behavioral vectors to derive latent classes of urban characteristics in terms of crowd behavioral patterns and relevant urban areas which are extracted using geo-tagged Tweets. It is appeared in above researches that geo location data link a context to address, so that it can propose the characteristic of each location. However about the tweets of stroller's views, users tend to tweet without it, and also we consider that to use the geo location data is not suitable for data about stroller because of protection of privacy. Thus, it is difficult to use it in this research. However, there are more tweets which include "station name" than with geo location data. Therefore, we will use station names instead of geo location data to show the characteristic of the place. On the other hand, Sawada et al. [17] visualize tweets with a network model. A network model is a database model conceived as a

International Journal of Asia Digital Art&Design

flexible way of representing objects and their relationships. It is good at showing the schema, viewed as a graph in which object types are nodes and relationship types are arcs; however the miner element is settled at a low rank and it is worried that the minority view's accessibility become degraded. Our study aims to show the minor views, so that network model is not competent for this research. However, we should pay attention the construction network models method to devide the sentence into clause and show not the full context but the word. We consider that this method enables users to access the unexpected words which are tend to skip over while reading. "TwitInfo"[18] presents a system for visualizing and summarizing events on Twitter. This allows users to browse a large collection of tweets using a timeline-based display that highlights peaks of high tweet activity with positive and negative sentiment. We consider that using timeline is applied to showing the view's changing over the days in our archiving. Sentiment viz"[19], "Kazemiru"[20], and "Tweet beam"[21] are visualizing applications for the general public to show the large information with Twitter. All of them show the tweets at random, so that all tweets have equal accessibility. And they have an interactive proposing the context by mouse over the icons. The normal display does not show the context, and they required the users' operations. To hide the text from the display can design more friendly. We want to apply this approach. The other interested points of these researches to be able to apply for our study are extracting sentiment of the context in TwitInfo and Sentiment vis to show the emotion's background of using the search word. Kazemiru classify the Tweets according to the scene and icons are applied with the color, to discover groups of similar tendency of views.

3.3 This research's visualization approach

From above, we will summarize the visualization methods which our research can apply.

- Collect the views about strollers:
 - We will use Twitter data for getting users' views about stroller of stroller users and the other people.
- Language Analysis:
 - Divide sentence into clause and show the keywords to enables users to access the unexpected words which are tend to skip over while reading.
 - Extract the tweet's sentiment to show the emotion's background of using the word.
 - Classify the tweets according to the scene.
 - Extract the station name.
 - Design of visualization
 - Set a calendar to show the view's changing over the days.
 - Map the tweets on each station name instead of using geo location data to show the characteristic of the place.
 - Present Tweets randomly to make higher accessibility for minor opinions.



Figure 1 Screenshot of our application

Table 1 The experiences of stroller users an	d the	other
people on Twitter		

1 1		
Stroller users	The other people	
There are few opportunities to	I saw a mother with stroller at	
get help from others	stairs, but I had no idea how to	
	do is better. So couldn't do	
	anything.	
I had commuted with stroller,	There was a mom who	
so that when I use a station	suddenly drift with a stroller in	
without elevators or escalators I	every change of direction at the	
hold my stroller with one hand	station. When I saw the baby in	
and my baby with one hand. I	the worry, his face was of the	
want to avoid rush, but working	man who attack the pass.	
mothers cannot. I met people	_	
who helped me to carry my		
stroller in a cool face.		
Appreciated.		
Asakusa is not recommended to	I watched a man helped	
stroller users. I wish the	holding a stroller at stairs which	
station's usability is better at	looks hard to use for holding a	
least.	baby mothers . Feel good.	
Thanks for someone who	I wonder people who are	
helped me to lift my stroller on	pushing the stroller do not feel	
stairs at Nihonbashi and	yourself dodge at not limited to	
Ootemachi, It was really	Disney,	
helpful.	I thought that while waiting for	
	a friend in the Sunday at a	
	station	



Figure 2 The image of calendar

Have an interaction system to show the context, and we design icons according to the classified categories.

The instructions at the next section tell you about our visualization design based on above list.

4 About our visualization design

Figure1 is the screenshot of our application.

Table 2 Example of Language Analysis1

Tag	Data		
Content	I saw the woman who was trying		
	holding her stroller at the stairs at Tokyo		
	station, and it looks hard, so that I asked		
	her "May I help you to carry your		
	stroller with you?". However, she		
	shunned my kindness. After that I will		
	talk only to the elderly.		
Station Name	Tokyo		
Latitude	35.611382		
Longitude	139.766084		
Emotion	Jegative		
Key Phrase	Tokyo, stroller, stairs, carry, with, hard,		
	shunned, elderly, kindness, only, talk		

Table 3 Example of Language Analysis2

Tag	Data	
Content	A young man helped me to lift my	
	stroller at the stairs at the station. He	
	was naturally nice guy, but it looked	
	so cool all the more! He was up to the	
	stairs already, but down to us to help	
	me! I greatly appreciate his kindness!	
Station Name	null	
Latitude	null	
Longitude	null	
Emotion	Positive	
Key Phrase	young man, help, lift, stroller, stairs,	
	nice, guy, cool, down, appreciate,	
	kindness	

Table 4 The icons			
ID	Image	Meaning	
a		The views of stroller users	
b	Ŕ	The views of the other people	
С	۷	The positive sentiment	
d		The negative	

....

4 771

4.1 Collect the views of stroller

About views of people are able to be seen on SNS; "Twitter" which is one of SNS includes users' views, which reflect their sentiments, lifestyles and environments from every walk of life. Many opinions about strollers at railway stations by the general public are opened. The tweets which include "station" and "stroller" are collected via Twitter Search API[22]. To collect the minor opinions, we set the result type as "mixed"; include both popular and real time results in the response. The collected views are classified as stroller users or the other people. It is judged by the users' profile information. When the

sentiment





Figure 5 The mouse over the station name

profile context includes the words like mother, childcare, baby, and nursing, the view is tagged as to stroller users, if not, it is tagged as the other people.

Furthermore, we constructed the contribution form in the application to collect the views of people who do not have an account for Twitter. Users have to insert 4 data in the form; users type (stroller user / others), date, views, and station name. There are required items except for a station name.

Table 1 presents some of collected views.

4.2 Language Analysis for views

Table 2 and Table 3 show the result of language Analysis for views. In this paragraph, we will introduce about our language analysis.

4.2.1 Sentiment and Key phrase

We extract the sentiment of "positive / negative" and key phrases from users' views by language analysis [23]. The extracted key phrases are limited to a noun, a verb, and an adjective. These key phrases make users to understand the content easily and increase imagination.

4.2.2 Classify the tweets according to the scene

In this application, we classify the tweets according to the scenes which are described at barrier free map at stations, like



Figure 6 (Left)Appearing the context by mouse over







"elevator", "escalator", "stair", and "family bathroom". In addition, we add a category of "exchange the train", which are mentioned in Matsubara's report. If tweet includes above the word, it is classified.

4.2.3 Extract the Station name

To extract the station name, we prepare the dictionary of station list. This dictionary includes the station name of Yamanote Line, as the sample case, and the based information of each station. This information is got by Hatena Keyeord API[24].

4.3 Design of visualization

4.3.1 The graphic design and structures

The views are visualized as web application written in processing.js. We design the two icons, the one means the views of stroller users(Table.4-a), and the other means the views of people who are not stroller user(Table.4-b). Each of icons has one view. If the included text's sentiment is positive, the heart shape is added to the icon(Table.4-c). If its sentiment is negative, the shape of tears is added to the icon(Table.4-d). Our content contains 3 categories.

- 1. Calendar (Figure 2) : The calendar is located in the upper part of the display. It has the arrows and users can select the date by mouse click. The icon size is depended on the calendar. If the view is published in the calendar's day, the icon size is magnified by 3 times. Furthermore it has the collide event (cf. 4.3.2).
- 2. Clustering (Figure 3): The images of Elevator, Escalator,

Stair, Family bathroom, and Exchanging trains are located in the upper part of display. The box is appeared by mouse click the image. The icons related to the scene are listed in the box. The stroller user's icons are listed from the right part of the box, and other's views are listed from the left part of it.

3. Station list (Figure 4)(Figure 5): The list of the station located at the bottom of display. The small circles above the name show the count of the views related to the station. The related icons will gather around of the name and station information is appeared by mouse over the station name.

4.3.2 Interaction and Movement

1. Basically action: The icons move around the canvas. The speed is between 1.0 and 2.0. Users can see the full text by mouse over the icon(Figure 6-Left). The movement of the icon is stopped and the scale is expanded while mouse over.

2. Collide event: When the icons collide each other, key phrase appears on the canvas(Figure 6-Right). To enhance the visibility of the text, three key phrases are appeared and this event is arise less than five at the same time. The displayed key phrases are selected at random on each occasion. The key phrases are shown like a bubble. When the bubble's position-y is going out of display, there fade out. We consider that it helps users to get information unintentionally.

5 System

Figure.7 shows the structure of our visualization systems. The PHP code which gets the data from Twitter is run every day via cron. And language analysis is held at the same time. After that, the data is saved as json file. The visualization application gets these json files via ajax.

6 User reactions after public

We published this application on 18 November. We got the users comment about our approach. Here we present some of them.

• I thought that it helps the needs of out society at the point of feminine.

• Intuitive application depended on the needs.

• I sympathize this approach because to go out with baby was too hard.

• Such a sharing information is very important.

• I found the unexpected views! I studied, and want to practice.

• It can solve the urgent problems.

• To visualize the social difficulty is important by web service, however I wonder if there is a solutions which can solve in that time and place.

7. Conclusion

Our study in this paper aims to show railway stations' experiences for strollers from the point of users' view. To approach this purpose, we proposed a visualizing web application to archive the views of railway stations experiences between stroller users and other people. We created a system to collect the views from Twitter and our own contribution system. We applied language analysis to the views and extract users' sentiment and key phrases of the context. In addition, we visualized these views to overview with the sentiment and the key phrases simultaneously.

We got the user comments after the publication. We regarded that our approach can present to consider the experiments of strollers at stations.

We considered that this will give a better understanding of various inconveniences for stroller users, and propose the guidelines of that what kind of behavior and understanding are required for each other.

Acknowledgement

This work was supported by Grant-in-Aid for Japan Society for the Promotion of Science(JSPS) Fellows Grant Number 26-632.

References

[1] Ministry of Land, Infrastructure, Transport and Tourism, *Barrier free and universal design*,

http://www.mlit.go.jp/sogoseisaku/barrierfree/sosei_barrierfre e_mn_000001.html ,2014

[2] JAPAN TODAY, *The 51 busiest train stations in the world– All but 6 located in Japan*,

http://www.japantoday.com/category/travel/view/the-51-busie st-train-stations-in-the-world-all-but-6-located-in-japan, 2013

[2] Nobuaki Ohmori, Ayako Taniguchi, Rikutaro Manabe, Yoshinori Terauchi, Sadayasu Aono, *Travel Behavior and Attitude towards Barriers against Out-of-Home Activity Participation of Women with Children : In Case of Mothers with Infants Living in Tokyo Metropolitan Area* : Papers on city planning Vol.46, No.3, pp.259-264, 2011

[3] Masumi Idei, Keiko Matsuhashi, Kazuoki Ohara, Yasuhiro Fujioka, *A Research on Station Use of Family with Babies and Little Children: A Study on Station Planning for Child-care Barrie-Free*, Summaries of technical papers of Annual Meeting Architectural Institute of Japan, Vol.E-1, pp.391-392, 2010

[4] Atsushi Matsubara, *A survey on the movement with children in public transport*, Foundation for Promoting Personal Mobility and Ecological Transportation

http://www.mlit.go.jp/common/001002187.pdf , 2013

[5] Hiroko Tatewaki, Kunio Hunahashi, Michihiro Kita, Takeshi Suzuki, Le Bin, *Behavior of Stroller Users in Umeda Terminal Area. Osaka*, Summaries of technical papers of Annual Meeting Architectural Institute of Japan, Vol.E-1, pp.917-918, 2004

[6] Ministry of Land, Infrastructure, Transport and Tourism, *Decisions to use strollers in public transportation*,

http://www.mlit.go.jp/report/press/sogo09_hh_000083.html, 2014

[7] Yuki Okuyama and Ayako Taniguchi, *A STUDY ON EXISTENCE OF GENERATION GAP CONCERNING WITH CHILD RAISING AND NEGATIVE SIDE EFFECT CAUSED BY PROMOTING BARRIER FREE MEASURE*, Journal of Japan Society of Civil Engineers, Vol.68, No.5, pp. I_1133-I_1142, 2012

[8] Benesse Holdings, Inc, Womenspark,

http://women.benesse.ne.jp/ ,2014

[9] Echo-Mo Foundation, Val Laboratory Corporation, *Rakuraku odekake-net*,

http://www.ecomo-rakuraku.jp/rakuraku/index/, 2014

[10] Val Laboratory Corporation, mamaspert,

http://mama.ekispert.com/, 2014

[11] Yahoo Japan Corporation, *chiebukuro* "Q&A about stroller",

http://chiebukuro.yahoo.co.jp/tag/tags.php?tag=%E3%83%99 %E3%83%93%E3%83%BC%E3%82%AB%E3%83%BC, 2014

[12] Tom Atlee and PórGeorge, *Collective Intelligence*, Evolutionary Salon Vol.2, pp.14-18, 2006.

[13] Tetsuro Takahashi, Yuya Noda; *Can Twitter be an alternative of Real-World Sensors?*, IEICE technical report.
 Natural language understanding and models of communication, Vol.110, No.400, pp.43-48, 2011

[14] Tsutomu Yamanaka, Yoshinori Hijikata, Shogo Nishida; Architectonics of a text-summarization system with temporal-spacial data, IPSJ SIG Notes, Vol.2009-DBS-149, No.22, pp.1-8, 2009

[15]Takashi Sasaki, Makoto Okazaki and Yutaka Matsuo, *"Earthquake shakes twitter users ; real time event detection by "social sensors*, Proceeding of the 19th international
conference on World wide web, pp.851–860, 2010
[16] Ryong Lee, Shoko Wakayama, and Kazutoshi Sumiya, *Urban Characteristics Extraction Based on Crowd Behavior by Tweets Analysis*, Information Processing Society of Japan
Database, Vol.5, No.2, pp.36-52, 2012

[17] Sawada Yoshito, Takahiro Endo, Muneyoshi Numada, Kimiro Meguro, and Haruo Sawada; *Analysis of Twitter messages in the heavy snow in 2011*, Institute of Industrial Science The University of Tokyo SEISAN KENKYU Vol.64, No.4, pp.467-473, 2012

[18] Adam Marcus, Michael S. Bernstein, Osama Badar, David R. Karger, Samuel, and Robert C. Miller, *Twitinfo: aggregating and visualizing microblogs for event exploration*, Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp.227-236, 2011

[19] Healey, C. G., sentiment viz :

http://www.csc.ncsu.edu/faculty/healey/tweet_viz/tweet_app/, 2013

[20] SSP Co.Ltd., Kazemiru : http://kazemiru.jp/ ,2014

[21] TweetBeam B.V., TweetBeam,

http://www.tweetbeam.com/, 2014

[22] Twitter.Inc., Twitter search API,

https://dev.twitter.com/rest/reference/get/search/tweets,2014

[23] XING INC., Language Analysis WebAPI,

https://lr.capio.jp/services/webapis/, 2014

[24] Hatena Co., Ltd., Hatena Developer Center,

http://developer.hatena.ne.jp/ja/documents/keyword/apis/rest,2 014

International Journal of Asia Digital Art&Design

Seokjin Kim Tokyo Metropolitan University kimusj@sd.tmu.ac.jp

Chris Chen Tokyo Metropolitan University papala2000@gmail.com Space Design of City Home Indoor Plant Module for Relaxing Space of Home Environment in East Asia Region



Abstract

In Right now, population of the world is increasing rapidly day by day, and as it will in the future. Large numbers of people gathered in a city which makes the city grow into a megacity. Especially in East Asia, according to the survey of population in the world, we can see that most of cities in East Asia have extremely high density and population. Most of people come to city to find a job, and work is the biggest source of stress, also past studies have shown people who live in a megacity get stressed easily as crowded and polluted environment. We need to deal with the stress, or it may cause some serious health problem. The objective of this design project is to create a modular space which provides relaxing time for the people who live in a megacity of East Asia, an example of new lifestyle.

Keywords: indoor plant, module design, lifestyle

1 Introduction 1-1. Background of the study

Right now, population of the world is increasing rapidly day by day, and as it will in the future. Large numbers of people gathered in a city which makes the city grow into a megacity. Especially in East Asia, according to the survey of population in the world, we can see that most of cities in East Asia have extremely high density and population [1]. Most of people come to city to find a job, and work is the biggest source of stress, also past studies have shown people who live in a megacity get stressed easily as crowded and polluted environment. We need to deal with the stress, or it may cause some serious health problem.

1-2. Aim of the study

The purpose of this study is to create a space or a product which can provide relaxing effect in a healthy way for the people who lives in a big city of East Asia. There are three important factors that need to be included:

- (a). If it's fit for the limited space in cities of East Asia.
- (b). The effect of release stress and relax in healthy way.
- (c). Easy to do, and not expensive.

In details of the module, there are many issues we want to look into. Material is one of important factors of the module, for making a decision; several types of material had tested on 3D simulation. Each module has being designed to join other module with organized water supply system, and was defined 3 standard sizes for fitting the size of houseplants. There are many kinds of houseplants and some of plants can only be grown in appropriate condition. To create the condition, we need to consider several factors (such as moisture, light, temperature, humidity and fertilizers. Temperature and humidity) are hard to control if not in a greenhouse, but moisture, fertilizers and light issue could be solved by the function of modules. On this project, we also made a model to do some experiments for collecting and analyzing the results from the users, identify the relaxation effect of the module and compare difference between the module and traditional flowerpot.

2 Related Researches

2-1. Houseplants in East Asia

Since people live in such stressed environment, we need to learn how to relax and feel calm. There are many ways exist which can relief our stress and feel relaxed (such as gardening, Yoga and music), also there are some cultural spaces which have a great effect of relaxation. Researchers also found that



Figure 1. Relaxation space, houseplants, module design.

plants are very good for relief stress and pain even we just place it in our room. On the other hand, according to the survey, living spaces in megacity of East Asia are extremely small and limited. It means people can't afford something which is too big (such as a home theater or a pool). We want something is functional but not take too much space; modular design might be a very good answer for it (Figure 1).

Houseplant is a plant that grows in house, office or any building. People usually grow houseplants for decorative purposes, positive psychological effects, or health reasons such as indoor air purification [2].

There are many advantages of growing houseplants at home. Therefore, in the case of megacity, people were busy at work and have no time to take care of plants, sometimes even not at home for few days due to a business trip, and cause plants die (Figure 2-1) [3]. Moreover, since living spaces are limited in megacity, there is no enough space for houseplants at home, so some people choose not to grow a houseplant at home. Flowerpot is the most common item for growing houseplant; it has multiple standard sizes which depend on the size of plant. But in the situation of city, the flowerpot takes too much space

Figure 2-1



Figure 2-2 Figure 2-3

Figure 2-1. Dried-up houseplant. Figure 2-2. House plants on

balcony. Figure 2-3. Flower pot placed next to the window.

from our home if we just line it up (Figure 2-2) [4]. Also, place flowerpot at inappropriate location such as window or door side may cause some inconvenient issue (Figure 2-3) [5].

2-1. Modular design

The basic idea underlying modular design is to organize a complex system (such as a large program, an electronic circuit, or a mechanical device) as a set of distinct components that can be developed independently and then plugged together. Although this may appear a simple idea, experience shows that the effectiveness of the technique depends critically on the manner in which systems are divided into components and the mechanisms used to plug components together.

Modularization, due to the functional independence it creates, has been called the goal of good design. Industry has made an effort to modularize products to be flexible to the needs of end users and marketing. This effort has led to the creation of product families. Occasionally, modules are created with some aspects of production in mind. However, this modularization is done without fully understanding the implications of the design. Although often yielding highly functional products, once the entire manufacturing process is accounted for, this

International Journal of Asia Digital Art& Design

unstructured modularization often leads to costly redesigns or addition, the expensive products. In unstructured modularization makes the process difficult to repeat if it is successful and difficult to avoid if it is unsuccessful. Modularity requires maintaining independence between components and processes in different modules, encouraging similarity in all components and processes in a module, and maintaining interchangeability between modules. Modularity with respect to manufacturing necessitates understanding the various manufacturing processes undergone by each attribute of each component. We could use various combinations of modules to fit our needs and the space of the room, such as limited living space issues could be solved by the flexible properties of modularization.

3 Concepts

The concept of this idea is all about relaxation, growing houseplants in a modular space which provides relaxing effect for the people who live in megacity of East Asia. There are various kinds of modules which have different functions and purposes, and the numbers and types of modules depend on the users and environments.

In order to grow the plants, three sizes of module (Figure 3) were considered; a small module for a small size of plant, a medium module for a medium size of plant and a large module for a large size of plant. Medium and large modules are multiples of small modules, so that modules are able to create a modular partition and space.

Except growing plants in mainly function of module, additional functions are also very important to this idea. Think about what we need in growing plants, light and water are the essential elements for plants. For this reason, it would be convenient if we apply water supply and lighting modules into this idea. On the other hands, music is also a good way to relief stress, image if we can read a book and listen to some soothing music in a green space, it could be a very good experience of relaxation.

The next step is to think about how to water a plant, we can do it just simply by our own, but sometimes people are away





Figure 4. Ideas of additional modules

from home for a brief time by work or private reasons. This is also a good reason to explain why some people don't want to have plants in their house in megacity. To solve this problem, we can use some water pipes which are connected to water supply modules and convey water to the plants. Here are some ideas of additional modules (Figure 4).

To create a space that make people feel relaxed and calm, we set up the space between balcony and living room. It makes people feel they aren't inside of the building but outside, and also feel safety as inside of the house, a middle space between inside and outside of the house.

Light is an essential element in growing a plant. We need to consider the quality, quantity and duration of sunlight, and it depends on house facing direction and position. In this project, the space is set up between balcony and the living room so the sunlight can go through the window to the plants. However, some houses may not get enough sunlight due to the direction and position issues, in these cases, artificial light may be needed to keep our plants healthy, so the best way we can think about is using both sunlight and artificial light for adapting various conditions.

Before we think about what is going to change in our lifestyle with this space, first we need to imagine what people will do if this space is set in their house. For this reason, we will perform a simulation that by the husband as we set at first of this chapter as below (Figure 5):

(a). Come back home at 7:00 pm, and have a dinner with family

(b). After dinner, the husband walks through relaxation space to the balcony and then smokes a cigarette (point 1).

(c). Take care of houseplants (point 2).

Figure 3. Plant's module

(d). Sit on a chair at middle of relaxation space and read a book (point 3) for an hour.

(e). Leave relaxation room and have a chat with family, then go to bed.

From this simulation, we can see the husband spends about an hour to relax in relaxation space alone and do some houseplant care. These actions are actually helping him to relief stress from works and clearing his mind, in addition, he can communicate with family more smoothly without work stress. Also, this is just one of the examples, as the concept of idea; we may do any other activities (such as Yoga or listen to music) by our preference to relax in relaxation space.



Figure 5. Modular space lifestyle

4 Detail of module

The module is designed in way which radiates relaxation and calmness, but with a simple structure which is easy to use for any user. Each module includes a light unit that provides lighting for plant and space, so even the sunlight is not enough for the house, the plant can still be fine by the grow light [7].

All of the modules are designed in organized way which is able to connect with each other (Figure 6-1), but the contents is different that depends on the function of modules. For example, a plant module is formed by the light, soil and plant unit, and a water module is formed by the light, water and container unit (Figure 6-2).

Besides the plant and water module, there are three additional modules designed to produce more functions and varieties for the space(Figure 6-3).

(a). Cap module: like a cap to put upon the module so user can utilize the space (such as a music player or some books) which top on it.

(b). Stand modules (left and right): both modules have to use together to create a space at the center of modules, similar to cap module, this module is also designed to utilize a space for additional function.

Figure 6-1



Figure 6-2



Figure 6-1 and 6-2. modules and contents. Figure 6-3.

Additional modules.

5 Size of module

Before we set up the size of module, first we need to know height of houseplants and size of standard flowerpots. Here are the sizes of houseplants (Figure 7-1):

(a). Small size houseplants 30~40cm height (examples: Peperomia, Spiderplants and Green Dracaena)

(b). Medium size houseplants 60~80cm height (examples: ZeeZee plant, Arrowhead Vine and Chinese Evergreen)

(c). Large size houseplants 90~120cm height (examples: Snake plant, Croton and Dieffenbachia)

There are many kinds of houseplants and some of them even grow over 200cm height, but in this case, we will pick up

International Journal of Asia Digital Art&Design



Figure 7-1. Size of houseplants. Figure 7-2. Size of flowerpots

and modules.

small to medium size of houseplants only, because of large size houseplants are not suitable for the living space in East Asia, and if the houseplant is too big, the module won't be needed either.

By the size of houseplants and flowerpots, we had set up 3 sizes of modules to fit various houseplants (Figure 7-2).

6 Results and Conclusion

The result of this project is as images of below (Figure 8). The modular space could provide a great relaxation effect, and release the stress from work and the cities. Even for the people who are busy or having some living space issues in East Asia, this idea is able to handle these problems. However, it is an unexpected answer from the survey that people are not interesting in houseplants, we may need to think about how to make people feel interested in houseplants and show people that plant is good for health and mind by the modular space in the future.







Figure 8. The modular space.

References

[1] R. E. Munn, ["Toward Sustainable Development: An Environmental Perspective", F, Archibugi and P. Nijkamp, (eds)] Kluwer Academic Publishers, 1989

[2] Munro David A, ["Sustainability: Rhetoric or Reality?"In Trzyna, Thaddeus (eds)] Center for the Environment and Public Policy 1995

- [3] "Garden work"
- http://sundaygardener.blog8.fc2.com/blog-entry-378.html
- [4] "Veranda and houseplants"
- http://www.ts-niwa.com/blog/eco/tsgs-240.html
- [5] "Houseplants"
- http://blogs.yahoo.co.jp/nwqrt283/33683961.html

[6] Kim Myong Ju, Kwok Deok Hun [Understanding of Ubiquitous] Ihan 2008

International Journal of Asia Digital Art and Design Vol.19 No.01 Date of issue 2015/04/02 Asia Digital Art and Design Association

> *Chair* Kiyoshi, Tomimatsu

Chairperson, Academic Referee Committee Hyunsuk, Kim Toshiya, Kuroiwa Park, Seungho Kuo-Kuang, Fan

Designed By Iwamoto, Yushi Edited By Takase, Yuiko Izumoto, Chika

Published By

Asia Digital Art and Design Association c/o Faculty of Design Kyushu University 4-9-1, Shiobaru, Minami-ku, Fukuoka, 815-8540, Japan http://adada.info adada.post@gmail.com Copyright 2015 Asia Digital Art and Design Association