Conference proceedings of the Design Management Academy
Research Perspectives on Creative Intersections

edited by
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Editorial: Research Perspectives on Creative Intersections

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The conference general theme Research Perspectives on Creative Intersections captured the overall conference spirit. It also reflects the conference planning and organisational processes which involved the community of international scholars located in different institutions, faculties, schools and departments.

The interdisciplinary nature of the conference enabled active intersections of scholars from the fields of design, social sciences and business studies. The mingling of researchers from diverse disciplines reflects the need for interdisciplinary approaches to research complex issues related to innovation.

The intersection between emerging and established researchers was an intended aspect of the conference. The reason was that today’s PhD candidates will drive the future research. The conference succeeded by attracting significant number of PhD candidates who represented a third of the conference delegates. This provides a good indication for the future growth research related to design innovation.

Altogether, 295 authors have submitted: 140 full papers and 31 workshop proposals. These numbers indicate that a single authored research is no longer the norm. The intersection which stems from collaboration amongst researchers to undertake and disseminate research is now becoming the established practice within the design innovation research.

The 19 conference tracks, for which the papers were submitted, were organised within 7 overarching themes (see Table 1). The track facilitators ultimately shaped the overall conference scope and direction. The tracks’ topics acted as the focal points for the overall Call for Papers. Thus, our thanks you go to all the 69 tracks’ facilitators. It was them who collectively were responsible for the conference programme and we would like to thank them for their valuable services on the International Scientific Programme Committee.
### Table 1 Conference Tracks

#### Theme 1) New Models of Innovation
- Track 1a. The Interplay between Science, Technology and Design
- Track 1b. Interdisciplinary Perspectives and Trends in Open Innovation
- Track 1c. FROM R&D TO D&R: Challenging the Design Innovation Landscape
- Track 1d. Design creating value at intersections
- Track 1e. Design management transforming innovation strategy

#### Theme 2) Product-Service Systems
- Track 2a. Capturing Value and Scalability in Product-Service System Design
- Track 2b. Service Design for Business Innovation for Industry 4.0

#### Theme 3) Policy Making
- Track 3a. Creative Intersection of Policies and Design Management

#### Theme 4) Intersecting Perspective
- Track 4b. Challenges and Obstacles to the Enactment of an Outside-In Perspective: The Case of Design
- Track 4c. At the Intersection Social Innovation and Philosophy

#### Theme 5) Methods
- Track 5a. Design practices of effective strategic design
- Track 5b. Markets and Design: Vertical and Horizontal Product Differentiation
- Track 5c. Foresight by Design: Dealing with uncertainty in Design Innovation
- Track 5d. Contemporary Brand Design

#### Theme 6) Capabilities
- Track 6a. Building New Capabilities in an Organization: A research methodology perspective
- Track 6b. Exploring Design Management Learning: Innovate with 'user' oriented design and KM perspectives
- Track 6c. Design teams in the pursuit of innovation
- Track 6d. Designing the Designers: Future of Design Education

#### Theme 7) Foundations
- Track 7a. Pioneering Design Thinkers

We would like to also thank the over 150 expert reviewers who provided their valuable time to provide critical peer feedback. Their service on the International Board of Reviewers was invaluable as the good quality peer reviews provided a vital contribution to this international conference. Each reviewer scored papers on a scale of 0 to 10 and provided critical review comments. Most papers were reviewed by two people, though some had three or even four reviewers, and in a very small number of cases only one review was submitted. Total number of submitted full papers was 140. After the blind peer review process 66 papers (47%) were accepted and 49 (35%) papers were provisionally accepted as these needed major revisions, and 25 (19%) papers were rejected.

In making the final decisions about papers, the Review Committee first looked at all papers where the difference of opinion between reviewers was 4 points or greater and moderated the scores if necessary. The Review Committee then discussed all papers that were just under the general level of acceptance to determine outcomes, before finally looking at any exceptions.
At the end of the review process 103 (73%) paper submissions were accepted for presentations of which 95 (68%) were included in the proceedings and 38 (27%) papers were rejected. Seven accepted papers were presented at the conference as research in progress and they were not included in the proceedings.

The workshops provided another intersection on how delegates and workshop facilitators interacted. Altogether, 31 workshop proposals were submitted and 17 (54%) workshops were accepted by the International Workshop Organising Committee. We would like to thank the International Workshop Organising Committee members: Katinka Bergema, Nuša Fain, Oriana Haselwanter, Sylvia Xihui Liu, Ida Telalbasic and Sharon Prendeville for providing their expertise.

We would like to thank both keynote speakers, Professor Jeanne Liedtka and Mr Richard Kelly, who generously gave their time to share their insights with the conference delegates. Their generosity allowed us to offer bursaries to five emerging researchers to attend the conference. The bursar recipients were selected from close to 40 applicants. The number of applicants indicates the need to setup funding schemes to allow emerging researchers to attend international events such as this conference.

The PhD Seminar event which took place a day prior to the conference was attended by over 100 delegates. The PhD Seminar was chaired by Dr Sylvia Xihui Liu and Professor Jun Cai. Initially 40 submissions were received of which 36 were presented at the event. The event culminated with a debate organised by the PhD students who were inspired by the “Open Letter to the Design Community: Stand Up for Democracy” by Manzini and Margolin (2017). We are grateful to the debate organisers.

The location of the conference in the Jockey Club Innovation Tower designed by Zaha Hadid at the Hong Kong Polytechnic University has also provided delegates with visible cultural intersections of a rapidly transitioning major interconnected global city from one political sphere of influence into another. The conference would not have happened without the solid work provided by the local organising team which was led by Professor Cees de Bont and consisted of: Ms Rennie Kan who took up the role of the fixer; Mr Pierre Tam who in his role as the Conference Secretary tirelessly worked on satisfying at many times conflicting requirement; Ms Flora Chang who checked and checked again all delegates registrations; Mr Rio Chan wizard of IT and Mr Jason Liu who provided the visual direction for the conference.

The Design Management Academy’s international research conference was organised under the auspices of the Design Society’s Design Management Special Interest Group (DeMSIG) and Design Research Society’s Design Innovation Management Special Interest Group (DIMSIG) in collaboration with: The Hong Kong Polytechnic University, Loughborough University, Tsinghua University, University of Strathclyde, Politecnico di Milano and Delft University of Technology. The conference was a culmination of two years of planning and the 2019 conference planning commenced well before the 2017 conference programme schedule was finalised. It is a hope that the conference will act as a platform to build a diverse community of scholars who are interested to explore and discuss design innovation practices.
Reference


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Theme 2: Product-Service Systems
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Section 2.a
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Introduction: Capturing Value and Scalability in Product-Service System Design

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It is widely recognized that Product-Service System (PSS) is a promising new business creation approach. In the digital era and with the rise of the service economy, PSS provides enterprises with additional approaches to create sustainable innovations and build competitive advantages. It mainly focuses on designing good experiences, establishing value networks among different stakeholders, creating new business models, and improving existing business models. Furthermore, PSS emphasizes service-dominant logic and the “use phase” of the product life cycle analysis.

Although the value of PSS has been widely recognized, there is still a lack of successful PSS innovative cases. Past research has noted that there are a lot of barriers and challenges when designing and implementing PSSs. In addition to understanding the user’s needs, wants, and desires, PSS design has to adopt a holistic view on value creation, scalable methods, value propositions integrating internal and external stakeholders, and organizational transformation. This section aims to offer a platform for practitioners and researchers to uncover compelling insights, discuss latest developments, and envision future directions for PSS design.
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On the Service Design of the Restaurant Queuing System in the Business Circle

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With the rapid development of China’s economy, people’s living standards have stepped on their way of continuous improvement, and the number of dining out also increases continuously. Therefore, the restaurant-queuing problem in commercial circle has become a specific social phenomenon. The paper aims at studying restaurant queuing system of commercial circle from the perspective of service design to figure out the problems in current restaurant queuing system, complaints and demands from users through conducted research and contextual inquiry, and collect statistics for studying user’s experience and analysing system function and affordability so as to draw the service blueprint of queuing system in commercial circle. Furthermore, suggestions on solution of various problems in restaurant queuing will be provided in order to better arrange business space, restaurant resources and users’ time.

keywords: Service Design; Restaurant Queuing; Business Circle; System

Introduction

The economic model has gradually transformed from agricultural and industrial economy into servicing mode with the acceleration of economic globalization. Product demands focusing mainly on function have turned to concentrate on customers’ experience and service received. At present, restaurant industry comes to be a basic service industry. Along with the increasing living standard, a large proportion of citizens eat out more frequently in China, this condition gives rise to a typical social phenomenon nowadays, namely there are lots of customers jostling in front of popular restaurants and waiting for seats for having lunch or dinner, this phenomenon also triggers a series of problems. In terms of service provider, improper queuing system and low-efficiency services cause loss
of customers and damage for brand reputation. Considering of customers’ experience, queuing for a long time not only wastes time but also negatively affects dining experience. Regarding of public space in commercial circle, lots of people queuing in the location may give rise to space jam which is inconvenient for people to exit and incurs possibility of property loss etc.

**Literature review**

Service design has been gradually applied to the field of commercial and public services, through the integration of resources, redesign service model, re-allocation of service processes, etc., so as to establish and implement a high-quality service model, which creates greater business profits and brand value. At present, most of the research in this area is associated with management, sociology and other disciplines. The research on the combination of queuing system and service design has relatively attracted less attention from the academic field. Based on the research method of service design and the theoretical research of queuing system in catering business, this paper analyses the restaurant queuing system in commercial circle.

**Restaurant queuing system**

Restaurant queuing has become a typical social phenomenon in china, giving rise to a lot of problems. Profound research has been conducted on restaurant queuing problem. Dai Wei-qi (2006) put forward a series of problems related to separate operation in the field of business management, service quality deterioration and insufficient implement in restaurant queuing management have come into existence. Shi Ying (2002) analysed the existing problems regarding of restaurant queuing management from three aspects: waiting time of customers, length of the queue and service capacity utilization ratio. Wang Huan-yu (2007) thought that restaurant managers should arrange necessary services orientated to expected number of customers and settle down arrival time to ensure needful reception capacity. Han Ya-juan and Xie Hui (2012) established a queuing model with loss queuing model in different waiting area and queuing model with customer exiting in waiting area, and therefore provided a theoretical basis for effective queuing management.

These studies have brought up some problems and reasons for queuing in restaurants. But they did not consider the full range of services from the perspective of users to give full service experience. Meanwhile, with the development of Internet and technology, the current situation of restaurant queuing system has changed. In this paper, we focus on the restaurant queuing service system in the mobile Internet era.

**Service Design**

Service design refers to a holistic approach under the intention of helping to develop and provide high-quality services, contributing to acquisition of comprehensive and empathic understanding on users’ needs. Shocstack (1985) proposed concept of “service interaction” and pointed out the importance of tangible and intangible service, that is, face-to-face interaction between providers and receivers as well as service interaction between customers and hardware facilities, physical environment in the process of offering services. Loverlock (2004) stressed all factors like service staff, service facilities, service environment and other personnel in every link affecting the service experience of
customers and their perception and recognition towards enterprise culture. Yoo, Arnold and Frankwick (2012) and other scholars insisted that interaction among customers also delivers an impact on the whole service experience during service. Zhang Fang (2015) presented the composition of restaurant service encounter factors under the background of mobile Internet, and analysed the relationship between customer experience value and behavioural intention.

In the restaurant queuing system, there are interface encounter, physical environment encounter, personnel encounter and other encounters. Based on the comprehensive service encounter in the system, this paper explores methods and suggestions for improving the queuing system.

**Research on related products under mobile Internet context**

Along with progress and development of the Internet and technology, more and more restaurant queuing products come into existence in the market, mainly classified into three categories: the first is based on mobile applications, focusing on mobile applications and public number; The second category is related to intelligent hardware products. The former, with great flexibility in time and place, can be used for ordering, waiting in anytime, anywhere while the latter has a greater limitation under comparison. The third refers to a product combining mobile applications and smart hardware, can be operated through phone applications to fulfill the function of waiting for a number of restaurant, and such product is very popular in the current market.

Comparative analysis of three hot products in the market will be conducted (Table 1). “Public remark” is based on its advantage of huge restaurant information resources, and diverse restaurant queuing functions, but only available to some cooperative restaurants, but with low utilization rate and unable to provide accurate queuing time. Haidilao, well-known for its service quality, has researched and developed brand application combined with all services of queuing, takeout, meal order and base retail, available for providing queuing details of different restaurants for the convenience of customers on choosing the right dining room, and offering snacks, beverages and entertainment equipment and other services in the process queuing, but without real-time queuing reminder that makes customers easier to be informed of the number and results in time waste; the waiting area is usually set outside the store surrounded with public environment and queuing in such space may bring about space jam to a certain extent inside the market. “Enjoy the Delicious without Waiting” combines three platforms of WeChat public number, mobile applications and intelligent hardware, with function of queuing, food reservation, reservation and others. It is a more mature product currently, but still confined to functional products, without taking other factors into consideration in the whole service system process, such as: waiting area environment, recreation during waiting time and so on.
Table 1  Analysis of relevant products

<table>
<thead>
<tr>
<th>Product</th>
<th>Relying platform</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public remark</strong></td>
<td>• APP</td>
<td>• Own huge resources and information of restaurants</td>
<td>• Confine to some restaurants at low utilization rate;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Gather group-buying, paying, remarking and others.</td>
<td>• Unable to provide accurate queuing time.</td>
</tr>
<tr>
<td></td>
<td>• Offline hardware</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Haidilao</strong></td>
<td>• APP</td>
<td>• Provide queuing details for different restaurants;</td>
<td>• Provide no real-time reminder.</td>
</tr>
<tr>
<td></td>
<td>• Offline hardware</td>
<td>• Good offline service, provide snacks, beverages and recreation facilities</td>
<td>• The usually outside waiting area with deficient environment may affect market space.</td>
</tr>
<tr>
<td><strong>Enjoy the Delicious without Waiting</strong></td>
<td>• APP</td>
<td>• Good flexibility with combination of online and offline;</td>
<td>• Lack the consideration of other factors in the whole queuing service such as environment of waiting area, pastime way;</td>
</tr>
<tr>
<td></td>
<td>• WeChat Subscription</td>
<td>• Use in WeChat public number, Do not need to download other apps again;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Offline hardware</td>
<td>• Remind queuing time automatically.</td>
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Research methods

This study applies methods and tools of service design to explode the status quo of the restaurant queuing in commercial field and the experience of users in the service experience process, followed by analysis on the function and affordability of the restaurant queuing system, finally service elements of the restaurant queuing system will be summarized. The research contents of each stage are explained as follow:

The first stage refers to the dining problem. Through questionnaire survey, this paper firstly discusses existing problems and users’ behaviours in the restaurant queuing system based on the customer’s perspective. Through contextual inquiry and interview, customers (service recipients) and servicers (service provider) will be observed and interviewed in the process queuing, and provide in-depth suggestions and analysis on user demands for restaurant queuing system.

The second stage is related to the analysis of demand. Target user groups are divided and typical personas are established by reference from the previous research. Furthermore, customer behaviour and emotional experience are analysed through drawing of map on customer experience process, which understands user needs, complaints and design opportunities.

The third stage is associated with functional analysis. Combined with user needs in the design research, the basic functions and auxiliary functions of the restaurant queuing system are analysed to determine the fundamental function points of the system, and the
whole function of the system is subcategorized into several sub-functions according to the logical order from main to secondary.

The fourth stage involves the practice of generating system availability and service elements. Based on the functional analysis, the function-activity interaction matrix is used to obtain the system affordability which can meet the users of functional requirements and behavioural habits. Through application of service blueprint tool, the user’s behaviour corresponds to the function of the system, so as to get the service touch-points in the service before, service, service after, which generate service elements.

**Service design research on restaurant queuing system**

In order to inquire into the deep reason for restaurant queuing and complaints or demands from users, this design survey adopts approaches for combining questionnaire survey, contextual inquiry with interview.

**Questionnaire Survey**

The survey was conducted in the way of online webpage survey from “questionnaire star”, with a total of 198 questionnaires downloaded, including 172 valid questionnaires. The questionnaire is divided into two parts. The first part lies in the basic information of the respondents, including gender, age, occupation and monthly income. The second part covers the queuing system of the restaurant, such as queuing time, number of meals, factors and so on.

The questionnaire survey data shows that the proportion of men and women participating in this questionnaire is basically balanced (male 48.23%, female 51.77%). And the targeted users are divided into three groups according to differences in occupation and age: students, workers, middle-aged. Specific findings are as follow:

- Students (30.81%) eat in restaurant 5-10 times (40.12%) in a month, most of whom are willing to wait in line for meals, can accept a relatively long queuing time. But they also believe that unpredictable queuing time (74.42%) is the biggest problem. They usually use mobile applications (83.72%) to kill time while waiting for a meal or stroll around the shops.

- Workers (41.63%) also eat in restaurants frequently, and decide whether to wait in line for meals depending on purposes for having meal. And most people choose to spend the time waiting in queue by chatting with their peers (32.4 percent) on cell phones / tablets (66.13 percent).

- With less frequency compared with students and workers, most elderly (11.61%) are unwilling to wait for meals (72.44%) and eat about less than 5 times a month in the restaurant. Most of them think that a good waiting environment (57.98%) is an important factor to decide whether to wait or not. During the waiting, they mainly chat with their companions (58.42%), followed by the choice of reading some magazines provided by the restaurants (30.2%).

From the above findings, the customers of different ages and occupations share similarities and differences in behaviours, demands, waiting psychology.
• User group. Based on the above data, the main consumer groups in the restaurant are students and workers. They have meal in restaurants with a higher frequency and are able to accept the restaurant line-up.

• Waiting for demand. Depending on the purpose for having meal, there is also a difference in the demand for restaurant queues. Considering of the purpose of entertainment for the purpose of dining, customers can accept a longer time, and give priority to waiting environment and approaches for enjoying pastime. In order to conduct business negotiations and make order for daily work meal, customers generally book earlier, and cannot accept a long queue. In this case, they pay attention to the efficiency of the queue and quality of service.

• Waiting behaviours. During the queuing period, different age groups choose different ways for waiting in line. Most of students and workers prefer to play mobile phones / iPad or stroll around the shops to spend waiting time, while the elderly is in favour of spending time for queuing through reading magazines and books in waiting area.

**Contextual inquiry and interview**

Contextual inquiry and interview are conducted to further explore user’s behaviour and psychology in the process of queuing. The research time is respectively at dinner peak time during holidays and festivals and lunch peak time in working days with research locations orientated for popular restaurants inside the Jiedaokou, Hanjie, Guanggu business circle of Wuhan city. Seven typical users are selected for contextual interview, referring to respectively: two undergraduates, two company employees, one retiree and two restaurant waiters. The interview lasts about 20-30 minutes on average. Meanwhile, the approach of using video and recording equipment is applied to record the research after the permission of interviewee. The survey results are concluded as follow:

• Dinner purpose decides whether to wait up in line or not, for example: under the purpose of tasting in a famous restaurant, they’ll keep on waiting regardless of queuing time, environment, etc., but they are unlikely to queue for meals when having lunch on working days.

• Waiting area environment is also regarded as an important factor for users to decide whether to wait or not. Clean and comfortable waiting area environment is inclined to make users more willing to queue for meals; it’s best to provide some infrastructure and entertainment equipment, such as: charging sockets, wireless networks, magazines and books, computers and so on.

• Select the ways for enjoying pastime according to the waiting time during the queuing. For example: stroll around stores with more than half an hour waiting; chat with friends, play phone and so on when the waiting time is less than 20 minutes.

• Most users choose to use the app of "Enjoy the Delicious without Waiting" and other mobile applications before taking the number for queuing, but the real-time data may be inaccurate, leading to arrival at the restaurant ahead or the problem of still queuing for a long time or restarting another round of waiting after having passed the turn.
Restaurant servers mentioned that many problems have appeared in the peak hour of queuing for meals: Firstly, it’s difficult to arrange the table orderly with the influx of many customers, and sometimes there are some mistakes among queuing systems of different platforms, all of which easily lead to misunderstanding among customers; Secondly, the correlation between queuing time and customer’s dining time, in other words, the former’s dinning time basically determines the queuing time of the next customer; Thirdly, there is dilemma for a large number of customers returning over the number; Fourthly, various service quality for different customers may cause the contradiction among customers and conflicts between customers and service personnel.

**Personas**
The above design research concludes that there is a certain correlation between different age groups, occupational characteristics and user’s psychology and behaviours of queuing. Therefore, based on different age and occupation, three user’s personas will be established, namely: Anna (Figure 1), college students, frequently going shopping and having parties with friends in business circle, so the choice of eating in restaurants is more preferable in most cases. Jack (Figure 2), a company employee working around business district, usually has lunch in nearby restaurant without the need for queuing. But when having a party with colleagues and friends, he generally makes a reservation or takes the waiting number by calling or on the app, or queues timely; Susan (Figure 3), one of the retirees, occasionally dinners together with the family and friends outside, focusing on the restaurant environment, including dining environment and waiting area environment.

**Anna**
Age: 22 years old  
Identity: college students  
Hobbies: travel, shopping, sports  
Personality: Optimistic, friendly

**Character description:**
As a college student, I usually go shopping, watch movies, take part in party with friends in the after–school leisure time, so with the frequency of eating in business circle. Besides, as a food lovers, I often ask students to eat in restaurant with high marks online and good reputation, under which we don’t care so much about queuing, because we’re aware of the queuing thing when eating in famous one. At this time, we generally will be in shopping malls, and go back to restaurant until it is close to our queuing number.

*Figure 1  Persona 1-Anna*
Research on Customer Journey
The preliminary contextual inquiry records customers’ behaviour in the process of queuing, and explores the whole experience of the target users before, in, and after...
service based on the arranged personas (figure 4). In the meantime, the following complaints from the customer journey map are generalized:

- Before service, it’s difficult for the user to choose proper restaurants and find the exact location through the large amount of or incomplete information;
- In the process of receiving services, without knowing the waiting time after having received the card No., therefore it’s hard to choose the approach for enjoying pastime during queuing, long time of waiting could gradually trigger customers’ negative emotion, especially in poor waiting environment that’s prone to incur annoyed feelings, even cause conflicts between customers and service staff, and among customers. Moreover, in the absence of reminding the precise time, the user can easily pass the turn while waiting, leading tore-queuing after returning to the restaurant.
- After service, due to the excessive number of customers, service personnel may not be able to serve the new customers, making some customers receive the feeling that they are treated with no hospitality, and they are unable to order; and in some cases, the slow speed of serving meal gives users a negative impression on service quality.

Figure 4  Customer Journey Map

Function Analysis of Service System
Analysis of user’s experience focuses on exploring their behaviours, while functional analysis focuses on defining the system boundary. The following functional system diagram (Figure 5) is created based on the analysis of basic and auxiliary functions of restaurant queuing service system. It can be seen from the figure that the row number, the first-level function, in the restaurant queuing service system is considered as the core function of the system. In order to give users a good queuing experience, it’s preferable, in the theory, to provide users with necessary restaurant information, specific information
about the tables, comfortable waiting environment and guidance for service staff after the queuing in second-level auxiliary function.

In addition, it’s also suggested to refine the functional framework in second-level function, before and in service, offer detailed information of restaurant introduction, per capita consumption, dish features, user comments and others for users to be informed and choose proper restaurants. In service, it’s better to provide real-time waiting time and table info to have users known of the instant queuing situation; provide comfortable waiting environment, and configure appropriate infrastructure, such as: charging place, wireless network, and game equipment and so on. After the queue, the practice of providing thoughtful services to guide users seating successfully is recommended.

Figure 5  Function Analysis

Affordability
Affordability refers to the specific feeling on the possible behaviours provided by the content and thing, describing connection of environmental attributes and individuals, in other words, the interaction between service environment and users in restaurant queuing service system. The paper discusses the functional affordability of restaurant queuing service system based on the function-activity interaction matrix (Table 3), here draws the following conclusions:

- Provide basic information of restaurant. When the user browse and select the restaurant, the system provides necessary basic information of the restaurant, including: Restaurant introduction, per capita consumption, specialty dishes and user evaluation. In the process of interaction, it is mainly the functional interaction between the platform that contains websites, applications or subscriptions and the customer, and the physical interaction between the customer and the service provider.
- Provide queuing time and table information. Queuing time and table information is regarded as the core element of the entire restaurant queuing system, running through most of the interaction with the service before and during the service. In
browsing the restaurant information and selected restaurant behaviour, the user needs to receive guidance from the details of the restaurant information and the specific circumstances of the queue. Those information should be provided through the software or the waiter. In the process of waiting in the queue, the system provides accurate queuing time and table information, allowing users to understand the real-time queue.

- **Provide complete waiting area environment.** In the queue, the restaurant provides a comfortable waiting environment, with sufficient service facilities and real-time alerts. One of the most important factors lies in the interaction of real-time reminder, it can be provided to users by the service staff, mobile applications and other smart hardware.
- **Provide follow-up services.** After entering the restaurant, dining environment and attentive services also affect the entire experience. It is mainly based on the physical interaction between service personnel and customers.

*Table 2  Function-Activity Interaction Matrix*
Analysis of Service Encounter

Service Blueprint, defined as the diagram depicting servicing system in details, connects all the stages of business channels, related locations, user experience and procedures of offering and receiving services, along with a categorized framework which transform the network-shaped servicing strategy with systematic elements into concrete factors for service provision. Based on the previous stage of research, namely practical research, analysis on user behaviours and functional evaluation, service blueprint for queuing system in restaurants is created, as it is shown in Figure 6, in order to study the service touch-points in the process of interactions among customers, reception personnel, service personnel and support employees. In this case, profound and complete understanding on specific servicing procedures and internal cooperation among service providers can be realized. On basis of the service point points generalized before-, during- and after service, following conclusion can be drawn:

- Before service, contact with customers is formed mainly through APP or supporting platforms like online websites. Depending on demands for searching for restaurant information, restaurant personnel should post necessary information through APP or official websites, based on which customers receive
and browse comprehensive information and make further choices for proper ones to visit. When selecting the preferable restaurant, customers, inclined to make reservation or visit the restaurant directly, need the support from reservation system as well as restaurant employees’ reception of and feedback from information on reservation.

- During service, the important factor lies in queuing system and waiting environment. In the process, the queuing system needs to embrace diverse functions like support for users’ requisition of the waiting sequence number, real-time checking of waiting time and reminder of queuing sequence. Meanwhile, the reminder system can also be operated through communication with personnel at the reception desk. Considering of waiting environment, on one hand, comfortable and convenient infrastructure facilities need to be provided, such as waiting tables and chairs, lights, snacks etc. On the other hand, contact with other elements within business circles needs to be taken into consideration, including other business stores, entertainment facilities and so on.

- After service, from the perspective of users’ direct perception of service experience, personnel at the reception desk are mainly responsible for providing services. After finishing queuing, customers will be guided by the restaurant personnel to their seats and receive following services like making orders, serving dishes. However, it should be concentrated that mutual cooperation among restaurant personnel is another inevitable factor in the whole process of servicing.

Through transmission of user demands and behaviours in the process of queuing, service providers, both responsible for proving services directly and for offering support, offer interactive feedback to customers. In the servicing process, multiple ways for receiving services are offered through diverse channels and touch-points, including contact between customers and restaurant itself, between customers and environment, between customers and personnel providing direct services and offering indirect support, between customers and other elements, all of which build up users’ perceivable dining experience and therefore directly or indirectly affects the preference for customers to visit the restaurant again and their appreciation of the brand culture.

**Figure 6  Service Blueprint**
Conclusion
With the development of experience economy, people have become increasingly concerned about service quality and experience in their consumption. A good service experience not only brings about the rich commercial value, but also gives rise to more recognition on the whole enterprise culture and brand. As the economy and living standards improve, China, with large population, is filled with a greater proportion of people dining out. Therefore, the restaurant queuing problem has become a specific social phenomenon. Although there are related products orientated for dealing with this problem in the market, they are only confined to the product itself, ignoring the entire service encounters in restaurant queuing system. Throughout the whole service process, this study explores user’s behaviour, psychology and service encounter in service process, aiming at clarifying thoughts of deploying user’s time, restaurant resources, business space and others based on design research of restaurant queuing service system. In accordance with the interface service encounter, the space service encounter and the personnel service encounter in the system, the following design suggestions are put forward:

- Create a comprehensive, easy-to-use interface service. In the intelligent era, mobile application relies on internet platform which provides more convenient services to users. In the restaurant queuing system, it provides a comprehensive, easy to use service platform through the integration of information publishing platform before service, service queuing system, entertainment system in service, service payment and evaluation system after service.

- Provide comfortable, composite space service. In the middle of queuing, the customer may choose to wait in the waiting area or stroll around commercial shops. Therefore, on one hand, the restaurant should arrange complete, comfortable waiting environment and corresponding forms of entertainment activities according to the style and brand culture of the restaurant. On the other hand, the space of business circles containing restaurants, shops, recreational shops and exhibition need to be designed reasonably, which shunt queuing costumers to other shops and unleash economic vitality of whole commercial cycle. This helps the user to reduce the length of the perception of queuing from the psychological level, making it more relaxed and happy to spend queuing time.

- Provide considerate personnel service, create great restaurant brand image. It is essential to provide standardized service in terms of servicer’s manners and polite expressions, and train servicer’s service quality to serve customer initatively and empathetically.

Limitations and future work
This research presents some limitations. First of all, this study, equipped with fewer samples from questionnaires and real interviews, makes the research results less representative and typical. Meanwhile, most of the research is based on the user’s perspective and lacks in-depth research on other members. Future research will expand the research sample to improve the objectivity and effectiveness of the research results. At the same time, this study will further study service system of all stakeholders, customer service personnel, service providers, business operators, in order to explore their needs in
the service system of complaints, behaviour and psychology of customers, and then design a set of reasonable complete service system. Secondly, this paper puts forward some design opportunity points, affordability and service elements in the restaurant queuing system through the customer journey map, activity-function interaction matrix and service blueprint, under the intention of providing the idea for improving the restaurant queuing system. However, practical solutions and empirical validation are not included within this paper. Future work will continue to study the subject, design practical program of restaurant queuing service system, and verify the validity and feasibility. Finally, with the development of technology and the progress of the times, the restaurant queuing situation and user behaviour are more likely to change, accompanied with more application of advanced technology into the system. Under this background, we need to constantly update and iterate in the future work.

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Applying Value-based design to lead technology innovation towards PSS development: A case study of FamiCare in ITRI

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Product-Service System (PSS) design has become an emergent paradigm in technology innovation. However, little research addresses the two major issues in PSS development: 1) how to identify the value propositions, and 2) how to construct value constellations. Design-Driven Innovation (DDI) is an approach to lead to new meaning for technology. Based on DDI, this study constructs a concept of value-based design for technology innovation towards PSS development and conducts a case study of the FamiCare innovation project to explore the insights. Firstly, to identify the value propositions for PSS, it is critical to uncover the core functions of the technology, and interpret new meanings through collecting critiques from stakeholders. Secondly, co-creation workshops and visualized tools are able to facilitate the construction of PSS value constellations. Thirdly, both emotional and functional value should be considered during the PSS development. Finally, this study highlights the main challenges and outlines a methodological framework.

\textit{keywords: product-service system; technology innovation; value constellation; value-based design}

Introduction

While innovation has become a key strategic driver for organisations to gain competitive advantages, there is growing recognition of the collaboration between design and technology (Kyffin & Gardien, 2009). Design-Driven Innovation (DDI) is an approach to lead
radical changes for technology through interpreting its core features and deriving new meanings to meet different levels of values (i.e. functional value and emotional value) (Verganti, 2008, 2009). However, with the rise of the service economy and the paradigm shift from value-in-exchange to value-in-use, the role of design has gradually changed (Mager & Sung, 2011). Whereas design was often used for value-added in product innovation (Cantarello, Nosella, Petroni, & Venturini, 2011) or function enhancement (Driver, Peralta, & Moultrie, 2011), some researches (Patricio, Fisk, Cunha and Constantine, 2011; Mager and Sung) advocate that design has gradually gained importance in creating value and value-system in service development.

PSS is an emerging innovative business model that focuses on delivering a unit of satisfaction through the combination of products and services (Ceschin, 2014; Sakao and Lindahl, 2012). Some relevant concepts (such as, complex product system and technology cross-fertilization) have become new patterns which can affect the upstream of research and development (R&D) and lead technology innovation towards PSS development (Davies, 2004; Libaers, Hichs, & Porter, 2010). Björkdahl (2009) and Velamuri, Neyer, and Möslein (2011) believe that with the introduction of PSS concepts, the outcomes of technology innovation can better meet customer needs, and can generate more value through the integration of new resources or technologies.

In essence, the success of PSS accentuates appropriate value propositions and value constellations that provide mutual beneficial interaction among various actors (Frow and Payne, 2011; Libaers, et al., 2010; Xing, Ness, and Lin, 2013). In addition, while emotional value has been proven to have greater effects on customer experience compared to functional value, Beltagui, Candi, and Riedel (2012) consider that emotional value should be more emphasized in service development. Nevertheless, in the context of technology innovation, while past studies (Björkdahl, 2009; Velamuri, Neyer, and Möslein, 2011) mainly focus on the benefits of integrating new resources for PSS development, few studies address the issues of finding the value propositions and value constellations for the technology.

Therefore, considering the challenges of PSS development and the value of design mentioned above, this study extends the approach of DDI and proposes the concept of “value-based design” (Sakao & Lindahl, 2012) for technology innovation towards PSS development. To not only discover and criticize the meaning of the technology, the value-based design emphasizes identifying the value proposition in the front-end of the innovation so as to lead value constellation establishment and PSS development. Moreover, this study conducts a case study of the FamiCare innovation project in the Industrial Technology Research Institute (ITRI) to answer the following two questions: 1) How does value-based design lead the identification of PSS value propositions for technology innovation towards PSS development? 2) How does value-based design facilitate the construction of PSS value constellations for technology?

As one of the major non-profit research and development (R&D) organisations in Taiwan, the goal of ITRI is to help industries in Taiwan stay competitive and sustainable (ITRI, 2015). Due to rapid market change, ITRI discovered that delivering the latest technology to industries was no longer sufficient, and started to introduce the knowledge of PSS development into the R&D process. FamiCare technology is an innovative applied
technology developed in ITRI, and was originally designated to enhance functions for home security monitoring. However, when lacking a systematically approach, the R&D team found that it was difficult to discover appropriate innovative directions for PSS development. Thus, the R&D team assigned responsibilities to the Design team in ITRI to boost the efficiency and effectiveness of the FamiCare innovation project in ITRI for PSS development. After three months, the Design team proposed a PSS concept of Home Pet Care services and led a transformation of the FamiCare technology’s meaning from home security monitoring functions to recording and sharing the precious moments of pets, which contains emotional value. It also attracted new types of stakeholders for the PSS value constellations of Home Pet Care services. Furthermore, the Design team cooperated with the R&D team to determine the directions for future development of the FamiCare technology. Currently, the concept of Home Pet Care services has completed user testing at the end of 2016 and is now ready for commercialization.

In conclusion, firstly, this study proposes the research questions and conceptual framework through the literature review on the function of design in PSS, the role of design in technical innovation, and the methodology of DDI. Secondly, this study describes the research methods. Thirdly, this study illustrates the development process of the case. Fourthly, this study responds to the proposed questions and develops a methodological framework of value-based design for technology innovation towards PSS development as a reference for similar projects in the future.

Literature Review

The changing role of design in innovation

With the rapidly changing market, Lettl (2007) considers that organisations cannot rely on incremental innovations alone. Radical innovation, which would cause market shifts and user behaviour change, has been recognized as a crucial strategy to sustain long-term competitiveness. In addition, both Norman (2004) and Beltagui et al. (2012) find that technology and functional innovation no longer constitute a basis for competitive advantages in innovation, and organisations should pay more attention to emotional value. For example, people use the iPhone is not only because the functional value from latest technology, but also the emotional value that trigger through the experience of sharing photo with family, listening music, etc.

Design, as a process of making sense of things, has been recognized as a critical means to pursue successful product innovation (Cantarello, et al., 2011). Other than the two innovation models of technology push and market pull in the past, Verganti (2008, 2009) proposes Design-Driven Innovation (Figure 1), and claims that design can lead radical innovation through perspectives of emotional value. It assumes that based on a deeper understanding of society and culture, design can help innovators envision new meaning from emotional perspectives and lead to technology epiphanies.
However, while service has been increasingly regarded as a crucial direction for innovation in the era of the service economy, design has gradually changed its role. Beltagui et al. (2012) advocates that as emotional value has greater influence than functional value, design should be involved to reconcile disparate elements or interests and to improve the overall experience of service delivery (e.g. tangible objects, employees, supporting systems). Moreover, both Mager and Sung (2011) and Patricio et al. (2011) argue that with a holistic viewpoint, design has been applied as a strategic approach to help organisations synthesize the needs from different stakeholders, and create values and new frame for the service system in the front end of innovation. Therefore, this study considers that in service development, design is not only to integrate functional and emotion values, but also to create and form the new value-system.

The paradigm shift from technology innovation towards PSS development

Velamuri et al. (2011) argue that technology innovation is one of the key strategies to stay competitive. Many countries have established national-level R&D organisations (e.g., Dutch Toegepast Natuurwetenschappelijk Onderzoek, TNO) to stimulate the improvement of industry capacity. However, in recent year, Finne and Holmström (2013), and Libaers et al. (2010) notice that some of the R&D organisations have found the benefits of integrating resources and functions from new types of stakeholders, and started to implement methods such as technology downstream integration and technology cross-fertilization. Accordingly, Davies (2004) explains that concepts related to PSS (such as, dematerialization, servitization) have gradually gained attention and become a new pattern in the field of technology innovation.

Basically, PSS is defined as “a marketable set of products and services, jointly capable of fulfilling a customer’s needs” (Goedkoop, Halen, Riele, and Rommens, 1999, p. 3). Valencia, Mugge, Schoormans, Schifferstein (2015) assert that through the combination of services and products, PSS integrates and delivers various functions within a total solution to the customers via value-in-use. Thus, for a single organisation, Livaers, et al. (2010) uphold that it is difficult to possess all of the assets, and Xing, et al. (2013) consider that it is crucial to integrate new resources and construct value constellations for mutual beneficial interaction among various stakeholders. As a result, it implies that before
integrating more functions into PSS, as shown in Figure 2, value propositions should be identified in the first place as a base to attract stakeholders for value constellations construction (Frow & Payne, 2011; Osterwalder, Pigeur, Bernarda, and Smith, 2014).

Figure 2  PSS Value Constellation

However, creating and identifying value propositions for PSS development is not easy for traditional technology organizations (Björkdahl, 2009). Whereas most of the studies (Finne and Holmstrom, 2013; Libaers et al., 2010; Valencia, et al., 2015) focus on integrating new functions or resources to technology for PSS development, few studies address the issue of how to identify appropriate value propositions and construct value constellations. In addition, while Beltagui et al. (2012) has pointed out the significance of emotional value in service development, the empirical studies related to PSS development have emerged very slowly and in a more scattered way. Therefore, in order to lead technology innovation towards PSS development, new approaches should be involved.

In technology innovation, design has been applied to lead radical innovative meaning and new product development (Verganti, 2009). On the other hand, Morelli (2002) advocated that design, as a holistic approach, should be introduced into PSS development to guide the direction via identifying value proposition and integrating values from different stakeholders. Accordingly, this study extends the approach of DDI and proposes the model of value-based design (Figure 3) (Sakoa & Lindahl, 2012). Firstly, value-based design is value centred that considers different level of values, and value proposition is the guidance for innovation. Secondly, it adds a new axis of “different stakeholders”, and assumes that there should be more than one layer of value propositions to include different perspective values of stakeholders for further PSS value constellation establishment. In sum, the concept of value-based design provides a framework for identifying value propositions to meet different level of values, and constructing the value constellations to benefit different perspectives of stakeholders involved in the PSS.
Furthermore, in order to understand the dynamic process of value-based design to drive technology innovation towards PSS development, this study constructs a conceptual research framework (Figure 4), and proposes the following two questions: 1) How does value-based design lead the identification of PSS value propositions for technology innovation towards PSS development? and 2) How does valued-based design further facilitate the construction of the PSS value constellation for the technology? Through the following case study, this study hopes to answer the two questions proposed.

**Case Study Research Method**

*Description of Case Study Research Methods*

For preliminary or exploratory research topics, especially the “why” and “how” questions, Rowley (2002) points out that the case study research method provides a structured framework, and allows researchers to understand the problems and observe the complicated dynamic insights that were originally hard to explore. Thus, in order to answer the aforementioned issues, this study selected the FamiCare innovation project in ITRI as the case study subject. There are two reasons for selecting the FamiCare innovation project: Firstly, compared to R&D divisions in corporations or academic research organisations, ITRI is a non-profit technology research division that is close to the industry yet with fewer issues of confidentiality; therefore, it allows research to uncover deeper insights and contribute to both the academics and the industries. Secondly, the
FamiCare innovation project is a case that applies design to drive technology innovation towards PSS development, which is in alignment with the purpose of this study. Triangulation research (Shanks & Parr, 2003) was employed in the case study to support the rigorous inquiries for data collection, which includes observation, document analysis, and in-depth interviews with the team members (Table 1) of the FamiCare innovation project.

**Table 1  Description of the FamiCare innovation project team members**

<table>
<thead>
<tr>
<th>Category</th>
<th>Duty</th>
<th>Role</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Management of overall project timeline and quality management</td>
<td>Engineer</td>
<td>A1</td>
</tr>
<tr>
<td>Technology</td>
<td>Management of overall technology development direction</td>
<td>Senior Engineer</td>
<td>A2</td>
</tr>
<tr>
<td>Technology</td>
<td>Execution of technology development</td>
<td>Junior Engineer</td>
<td>A3</td>
</tr>
<tr>
<td>Technology</td>
<td>Design project timeline and quality management</td>
<td>Design</td>
<td>B1</td>
</tr>
<tr>
<td>Design</td>
<td>Design project timeline and quality management</td>
<td>Design</td>
<td>B2</td>
</tr>
<tr>
<td>Design</td>
<td>Execution of design research, ideas generation, strategy planning,</td>
<td>Designer</td>
<td>B2</td>
</tr>
<tr>
<td>Design</td>
<td>value constellation establishment, and stakeholders’ invitations.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Case Description**

The FamiCare technology was a video cloud processing applied technology aiming at incrementally improving the functions of security-monitoring solution for smart homes. As shown in Figure 6, it includes various functional modules, including: IP cam, wireless transmission, cloud data management, and smart APPS. Originally, the Technology team focused on the integration of technologies from different fields to build up a total solution in hopes of finding innovative applications (including: homes, communities, and shops). However, due to the lack of systematic methods, it was hard to discover which direction had the most potential opportunity. Hence, the Technology team assigned responsibilities to the Design team in ITRI in hopes of applying design to lead the innovation project.
The progress of the FamiCare innovation project, as shown in Figure 6, combines the 4D (Discover, Define, Develop, and Deliver) design process (Design Council, 2005) and the PSS design methods proposed by Morelli (2002). Firstly, in the Discover stage, the goal is to discover the core features and interpret into new possible meanings of the technology through the co-creation of the Design team and Technology team. Secondly, in the Define stage, based on the meanings, it aims at identifying the suitable value proposition through critiques from related experts. Thirdly, in the Develop stage, the related organisations or stakeholders are invited to co-create the visions and possible PSS concepts. Finally, in the Deliver stage, through the collaboration among the design, technology, and related stakeholders, the final value constellation of PSS is constructed.
Applying value-based design to drive FamiCare technology innovation towards PSS development

Discover and Define: to uncover the core features and identify the PSS value proposition of the technology

In the Discover stage, in order to identify the value proposition, the Design team proposed four questions to uncover the core features of the FamiCare technology, including: 1) What is the core of the FamiCare technology? 2) What are possible applications that have been identified? 3) What are possible substitute solutions? 4) What are the visions for technology development in five years? Through debating the four questions with the Technology team, the Design team found that to solve all of the home security monitoring problems (e.g. real-time video, event analysis and recording, two-way communication, etc.), the FamiCare technology had already become an overly complex system. However, without systematically value analysis, it was hard to determine the major competitive advantages. After a thorough discussion, the two major modules, including “Smart image capturing and labelling” and “FamiCare Cloud Service”, were uncovered to be the core features of the FamiCare technology. The features of the two modules are described in Table 2.

Then, in order to find the potential applications for the FamiCare technology, the Design team listed different types of family groups (such as, three generations living together, home of nannies, and families with pets) and analysed their needs according to the two features. Based on the results, the Design team interpreted the core features into a set of meaning assumptions for the FamiCare technology, as shown in Table 3.
Table 2  Descriptions of the Two Major Modules of FamiCare and Its Features

<table>
<thead>
<tr>
<th>Modules</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart image capturing and labelling</td>
<td>to intelligently analyse and capture dynamic images that suddenly change in the video record</td>
</tr>
<tr>
<td></td>
<td>to automatically label the video record clips being captured as dynamic images</td>
</tr>
<tr>
<td>FamiCare Cloud Service</td>
<td>to encrypt and quickly access video files in the cloud</td>
</tr>
</tbody>
</table>

Table 3  The Interpreted Meaning Assumptions of the FamiCare Technology towards Different Users (only partial project results are listed)

<table>
<thead>
<tr>
<th>Technology Core Characteristics</th>
<th>Interpreted Meaning Assumptions towards Different Types of Family Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three generations living together who care about the safety of the elderly and children.</td>
<td>Home of nanny who needs to watch and record the lives of the children for their parents.</td>
</tr>
<tr>
<td>Smart analysis and capturing dynamic images</td>
<td>to record one day courses and activities of the children for the parents</td>
</tr>
<tr>
<td>Automatic labelling</td>
<td>to help parents quickly select important video clips and review their children’s activities.</td>
</tr>
<tr>
<td>Encryption and fast access</td>
<td>to view the situation at any place in real-time to co-manage with other family members simultaneously</td>
</tr>
<tr>
<td></td>
<td>to view the activities in real-time to allow the parents to share interesting images of children easily</td>
</tr>
<tr>
<td></td>
<td>to view the activities in real-time to allow the family to share interesting images of pets easily</td>
</tr>
</tbody>
</table>
In the Define stage, the Design team invited the experts in the respective fields, including: elderly caregivers, nanny consultants, and pet hotel managers, to provide critiques towards the innovative meaning assumptions and co-define the value propositions of FamiCare technology based on the different family groups mentioned above. Moreover, the Design team also cooperated with the Technology team to conduct analysis from the perspective of technology feasibility.

According to the critiques and technical feasibility analysis, firstly, the Design team found that for the families with three generations living together, privacy and dignity were the main issues. It means that though the elders were gradually growing weaker, most of them still cared about their privacy and did not want to be monitored. Secondly, the nanny consultants stated that since every moment in the daily lives of children are precious for the parents, it is difficult to determine which moments are critical. In addition, as for technology feasibility, the technology team mentioned that if the children are active most of the time, it is hard for the smart dynamic image capturing technology to identify which movements needed to be recorded. Therefore, the FamiCare technology may not generate values for the families with three generations living together and the nannies.

Thirdly, the pet hotel managers mentioned that for the families with pets, enjoying adorable behaviour and having intimate interactions with their pets at home to relax has become a major pastime among pet owners. Nevertheless, due to work schedules, many people can hardly know their pets behave during the daytime. Thus, with the features of smart dynamic image analysing and capturing, the Design team found the new meaning where the FamiCare technology can help the pet owners to track, retrieve and share the precious moments that occur in the lives of their pets during the day.

In addition, in order to gain a deeper understanding of families with pets, the Design team selected a group of owners who liked to share about their pets’ lives, and visited their homes for observation and interviews. The Design team surprisingly found that besides the owners affirming the meaning mentioned above, they were also concerned with their pets’ abnormal behaviour and mental illnesses. Therefore, after analysing the potential of the application and technology feasibility, both the Design team and Technology team considered the new direction valuable, and they defined the value proposition as “to allow the families with pets to observe and share the precious moments of pets, and have a better understanding of their pets’ behaviour and psychological states”.

**Develop and Deliver: to use design to connect stakeholders and establish a PSS value constellation**

In the Develop stage, the main objectives of the FamiCare project was to collect different critiques from the related professions to modify the value proposition and generate the details of the PSS concept for FamiCare. Based on the value proposition, the Design team and Technology team proposed new value-systems and identified the possible stakeholders, including a family with pets and a pet psychologist, and invited them to join the co-creation workshop. Moreover, the Design team created a visualized storyboard to illustrate the customer journey of the PSS concept for the stakeholders.

During the workshop, while the family with pets considered that the meaning of the concept as valuable for them, the pet psychologist approved the idea of applying
abnormal behaviour detection and recording to improve psychological diagnosis and treatment; also, the records could become rich data and contribute to pet psychological research in the future. Thus, after co-creation, the Design team proposed the PSS concept of Pet Care service and revised the storyboard as shown in Figure 7.

After analysing and organising the feedback from the interviews and co-creation workshop, the Design team discovered that the Pet Care service can benefit different stakeholders from three perspectives: 1) for families with pets, it allows the users to examine and share interesting segments of their pet’s lives and understand the mental status of pets; 2) for pet psychologists, it can improve the quality of medical services and contribute to the medical research through the recorded data; 3) for the Technology team, it can become a sustainable service platform through extending the interaction with different stakeholders. Finally, the Design team established a value interaction map to illustrate the value constellation of Pet Care services (Figure 8) and planned the future development direction for FamiCare technology, which includes 1) T1: the way to detect abnormal pet behaviour; and 2) T2: the method to collect the data of abnormal pet behaviour.
Discussions

How does value-based design identify the PSS value proposition for the technology?

Björkdahl (2009) declares that many R&D organisations have started integrating different technologies from other fields for PSS development in order to stay competitive and enhance the value of the technology. However, this study finds that without systematic process to define the appropriate meaning and value propositions for the PSS, the integration may cause confusion. For example, the FamiCare technology was originally developed as an incremental improvement for home security monitoring and the Technology team aimed to integrate functions to enhance its value. Nevertheless, the
Technology team found that not only were the features out of date, the directions of development were lost. The interviewee A1 mentioned: “We found that without a clear core value, integrating technology only made the FamiCare technology resemble other products.” It corresponds to the statement of Osterwalder et al. (2014) that without a clear value proposition to guide the direction, the innovation may lead to unwanted results such as misalignment of resources.

Basically, value is the centre of value-based design, and value propositions is the guide for PSS development. With the appropriate meanings and corresponded value propositions, this study regards that the supporting resources can be meaningful to the users and stakeholders. According to the findings of the FamiCare innovation project, this study regards that the following two steps are crucial to generate radical innovative value propositions for PSS development: 1) to uncover the core features of the technology; and 2) to map them into value assumptions based different groups of users. Through these two steps, the project team were able to rethink the core features of the technology and generate meanings to meet emotional value and functional value in a systematic process.

In addition, by collecting critiques from both users and stakeholders, it allows the project team to establish a holistic view towards the PSS development. For instance, the Design team did not only identify the innovative value for the family with pets, but also established the system that are needed to support the service.

This finding support the extension of Verganti’s (2009) methodology from product innovation to service innovation. Also, as Beltagui et al. (2012) argued, design is the key to enhance the effectiveness of service innovation through combining emotional value and reconciling disparate interests of stakeholders. Therefore, as shown in Figure 9, in the context of technology innovation towards PSS development, this study regards that value-based design plays a critical role for value creation and value proposition identification in three manners: 1) to dig out the core features of the technology; 2) to interpret the core features into innovative meanings through considering both emotional and functional values; 3) to iterate the process of analysing technology feasibility and collecting critiques from different stakeholders (organisation, customers, and partners) to establish a holistic view for identifying the appropriate value proposition.

![Figure 9 The Process of Defining the Technology Value Proposition of value-based design](image-url)
How does value-based design further facilitate the construction of the PSS value constellation for the technology?

Basically, the concept of PSS is to integrate the resources from different stakeholders to develop a system that can satisfy different users (Goedkoop et al., 1999; Xing et al., 2013). Nevertheless, gathering the insights from different stakeholders is not an easy task (Vasantha, Roy, Lelah & Brissaud, 2012). Based on the case study, this study suggests that applying visualized storyboards and co-creation workshops could be effective tools to communicate the value propositions. The interviewee B2 mentioned: “The workshop environment and visualized storyboard allowed the stakeholders to easily understand the value propositions and provide critiques from their perspectives.” This result is in line with the statements of Brown (2009) and Osterwalder, et al. (2014) that designers often apply methods, such as visualization and role-play, to illustrate the details of the concepts, and improve the communication with stakeholders from different backgrounds.

In addition, since PSS is often accompanied by various types of stakeholders, it is necessary to make connections among the resources, interests and shared visions (Xing et al., 2013). This study applied the value interaction map proposed by Morelli (2006) and found that it is a useful tool for the development of the value constellation of the FamiCare technology. The interviewee A1 mentioned: “The value interaction map not only allowed us to understand the roles and resources in the PSS, but also defined how the mutual beneficial interactions occurred in the value constellations.”

In summary, this study considers that value-based design is a strategic approach centred on value. It can help organisations identify value proposition from a holistic view that covers various stakeholders’ values. Although the FamiCare innovation project is based on the context of the technology industry, this study believes that the results could also be applied in other fields (e.g. retailing industry). As shown in Figure 10, this study develops a methodological framework and tools applied in the process of value-based design for technology innovation towards PSS development. Firstly, the core features must be explored to identify critical roles of the technology in the development of PSS. Secondly, through the repeated exploration of the different levels of values from different stakeholders (including end-users and partners), and the function of technology, the most potential value proposition of PSS is determined. Finally, through the co-creation among the stakeholders, the value constellation can be built. In addition, the techniques and tools of design was found to be useful throughout the process of PSS development. The workshops, story board, and value interaction maps are important to facilitate co-creation and communication. Also, the mapping matrix of technology core features and meanings and collecting critiques from stakeholder interviews can uncover the hidden problems and possibilities.
Conclusion and Future Research Direction

With the rise of the service economy, the relevant concepts of PSS have attracted the attention of some R&D organisations, and the role of design in technology innovation has gradually changed. However, few studies have addressed the two key elements of value propositions and value constellations in the field of technology innovation towards PSS development. The contributions of this study are to extend the DDI (Verganti, 2009) to the model of *value-based design*, and conduct a case study research to explore the insights.

Basically, *value-based design* places value in the centre, and value proposition is the base for value constellation construction and PSS development. And, according to the case study of the FamiCare innovation project, this study suggests the process of *value-based design* as followed: 1) to uncover the core features of technology; 2) to define new meaning for the core features, and collect critiques from various stakeholders to identify the appropriate value proposition through a holistic view; 3) to engage the stakeholders to co-create the value constellation and PSS concept. It is worth noting that both emotional value and functional value should be considered in the whole process. In addition, visualized tools can effectively facilitate the development of value constellations.

Since this research is a single case study, the future research directions are as follows: firstly, this study expects the findings to be applied to different cases for verification. Secondly, the result of this study is based on FamiCare technology, which originates from a type of applied research (Stoke, 1997), and it is unclear whether the technology generated from basic research will cause impact on PSS development. Thirdly, due to the limited length of this article, this study only selects and discusses the tools that are critical to the two questions mentions above, so it is worth discussing other possible tools to facilitate the value-based design process. Fourthly, the work of interpreting the meaning of the technology is largely reliant on a long developed database of design research.

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References


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PSS and Innovation of Meaning.

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This study explores the relationship between product meaning and product service systems (PSSs), in the context of innovation of meaning (IoM). Existing IoM studies have focused on intended meaning (as defined in new product development) and ignored the received meaning that users reconstruct throughout an entire product life cycle. The process by which a user assigns meaning to things can be not only static but also dynamic. This study focuses on PSSs as comprising integrated products and contexts offered by services, and analyses the case of Japan’s largest manufacturer of ankle–foot orthoses, which is an assistive product. The results show that PSSs help users reconstruct meanings in dynamic cognitive processes; PSSs also help users leverage metaphors that contribute to consistency between products and services. Additionally, the positive emotion elicited from users by novel meanings can help augment profits by promoting the sale of related products and services.

keywords: PSS; meaningful innovation; context; emotional value

Introduction
Levy (1959, p. 118) states why consumers purchase products: ‘People buy things not only for what they can do, but also for what they mean’. Product meanings for which people search extend beyond mere form and function (DeBerry-Spence, 2008). In the last decade, research into product meanings have been promoted by innovation discourse, with there being an increased number of design studies—as design is ‘making sense of things’ (Krippendorf, 1989). The term ‘innovation of meaning’ (IoM) implies a drive to redefine the problems worth addressing, and its consideration is likely to create a new dimension that will compete with others (Verganti, 2008). Although existing studies address how to create a novel meaning in new product development (NPD) (Buganza, Dell’Era, Pellizzoni, Trabucchi & Verganti, 2015; Dell’Era & Verganti, 2009; Jepsen, Dell’Era & Verganti, 2014;
Norman and Verganti, 2014; Verganti, 2008), they also focus on the intended meaning encoded in NPD, and ignore the received meaning that users reconstruct throughout an entire product life cycle.

Meanings stem from the user’s perception and his or her cognition of a product. This means that the process by which a user assigns meaning to a product can be not only static, but also dynamic (Kazmierczak, 2003); this is because the circumstances under which one uses products are always dynamic and diverse (van der Bijl-brouwer & van der Voort, 2014). However, the users cannot completely control product meanings; therefore, there is a need to encode intended meanings into a design, and providers can help guide users’ cognitive sequences in assigning specific meanings (Kazmierczak, 2003). Thus, the provider is likely to consider two different perspectives: the users’ first contact with a product, and sequential interaction with users throughout an entire product life cycle.

For consumers, product appearance represents his or her first contact with a product (Ulrich & Eppinger, 2004) and they will have a cognitive response to a product, based on initial information perceived by the senses (Crilly, Moultrie & Clarkson, 2004). However, response to the product’s appearance is just one stage in a process of communication with users (Crilly, Moultrie & Clarkson, 2004). User interpretation is affected by the consumption setting (DeBerry-Spence, 2008). This means that meanings emerge as a result of the interaction between users and providers (Arould & Price, 1993), and human-to-human or human-to-product interactions are generated through the provision of services (Pacenti & Sangiorgi, 2010). Therefore, the creation of new meanings requires the integration of products and services.

The product service system (PSS) is a concept that relates to the integration of products and services, and delivers use-based value to users (Baines et al., 2007). The concept of the PSS also includes business model development, including results-oriented, use-oriented, and product-oriented business models (Vasantha, Roy, Lelah & Brissaud, 2012). Recently, researchers have undertaken design-related studies of PSSs, after Morelli (2002) stressed that design disciplines have not been involved in the PSS discourse. The literature tends to focus on the design process (Morelli, 2002, 2003), methodology and tools (Vasantha et al., 2012), and Smart PSSs (Valencia, Mugge, Schoormans & Schifferstein, 2015). Although Manzini (2015) hints at the relationship between sense-making (which is the essence of design) and PSSs in the context of social innovation, he does not discuss product meaning in the context of IoM. The current study explores the relationship between product meaning and PSSs, in the context of IoM. As such, this study seeks to answer the following research questions.

1. How does a PSS contribute to changing a meaning that users reconstruct in their context in which they use a product?
2. How do IoM contribute to developing profit potential in PSS?

This study pursues these goals by exploring the case study in the assistive products (APs) industry, especially the Japanese ankle-foot orthosis (AFO) industry. The APs industry is a recent focal one of Inclusive design, which aims at reducing product-related stigma (Correia de Barros, Duarte & Cruz, 2011). Correia de Barros, Duarte & Cruz (2011) noted that the aesthetics and the stigma associated with APs use discourage users to use them. To change the meaning attributed by people to use APs is a socio-technical challenge for
companies in the industry. Thus, the paper contributes to the limited understanding of the role of PSS in IoM and provides practical guidance to develop an integrated products and services in the APs industry.

The structure of the paper is as follows. The next section briefly investigates the existing literature regarding the intangible product attributes, IoM and the role of service. Then, the study employs a single case study to examine the new PSS development process in which the designer tries to change the product meaning. After that, the paper shows the comprehensive model regarding the relationship between PSS and IoM.

Literature review and research framework

Definition of IoM

A product’s appearance bears both tangible features and intangible attributes. The tangible features are dictated by size, material, colour, shape, and texture, *inter alia* (Bloch, 1995; Demirbilek & Sener, 2003; Hoegg & Alba, 2011). The tangible features communicate information regarding functionality, aesthetics, and symbolism (Eisenman, 2013). Consumers will assess a product based on this set of information, as received and perceived by the senses (Crilly, Moultrie & Clarkson, 2004) and the intangible attributes of a product relate to this assessment.

The literature shows the three-dimensional segmentation of the intangible attributes of a product: *aesthetic impression, semantic interpretation, and symbolic association* (Crilly, Moultrie & Clarkson, 2004). Aesthetic impression describes aesthetics that appeal to the human senses (Norman, 2004). Semantic interpretation refers to a consumer’s response to functionality, utility, mode of use, and other qualities. Symbolic association is described as the personal and social significance assigned by the user, by virtue of messages, symbols, culture, and meaning. (Table 1 summarizes the other definitions, as found in the literature.) Thus, IoM means to innovate the symbolic aspect of a product.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Three-dimensional segmentation of intangible attributes</th>
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<tr>
<td>Norman (2004)</td>
<td>Visceral level</td>
</tr>
<tr>
<td>Candi (2006)</td>
<td>Visceral design</td>
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<tr>
<td>Rampino (2011)</td>
<td>Aesthetic</td>
</tr>
<tr>
<td>Eisenman (2013)</td>
<td>Aesthetic information</td>
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</tbody>
</table>

Verganti (2008) proposed a radical change of meaning as *design driven innovation* (DDI), defining the meaning in a broader way (e.g., emotional and symbolic value). Meanwhile, Rampino (2011) categorizes the four different kinds of innovation driven by design, as *aesthetic innovation, innovation of use, meaning innovation, and typological innovation*. Aesthetic innovation relates to aesthetic impression, innovation of use refers to semantic interpretation, and meaning innovation concerns symbolic association. Rampino (2011)
also stresses that the distinctions among these types of innovation are based on their higher or lower degrees of novelty vis-à-vis product appearance. The innovation of the symbolic aspects of a product also depends on the other intangible attributes, because all aspects of the intangible attributes are highly interrelated (Crilly, Moultrie & Clarkson, 2004).

**Reconstruction of symbolic association in the context**

Symbolic association consists of self-expressive symbolism and categorical symbolism (Crilly, Moultrie & Clarkson, 2004). Consumers categorize a new product to understand it, and they do so by comparing it to previous products (Eisenman, 2013). In the provision of either a single product or an integrated product–service, product appearance is a powerful tool that conveys an intended meaning, because it acts as a ‘first contact’ with consumers. The efficient use of design metaphors enables users to understand how a product might be used, and it thus conveys meaning to consumers (Crilly, Moultrie & Clarkson, 2004; Nobel, Bing & Bogoviyeva, 2013). Generally, metaphors work to mimic other types of products, or objects found in nature (Crilly, Moultrie & Clarkson, 2004; Nobel and Kumar, 2010).

Meanwhile, by leveraging self-expressive symbolism, users can express their social position and status simply by owning a product (Crilly, Moultrie & Clarkson, 2004)—in other words, users recognize a product as an extension of themselves (Belk, 1989). The metaphors also influence self-expressive symbolism. People attach social meaning to a product’s appearance, because they have created or adhered to stereotypes that allow for faster (but not necessarily accurate) judgements (Correia de Barros, Duarte & Cruz, 2011). However, the metaphors cannot suffice in fixing a well-defined meaning throughout an entire product life cycle, because users dynamically reconstruct meaning within the context that they experience (Klein III & Kernan, 1991; DeBerry-Spence, 2008). When manufacturers offer consumers standalone products, the received context depends on the many personal and contextual factors inherent in those consumers’ lives (Zomerdijk & Voss, 2011). Thus, the provision of the intended context is likely to be important to fix a well-defined meaning.

**Service and context**

The context is defined as “information available to a particular person, and on a particular occasion, for use in the meaning-assignment process” (Klein III & Kernan, 1991, p311). Such information is offered by service evidence (Shostack, 1984) and human-to-human interactions within services (Pacenti and Sangiorgi, 2010). Thus, an integrated product and service is likely to offer the information related to the product in the context that a company develops intendedly. Moreover, the human-to-human interaction is one of the ways to share an intended meaning with consumers.

Dell’Era and Verganti (2011) note that collaboration between producers within the same design discourse can help disseminate new meaning within an industry. Such collaboration helps a company that is developing new meaning to educate other companies about it; they communicate and share it during NPD. A service, on the other hand, is likely to offer to users an education regarding a new meaning, because the company could communicate with users. Moreover, consumer engagement that speaks to commitment, trust, self-brand connection, and loyalty occurs within the dynamic, iterative process.
inherent in a service relationship (Brodie, Hollebeek, Juric & Ilic, 2011). Consumer engagement helps users to co-create experience and value with companies. This means that a service also works as a way of sharing intended meanings with users. Thus, PSSs can help guide users interpret an intended meaning, as defined in NPD, in the intended context, as defined in new service development (NSD).

**Research framework**

Given that PSS guide users to interpret the same meaning with the intended one in their context of consumption, IoM should be considered creating a business model in new PSS development because the impact on the new meaning depend on the interactions among several stakeholders (Dell’Era and Verganti, 2009). This emphasizes that it is important to examine the interactions, and how such interaction makes new profit potentials. Notwithstanding the importance, the existing researches on PSS have focused on the developing the methods and tools (Vasantha et al., 2012). Moreover, although the researchers on the design disciplines addressed the design-related studies on PSS (Pacenti and Sangiorgi, 2010) after Morelli (2002) have stressed that design disciplines have not been involved in the discourse of PSS, the concept of IoM has not been encoded into new PSS development process.

Based on the literature review above, the research framework of this study is developed (see Figure 1). Above all, the users reconstruct the product meaning in their context by interpreting the intended meaning that the company developed (Kazmierczak, 2003). The aim of service design for IoM is to design the context to guide users to recognize the intended meaning. Additionally, the paper examines the relationship between IoM and profit potentials in PSS.

![Figure 1 Research framework](image-url)
Case study

Research Design
The purpose of this study is to explore and clarify the relationship between product meaning and the PSS, within the context of IoM. We undertake an in-depth case study to examine the dynamic process by which users perceive intangible product attributes and identify new themes and variables, with the goal of answering how or why (Yin, 1994).

When choosing appropriate and transparently observable cases, it is important to control for environmental variations (Eisenhardt, 1989). Therefore, we identified the common constructs of IoM. Tangible product attributes depend on technological features and the social processes that surround their evolution (Pinch & Bijker, 1987). Crilly, Moultrie and Clarkson (2004) imply that once tangible attributes are solidified, the emphasis might shift to intangible ones. Moreover, Eisenman (2013) mentions that intangible product attributes extend a product’s basic functionalities; he also suggests that when new products emerge, their appearance acts as a tool that explains to users what they do. The design of intangible product attributes concerns itself with creating a ‘bridge’ between technical possibilities and market opportunities (Candi & Samundsson, 2011). Therefore, having core technological competence is a basic competitive advantage, and whether or not a company has this competence must be considered a form of bias in case selection.

Although the present study focuses on intangible attributes, it is difficult to evaluate their evolution, because they are very much contingent on customers’ perceptions and interpretations. Therefore, this study refers instead to industrial designers’ participation in new PSS development. Although the concept of industrial design has been defined in various ways (Verganti, 2008), it is agreed that it is responsible for a product’s appearance and user-friendliness, among other things (Gemser & Leenders, 2001; Pedgley, 2009). Gorb and Dumas (1987) determined a process by which nondesigners are engaged in design. Regardless of industrial designers’ participation in this process (or lack thereof), customers have cognitive responses that are driven by their perception of tangible product attributes (Crilly, Moultrie & Clarkson, 2004). However, relatively recent studies have shown that industrial designers’ participation in NPD has positive impacts on company performance (Gemser & Leenders, 2001; Veryzer, 2005; Marion & Meyer, 2011). Therefore, their participation must be considered when controlling for environmental variables.

In summary, the two dimensions inherent in selecting a case—namely, technological competitiveness as a tangible product attribute, and industrial designer participation as an intangible one—form the basis of our typology.

Next, we focus on a narrower investigation area, to reduce industry bias. This study employs a case from the Japanese ankle–foot orthosis (AFO) industry. Most customers in this industry periodically obtain public financial assistance to buy or lease durable medical equipment (DME), including AFOs. Therefore, price-competitiveness in this market is no more important than in other industries. Once customers buy or lease DME, they keep it for a certain period. Moreover, most of the Japanese AFO companies have not employed designers to enhance the hedonic value of its products. Therefore, an examination of this industry can reveal the effect of a designer’s participation in new PSS development processes.
In this study, we analyzed the case of Kawamura Gishi Co., Ltd., Japan’s largest manufacturer of AFOs. Kawamura Gishi offers both products and rehabilitation and related services, and its sales grew from JPY3.38 billion in 1992 to JPY6.62 billion in 2009 (i.e., a 96% growth rate). The company developed an innovative AFO called the Gait Solution Design (GSD), by leveraging high-technology competitiveness (Figure 2). Its most unique feature—namely, a hydraulic damper that can be adjusted through the use of a single tool—provides only minimal gait support and has received significant attention in the field of orthosis therapy. Moreover, in the new PSS development process for GSD, Kawamura Gishi employed a design firm that had won various design awards; ultimately, the GSD won the Red Dot Design Award and Japanese most prestigious design award (Good Design award). The review committee of Good Design award reportedly appreciated GSD as having the innovative product concept, the novel product form, high competitive technology, the attention for a longer product life and the ease-of-use. However, prior to the design firm’s participation, the company had developed Gait solution (GS), which have the same function (a hydraulic damper) with GSD, and sold only 10 GS units; after launching the GSD, total sales of GS and GSD exceeded 300 units. This means that high-technology competitiveness was not a driver in generating profits and GSD of which the designer participated in the development process had an impact on the sales (Figure 3).

![Figure 2 The GS (left) and GSD (right)](image)

We conducted 14 semi-structured interviews at Kawamura Gishi and Pacific Supply Co., Ltd., a subsidiary company that carries other companies’ products and services. Additionally, we interviewed the head designer at the design firm employed by Kawamura Gishi. Table 1 demonstrates the profile of the interviewees. The interviews were conducted between June 2010 and December 2015; audio recordings of those interviews were captured, which were subsequently transcribed by two researchers.
Figure 3 Case selection strategy

<table>
<thead>
<tr>
<th>ID</th>
<th>Person</th>
<th>Department</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top executive</td>
<td>Management</td>
<td>Kawamura Gishi</td>
</tr>
<tr>
<td>2</td>
<td>Chief engineer</td>
<td>Development</td>
<td>Kawamura Gishi</td>
</tr>
<tr>
<td>3</td>
<td>Top executive</td>
<td>Management</td>
<td>Kawamura Gishi</td>
</tr>
<tr>
<td>4</td>
<td>Manager</td>
<td>Sales</td>
<td>Kawamura Gishi</td>
</tr>
<tr>
<td>5</td>
<td>Chef engineer</td>
<td>Development</td>
<td>Kawamura Gishi</td>
</tr>
<tr>
<td>6</td>
<td>Division manager</td>
<td>Sales</td>
<td>Kawamura Gishi</td>
</tr>
<tr>
<td>7</td>
<td>Manager</td>
<td>Manufacturing</td>
<td>Kawamura Gishi</td>
</tr>
<tr>
<td>8</td>
<td>Division manager</td>
<td>Marketing and sales</td>
<td>Kawamura Gishi</td>
</tr>
<tr>
<td>9</td>
<td>Top executive</td>
<td>Manufacturing</td>
<td>Kawamura Gishi</td>
</tr>
<tr>
<td>10</td>
<td>Chief engineer</td>
<td>Development</td>
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<td>Top executive</td>
<td>Management</td>
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<td>R&amp;D</td>
<td>Kawamura Gishi</td>
</tr>
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<tr>
<td>14</td>
<td>Division manager</td>
<td>Development</td>
<td>Pacific Supply</td>
</tr>
<tr>
<td>15</td>
<td>Assistant director</td>
<td>Design development</td>
<td>GK dynamics</td>
</tr>
</tbody>
</table>

The Development of GS

An AFO is a device that assists hemiplegic patients who have an ankle disability. In the past, an AFO was primarily a special-order product that was adapted to a customer’s body, after measuring his or her physical dimensions. More recently, immediate use of an AFO following physical impairment has been considered desirable, given its medical benefits. Accordingly, there has been an increased need for standardized, off-the-shelf products; however, it can be difficult to customize an existing AFO, because a user’s medical
condition can change daily. As a result, interest is increasing in standardized products that feature dimensions that can be adjusted in response to physical changes that occur after the product has been manufactured and delivered. In response to this interest, Kawamura Gishi decided to develop a new standardized AFO.

Kawamura Gishi had developed GS that has basic functions, using a technology novel to the development process in this industry. These basic functions were developed by a team that included a mechanical engineer and an academic researcher. This GS’s flexible design is such that, as a user’s medical condition changes, it can be adjusted. As a point of comparison, in older-style AFOs, the strength of the braking force is changed by adjusting its material thickness, or by trimming; fine adjustments are practically difficult. The GS, on the other hand, has a unique hydraulic damper that can be adjusted using a single tool; this can modify the strength of the braking force and the angle at which it takes effect.

In spite of being technologically innovative, GS sales did not initially grow, because its appearance did not differ from that of the existing AFO. This is illustrated by the following quotation, from one of the interviewees (ID: 7):

*The reasons for slow sales are its large size, how it makes wearing shoes difficult, and its low-quality aesthetics.*

The older-style model puts visual stress on users, as the shape of the foot–ankle assembly necessitates that they wear custom-tailored shoes. Using an assistive product (AP) like an AFO and custom-tailored shoes makes one’s disability visible to others (Correia de Barros, Duarte & Cruz, 2011). For this reason, the existing AFO elicits negative emotions from user. Thus, the NPD team of GS have determined to improve it and to involve an industrial designer in the process, who won various design awards, such as the Red Dot Award.

**Design of Product Appearance of GSD**

The designer initiated the development of a concept in order to address users’ cognitive responses. First, he focused on the users’ cognition of rehabilitation, and he used a metaphor to transform its meaning. This is illustrated in the following quotation.

*I think of rehabilitation a sort of ‘sport’, and an AFO is a piece of equipment used to promote exercise among users. I therefore want users to obtain a ‘sporty’ impression from the outward appearance of the AFO.*

Here, the designer uses a metaphor, in which rehabilitation is equated with ‘playing sports’ and an AFO with ‘sports equipment’. The intangible product attributes involved are as follows.

- **Aesthetic impression**: The GSD has a titanium frame, and its shape resembles a streamlined skeleton. This material and shape help express ‘dynamic stability’, which implies a sense of vitality. Biological forms that resemble human figures tend to attract and fascinate consumers (Chang & Wu, 2007). Moreover, colour is a factor that enriches the sensory experience (Da Silva, Crilly & Hekkert, 2015) and significantly affects human emotions (Wei, Ou, Luo & Hutchings, 2014). For this reason, the GSD is offered in three different colours (see Figure 2). The classic colour of the existing AFO (Figure 4) is ideal, as it matches the skin tone of many people and thus camouflages the device. Then, to encourage users to ‘show off’
their new AFO, the designer gave them the opportunity to select their favourite colour.

Figure 4 Comparison of a classic AFO (left) and the GSD (right)

- **Semantic interpretation:** Streamlining the foot–ankle assembly made it possible for users to wear a variety of shoes over top of the GSD. The shape is similar to a shoe innersole; this allows users to wear *their* shoes, rather than custom-made ones. Additionally, the GSD is shaped like a sandal (Figure 5). A user can put the product on, without raising his or her foot, by tilting the frame forward and inserting the foot from the rear. Users can perceive the GSD’s ease of wear from its appearance, and this motivates them to wear their own favourite shoes with it. Moreover, materials selection determines a product’s range of function, durability, and user experience (van Kesteren, Stappers & de Brujin, 2007). Whereas the frame material of the existing AFO is plastic, the GSD designer selected titanium, which is not only lightweight and durable, but also perceived by users as being strong.

Figure 5 How to wear the GSD

- **Symbolic association:** AFO users require rehabilitation to improve their medical condition; this might involve unpleasant affective states (Markussen, 2009). The GSD designer, who has experience in designing sports equipment, wanted to portray this rehabilitation as ‘playing a sport’; he encouraged users to evoke a ‘sporty’ impression, via the GSD’s physical appearance. Correia de Barros, Duarte
and Cruz (2011) note that APs are associated with negative stereotypes, and they suggest that designers work to reduce the associated stigma. Design attributes allow users to categorize products (Eisenman, 2013). The GSD’s aesthetic impression and semantic interpretation work together to transform the user’s categorisation of the AFO and influence the social values it may connote.

**Developing of new service**

Kawamura Gishi also have offered the maintenance service, adjusting its material thickness or trimming the plastic body, with the traditional AFO and the rehabilitation instruction using the adjusted AFO. Such adjusting can not be restored and depends on the tacit knowledge of servicepeople. This means that it is difficult for the users to understand the effect of the rehabilitation.

In addition to the development of new product appearance, the designer emphasized the need to visualize the effect of rehabilitation; this was seen with the Nike+, which allows users to visualize the effects of their running. This is illustrated in the following quotation of the designer.

> A player’s motivation to improve his or her ability is crucial to continue to train hard. In the case of rehabilitation, patients do not concern about winning or losing. I think it is important to visualize effects of rehabilitation.

Kawamura Gishi developed a unique rehabilitation service that enables users to quantitatively verify their medical condition, called the Gait Judge System (GJS). When users better understand their medical condition, they respond more positively to the ensuing rehabilitation program offered by the rehabilitation team; this program comprises medicine, a rehabilitator, and a Kawamura Gishi service person.

**Motivation for Service**

With a PSS, the product’s appearance is the first point of contact with the users, and it should be used to attract them to the associated service. For users of the older-style AFO, the product was something they tried to hide, on account of social concerns (e.g. stigma). Consumers are motivated to avoid products that generate displeasure (Desmet & Hekkert, 2007). For these reasons, the very appearance of the AFO discouraged them from undergoing rehabilitation, and it thus impeded improvements to their medical condition. Therefore, the designer explored ways in which to change users’ negative emotions to positive ones, to motivate them to undertake rehabilitation. This chain of events is seen in the following quotation.

> The motivation of a user is an important factor in solidifying the commitment to rehabilitation. Design has the power to motivate users and help enhance their rehabilitation effect.

The GSD has aesthetic appeal and highly practical qualities. It elicits positive emotional responses from users, and thus acts as a cue in expanding their sphere of action and attracting them to the rehabilitation service.
Innovation of Meaning

A product’s meaning for any given person is likely to be affected by that person’s first-sight response to design attributes, and from the longer-term psychological processes that subsequently ensue (Eisenman, 2013). GSD and the related rehabilitation service contribute to changing first and second-order meanings. First-order meaning works as a categorical meaning at the user’s first point of contact. Users categorize GSD as a piece of sports equipment, on account of its aesthetic impression and semantic interpretation. Moreover, the positive aesthetic impression and the ability to wear one’s own favourite shoes release the product from what might otherwise be a negative societal connotation and thus help reduce user stigma (Correia de Barros, Duarte and Cruz, 2011). In this process, the users associate with the self-expressive symbolism.

Moreover, the rehabilitation service offers the intended context in which users will use the GSD. The GJS and the rehabilitation team work together to offer users the experience of improving their ability to walk. The store of experience with the GSD works as a second-order meaning and helps in the dynamic reconstruction of interpreting the GSD. In this process, the same product meaning is shared by the company and the product users. As mentioned, Dell’Era and Verganti (2011) stress that collaboration among companies helps in disseminating product meaning; in this case, instead of companies’ collaboration, the service itself is useful in sharing product meaning with users.

In changing a product’s meaning, the intended meaning that underlies product and service development is likely to be consistent. In this case, the designer used a metaphor—namely, that AFO use was analogous to playing sports. Existing studies show that metaphor use is effective in conveying a specific meaning through product appearance (Crill, Moultrie & Clarkson., 2004; Nobel, Bing & Bogoviyeva, 2013). Moreover, Zomerdijk and Voss (2011) suggest that metaphor use can guide the development of experimental services. The current study finds that metaphor use in developing a PSS helps maintain consistency between the intended meaning and the intended context. As a result, the integrated product and service accurately and consistently trigger the same meaning among different users.

Profit potentials

As a result of GSD and GJS, total sales of GS and GSD exceeded 300 units while prior to the design firm’s participation, the company had sold only 10 GS units. Moreover, PSSs have a potential to expand lifetime value of each user throughout the entire product life cycle. IoM elicits a positive emotion from users (Verganti, 2008). The positive emotion is key to extending product life (Utterback, Vedin, Alvarez, Ekman, Sanderson, Tether and Verganti, 2006). The GSD has some features to extend its product life. This is illustrated in the following quotation of the designer.

*We employ the titanium frame and design the structure that enables the salespeople to easily exchange every other replacement parts on the spot.*

This contributes to growing the sales of the maintenance service, in addition to the sales of the rehabilitation service. Moreover, the current study finds that positive emotion also impacts other profit potentials.
The provision of high-quality service is key to developing a dynamic relationship between companies and users (Raja, Bourne, Goffin, Çakkol & Martinez, 2013). The satisfaction that accumulates across a series of service events results in cumulative satisfaction (Lam, Shankar, Venkatesh, Erramilli and Bvsn, 2004). Moreover, customer satisfaction can affect ex-post relationship qualities such as trust and commitment (Hennig-Thurau & Klee, 1997). In the current case, the positive emotions elicited among users by the appearance of GSD and the rehabilitation service allow the company to build close relationships with them. Understanding this, the company’s sales team frequently visited customers to adjust the braking force of their GSDs as a user’s medical condition changes and to exchange the replacement parts. Such service visits allowed the salespeople to learn directly about the users’ needs (Morelli, 2003). During such visits, there were sometimes requests for additional products (e.g. wheelchairs, canes, and supporters) or for services (e.g. home improvements). To meet such users’ needs, the company strengthened the service business that offered the products and services bought from other companies through Pacific Supply Co., Ltd. By undertaking these steps, Kawamura Gishi expanded the lifetime value of each user.

**General discussion and conclusion**

This study sought to clarify the relationship between product meaning and a PSS in the context of IoM, and it led to three conclusions.

- Services help users reconstruct meanings within the context of the dynamic cognitive process.
- The use of metaphors can contribute to maintaining consistency between products and services.
- Eliciting positive emotions among users (i.e. through the use of novel meanings) has a potential to lead to better profit-making, by increasing the sales of related products and service.

The first finding implies that a PSS is an effective means of leveraging IoM. Cognitive responses to a product’s appearance comprise just one stage of a process of communication with users (Crilly, Moultrie & Clarkson, 2004), and users reconstruct received meanings in terms of their own individual context (Kazmierczak, 2003). Given that a company encourages users to share an intended meaning that it developed, it is likely to be responsible for the context of consumption throughout the entire product life cycle.

The second finding indicates that metaphor use is more important for a PSS than for the provision of a single product or service. A PSS is needed to integrate a company’s business model and its products and services. Even before the product–service structure is defined, a value proposition that describes its added value is needed, in the first phase of new PSS development (Morelli, 2003). The use of metaphors helps those involved in the process better understand the value proposition (Zomerdijk & Voss, 2011), and it helps maintain consistency between product and service. Moreover, the use of metaphors helps a user meaningfully express his or her personal identity through a product (Crilly, Moultrie & Clarkson, 2004). Thus, metaphor use is also useful in engaging PSS.
The third finding implies that future PSS research will discuss emotion and how it relates to making profits and reducing environmental impact. Emotion is not only a factor on which users rely to select a product: it is also important, from the company’s perspective, in extending the duration of use (Uttercack et al., 2006). Additionally, engendering positive emotions allows the company to build close relationships with users, and longer product life cycles are likely to increase the number of opportunities to contact them. During those contacts, the company can directly learn about users’ needs, within the context of their daily lives. Given that the company has the ability to fulfil many of their pertinent needs, the development of such relationships is likely to expand the lifetime value of each user.

Figure 6 summarizes the findings of this study. It is important to emphasize that IoM is achieved not by users’ static cognition processes, but by dynamic processes that are influenced by interactions between the company and the user.

Figure 6 The comprehension model
This comprehensive model has an implication for future studies. The recent studies on the disciplines of design management have increased the focus of the product experience (Yoon, Desmet, and van der Helm, 2012; Forslund, Karlsson, and Söderberg, 2013; van Rompay and Ludden, 2015). Desmet and Hekkert (2007) showed the components of product experience: aesthetic experience, experience of meaning, and emotional experience, and they are highly related and partly overlaps. It implies that companies are likely to be required provisions of integrated products and services. Thus, practical managers need a guidance to design products and services in order to elicit emotional satisfactions from users. However, the existing studies of the PSS have neglected to include the factor related to the emotion in their design methods. Meanwhile, although the existing IoM studies showed the process to innovate a product meaning as a way to elicit positive emotions from users (Verganti, 2008; Dell’Era and Verganti, 2011), the role of services in IoM remained. This study therefore underlines the importance of IoM achieved by the integrated products and services to the positive emotion from the users. Most of PSS researches have been addressed the perspective of engineering (Vasantha et al., 2012). Thus, it is hoped that this study and its findings will push PSS researchers on the disciplines of design management to tackle questions that relate to IoM.

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References


About the Author

**Satoru Goto** is currently an assistant professor at Toyo Gakuen University, Japan. He received his PhD in the Technology Management from Ritsumeikan University. His current research interests are PSS and design driven innovation.
Co-creating product-service-system with and for the ageing society in different socio cultural contexts

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This paper reports on an empirical study about how designers and design researchers applied a co-creation method to generate product-service-system (PSS) concepts in multi-stakeholder teams, to promote physical activities for elderly people in an EU project. This method is developed based on the Value Design method. The value design method consists of a workshop process and a set of generative research tools to support the value creation process. By analysing the workshop process, results from the end user value creating process, the stakeholder value creating process and the encounter process, this paper demonstrates how designers can use such a co-creation process together with the created generative research tools to enable the value creation for the purpose of adopting the PSS approach by the stakeholders and the end users. The results also showed that different social cultural contexts related to the field of interest determined the stakeholder network construction.

keywords: co-creation; value creation; product-service-system; ageing

Introduction
Ageing has become an unavoidable dilemma and will pose an increasing challenge to the healthcare systems in many different countries. In particular, the health expenditure in the EU is expected to rise 350% by 2050, compared to an economic expansion of only 180%.

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Combining multi-stakeholder values in integrated solutions

To tackle this challenge, a lot of research efforts from different disciplines have been spent to understand this phenomenon and create solutions from their perspectives. For example, research from biomedical field focuses very much on how to improve the diagnosis and treatment of age-related diseases. Biomedical research addresses how to monitor treatment effect which can eventually reduce long term care costs; while research from the home care perspective focuses on providing efficient care so as to manage the increasing care costs and limited care budgets. However, these mono-disciplinary solutions do not necessarily solve ageing problems, in contrary, new age-related problems may be created. For example, if a new medicine is developed for a certain age-related disease, this medicine may not be available for all elderly patients due to differences in social-cultural background and stage of their disease. Or even if employing advanced care technologies can reduce care costs at home, there is no guarantee that the quality of care can remain as before. All these examples suggest that ageing is a wicked problem (Rittel and Webber, 1973). There are multiple stakeholders present in this field with different competencies and solutions from their own perspectives. There is thus a strong need to pay more attention to the relationships between different stakeholders and connections between their solutions to support their collaborative act in creating solutions.

In addition, advances in social, mobile, information processing (big data analysis), and the opportunities of cloud, i.e. the Nexus of Forces (Howard et al., 2012) have already influenced the way that products and services are being developed today. Howard et al. (2012) argue that the traditional way of developing products or services by passing them from one organizational unit to the next along the product development processes, i.e. the value chain model (Porter, 1985), will not lead to the competitive advantages that Porter (1985) has envisioned. When addressing the evolution from value chains to networks, the value network approach (Normann and Ramirez, 1993) is more desired according to Peppard and Rylander (2006), specifically in the context of mobile network operators. Gardien (et al., 2014) also pointed out that a more collaborative and flexible approach to innovation is necessary under the emerging technological and economic changes. Therefore in the context of designing for the ageing challenge, a multi-stakeholder collaborative network approach is more appropriate and desired.

This conclusion also implies that a single product or service provided by these mono-disciplines will not be able to provide for the involved complexities of ageing, the wicked problem. It is interesting to then introduce the concept of Product-Service-System (PSS) here. The concept of PSS started from the field of sustainable innovation (Mont, 2002; Mont, 2004; Tukker & Tischner, 2006). According to Goedkoop(et al., 1999), PSS can be defined as “a marketable set of products and services capable of jointly fulfilling a user’s need”. Although already existing about seventeen years, PSS has received significant attention recently in the creative industry (Goedkoop et al., 1999, Baines et al., 2007; CRISP, 2010) and in design research (Manzini & Vezolli, 2003; Morelli, 2003; Morelli, 2006; Baha et al., 2013a; Sturkenboom et al., 2013b). Reim (et al., 2015) conducted a systematic literature review on the implementation of business models for PSS creation and identified five prominent tactics of creating a PSS. These tactics are related to contracts, marketing, network, product and service design, and sustainability. Gültekin et al. (2016) stressed that when designing for multi-stakeholder network innovations a continuous
reflection on the design space, the business space and the collaboration space is required. The design space refers to the users and use characteristics. The business space, which can be also called as the implementation space, refers to the activities and resources required to realize the design solution. While the collaboration space refers to stakeholders in the network, their motivation and impact on the proposed solution. The discussions above suggest that PSS is a promising method to tackle the wicked problem of interest here.

The lack of adoption of PSS solutions
One of the challenges identified by Omann (2003) related to PSS innovation is the lack of adoption of the PSS. Baha et al. (2013a) identified two barriers to adaptation of the PSS innovation approach: 1) users’ difficulty with the cultural shift from ‘ownership’ to ‘usership’ (Scholl, 2006; Rexfelt & Ornas, 2009); (2) stakeholders and producers’ difficulty with shifting from the value chain approach to the value network approach (Mandell, 2011). These two challenges call for a better understanding of the consumers and stakeholders as well as their needs and wants.

The use of the value design method for creating PSS solutions
Gültekin et al. (2016) created a co-creation method, the Value Design Method, to support the creation of PSS concepts by a multi-stakeholder collaborative network to connect both user insights and stakeholder insights and facilitate the collaborative ideation process. The details of the development process and how the method compares to existing methods on developing experience and business design solutions are described in Gültekin et al. (2016). The main contribution of this method lies in the fact that it enables the designers, together with the multi-stakeholder network, to create design concepts in a broader context by considering business dimensions or stakeholder roles in their collaboration next to user-product interaction. This paper will explore how this method can support the designers to co-create PSS together with multi-stakeholder network in the ageing context with specific focus on improving the adoption of the PSS approach by the stakeholders and end users.

The Responsive Engagement of the Elderly promoting Activity and Customized Healthcare (REACH, 2016) is a EU funded project focused on ageing. It aims to prevent chronic diseases and reduce long-term care costs by promoting physical activity among elderly people. Its consortium consists of 17 partners from more than four different EU countries such as knowledge providers (research institutes, universities), technology providers (sensors technologies, prediction software, intervention mechanisms), multiplicators (insurance companies, standardization organizations, etc. who are able to multiply the impact of REACH in long term), and solution operators (clinics, rehabilitation centers, and home care providers) (REACH, 2016a). REACH aims to build a PSS that “will turn clinical and care environments into personalisable modular sensing, prevention, and intervention systems that encourage the elderly to become healthy via activity (physical, cognitive, mobility, personalized food, etc.)” (REACH, 2016). Due to the diverse backgrounds of the stakeholders and their different expertise and interests in various social cultural contexts in EU, this paper investigates how the value design method (Gültekin et al., 2016) can be used by designers to facilitate co-creation workshops for creating PSS concepts with stakeholders from different social cultural contexts and eventually support the adoption
of the PSS approach by the end users and the stakeholders. In these contexts healthcare policies and business models, stakeholder relations, end-user participation is different.

The paper is organised as follows: Section 2 discusses the stakeholder context of REACH and the motivation of applying the value design method in detail. Section 3 presents the research method that is used to collect and analyse the case study data. Section 4 reports then the detailed results and corresponding analysis. This paper closes with the discussion and conclusion.

**Background**

**Related work**

As already discussed in the introduction, PSS creation calls for a better understanding of the consumers and stakeholders as well as their needs and wants. This section briefly discusses what is the current related state of art in the design research field.

1. **Understanding the needs and wants of the users and stakeholders**

Designers often find it difficult to empathize with user groups when working with complex design problems such as ageing. Due to the diverse ageing population with different physical, sociocultural, environmental, and economic conditions and connections within society, it is difficult to completely understand the needs and wants of these user groups. A more explorative approach at the early stages of the design process to understand the nature of the problem is desired. The direct involvement of users in the design process, in order to move from an understanding of users as a subject of study towards an understanding of users as experts of their own experiences, is more appropriate here (Sanders and Stappers 2014). Participatory innovation and co-design are ways to involve users collaboratively in the design process (Buur and Matthews 2008; Mattelmäki and Visser 2011). When collaborating in multi-stakeholder teams, generative design research toolkits can be used by the stakeholders to create dialogues among stakeholders when co-creating values for the end users (Anderson & McGonigal, 2004, Vaajakallio & Mattelmäki, 2007). The purpose of applying generative design research toolkits is to support the co-creation of ideas, insights and concepts in multi-stakeholder innovation (Sanders & Stappers, 2014).

Co-creation is creative and collaboratives. It is also an interdisciplinary process for people with shared goals, but different skills and knowledge, to collaborate together (Vargo et al., 2008). Co-creation is often seen applied to networked innovations where the value is created for the users through direct and indirect relationships with many partners at the network level (Romero & Molina, 2011). Through co-creation, stakeholders combine their knowledge, resources and expectations to understand and address wicked problems and develop propositions and realization plans (Basole and Rouse, 2008; den Ouden and Valkenburg, 2011). In this way, co-creation is a useful network innovation approach that can help align the different expectations of the stakeholders and create shared values and joint propositions for the intended target users.

2. **Tools for developing PSS solutions**

As already discussed in the introduction, although the understanding of PSS is relatively new and originated from sustainable innovation, there is an increasing understanding of
how designers can play a key role in initiating collaborative network innovation (CRISP 2010; Morelli 2003; den Ouden 2011, Baha et al., 2013a). Next to their functional specialism in design, their highly developed skills in making and producing, facilitating and empathizing, leading and entrepreneurship are relevant for the scope and complexity in PSS innovation (Sanders & Stappers, 2008; Stompff, 2012; Han, 2010; Tomico et al., 2011). Gültekin et al. (2016) proposed a co-creation the value design method that can be used by designers to support the early ideation of multi-stakeholder innovation. In particular, this approach specifically aims at supporting the designers together with the stakeholder network in enriching a design concept by considering not only values for the end users but also values for the stakeholders and their roles in the proposition. The value design method consists of the following four stages:

- **Briefing & Analysing.** This stage starts with an introduction of a design brief consisting of a design problem and an initial concept, followed by the analysing step. In the analysing step, the basic use context is defined, the typical user activities in the use context are identified, and the use scenario is structured. The design challenges including problem areas, un-met needs or conflicting interests between stakeholders are also identified and served as starting points to look for design opportunities.

- **Identifying values:** In this stage, the values of the initial concept are analyzed according to the three different levels defined by the Value Framework (den Ouden, 2013) namely: Value for the User (why the concept is meaningful for the users), Value for the Market (why the concept differentiates itself from the existing solutions), and Value for the Stakeholders (why the concept is attractive to the stakeholders).

- **Synthesizing:** At this stage, the participants discuss which design challenge was more crucial to solve and what the added value would be based on the results from step 1 and step 2. The initial concept is enriched with additional synthesizing activities.

- **Consolidating & Evaluating.** At this last stage, the participants focus the discussion on how to realize the finalized use scenario and the concept. The concept is evaluated through joint reflection.

**Project background**

In order to create the expected PSS, REACH needs to create a collaborative network with various stakeholders within a joint development team. The development strategy of REACH is to create PSS subsystems in four different fields of application at the four solution providers including a clinical environment, a rehabilitation/care home center, a home care provider, and a home care/care home at a municipality level in four different EU countries before the final integration of the total PSS. These four different application fields, i.e. use cases, were chosen to represent the different health states of elderly users in their recovery journey from hospital to home. In this way, REACH can demonstrate how the value design method can be applied by designers to support the project use cases to co-create the intended PSS with stakeholders from different social cultural contexts.

The table below demonstrates the different characteristics of the four different use cases.
Table 1  The four testbeds and use cases

<table>
<thead>
<tr>
<th>Use case</th>
<th>Country</th>
<th>Solution operator</th>
<th>Health state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use case 1</td>
<td>Germany</td>
<td>A: Clinical environment</td>
<td>Hospitalized</td>
</tr>
<tr>
<td>Use case 2</td>
<td>Switzerland</td>
<td>B: Rehabilitation /care home</td>
<td>Rehabilitation</td>
</tr>
<tr>
<td>Use case 3</td>
<td>the Netherlands</td>
<td>C: Home care center</td>
<td>Independent living with support at activity center</td>
</tr>
<tr>
<td>Use case 4</td>
<td>Denmark</td>
<td>D: Home care/care home at municipality level</td>
<td>Independent living with support at home</td>
</tr>
</tbody>
</table>

Research approach
This paper examines how the value design method can be applied in co-creation workshops of REACH to create concepts with values for both the target elderly people and the related stakeholders.

Firstly, the designers and design researchers from the project consortium took the lead in developing the customised workshop method based on the value design method and facilitating the workshop. A set of generative design research tools were made to support the co-creation processes in the workshops. Then, multiple-case studies (Benbasat et al., 1987; Yin, 1994) of co-creation workshops based on the workshop method were conducted related to different use cases (see Table 1) to strengthen research findings related to the way in which the value design method could be applied to support the ideation of value co-creation with the target user group and different stakeholders.

As mentioned, the value design method aims at supporting stakeholders to create PSS in the early ideation phase. Based on service-dominant logic (Lusch & Vargo, 2006), Payne (et al., 2008) proposed a conceptual framework to analyse the co-creation process from three different processes: the customer value-creating process, the supplier value-creating process and the encounter process. These three processes demonstrate how customers experience the created values for them through the interaction and exchange processes with the suppliers and enabled by the suppliers’ action in creating such values. They argued that the insights generated from the combined perspectives could help the stakeholders to see the opportunities for adopting the co-creation of values. This paper discusses a PSS network co-creation process. Using similar logic, the workshop process and results will be analysed from the following three perspectives: the end user value-creating process, the stakeholder value-creating processes and the encounter processes. Figure 1 below depicts the relation of these three processes.
Co-creation workshop program and created generative research tools

As discussed above, four co-creation workshops based on the value design method were conducted at the four different test bed locations in the context of REACH. Below the general set up of the workshop and the created generative research tools are discussed. Since this workshop program was based on the value design method, the program follows the 4-step approach discussed earlier. Added features due to consideration of the specific REACH context are discussed below.

1. Brainwriting

Gültakin et al. (2016) recommended applying the value design method when there is already an initial design concept and a need to integrate knowledge from experts and related stakeholders. However, when starting the project, there were no initial design concepts yet and it was therefore not possible to apply this method directly in the co-creation workshops. Thus, this method was adapted in order to embed ideation activities. Since these co-creation workshops quite often involve multiple yet unacquainted stakeholders with different interests and expertise from various nations in Europe, the brainwriting technique instead of brainstorming technique (VanGundy, 1984) was chosen to organise the group ideation session prior to the application of the value design method. During the brainwriting session, each individual participant writes his/her ideas on a sheet of paper. After five minutes, the sheets are rotated to a different workshop participant, who builds off of what their predecessor has written. This process continues until everyone has written on everyone else’s sheet. The entire session can take about 20-30 minutes. In the end, all group members will rank the created ideas individually and jointly elect favourite ideas to work on further as a group.

Afterwards, the value design method can then be applied to support a multi-stakeholder team to iteratively develop a proposition. The iterations consist of idea development based on pairwise comparisons between design considerations (who are the users, what are their characteristics and what is their context of use?), stakeholder considerations (what are the drivers behind their actions, and what can they contribute to the propositions?) and business considerations (what is needed to implement the propositions?). Scenarios are used as a dynamic thinking tool to evolve the propositions during the process.
2. Co-creation input and output templates

The layout prompts introduced in the value design method was designed specifically to guide the flow of the workshop following the 4 steps. The created lay-out forms were found limited in providing guidance when filling up the contents by the participants in earlier studies (Gültekin et al., 2016). Therefore, a number of co-creation templates were created as generic design research tools to support, on the one hand, the documentation of the workshop results and on the other hand, guide the participants through the workshop process and allow them to share their knowledge on specific topics based on their expertise when creating PSS concepts. The types of input templates created include: input cards, triggering cards and output cards.

Input cards consist of experience-mapping cards based on Philips’ experience map method (Philips, 2014) and were served as input for the co-creation workshop. The local use cases created these experience maps from their own user research based on the template provided by the designers. The contents of the input cards contain the user insights from the four use cases. The triggering cards, as sources of inspiration, aim at supporting the ideation of the different stakeholders and consist of:

- Insight cards: these cards were created by designers prior to the workshop to describe the user insights based on the local use cases and project objectives.
- What-if cards: these cards were created to stimulate the brainwriting session. What-if questions on these cards were formulated based on the interests of REACHnd the needs of the use cases.

A number of templates were created to capture the workshop output. These templates are:

- Framing opportunities template: this tool was made to identify the design opportunities and formulate the design challenges based on user insights identified earlier.
- Idea template: this template was made to capture the created ideas by specifying what the idea is, why this idea, how it works and what capabilities are needed to make it happen.
- Experience flow template: this template helps record any thoughts, feelings and actions the user might experience or do when using the designed product or service. One might uncover important aspects of the design that one has overlooked, which can pose equally as an opportunity as well as a threat. It helps to carefully examine what users of your product and/or service might experience, and document your observation. This template was created based on Philips (2014).
- Service blueprint template: this template was based on the service blueprint technique. By defining customer actions, the resulted physical evidences, separating visible from invisible customer-employee contact, and identifying the support processes in the background, this technique can demonstrate different processes provided by a stakeholder organization, in order to create and deliver the intended services (Shostack, 1984). The service blueprint was made to describe the different actions that the stakeholders need to take in
order to realise the intended services and experiences for the target customers.

The following figures give an example of the insight cards and what-if cards used in the workshop.

![Insight Card](image1)

**Figure 2. Example of Insight cards, What-if cards**

3. **Stakeholder Empathy Wheel**

In addition to the content-related workshop activities as discussed above, in order to have a successful workshop it is important to realise that the design workshop process is a social process (Cross and Cross, 1995). It is necessary to align the moods and spirit of the participants and create a trusting and safe atmosphere for the follow-up co-creating activities. Therefore an ice-breaking activity was designed for the participants to take at the beginning of the workshops. This activity was based on professional empathy principles (Steenbakkers et al., 2015) and the stakeholder empathy wheel template (see Figure 3), a generative research tool created to help the stakeholders to introduce themselves to each other and express their needs.

![Stakeholder Empathy Wheel](image2)

**Figure 3. Stakeholder Empathy Wheel Template**

Since the purpose of the workshops was to create initial PSS concepts that the development team of the project could continue to work on, at the end of the workshops,
all concepts were ranked and prioritised based on the purpose of the REACH and the preferences of the stakeholders.

As a result, the co-creation method based on the 4-stage of the value design method lasts for two days and consists of the following steps:

- Professional empathy
  Creating a trusting, collaborative atmosphere for better acquaintance in multidisciplinary teams
- Design considerations
  Creating common ground for further ideation based on experience maps and personas from the local use cases
- Ideastorming
  Brainwriting in teams and concept selection
  Stakeholder considerations
  Creating experience flows for each different stakeholders involved in the concepts
- Business Considerations
  Creating service blueprints for the selected concepts, and defining actions at both the front and back stage to realise the intended user experiences
- Joint reflection and conclusion
  Ranking the created concepts and select those to develop for the next project stage.

**The workshop participants**

The first workshop was organised to take place on June 21 and 22 2016 in test bed location A. In total 30 people (9 project consortium partners, 3 elderly patients, 3 caregivers, 11 staff from the solution operator A and 4 local stakeholders outside the project consortium) participated in the workshop. Among them there were 3 designers/design researchers who facilitated the workshop.

The second workshop was organized to take place on September 5 and 7 2016 in test bed location D. In total 26 people (including 17 from the project consortium partners, 2 elderly patients, and 7 staff members from solution operator D) participated in the workshop. Among them there were 3 designers/design researchers who facilitated the workshop.

The third workshop was organised to be on Sept 13 and 14, 2016 in test bed location C. In total 40 people from the project consortium partners, the elderly, their formal and informal caregivers, local partners with the solution provider C, including other care organisations, municipalities, insurance companies and physiotherapists, participated in the workshop. Among them there were 3 designers/design researchers who facilitated the workshop.

The fourth workshop was organized to be on Oct 17 and 18 2016 in test bed location B. In location B, 21 project consortium partners, 3 patients, 3 caregivers and 3 local partners participated in the workshop. Among them there were 4 designers/design researchers who facilitated the workshop.
The participants outside the project consortium were invited based on their organizational position and expertise. In this way, a mixed-gender, multi-age group with different knowledge domains participated in each workshop.

Results and analysis

Co-creation workshop process
The workshops mostly went according to plan, except for one situation. Initially, it was expected that the workshop could be organised in English for solution operator A. However, due to the participation of the elderly patients with English language deficiency, the workshop had to be given in German. To better accomplish this, designers/design researchers decided to change the group brainstorm and idea-storm activity in a fishbowl discussion session. The elderly and care providers were organised together in the centre of the session as the insight-gathering focus group and two ideation groups were organised, and positioned around, to create ideas based on the insights/feedback received from the continuous ping-pong discussion and interaction with the focus group. In this way the input from the patients and caregivers could be used iteratively to develop the intended concepts.

1. The end user value-creation process
The end user value-creation process took place in the co-creation process during the pairwise comparison between the design space and the collaboration space. In all workshops, the elderly participants primarily participated in the sessions on the first day. These elderly provided extra insight to the personas, defined earlier, and to the experience mapping done prior to the workshops. Some of the elderly participants were also available on the second day and provided feedback on the ideas that the stakeholder teams created. Their primary input to the co-creation workshop were twofold: inspiring and informing. They interacted with the stakeholders with support from a number of generative research tools such as the idea template, the experience mapping template and the service blueprint template. These tools allowed the elderly to understand the created ideas and supported them to formulate their input.

The stakeholders gained many user insights through the interaction with the end user and also by using the insight cards. The values for the target elderly group were defined in the ideastorming section of the workshop and recorded in the experience mapping template and the service design blueprint template to support further dialogue between stakeholders and the end users.

2. The stakeholder Value-creation Process
It was observed that the created generative research tools had different functions at various moments in the workshops when creating values for stakeholders.

During the ice-breaking phase, the stakeholder empathy wheel template allowed the stakeholders to express who they are, what resources they have and what they want to achieve with the workshops.

The experience flow template was used in the stakeholder consideration phase to understand the motivation of different stakeholders and what impact they could have on the end user experiences. The service blueprint template was used in the business
consideration phase to identify the important resources and activities for the value creation.

When reviewing the end user value-creation process and the stakeholder value-creation process, it can be concluded that the combination of using the workshop approach based on the value design method and generative research tools enables the designers to facilitate the workshop and support the stakeholders and the end users in adopting this co-creation approach. The designers and design researchers keep defining and facilitating the co-creation approach, while the stakeholders and the end users are active in co-creating values.

3. The encounter process

Since the ideastorming session started with enriching the personas and experience maps the insight cards and what-if cards helped the stakeholders to get informed and inspired for additional ideas.

The stakeholders first made use of framing opportunities template to come to an agreement on the design challenge during the design consideration phase. The stakeholders then used the idea template to capture different ideas during the ideastorming phase.

It was observed that during the workshop the generative research tools were able to:

- Support the participants to become motivated when interacting with each other using the professional empathy wheel
- Support the participants to emphasize with the elderly target group when using insight cards.
- Support the participants to identify and express opportunities for innovation when using the what-if cards and the framing opportunity template
- Support the participants to describe the ideas using the idea template
- Support the participants to define the realisation activities using the experience flow template and the service blueprint template. It is interesting to note that the ideas were further developed when the workshop moved forward to the stakeholder consideration phase and the business consideration phase and the templates used later also captured the evolvement by detailing the ideas using the experience flow and service blueprint.
- Support the designers/design researchers to gain the ability to improvise in action when the elderly participants were not able to provide comments in English for example.
- Support the designers/design researchers to document the co-creation process with co-created outputs and reflect while facilitating the workshops.
- Support the participants to build on the results further step by step and reflect while participating the workshop.

The generative research tools were able to capture the changes made and create a platform to inform, inspire and create dialogue between stakeholders when expressing their ideas (Sanders, 2008).

The table below indicates where in the co-creation process different generative research tools support the value creation for the end users and stakeholders.
Table 2. Different use of generative research tools in the co-creation workshops

<table>
<thead>
<tr>
<th>Co-creation process</th>
<th>End user value-creating</th>
<th>Stakeholder value-creating</th>
<th>Encounter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional empathy wheel</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insight cards</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What-if cards</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Framing opportunity template</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ideate template</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience flow template</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Service blueprint template</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

What can be concluded is that the workshop program allowed the participants to move from the design space, the collaboration space to the business space fluently. In this way, the elderly participants could inform the stakeholders about their needs and wants and help to create a common ground (values for the end user) for co-creation. They could also give feedback to the stakeholders on the ideas generated. The stakeholders could exchange their ideas with each other, define and express their intended values (values for stakeholders) and negotiate based on the common ground defined (encounter process).

Co-creation workshop results

At solution operator A, 4 concepts were chosen as the most preferred concepts at the end of the workshop. The PSS concepts focus mainly on objectively measuring health progress and activity status in a hospital context, including incontinence, physical activity, and providing feedback about the overview of user progress, motivating more activities or preventing unwanted situations. The resulting stakeholder network consists of the target elderly patient group, the solution operators including healthcare professionals, multiplicators such as insurance and technology providers for sensing, rehabilitation, and data analytics.

At solution operator B, the participants chose 3 preferred concepts. The PSS concepts focus mainly on sensing physical activities, locations and social connections, documenting healthcare progress in both at-home and in-hospital contexts, so as to motivate a more active lifestyle within their capability. The created stakeholder network consists of the elderly target group, solution operators including healthcare professionals and informal caregivers, technology providers for sensing, rehabilitation and data analytics.

At solution operator D, 3 preferred concepts were chosen as the output of the workshop by the participants. The PSS concepts primarily focus on both subjective and objective measurements of health status and provide feedback to motivate more physical activities. The resulted stakeholder network consists of the elderly target user, solution operators including informal caregivers and healthcare professionals from municipality and technology providers for sensing and data analytics.
At solution operator C, the participants chose 3 concepts as the more preferred concepts. The PSS concepts focus on detecting irregularities in daily activities, sensing environmental changes and promoting physical and social activities. The created stakeholder network consists the elderly target group, the solution operator including informal and formal caregivers, the multiplicators such as insurance, and the technology providers for sensing and data analytics.

From the workshop results it can be observed that the main values created for the end users were similar: focusing on sensing physical activities and health status and creating motivation for a more active lifestyle. However, the stakeholder networks (the collaboration space) were somehow different. Multiplicators only appear in the stakeholder networks at solution operator A and C but not B and D. This has to do with the national healthcare policies in these countries. Solution operator B and D operate in welfare-based healthcare systems, while solution operator A and C operate between welfare and private insured healthcare systems.

Prior to the workshop it was expected that the role of technology providers should differ in home and hospital/clinic situations. Rehabilitation technology provider was expected to be relevant for the hospital/clinic situations while sensing technology providers were more relevant for home context for the purpose of preventive care. The resulting concepts suggested that sensing technology providers would also be needed in the context of hospital/clinic contexts for REACH for the purpose of sensing and monitoring of the recovering progress. Data analytics was found to be generally required for both home and clinic set up.

These observations imply that when applying co-creation workshops in socially culturally different contexts with participants from other social cultural contexts, although the values for the end users may be comparable, the collaboration space and the business space can differ much depending on the local social cultural contexts.

Figure 4. Workshop session

Discussion and limitation of the study

The value design method for multi-stakeholder ideation was applied to create PSS concepts at four solution operators for REACH. The workshop process and the workshop results demonstrated that such a method is capable of creating value for both
stakeholders and end users so as to motivate their adoption of the PSS approach. The generative research tools utilized, created a platform for end users and stakeholder to communicate about their wants and needs. It is necessary to mention that the workshop participants were from different disciplines with various experiences with co-creation from limited experiences to expert facilitators.

At the same time the stakeholders had had some interaction and commitment, because they had already been selected and had interacted in developing the REACH project proposal before participating in the workshops.

This paper was written from the observation and experiences of the designers and design researchers who developed the workshop program based on the value design method and facilitated all workshops. With the expertise of these designers and design researchers and the support of the generative research tools the stakeholders were empowered to socialize with each other, communicate their needs and wants, identify the innovation opportunity together, and express their intention in the project through the PSS concept co-creation. At this moment, the stakeholder networks formulated at the four workshops are working together to further develop the PSS concepts within the context of REACH. It is expected more research data related to the co-creation process with the stakeholders from their perspective will be collected so as to contribute to the empirical research on managing and measuring co-creation process and adoption of PSS approach further.

**Conclusion**

The paper demonstrates the usefulness of the value design method in supporting the designers to facilitate the stakeholder network to conduct design iterations between the design space, the collaboration space and the business space. The created generative design research tools were found useful in particular when designing and documenting the details related to PSS design. Yet it is important to realise that the discussed co-creation workshop at the early design stage of PSS innovation is just the first step towards the creation and realisation of the intended PSS innovation. How to co-make business from these concepts and make real society impact along the development and realisation process of the PSS innovation remains a challenge for the multi-stakeholder network. Value co-production (Ramirez, 1999) has been widely discussed on its implications on defining business, organising work and managing the creation of values. The question of how designers can support the value co-production and make the co-created values sustainable along the multi-stakeholder innovation processes needs to be addressed from business, management and organizational perspective as the continuation of the agenda in the Crisp (2010).

**Acknowledgement**

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A prelude for PSS, practice consolidating theory

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This research paper describes the transition to integrate products and services into systems and contributes to a broader understanding of the research field PSS design as an emerging area and phenomenon. Ensuing a synthesis approach, we outline different organizational drivers that emerge from the transition toward PSS as innovation strategy. Based on five in-depth interviews with experts that have specific knowledge and involvement in PSS design projects, the paper confronts a previous literature review with its practical counterpart. Findings clarify the definition, related terminology and context of PSS, but also advocate a future effort to appropriately support an operational integration of product and service side. Additionally, we observe an obvious evolution of value creation - through a focus on the (user) experience - as part of the rise of the product service system itself, an essential insight that can contribute in various ways to current PSS practices.

keywords: product service systems, front-end of innovation, in-depth interviews, value creation

Introduction and exposition of chapters

Rapid advancements in electronics, information and communication technology are constantly challenging organizations to introduce new offerings to the market. More frequently the outcome results in product service combinations or systems that require the organization to systematically rethink the design process in order to integrate both tangible and intangible components. The main challenge is to manage the variety of underlying design processes, based on service, interaction and (user) experience design - in order to explore the opportunities provided by emerging PSS concepts. In the case of product service systems (PSS) it’s important that products and services are designed as a combined value carrier, rather than merely adding services as by-product or using

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products only as a means to provide services. In order to support a valuable inclusion or transition, this paper targets current academic researchers and design practitioners in the field of PSS in need of a logic that sets focus on the synthesis of both.

*A fixation on goods is understandable considering design’s historical role, the half-hearted integration of services increasingly out of touch with times.* (Secomandi & Snelders, 2011)

We hypothesize that, following a synthesis approach (Drejer, 2004; Sayem, 2012; Carlborg, Kindström & Kowalkowski, 2014; Morrar, 2014) previous neglected characteristics of innovation will surface, relevant for both manufacturing and service provider context.

The paper is organized as follows: the first part outlines why we choose in-depth interviews as research method, the specific research unit details and its sampling. Secondly, we introduce typical PSS associated terminology and its respective connotation before tapping into a broader definition for PSS and its clear connection to the user experience. A third part introduces the transition toward PSS that organizations undertake. Different pathways and characteristics will be discussed and set the dominance on the product or service side for PSS. Finally, an overall organizational approach is put forward to add to the habitual practice and motives for deciding on PSS as an innovation strategy, and recurring process characteristics are presented.

**Methodological approach**

The aim was to better describe and interpret the experts’ empirical descriptions about PSS in organizational context. We therefore selected semi-structured in-depth interviews as qualitative and interrogative research method for exploratory purposes. The interviews describe strategic and process parameters, conditions, decisions, activities, etc. to pinpoint potential added value in the early stages of design. Therefore, the research required opinions of people with specific knowledge and involvement in PSS design projects in order to generate theory from industrial context and practice, opposed to or complementing a previous literature review by Dewit (2014). Consequently, purposive-expert sampling was used as a nonprobability method to build on the experts’ experience.

Five interviewed experts, the research unit, represent their institutions respectively in Belgium, the Netherlands and Germany, and are all recently moving into the design and development of product-service systems. The first two experts represent Flanders InShape (BE), a program manager for knowledge transfer and a design management coach. In order to create capacity and competences in Flemish SME’s, they develop knowledge and tools in the areas of product and service development, design and design management, with the user as source and inspiration for innovation. The third expert is partner at Namahn (BE), a full service design agency that recently refocused toward a better understanding of human behavior, organizational processes and whole systems, in order to design products, services and purposeful experiences in a complex, digital environment. The fourth interviewed expert lead the Competitive Advantage through Strategic Design (CASD) project related to the Creative Industry Scientific Program (CRISP) at TU Delft (NL). The project was about achieving effective strategic design thinking that enhances the competitive position of PSS. The last expert was a project manager for service design and innovation at the Service Science Factory (SSF). Their innovation projects focus on design
and development of a new/improved service concept, complex service systems, technology-intensive services and transformative services both at Maastricht (NL) and Köln (DE).

Getting the facts straight

*PSS associated terminology and respective connotation*

Although PSS is widely accepted throughout the academic scene, in practice organizations use terminology as they see fit. A broad range of similar terms, concepts and methods proposed in literature that describe this transition in include products and services (Vandermerwe & Rada, 1988; Penttinen & Palmer, 2007; McAloone, 2011; Sakao, 2011; Vijaykumar, Vasantha, Hussain, Roy, Tiwari, & Evans, 2011, Vijaykumar, Rajkumar, Lelah, & Brissaud, 2012) was introduced to the interviewees. According to their specific knowledge and involvement in PSS design projects, the subsequent terminology applies to PSS in descending order. The choice of terminology on product service systems is not on the ‘what’, but more dependent on ‘who’ you talk to and the respective connotation they put on the former or the latter component in the system, product or service.

*Product-service combinations* are self-explaining. E.g., now you’re delivering products, what if you add a service component to add more value to the customer; sometimes they already provide after sales, but you can also add services before sales; etc. *Product-service, Product-service mix or system and hybrid product service* fall under the same category of understanding. However these term are slightly less in scope or profound than *PSS* itself, where the focus is on the system. The terms *hybrid product service* and *Industrial PSS* have a too technical connotation and interpretation.

*Integrated solutions* as a term is also a good alternative. Integrating the service part in the solution, makes it easier to talk about experiences and satisfaction by means of e.g., the customer journey.

A known term and used occasionally, but evoking some controversy is *servitization*, because of unfamiliarity to SMEs and often scary to manufacturers because of its association with total cost of ownership. Some argue that servitization is the process in which you develop PSS, others don’t associate servitization with PSS under any circumstance or at least not exclusively.

Because of a more clear connotation to the service and linkage to management and marketing fields, following terms are associated - but not entirely - with PSS; *service economy, service engineering, service/product engineering, service economy, SD logic and functional (total care) products*.

*Definitely, defining PSS*

Although many authors in the field of PSS contributed, no general accepted definition is formulated so far. However, after analyzing a vast array of current definitions (Shostack, 1977; Goedkoop, van Halen, te Riele & Rommens, 1999; Brezet, Bijma, Ehrenfeld & Silvester, 2001; Manzini & Vezzoli, 2003; Mont, 2004; Wild, 2009; Ceschin, 2012; Tischner & Vezzoli, 2013), some recurrent characteristics surface. Dewit (2014) further elaborated on clusters of recurring characteristics that emerged from an analysis of PSS definitions by Vijaykumar et al. (2012). We inquired the five experts after their
personal definition of PSS, in search of recurring elements comparable to the six clusters: ‘value constellation’, ‘evaluation criteria / selection’, ‘integration’, ‘scenarios’, ‘product/service definition’ and ‘user centered’. Table 1 depicts the experts wording that refers to the different clusters. However noticeable, also addressed subsequently in this paper, the experts leave out every phrasing that refers to ecological aspects, it is not the distinguishing factor to strategically engage in product service integration.

**Table 1  PSS clusters.**

<table>
<thead>
<tr>
<th>From theory emerging clusters</th>
<th>Experts used wording such as</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Value constellation</td>
<td>ecosystem; value proposition; end user and other people’s characteristics within (affected by or affecting) the context or system (as is)</td>
</tr>
<tr>
<td>(2) Evaluation criteria</td>
<td>context (project brief) dependent; discussion and convergence approach; both components add value (criteria); checking perspective affected/-ing</td>
</tr>
<tr>
<td>(3) Integration</td>
<td>the process of getting products and services combined in the system; providing a solution regardless of its components</td>
</tr>
<tr>
<td>(4) Scenarios</td>
<td>the transition from as is toward to be; enabling the solution to come about and grow naturally; it holds something more complete, the system, a story</td>
</tr>
<tr>
<td>(5) Product</td>
<td>briefing or defining the specifications of the to be solution, whatever the designed components (touch points) might be - affecting the context</td>
</tr>
<tr>
<td>(6) User centered</td>
<td>verifying a user’s perspective (central) throughout the entire process; bring a valued experience to those affected by the as is / to be context</td>
</tr>
</tbody>
</table>

Without aiming to put forward a new definition for PSS, the clusters archetypically build, add to and to some extent redefine PSS.

*PSS design is a constant discussion and convergence approach to understand, explore and define different perspectives on value of those that affect the context and others that are affected by it. Regardless of the distribution of product and service components in the solution, the PSS aims to sustain the ecosystem and allow continuous growth, essential to keep the PSS alive and enable the transition that goes beyond the design itself, toward meaningful innovation. It’s not about the design of the solution itself, but the enablers that make the envisioned change come about naturally. (Dewit, Baelus, Van Ael, De Roeck, De Rijck & Coreynen, 2016).*
Experience is king
You might tackle a need apart from any experience at all and work purely on performance. But without the focus, it’s bound to end up in technology or market driven products. Fortunately with the rise of PSS, especially recognizing the service part in the transition toward PSS, more interaction comes into play between people, beyond user friendliness or usability. With services and less(er) tangible components (Young, 2008), the experience has become more important because once it is about human interaction and emotion. E.g., sharing economy concepts are more than a just cost argument or reducing the amount of products sold, it also a way to involve and engage people. It’s constantly about the experience the users may have, interacting with each other, product and service side and trying to keep that as positive and as long as possible. Conclusively, the user experience contributes to PSS, however it remains very complex due to its multiplicity of touchpoints and their necessary coherence. So if you don’t design it in a consistent - emotional before aesthetic - way, the user will not like it. Ideally, the better user experience goes alongside the better PSS.

The important thing is the ‘integration’ of product and service, how they complement each other. The user experience has an intermediate role and therefore its necessary presence throughout the entire process. E.g., gathering information by spending an entire day with veterinarians to spot their latent needs; determining pre-purchase expectations by means of a preliminary concept or prototype of the future PSS; experiencing the actual use of the PSS.

Clearly, the road to synthesis has its primary objective to satisfy the customer and increase value. The customer perspective, need fulfillment and value creation are put at a central stage.

Aim for PSS
Based on the knowledge of the experts with multiple projects and company cases that aim for PSS, we were interested in what companies believe in, where they are going, how they get there, what makes them different and how they bring the message out.

The success of PSS is - partially - due to a trend in service design and some of its relevant principles. Service design terminology in terms of user research is what now can be referred to as design research. A lot of people are interested in the tools and its hands-on approach, allowing them to go further than determining or redesigning only one or two physical touchpoints. The aim is to extend to a completely new customer journey with all necessary touchpoints of the user in interaction with the organization, basically providing the possibility to create the whole story.

A PSS approach tends to open up knowledge and empathize with the user and his/her context. It strengthens, professionalizes and supports the innovation process and makes it more adept to technological, economic and societal trends. The aim is often to perform research and create relative knowledge, externalizing it throughout the organization to make it more implementable. Often - even with a small SME budget - you can have some quick wins by applying the tools, with or without external collaboration.

The idea of PSS is to gain or create a broader space in the (early) strategy making of a company, involving the company in more human centered, sense making or meaningful
innovation, design and development. Nonetheless it implies a different organization and mindset to reshape the innovation strategy of the company toward PSS.

However, instead of reinventing the wheel for every process, it’s necessary to work toward standardized processes and a qualitative and quantitative set of tools, e.g., customer analysis; market trends analysis; competitor analysis; value analysis; service blueprint; persona development; etc. This helps to formalize and establish a sense of urgency and highlights the need for change, developing a vision and strategy for innovation integrating both products and services and to initiate a mind shift that understands - different levels and perspectives on - value. Whereas now manufacturers too often see service integration as something that creates loyalty, customer satisfaction or a necessary cost factor to stay in contact with the customer in order to increase purchases.

What every designer wants, is to ultimately improve the world. PSS enables a deep understanding of human behavior and organizational structures. Likewise, its processes and the systems themselves allows us to go to the essence together with the client/organization and user to find solutions - products and services - that provide the best possible user experience.

**Drivers for PSS**

Comparing our empirical findings with a categorization by Cheschin (2012), the benefits that drive PSS are foremost economic and competitive. We acknowledge a considerable effort in corporate social responsibility or eco-efficiency throughout business. However, unanimously, the socio-ethical and environmental aspects that Cheschin mentions are hardly ever the strategic driver to engage into PSS, unless enforced by law or public pressure/awareness. Every organization has clearly developed an interest or willingness to bridge product and service to boost its value creation and noticeably in Table 2. The motivational aspects set a focus on the user and his/her experience.

**Table 2  **PSS drivers.

- Fulfil user needs in a new way, with an added value opposed to solely answering to customers’ demand, a rather incremental, market pull situation.
- Appear more disruptive and innovative for the more demanding customer.
- The competitor (abroad) drives the market and sets a new standard to follow.
- Creating value and competitive advantage through the better offer, the customer’s need is better fulfilled thanks to the added experience.
- Human insight drives organizations to improve and diversify through PSS to secure and expand their market situation.
- Improvement of image by consistency, branding and design management.
- The PSS enables the user to interact more frequently with the company.
- Important for the brand and its related experience - in the sense that it bounds the user to the company - uplifting loyalty.
- In order to keep existing customers for a longer period and attract new.
- You can involve technology that is meaningful to people without a too technological or industrial connotation.
**PSS dominance**

Besides a handful, most companies haven’t got any experience in terms of service innovation or aren’t aware. Ideally (see Figure 1) horizontally companies evolve toward the center, the line between the pure product and the pure service. Not the distinction in terms of product versus service is of importance, however the emphasis of the first part relative to the second and its context is (Chan, 2003). Vertically, incorporating human centeredness is a step in the right direction. Both logics have their up and downside, the point is to evolve toward a state between logics, an integrated logic, rather than substituting GD-logic for SD-logic. It remains equally important for organizations to adopt customer-centric service design methods, as to adopting product design methods to the requirements of services in order to increase the breadth of its PSS offering (Kowalkowski, 2010; Ryan, 2013; Dewit, 2014).

![Figure 1](source: Dewit (2014))

**Appropriateness of PSS typologies and characteristics**

It remains uncertain if current typologies and their categorization are driving PSS design. Additionally, it’s hard to believe that companies base their PSS management and design on static thinking. One of the most important things of PSS success, based on the discussions with industrial partners, is that you need to be able to plan the growth of the PSS, what it is right now and even more how it develops over time. For that reason, typologies like Tukker and Tischner’s (2004) are not good enough, because originally intended, their eight types of PSS work quite unidirectional. This addresses the need for a typology to evolve from the service side toward the product side, productization (see Figure 1). E.g., Fifthplay services for older people are no longer only about the product,
but evolving more toward pure service provision by people who come to your home that provide a gateway to new products, such as self-monitoring; self-care; connected weighing scales; etc. all to support that service.

Besides an update of the typology, a discussion tool with a clear set of PSS characteristics would also add considerably to the design process (Valencia, Muge, Schoormans, & Schifferstein, 2015). These characteristics could be used as critical success factors for evaluative or process condition purposes, to look how criteria are in place now and whether they are still relevant after some time (Dewit, 2016: Procedia CIRP journal paper).

**A transition toward PSS**

Manufacturing companies and service providers regularly come from a product-dominant logic, a general perspective on the product side, the technology and marketing. There still is no real understanding of services, not even in combination with products (e.g., aftersales and maintenance) usually they remain product-centered and standard, and foremost these are not new services. Their whole mindset has to change from product to service on a more strategic level. The in-depth interviews highlight a first basic step with choosing a pathway, to make it more explicit what type of PSS you are going to work with and the consequences each type entails. A second step is to underpin the innovation-through-services transition and place the user’s perspective central as a substitute for the technological or process-oriented (performance) motivation for innovation.

Table 3 below - as introduced in previous case-based research by Dewit (2014) - illustrates the different pathways an organization can undertake. Companies usually start designing PSS in a *sequential* manner, and frequently this addition comes in later stages of the design process. However more opportunities lie in a nested or even better a parallel approach, both can be described as pathways that consider integrating product and service in the early stages of the design process. Likewise it’s important to acknowledge how product and service work together instead of designing separate elements. *Nested* suggests that the product has to be designed to meet the service aspects and vice versa. *Parallel* goes even further and integrates the consideration of constant front-end interdependencies and strategic linkages between product and service.

<table>
<thead>
<tr>
<th>Table 3 PSS pathways. Source: Dewit (2014)</th>
</tr>
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<tbody>
<tr>
<td><strong>SEQUENTIAL</strong></td>
</tr>
<tr>
<td>![Sequential Diagram]</td>
</tr>
<tr>
<td>- you already have the product and/or service and you want to simply combine or develop the other part [servitization</td>
</tr>
<tr>
<td><strong>NESTED</strong></td>
</tr>
<tr>
<td>![Nested Diagram]</td>
</tr>
<tr>
<td>- developed from scratch, the design process starts from the product side and stepwise iterates on the necessary service [or vice versa]</td>
</tr>
</tbody>
</table>
PSS (design process) forms the core, both component sides work closely together, iterate at the same pace and regularly confront it with the user.

**Strategy as enabler for operational product service integration**

There is a clear shift toward intangibles and the addition of service components to the current offering, pure product development evolves toward (product and service) design in innovation. But it loses its integrality if organizations can’t design a product and then add a service to it or vice versa. A PSS process or approach - depending on the project - has to start from the beginning onward to see it as a one whole. Adding to Jacoby (2012), the innovation processes of products and services depend to a large extent on the input for the process, the reason why we focus on the early stages or front-end of innovation (FEI). Pointed out by prior research (Langerak, Hultink, & Robben, 2004; Reid & de Brentani, 2004), FEI decisions impact both product and service parts in the supposed offer, decisions taken in the development phase can only have an impact on partial aspects of the product or service (Dewit, 2014).

Unfortunately, PSS as such doesn’t appear much in a company’s strategy, however more often specific wording of product service - the addition of its components and the design - and intangibles do. It merely reflects society, that evolves from manufacturing, alongside and intertwining with the omnipresent share of service provision in an ever more growing experience economy. Clearly - besides PSS - a strategy has to say something about user centeredness as well, to at least be able to aim for a better customer or user experience (UX). Ideally, UX should be central throughout the design process and result in product and service specifications, but in reality it’s still very much used as a marketing tool to appeal aesthetically and emotionally to potential buyers.

PSS also affects the project briefing, because you don’t choose to design a product and a service, you choose to design a system. Without this distinction - product or service - you grow toward a better design challenge and actually start designing a system. What rolls out of the process later on - product and/or service components - surfaces with the scenarios, where you find out which needs are better solved by a product or by a service, combined into the system. Only after the front-end of innovation - right before development - product and service components have to be well defined or specified in the design brief. However regularly, everything is already fixed, the organization has a certain set of facilities, a portfolio, a market and related expertise, unfortunately this leads to vague project briefings and an ill-defined problem definition to start from. It’s particularly difficult to design and evaluate a good service, product-service or experience when (1) a company is not clear on what they want and (2) evaluation criteria are still very product-driven. Moreover, managers tend to link their strategy making to something concrete; a product or a service, however - clearly emerging from the interviews - if you get them to link with SD logic, you can get them to think about the needs, a more intangible talk (e.g., aging) that links the innovation strategy to a long-term horizon.
By expanding with the service component, the way we look at the design briefing is changing or at least bound to change. Product service systems are evaluated differently, the same KPI’s for product and service do not work. Adding different components set other focal points in the strategy and ask for different questions during exploration and ideation. The process should be more in function of filters - continuous evaluation and selection - instead of in function of solutions. Besides (e.g., product) appearance and usability, the whole service provision (sequence of touchpoints) is important in every aspect where the user’s experience - strategically - is to be kept as optimal and as long as possible. So a lot goes wrong when implementing the PSS, because of the lack of (systems) theory to be able to adjust in practice. Internally everyone should agree on principles of human centered design (HCD), but the depth always depends on the project and its context. The deeper it goes, the more you involve people into the process, which makes it evolve toward co-creation. The danger is to pull the user linearly through the process, which has absolutely nothing to do with the user experience. That’s why specific tools and their unique purpose come into play (e.g., power interest grid, context mapping, customer journeys, scenario’s, etc.). PSS design is the result of more user or human centered design, the focus is more on the experience s/he has with the product and/or service component and a better defined connotation of the former or the latter (Dewit et al., 2016).

**Preferred approach increasing feasibility in the transition toward PSS**

So ultimately, co-operation is the core of PSS, a multidisciplinary effort and best facilitated to incorporate and internalize the knowledge and competence to the core-business of the company, if not present. This hybrid implementation starts with the right amount of PSS design expertise - possibly together with a design agency - to facilitate a specific set of tools and enable collaboration between the company itself and the other stakeholders in the ecosystem. Short follow-ups have shown that companies can deliver some preliminary work themselves (e.g., preparation of personas), necessary to really push the internalization of PSS (design) knowledge, necessary because the company will continuously have to adjust the service part. It’s not the product anymore that you put on the market that’s good for three years. Services are alive, are the people, and if it’s not embedded in the culture of the company, it will not work. Facilitation should not be mistaken for complete outsourcing, the company will end up with something that is not theirs, relying too much on that external partner’s knowledge afterward. The design or consultancy agency might (appear to) be doing too much their own thing, instead of learning the people in the organization how to do it on their own. It regularly depends on what the company wants, and external agencies get paid by them to execute what they ask. So sometimes the result is too incremental, connecting too closely to the core business to reduce risk and accountability issues - rather than creating totally new business, an exploitation versus exploration discussion. There is a big difference in having the right tools, having the competences to act on them and being able to question the overall approach independently. Thus, a facilitating or mediating (university or government - not distorting the market) role in the PSS design support during introduction and start-up of the co-operation works really well aligning mutual benefit.

In current practices, middle management is often confronted - accountability - with a mere focus on implementation (e.g., industrial release) and performance (e.g., production process), not on change. PSS helps to rule out hidden agendas, when people have their
own stake, interest and outcome already in mind. If the organization really is curious to know what customers or users want and say, than they just cannot start with an end in mind for these kind of projects. Typically for PSS, it’s important to open up the design brief and (re)define problem definition at the beginning of the project to guarantee a good quality design brief to start with. It’s necessary that everybody understands the (primary) question and all variables. This new design brief might point toward different projects and priorities.

Discussion
The subjects in this small (five) nonprobability sample were selected on the basis of their accessibility and purposive personal judgment. Therefore, this study can be subject to bias and we do not attempt to generalize its results. However, the results are likely to benefit from a reflected respect and to be more credible with an audience that accepts those institutions and its people as experts in the matter.

Where it seems interesting to see individual background differences, we would agree when it supports an assimilation or demarcation approach (with reference to research in service innovation) to highlight those differences. However, since we are researching with a focus on a synthesis approach, we will present the results as joint findings - focusing on the transition toward PSS - rather than the background or original/specific domain knowledge the interviewees stem from. As we state that this approach will surface new elements because of the synthesis focus and provide an overarching view on the phenomenon of institutions and organizations that are fully going through the transition and already lead projects in PSS context.

This paper and previous research by Dewit concentrates on the delivery of value to the customer as the distinguishing factor to provide support for product service integration. For this reason, we deliberately leave out all aspects that gear toward ecology and related sustainability issues. However, we hope our research focus on (user) experience value creation can ultimately contribute to appropriately designed PSS, bearing externalities or rebound effects in mind, that sometimes result from PSS with a predominantly economic or competitive motive.

Conclusions
The aim of this paper was to consolidate the theory on PSS with a practical context. As a result from this research, we propose the most relevant findings that support the inclusion or transition toward PSS:
Proposition 1: For a complementing ‘integration’, product and service sides need to ‘flirt’ early and ‘date’ regularly throughout the design process, we therefore advocate a FEI approach for PSS where the UX has an intermediate role throughout the entire process.
Proposition 2: The PSS pathways explicitly visualize and supports what type of approach an organization chooses when embarking on PSS.
Proposition 3: Instead of a stage-gate method, PSS design requires ‘staged’ gates that symbolize a constant discussion and convergence attitude, preferably in filters of continuous evaluation and selection, rather than in filters of functionality.
Proposition 4: PSS hints the organization to move toward more long term oriented thinking to achieve its objectives. In order to provide the capability for growth of the PSS together with changing needs of the user, C-level management (and resources) must enable the capacity to lock in and prolong the interaction with the user.

Proposition 5: With a focus on the system in PSS, all stakeholders come into play; (1) the one(s) providing / affecting the context, the ecosystem and (2) those affected by it, the user - and his resulting experience through interaction with the system’s components.

Proposition 6: We evolve toward an integrated logic, where intangibles reflect society’s omnipresent share of the product service provision in an ever more growing experience economy. More specifically, through integration - a clear understanding of - the user’s perspective becomes a focal point in the integral nature of PSS as a substitute for the technological or process-oriented motivation for innovation.

Future research should integrate this PSS approach and its principles in a comprehensible framework for strategic insight and support, and a corresponding operational PSS design methodology to empirically test its applicability in the design process.

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References


About the Authors

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Section 2.b
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This article presents a framework for manufacturers to assess their readiness for taking a service design approach to the development of product-service systems (PSS). The framework is developed from the results of interviews with three manufacturing firms that have begun the servitization journey. The selected companies have traditionally been involved in goods production, and have recently started engaging with services in different ways. The readiness framework attempts to bridge the previous studies and models offering companies a self-assessment tool based on the service implementation readiness measured along nine dimensions that apply to manufacturing firms to adopt a more customer-centric approach that fits into their company and suits their needs.

keywords: design for strategy; service design; servitization

Introduction
In recent years, companies have faced radical changes in the way people connect, think and work together (Pine & Gilmore, 2000, 2011). We are now in the fourth Industrial revolution (Schwab, 2016), characterized by increasing blurring of the boundaries between commodities, goods, services, experiences and transformations. Dov (2014) notes that we have shifted from a knowledge economy to human economy. It appears that as customers and stakeholders develop a more sophisticated understanding of service, they seek more satisfying experiences and transformations from their interactions with both tangible and intangible products. In this context, the shift from products to services or the development of product-service systems (PSS) requires manufacturers to more effectively define what they sell. Rifkin (2001) proposed that in such a scenario, many things are no longer privately owned, but rather that users pay for access to services and experiences. In response to this evolving industrial context, to be competitive manufacturers are encouraged to examine the value chain and move further towards the
customer (Wise & Baumgartner, 1999). In response, designers have begun to expand their offerings from object-based product design to experience-based product and service design (Kimbell, 2011; Morelli, 2009b; Secomandi & Snelders, 2011; Wetter Edman, 2009). This research is concerned with how Service Design might help companies to identify routes to improve their value to customers through servitisation. Rethinking value for the customer motivates manufacturers to find their value in the supply chain. In order to evaluate the opportunity to control the channel to the customer, a company can assess their readiness and willingness to deploy a product-service system as an interface between the firm and the customer. At the lowest level, an integrated solution can be developed based on customers’ need within the boundaries of the company’s vision. Considering a service design approach, a company might then create a new PSS drawing on the existing company’s capabilities. Taking a wider view, the company might begin to explore the potential for addressing customer value through a new configuration of products and services developed jointly with other partners in its supply chain. The need to develop a readiness framework for smaller manufacturing firms stems from the recognition of SMEs as the engine of the national economy (BIS, 2013). The servitization process within manufacturing has a huge impact on the way companies innovate and operate to remain competitive; there has been lots of academic interest on firms’ capabilities and internal assets (Eisenhardt & Martin, 2000; D. Teece & Pisano, 1994; D. J. Teece, 2007; Ulaga & Reinartz, 2011) but little exploration into this size of companies in relation to services.

Background
This paper deals with small to medium sized (SMEs) manufacturing firms involved in the servitization process. It considers how service design might support them in developing in-house capabilities to implement product-service systems (PSS) and offer integrated products and services (Benedettini, Clegg, Kafouros, & Neely, 2009; Simons, 2013). There is extensive literature evidencing how large organizations have shifted from good-based to service-based provision, see for example Brax (2005); Mathieu (2001a); Oliva and Kallenberg (2003). Types of value proposition and drivers and barriers for their adoption has also been considered (Baines et al., 2007; Tukker, 2013; Vargo & Lusch, 2004b). However there has been little exploration of manufacturing SMEs from a service design perspective (Iriarte, Justel, Orobengoa, Val, & Gonzalez, 2014; Sangiorgi et al., 2012). In the UK economy, this class of company represents the largest section of the economy (BIS, 2013). Gebauer, Gustafsson, and Witell (2011) argue that in the current marketplace competitive advantage can be gained by those firms that begin to offer a service component to their customers; this shift encourages companies to adopt a Service-Dominant Logic for the creation of value propositions to customers (Vargo & Lusch, 2004a). However, Service Dominant Logic requires much more than an increased emphasis on services since it implies a reframing of the firms’ purpose and its role in value co-creation (Kowalkowski, 2010). The body of knowledge examined explores three facets of this topic, as follows:

- Manufacturers vs. Service providers - The design process and the manufacturing legacy
• The transition from products to services in manufacturing companies: drivers and barriers
• Recognising heterogeneity in SMEs

Manufacturers vs. Service Providers - The design process and the manufacturing legacy
In the extant literature, new product development and new service development are discussed separately. Further, the level of description of PSS development processes is less detailed than the previous two. In both cases, the early ‘fuzzy front-end’ of new product development is difficult to interpret (Clatworthy, 2013; Reid & De Brentani, 2004). Kimbell (2009) investigated the differences between new product development and service design and found that service designers pay attention both at macro (service experience) and micro (touchpoints) level. The literature raises a number of questions on how to frame PSS; how product and service components relate to each in the development process and the related skills and capabilities needed at each stage. Companies have been stimulated to start designing services with the same attention as products (Polaine, Løvlie, & Reason, 2013); however, this does not imply that the process is the same. Manufacturing firms that are encouraged to go downstream (Wise & Baumgartner, 1999) have to start facing customers from the very front-end of the development process (Walters, Thurston, & Cawood, 2012). PSS is generally concerned with moving towards offering greater integration with services (going downstream), moving towards offering greater integration with products (going upstream) (Baines & Lightfoot, 2013a). But manufacturers have to deal with a constant tension between integration and separation of offering, people competences, firms, suppliers and competitors (Voigt, 2016).

The transition from products to services in manufacturing companies: drivers and barriers
Manufacturing firms face major challenges when they start the transition from product-based to solution-based offerings. Shifting from goods-logic to service-logic requires deep understanding of customers to create value propositions (Michel, Vargo, & Lusch, 2008). Numerous authors assert that positive results can come from offering services (Brax, 2005; Gebauer, Fleisch, & Friedli, 2005); companies that adopt a service-based approach gain more competitive advantage because services are more difficult to imitate due to the higher specialization; and they provide long-term relationships with users (Oliva & Kallenberg, 2003). But a move into services is not a panacea and improvements in profits are not automatic (Baines & Lightfoot, 2013a). Certainly, manufacturing companies possess knowledge and expertise about their products; but deeper knowledge about internal assets and resources is needed for the additional development of services (Kowalkowski, Witell, & Gustafsson, 2013). However, there is limited availability of formalized service design or PSS processes that are useful to manufacturers in making the transition to additional service development. In this paper, the authors adopted the definition of PSS by Mont and Tukker (2006) as this concept suggests the need to link hard and soft issues such as technology and sociology, products and services, and to view existing environmental problems from a systemic perspective. Tukker (2004) categorises three types of PSS: product-oriented, use-oriented and result-oriented. Whereas services
in the PSS field are usually presented as: basics, intermediate and advanced services (Baines & Lightfoot, 2013a, 2013b).

From a design perspective, Morelli (2003) borrowed a set of criteria previously proposed by Bijker, Pinch, and Hughes (1989) to describe the technological frame applied to PSS. The new operative paradigm suggested by Morelli (2009a) considers services as social constructions; thus, customers should be an active part of the value co-production process. Mathieu (2001b) presents ‘service manoeuvres’ to indicate the typology of actions to take in manufacturing when moving to service offerings. Brax (2005) stated that manufacturing businesses that approach services require a different organizational setting than goods, because an incremental approach to servitization is inadequate for anything other than the most basic of new service development. Gebauer et al. (2005) introduced seven behavioural processes in order to increase the service awareness; to accept the risks of extending the service business; and, to believe in the economic potential of services. Recent studies on servitization show that for large manufacturing companies it is useful to break down the barriers for novel collaborations and to consider value at the centre; to develop a conscious and parallel evolution of the understanding of service, design and users within these firms (Sangiorgi, Lee, Sayar, Allen, & Frank, 2016). Within manufacturing firms who undertake transition, design professionals are suggested to cover a broader role as strategic partners in the entire servitization transition and in overcoming the key challenges to its effective implementation (Calabretta, De Lille, Beck, & Tanghe, 2016). For companies to understand alternative offerings in PSS, Kim (2016) introduces a framework to classify PSS according to the process and it comprises value, product, service, product-service ratio, customer, business model, actor, touchpoint, context, time, society, and environment. There is much rhetoric amongst the design community on how design provides practical solutions to complex industrial problems; therefore, it is timely to begin to investigate how design, specifically service design, might play the role of the interface between theory and practice in the implementation of PSS in SMEs.

**Recognising heterogeneity in SMEs**

Barney (1991) as cited in Ulaga and Reinartz (2011) points out the concept of uniqueness of the firm’s portfolio of resources and capabilities. That small companies differ from large companies is often highlighted in literature considering industrial activity. However, the heterogeneity of small companies is less often emphasised. In research that aims to create useful output for SMEs, it is worth noting that best practices, skillsets and assets differ from one company to another. The purpose of this research is to help smaller manufacturing companies to start thinking from an inside-out to an outside-in perspective. Welsh and White (1981) asserted that SMEs are not ‘miniature versions’ of large firms. SMEs are regularly recognised as the engine of national economies. However, they are precluded from accessing or effectively utilising service design, as they have neither the resources to engage external consultants nor the knowledge to develop in-house capability. Berends, Jelinek, Reymen, and Stultiëns (2014) state that prior studies found that small firms do not deploy the formalized processes identified as best practice for the management of new product development (NPD) in large firms.
The review of the literature highlighted a number of gaps regarding a design approach to servitisation in SMEs, including:

- A lack of studies on servitization on SMEs;
- A lack of case studies that applied a User Centred Design (UCD) approach and Service Design thinking;
- And, minimal guidance on the transition from established practices/routines to new ones in SMEs.

Thus, this paper will explore the conditions that affect companies’ readiness to implement services. Further, the paper documents to development of guidance for such manufacturers on how to re-configure their development processes to address the challenges, and explore the questions:

- What is the willingness and capability of manufacturing SMEs for the development of services?
- Can SMEs get a positive outcome from deploying service design thinking?
- How can SMEs recognise their readiness for service design approaches?
- How might they be guided in service design implementation?

Servitization is more than the creation and development of services as adds-on to existing offerings. It requires organisational change for manufacturers willing to start the servitisation journey. Manufacturing firms have to subordinate previous knowledge and practices on making products (Junginger, 2007, 2015) to as service as the interface between customers and firms (Heapy & Parker, 2006; Secomandi & Snelders, 2011). Thus, by answering these research questions, we aim to provide manufacturing firms an enabler tool to identify their assets and competences.

**Methodology**

Drawing from the literature, the servitization phenomenon comprises internal and external drivers and barriers influenced by the context in which the firms operate. This research is exploratory in nature and due to the lack of case studies on servitization of SMEs from service design, a qualitative approach with a longitudinal analysis of three manufacturing companies was taken to allow an in-depth investigation of the topic. Previous research (Brax, 2005; Gebauer, Paiola, & Edvardsson, 2010; Kowalkowski, 2011; Mathieu, 2001a; Oliva & Kallenberg, 2003) tends to prefer a qualitative approach to investigate the servitisation phenomenon. The review of the literature offers interpretations of servitisation that are filtered from the information that the researcher can access based on his or her point of access in the field (Brax & Visintin, 2016).

Servitisation does not seem to be a predefined transition process for small manufacturing companies, therefore if “any way goes” (Kowalkowski et al., 2013), this suggests that there is no unique and objective reality, but the inquiry is built through people’s experience. This phase resulted in the creation of a readiness framework based on semi-structured interviews. The application of the framework consisting of three questions along the nine dimensions identified as representative of the main facets of servitization. A total of twenty-seven questions (three per dimension) were formulated to be subsequently tested with the companies. Answers given were based on intensity, state of adoption and frequency of the activities and resulted in radar diagrams.
Recommendations on the next steps in servitization journey were provided. Data collected in the second phase ‘deepening understanding’ were analysed and triangulated with the extant literature. In the last phase, results were shared and the opportunity to iteratively deploy the framework to track firms’ evolution was illustrated to the companies. Similarly, in their extensive longitudinal study, Fischer, Gebauer, Gregory, Ren, and Fleisch (2010) took an interpretative multiple-case study approach organizing themes around the key dynamic capabilities from the literature and support them with research propositions.

**Case criteria**
Companies were selected using the following criteria:
- Defined as an SME;
- Stable and well established company;
- Previously demonstrated interest in developing services or in service design methods;
- Geographically accessible
- Committed to engaging with research activity

<table>
<thead>
<tr>
<th>Table 1 Companies overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
</tr>
<tr>
<td>Energy efficient ventilation solutions</td>
</tr>
</tbody>
</table>

**Research design**
The research design is shaped by the researcher as designer (Buchanan, 1992; Fallman, 2008); and, taking a designerly way (Buchanan, 1992; Cross, 2001; Dorst, 2011; Fallman, 2008; Snelders, Van de Garde–Perik, & Secomandi, 2014) of doing research. The research purpose is to provide a framework for companies to consider holistically their readiness to embark on developing their service provision (possibly through service design). Primary data were collected in three phases, namely: exploring; deepening understanding, and analysis and outcome. The research process adopted an inductive and an abductive approach. Themes on the various factors that might affect the companies were induced by the literature and informed the first questionnaire based on semi-structured interviews that helped to empathise with the companies. Answers from the introductory interviews defined the problem as the need for a readiness framework. The conceptual framework was abductively created, developed and iteratively tested with the companies. Case study (Yin, 2009, 2013) is largely used in servitization literature. However, beyond the definition of case study, following the twofold definition of design as process and outcome (Fallman, 2008), cases aim to generate an output.
The table below shows the engagement of the researchers with the three companies.

**Table 2 Overview of the engagement with the companies**

<table>
<thead>
<tr>
<th>Phase 1 Exploring</th>
<th>Company</th>
<th>Role</th>
<th>Topic discussed</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Company A</td>
<td>Marketing Director</td>
<td>Introduction Questionnaire</td>
<td>00:50:31</td>
</tr>
<tr>
<td></td>
<td>Company B</td>
<td>Managing Director</td>
<td>Introduction Questionnaire</td>
<td>01:19:59</td>
</tr>
<tr>
<td></td>
<td>Company B</td>
<td>Operations Director</td>
<td>Introduction Questionnaire</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Company A</td>
<td>Marketing Director</td>
<td>Follow-up Questionnaire</td>
<td>01:02:13</td>
</tr>
<tr>
<td></td>
<td>Company C</td>
<td>Managing Director</td>
<td>Introduction Questionnaire</td>
<td>01:31:56</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 2 Deepening Understanding</th>
<th>Company B</th>
<th>Managing Director (Operations Director)</th>
<th>Readiness Framework Strategic level</th>
<th>01:08:19</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Company A</td>
<td>Marketing Director</td>
<td>Readiness Framework Strategic level</td>
<td>01:29:02</td>
</tr>
<tr>
<td></td>
<td>Company B</td>
<td>Workshop (2 employees)</td>
<td>Readiness Framework Operational level</td>
<td>01:22:46</td>
</tr>
<tr>
<td></td>
<td>Company A</td>
<td>Operations Director</td>
<td>Readiness Framework Operational level</td>
<td>01:25:14</td>
</tr>
<tr>
<td></td>
<td>Company C</td>
<td>Managing Director</td>
<td>Readiness Framework Strategic level</td>
<td>01:36:14</td>
</tr>
<tr>
<td></td>
<td>Workshop supervisor</td>
<td>Readiness Framework</td>
<td>00:50:22</td>
<td></td>
</tr>
</tbody>
</table>
Operational level

<table>
<thead>
<tr>
<th>Phase 3 Analysis and Outcomes</th>
<th>Company A</th>
<th>Marketing Director</th>
<th>Operations Director</th>
<th>Presenting the results</th>
<th>00:32:04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company C</td>
<td>Managing Director</td>
<td>Presenting the results</td>
<td>00:48:01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company B</td>
<td>Managing Director</td>
<td>Operations Director</td>
<td>Presenting the results</td>
<td>00:58:49</td>
<td></td>
</tr>
<tr>
<td>Total time spent with the companies</td>
<td>14:55:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the first phase “Exploring”, face-to-face semi-structured interviews were set up, comprising of 18 questions grouped into six sections: general background information; the development process and people involved; the configuration of the offering; and, service perception. The questions focused on the internal activities and dynamics within the development team, how decisions were made and how integrated offerings were perceived and developed. The answers given in the first phase informed the first version of the readiness framework that was pilot tested with company A. This resulted in small modifications regarding the relevance of the topics discussed, and obtaining a feedback on this exercise. Although Company A is larger than Companies B and C, it offered valuable insights on the servitization. During the interviews, audio recordings were made and written notes were taken. In the data analysis phase, the diagram exploring barriers and drivers in servitization was scanned and coded and interviews were transcribed, coded and analysed using NVivo. This facilitated categorisation and the creation of a systematic cloud/list of emergent keywords, topics and issues concerned with raising awareness of servitization. The readiness framework was developed in an ongoing iterative process between interviews and literature. In the second phase “Deepening understanding”, the readiness framework was tested both at board level and at a shop-floor level. The framework consisted of semi-structured interviews with 27 questions (three questions for each of the nine dimensions) along three probes: frequency, state of adoption and intensity. In the third phase “Analysis and outcomes” company profiles were created and presented to add further validation on the framework.

**The Readiness Framework**

The framework assesses the prerequisites for manufacturing SMEs to make the transition from product-only offering to product-service continuum offering. It is intended to assist companies in recognising the opportunities for undertaking a servitization journey; to frame the challenges at the organisational level; to notice alignments between strategic and operational levels; and, to provide guidance on the dimensions to improve upon.

**Developing the framework**

The readiness framework is based on two leverages of service design: being and making. The first one comprises the meta-design skills associated with SMEs; while the second relies on the operational tasks needed to implement the value proposition whose product and service ratio depends on the first leverage. The user-centred service innovation perspective (Walters et al., 2012) instils a human perspective in the organisation and recognises individuals’ skillset and enables people to accomplish their goals.
As a result of the first set of interview, preliminary results based on the managers’ perspective were grouped as follows:

- Identity and legacy on making ("Fabricating at a slow pace to stop and think")
- Service awareness ("Manufacturing is not just making one thing in one place")
- Service design making ("Service design is not only designing a new service")

After the first interview, it became clearer that servitization is more than simply adding services but rather requires a deep understanding of the motivations and potential benefits. Bailey (2012) points out that design readiness is one of the factors to embed design within companies. The results implied the need for tools that could assist in organisational change in preparation for service development. The framework then developed from an investigation into what factors can influence such change and how might a company recognise what it needs to address.

**Origins of the dimensions**

In-depth analysis and coding of the interviews resulted in a number of recurring themes. This informed the creation of the readiness framework of 27 questions described by nine dimensions: effectiveness; experience; service history; external engagement; culture and development; creativity; risk propensity; communication; and, awareness.

The nine dimensions drawn from the data collected have been triangulated to the body of knowledge of the literature. Table 3 below presents the nine dimensions to assess firms’ readiness in servitization.

**Table 3 The nine dimensions: description and references**

<table>
<thead>
<tr>
<th>#1 EFFECTIVENESS</th>
<th>What has your company made to become what it is today?</th>
<th>This dimension considers the past achievements as the foundations of the</th>
<th>Eisenhardt and Martin, 2000; O’Reilly III and</th>
</tr>
</thead>
</table>
progress and growth of your company including the internal set of performance criteria. Tushman, 2004; Baldwin, 2003; Teece, 2007; Löfberg, 2014

| #2 EXPERIENCE | How would you define your offering in terms of breadth and depth? | This dimension considers the configuration of capabilities and the codification of new practice-based knowledge in the development team over the years. | Parasuraman et al., 1985; Teece and Pisano, 1994; Thomson and Koskinen, 2012; Hafeez et al., 2002; Junginger, 2007 |
| #3 SERVICE HISTORY | What is the nature of your offering? | This dimension considers the evolution of your offering from internal and external stimuli to anticipate or respond to customers’ needs. | de Brentani, 1991; Davies, 2004; Kindström and Kowalkowski, 2009; Avlonitis et al., 2013; Paiola et al., 2013; Baines et al., 2013; Kowalkowski et al., 2013; Dotzel et al., 2013; Löfberg, 2014 |
| #4 EXTERNAL ENGAGEMENT | How do you relate to the external world? | This dimension considers the way companies relate in supply chain and non-supply chain relationships; the role that actors play in the network and the co-creation opportunities. | Davies, 2004; Prahalad and Ramaswamy, 2004; NESTA, 2007; Payne et al., 2008; Verganti, 2009; Grönroos, 2011; Chesbrough, 2012; Kowalkowski et al., 2013 |
| #5 CULTURE AND DEVELOPMENT | How does the learning process occur within the development team? | This dimension considers the existing staff capabilities and the learning | Baldwin, 2003; Davies et al., 2006; Gebauer et al., 2010 |
| #6 CREATIVITY | How do you encourage and motivate your employees to express their ideas? | This dimension considers staff motivation; the way they explore and test new ideas; the rewards system and the environment the development team is immersed in. | Eisenhardt and Martin, 2000; Teece, 2007 |
| #7 RISK PROPENSITY | How do you manage novelty and uncertainty? | This dimension considers your attitude towards difficulties you encounter to meet the requirements of your offering to enter the market. | Kahneman and Lovallo, 1993; Eisenhardt and Martin, 2000; Avlonitis et al., 2013 |
| #8 COMMUNICATION | How do your employees access information within the development team? | This dimension considers the flow of information, the way it is exchanged within the development team to assist the decision-making process. | Normann and Ramirez, 1993; Payne et al., 2008 |
| #9 AWARENESS | How do you consider solutions with both product and service components? | This dimension considers the recognition of services as a critical component of the value proposition for the customers to offer. | Chase, 1978; Parasuraman et al., 1985; Bitner, 1992; Normann and Ramirez, 1993; Morelli, 2003; Davies, 2004; Brown, 2009; Ates and Bititci, 2011; Bailey, 2012; Madden, 2013; Acklin, 2013; Avlonitis et al., 2013 |
The readiness framework enables different levels of understanding of how people with different roles in the same firm see themselves in the servitization along the dimensions. In order to have an overview of the company the effectiveness dimension starts out the conversation with the description of past achievements, successful products and/or services that made the firm what it has become today. All the lessons learnt inform the experience dimension that sets out how knowledge has been codified to create the current configuration of the offering expressed in the service history dimension. As the offering evolves, the external engagement of the firm adapts accordingly. The working and learning environment affected the way culture and development is managed; sources of innovation and independent ways creativity takes place and, generally, the attitude towards novelty and the risk propensity related to change. Communication plays a role in circulating formal and informal information within the company that supports a shared vision of the future on raising awareness on the service value and the customer-oriented approach to instil in new value proposition.

Results - Deploying the framework
Building on an iterative process between the literature and the analysis of the results, the readiness framework is a self-assessment tool to identify and align competences and the implementation steps for manufacturers to take in a servitization journey. This section reports three case studies where the framework is applied presenting the results and the beginning to undertake the analysis of the framework in context. All the interviews lasted between an hour and an hour and a half. The board level answers are represented in radar diagrams that show the readiness from 1 to 5 for each dimension. The scoring system consists in a Likert scale where respondents were asked to answer according to intensity (very poor/ poor/ fair/ good/ very good), frequency (never/ occasionally/ sometimes/ often/ always) and state of adoption (not in use/ start planning/ planned/ start implementing/ implemented). Interviews with three manufacturing companies took place over 11 months. Staff from board level and operational level was involved in more than 14 hours interviews. Although the readiness framework has been developed as a self-assessment tool to be used by the companies to assess how ready they are to undertake servitization, the researchers completed the tool on behalf of the companies. Results were presented in a report and discussed with the three companies at the end of the study.

Case study Company A
Company A is a manufacturing company with over 460 employees that has been operating in the ventilation systems market for over 50 years. Between 2010-2013 it was involved in the Service Design Programme (a Welsh Government programme to help companies explore the development of services through service design). As a result of the project, they realized that training third party installers plays a key role in correct installation of their products, reduces frustrations of installers and, ultimately, better serves customers. They have a strong brand and sell a wide range of ventilation products from single fans for residential purposes to elaborate ventilation systems for commercial purposes. Currently no revenues is generated from selling services. Hidden services such as drawing and consulting are support product sales. Although service design tools are fully implemented
in their development process activities, the marketing director showed uncertainty on the real need to see their products as services because the lack of immediate evident economic rewards.

The operations director’s perspective showed the key role of the operations department as an interface between the engineering department and the workshop. From the operations director, the service component, in terms of support network and assistance via reps’ performance and customers’ happiness, is more emphasised and on ongoing refinement.

Presented below are the results from of the readiness framework at strategic level. Generally the dimensions are high, except for service history and risk propensity where they scored low for the wide product offering and little propensity to develop services as a source of profit.

![Figure 3 Radar diagram of Company A](image)

**Case study Company B**

Company B is a family-owned business that operates in the electro-chemical water treatment with 10 employees. The CEO/Technical Director founded the company. It is an R&D focussed business, prototyping and testing the plants they design to address clients’ enquiries.

Between 2010-2013 company B was involved in the Welsh Government Service Design Programme. The engagement helped them to make the service element more explicit in their offering and create a better experience for their clients. With the advancement of technology, they introduced a remote control that enabled them to shift from selling plants to leasing them.

They are currently involved in a large project promoted by a local river authority that involved a network of stakeholders in the farming community to dry waste and treat water. They are working on how to extend the use of the plant once water is cleaned. Employees appear well motivated around the regular development and testing of new products for clients.
Below the results from the application of the readiness framework are presented. Compared to company A and C, company B performed higher scores as they have begun to implement services in their offering.

**Figure 4 Radar diagram of Company B**

**Case study Company C**

Company C is has 34 employees that has been producing special purpose machine and automation systems for over 20 years. There are no standard catalogues of products since ‘every project is a launch’, as reported by the managing director during one of the interviews. The dynamic environment pushes them to undertake ongoing research, and requires high levels of flexibility and technology.

This company was selected because it is a novice to the idea of customer-centricity with no previous knowledge on service design. However, they are driven to start offering services following a client’s request to formalize a maintenance contract. Focussing on happiness of the customers and employees are already perceived as key drivers for the performance of the company.

A key finding from the interviews (as perceived from the MD) is the lack of informal communication and the inability of engineers to empathize with customers and operators due to their functional requirement viewpoints. This has a huge impact on the hiring process of new staff to manage company’s growth as planned. During the interviews the MD indicated an increasing awareness of the organisational and system requirements for servitization. He perceived that his firm had the capabilities but lacked the infrastructure to implement services.

Below are the results from the application of the readiness framework. Compared to company A and B, company C performed lower scores for the fact that is now starting to consider services. Although it performed well in the past and gained experience for the one-off machines that produces, a poor level of internal communication and flow of information hinder the service implementation further.
Discussion

In the three cases, the companies engaged with servitization in different ways, driven by different motivations and resulting in different impacts. Company A claims that service design tools have been used for improving the business focus, to make better decisions and to manage the company internally. Although service design tools had an impact on product development, they are still not explicitly considered for new service development or integrated in the current product development process. Whereas, in Company B, there was an understanding of the commercial benefits. They had started to consider the shift from product to services as an extension of their business formulae. In Company C, despite a lack of prior formal knowledge in service design, the managing director started focussing on soft aspects to measure performance beyond profitability. This included perceptions of customer satisfaction beyond standard KPIs. Therefore, he is currently finding information on how the customer-oriented approach can benefit his business. Further, he has been explicitly asked to offer maintenance contracts on their machines by a former client. According to the results, Company A offers product-oriented services, as 99% of the turnover came from the purchase of their systems; while Company B creates result-oriented PSS since their products demonstrate the amount of water treated. In both cases technology and digital tools informed the way the offering is created and the way the firms are building a dialogue with customers.

At board level, staff across the three firms point out the importance of communication; the flow of information within the company; and, the involvement of staff beyond the development team for the collection of insights. At an operational level, in Company A, the operations director and his department feel they are a conduit between the customers outside and the engineers inside. Information from sales representatives, contractors, and customers create awareness of customer frustrations early in the process. This information leads to improved service offerings. Company A has an on going refinement process of tracking and measuring performance based on individual daily targets. In Companies B and C, the employees interviewed described a sense of belonging to the current firm due to the diverse tasks and experiences they are offered. The managing director of Company B and C is a source of ideas and taken as an example.

Figure 5 Radar diagram of Company C
presenting a sense of progression. In Company C, the workshop supervisor is aware that there is room for improvement in communication in his department and looks for higher levels of involvement of the workshop at the outset of the design process.

The servitisation literature shows on one end awareness of the potential of services and on the other end describes many failures in implementation. For manufacturing companies willing to explore service orientation, Löfberg (2014) states a need for consistency between the three dimensions of business logics: value perspective, service business strategy, and service offering. Brax (2005) notes that becoming a service-focused business by broadening the total offering with services is challenging, because services are in conflict with the transaction orientation. Hence, becoming a provider of industrial services is not just a matter of the offering; the whole organization needs to re-focus its attention. Where firms lack understanding of the potential of developing service and the steps to take, it is unlikely for them to achieve success (de Brentani, 1991, 1995; Gebauer et al., 2005). Ates and Bititci (2011) point out that for building resilient SMEs the key enabler is change management process capability because, based on their findings, those firms seem to focus mainly on operational, hard and internal aspects of change management with a short-term, reactive behaviour, whilst neglecting strategic, long-term and soft requirements of organisational change process. However, change and culture management seem to be viewed separately in SMEs. Since culture management is driven by rewarding employees and internal communication activities. Change management practices mainly focus on implementation. Planning, preparation and embedding change seem to be less emphasised. Change management practices are primarily internally focused as evidenced by the limited relationship management with external stakeholders such as customers, suppliers and competitors. Little attention appears to be paid to communicating with customers, competitors and suppliers in managing change and culture. The conceptual framework presented in this paper is intended to assess readiness as preparation for change. As the company faces servitization, communication and external engagement start to become more central. The different shapes resulted from the readiness framework deployment attest that each company follow its path and what they are is based on their path-dependency (Eisenhardt & Martin, 2000).

**Conclusions**

The application of the readiness framework represents an attempt to bridge multiple perspectives involved in servitization, and, the practice of service design. It is not simply to develop new services, but to help manufacturing companies to frame new solutions. The comparison between the deployment of design within firms and how services require organisational change and alignment between board strategy and operations represented the starting point of this research. The framework developed presents a link between such design deployment and readiness for service, allowing companies to self assess across nine dimensions to better understand their readiness for a service design approach to PSS development. Further, the framework can be considered as an initial step in understanding what benefits service design can bring to SMEs. This research has a twofold contribution: on one side designers can use this tool to evaluate how to engage and offer coaching and training to firms; and on the other side, firms have the opportunity to self-assess their business to extend service awareness. The challenge behind the framework is
to train non-service designers to implement ideas, starting from a formalisation of the interactions (channels and touchpoints) between manufacturers, customers and stakeholders where services are seen as the glue (Lipparini & Sobrero, 1994) between products and experiences. The framework presented here begins to explore motivations and expectations of servitization; however, there is clearly still much work to be done to understand what benefits service design can bring to SMEs. In assessing readiness of manufacturing companies, further examination is needed regarding: the dependence of the size of the firm; the prioritization of the dimensions; patterns in family-owned business (in large samples); implication of firm’s position in the supply chain; the differences from large organisations; the future role of small manufacturing firm; the organic grow and the hiring process within this size of firm; and further implications of servitization of SMEs in manufacturing.

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Product Service System Design Research of B2C Carsharing Based on Beijing

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B2C carsharing is a kind of green and sustainable way to travel in worldwide. It has developed very rapid these years in Beijing, China. However, there is a lack of research on B2C carsharing from product service system (PSS) perspective in Beijing, which is a rapid developing, densely populated Asian city with a large number of vehicles. Therefore, this paper first analyses the current situation of the development of B2C carsharing in Beijing, and summarizes the characteristics of user groups, the product service system model, and the feature of car and service environment. Then taking a typical brand as a case to elaborate the system in more detail. Based on the refinement and generalization of the existing problems, we proposes the future design recommendations for the development of B2C carsharing from a PSS view in metropolitans like Beijing.

\textit{keywords: B2C carsharing; product service system; Beijing; user experience}

Introduction

Carsharing is a type of short-term vehicle access upon which a multitude of business models are based (Shaheen et al., 2015). It originated in Europe, from the late 80s of last century, a large number of sharing cars developed in Switzerland and Germany, while it appeared at Asian region in the year of 90s(Shaheen & Cohen, 2008). Carsharing provides user fewer ownership responsibilities, and less cost. Societal benefits include less demand for parking space and the indirect benefits resulting from costs being more directly tied to actual usage and vehicles being matched to trip purpose (Shaheen, Sperling & Wagner, 1998). The driver of the carsharing organization can reduce about 51% of personal traffic energy use and greenhouse gas emissions (Chen & Kockelman, 2016). A Sharing car can
replace 4-10 and 6-23 private cars in Europe and North America (Shaheen & Elliot, 2006). Different with the traditional car rental business, sharing car not only can be rented by year, month, week and day, but also provide hour rental business.

B2C is Business to Customer. The key point of B2C business models is that a company distributes the service by supplying acquired vehicles throughout a city, and the service is mainly for maximizing profits as well as supporting sustainable mobility (Cohen & Kietzmann, 2014). Product service system (PSS) concept is an emerging field of inquiry based on functional thinking (Mont, 2004). PPS system as a system of product, service, networks of actors and supporting infrastructure that is developed to be competitive, satisfy customers and be more environmentally sound than traditional business models (Mont, 2001). Carsharing is a kind of use oriented PSS. It is a system in which a service is shared amongst users to replace a product (Centenera & Hasan, 2014). We think that PSS of B2C carsharing means a carsharing integrated system, which is operated in B2C mode, mainly includes car, special parking space, user, the leasing platform and so on. Some scholars have done research on PSS of B2C carsharing and its development. Oksana Mont elaborated B2C carsharing from product service system perspectives, and analysed in-depth about institutionalisation, PSS framework, PSS feasibility of B2C carsharing (2004). Nicola Morelli put forward methodologies and operational tools that can be applied to the research of vehicle sharing product service system (Morelli, 2006). Robin Chase suggested that Zipcar (B2C carsharing service system) is more popular with young people who are willing to accept new things (Chase, 2016).

Beijing is the capital of China, where the population density is high. According to Beijing Municipal Bureau of Statistics and NBS Survey Office in Beijing (2016), by the end of 2016, Beijing resident population is 2172.9 million. At present, like other cities with rapid development in the world, traffic resources and road resources are one of the bottlenecks in the development of Beijing transportation. Statistics of Chinese Traffic Management Bureau of the Public Security Ministry show that as of the end of 2016, car ownership of Beijing is 560 million, ranking first in the country. However, there are currently about 320 million parking spaces in Beijing, lack of 260 million (Zeng, 2016). And the cost of parking is high in the city. To control the rapid growth of the vehicle, Beijing has implemented car restriction via a lottery system. At the same time, due to the smog is more frequent in recent years, the community and governments at all levels are also increasingly concerned about the green process of transportation. The rise of traffic demand is much faster than the speed of traffic supply.

It is not efficient only by increasing the number of roads. It is very important to improve the level of the utilization of the traffic resources through the reasonable urban planning (Downs, 1962). In this context, the green way to travel – carsharing mode in support of the government is growing up fast in recent years in Beijing. Actually, there’re some scholar who have done some research on carsharing in Beijing. In 2006, Susan made a survey of the feasibility study of car sharing service in Beijing, to infer the potential market of car sharing service there, and to provide a basis for the development of car sharing. Through the investigation and analysis, there are more than 25% of the respondents who are willing to accept the sharing of cars. Among them, the higher income and education level of respondents are more willing to accept the carsharing (Shaheen & Martin, 2006). Xia Kaixuan with the method of empirical research, taking Beijing city informal car sharing
service as the object, makes an empirical analysis on the level of service, and focusing on
the factors influencing the quality of service evaluation (Xia & He, 2006). B2C carsharing
emerged in China in 2010 (Li, 2015). From about 2015, the development of B2C car sharing
organizations (CSOs) in Beijing have becoming very rapid, more and more people choose
to share the car for daily trip. It appears many new situations and characteristics which are
different from Europe and America. As a typical super city of the developing countries, the
travel problem of Beijing is very reprehensive, in great need of exploration and mining.
The product service system of B2C carsharing in Beijing is worthy researching in-depht.
Therefore, we analyses through a lot of field research in Beijing area of existing B2C CSOs,
and put forward the corresponding development suggestions, in order to have some
inspiration and help for the research in the future.

**Methodology**

Carsharing is a kind of service. In service design, compared with quantitative research, we
emphasize the qualitative research methods, which means qualitative research is more
than quantitative research (Polaine, LØvile & Reason 2015). Therefore, besides large of
literature review, we also do the observation, depth interviews and service safari to
survey. The survey was implemented in Beijing, between October 1, 2016 and March 15,
2017. We chose three typical special parking place to do the observation and depth
interviews in the northwest, northeast and south of Beijing. Respondents for depth
interviews includes 20 users of five B2C CSOs, 3 maintenance personnel of different CSOs
and 4 staff of the parking place. Otherwise, the author also use the method of service
safari to experience the whole process of B2C carsharing service system in 4 CSOs for 8
times in Beijing.

Meanwhile, on account of lack of in-depth cooperation with B2C CSOs, it's hard for us to
communicate with large number of users to fill in questionnaire to obtain high reliability
data. Quantitative research will be further improved in the future.

**Analysis on the present situation of PSS of B2C carsharing in Beijing**

*Rapid growth phase*

The PSS of B2C carsharing is developing rapidly at present. In recent years, under the
encouragement and support of the local government, a large number of brands of B2C
carsharing have established and developed rapidly with the help of mobile Internet in
Beijing. As of the end of 2016, all of Beijing’s current B2C sharingcar network has
developed to a few hundred, there are more than 2000 sharing cars in Beijing (Liu, 2016),
and about 6000 sharing cars for civil servant (Liu, 2016).

*High level of intelligence*

At present, intelligent trip is as a brand feature for lots of CSOs in Beijing. Its intelligence
embodied in different aspects, mainly as follows:

- Carsharing services are basically based on the mobile internet. As of December
  2015, Beijing has more than 80% mobile Internet users (Wang, 2015). Therefore,
at present, most carsharing users in Beijing can complete whole process of renting
car through App of CSOs or WeChat (Chinese largest cross platform communication tool) using smart phone.

- Vehicle networking technology is widely applied. In China, there’re three major themes in automobile Industry 4.0, they are smart factory, smart logistics and internet of vehicles. In carsharing industry, internet of vehicles is very significant. It helps to realize constant communication among driver, backstage management, as well as vehicle. Backstage managers can achieve to remotely control the vehicle, engine monitoring, etc. In addition, the state of the users and vehicles can be real-time known by background managers. So as to achieve real-time location of the vehicle, no stores, unattended, no need to manually transfer the key.
- Almost no face-to-face service. There is almost no staff to do face-to-face service for users, in addition to a few other certification processes, users are prompted to complete the whole rental process through self-service operation in most PSS of carsharing in Beijing. Compared with other countries and other Chinese cities, there is rarely face-to-face service between the user and staff. The intelligent level of the system is relatively high.

**Provide relative software and hardware services**
Some CSOs with strong technical background have develop relatively mature intelligent system. So they not only provide car rental services for tenants, but also the business of hardware and software services for other carsharing companies, including the development of APP, operation support system, risk control and credit system of intelligent vehicle and periphery equipment and so on.

**Analysis of the typical PSS model of B2C carsharing in Beijing**

**The main PSS model**
At present, the common PSS mode of the B2C carsharing in Beijing area is usually carried out around three stakeholders, namely, user, car leasing platform and car group. The user need to upload personal information, and pay rental fees and deposit to the platform by smart phone. They can also constantly know the information and condition of car which they want to rent on the phone, and fetch or return the car directly in special parking place. The platform will be able to know the information of all the cars and control them remotely. The car group consists of several special parking place and 1-3 staff members. Usually, staff will be responsible for surrounding parking place, while generally will not appear in the parking place. Checking, scheduling and cleaning up the car after using is their mainly job. See the following system map Figure 1.
The type of fetching and returning the car

Fetching and returning the car is the key link of PSS of B2C carsharing. For the users, the convenience of fetching and returning the car directly affects the usability and user experience of the whole product service system. There are mainly three types of fetching and returning the car in Beijing, as described next, see figure 2.

1. Fetching and returning the car both at A point (A-A). That means user must fetch and return the car in the same special parking place (Pandavc, 2016).
2. Fetching the car at A point while returning it at B point (A-B). B point is another special parking place, which may be near user’s destination.
3. Fetching the car at n point and returning it at n point (n-n). It means that user fetches the car parked by last user at any legal parking space (including special
parking space), and return it at any legal parking space (including special parking space) as he/she want. The user need to pay extra fee for parking according to the distance to the nearest special parking space.

![Diagram of parking spaces](image)

*Figure 2 Graphic expression of three main types of fetching & returning. source: the author*

5. Under normal circumstances, type n-n is the most convenient way in three for user, and type A-A is easier to manage and spends less on vehicle scheduling. Almost all CSOs using battery-powered all-electric car like to apply type A-A & A-B, for there is always charge pile in the special parking place. While most CSOs using fuel car always choose n-n type.

**Research on the characteristics of product and service environment**

As a complete product service system, in the B2C sharing platform, the car should be the most important product. In addition, special parking place as the service environment, is also the thing that matters. Based on the field investigation, the author analyses the current characteristics of B2C sharing car and leasing environment as follows:

**The sharing car**

- Battery-powered all-electric car. In addition to a few brands, most of the current sharing cars are all driven by the battery, which have achieved zero emissions in the driving process, and is beneficial to the ecological environment protection. At the same time, due to the support of the new energy vehicle policy in Beijing, they will not be restricted by the limit line policy, and can be driven every day on the road.

- Existing models. The development of carsharing in recent years is extremely rapid, and it will spend tremendous amounts of human capital and physical capital to develop a new car. So currently, most CSOs choose existing electric cars made in Beijing, which is helpful for the development of local automobile enterprises, and has led to coordinated development of regional economy, in line with the concept of sustainable development. The appearance of the vehicle is mainly white body with colour pattern decoration. Currently, most of the leasing platform uses a white vehicle, the brand logo, slogan and two-dimensional code and other information as the colour decoration on the body of the car, which looks clean and vital.
• Special interior design. Most of sharing cars have special interior design to increase the necessary items for leasing. Generally, that will include system hardware, driving tips, service products and other small items for driving.

Special parking place
Special parking place may include special place to park, charging pile, Instructions and billboard. Currently, most of the special parking places without staff on duty, but in order to format parking place, provide convenient service for user to find the car easily and promote their own brands, some CSOs draw special pattern in the rental site.

The main user groups in Beijing
User is one of the most important stakeholders in PSS of B2C carsharing. Through the author's survey, it is found that, in addition to the characteristics of higher income and higher education, due to the new policy and cultural characteristics of the Beijing, the main user groups in Beijing also have following characteristics:

Group affected by limit line policy
In order to ease traffic conjunction, Beijing Traffic Management Bureau established limit line policy to restrict the number of cars on the road. Most of the private car owners who are limited by the policy have rigid demand to drive the car, so lots of them attempt to choose carsharing.

Diverse needs groups
Compared to other small and medium-sized city, Beijing has more diverse group of customers. From daily commute to short-term tourism, from ferrying kids to business trip. There’re many situation to use car and subdivision of user group. Typically, such as civil servant group, some government departments currently have replaced original cars to electric sharing cars.

Characteristics of rigid demand group
In the diverse needs groups, we have found a part just needs group who use sharing car relatively frequently. We should pay more attention on them. Most of them are young and middle-aged men and college degree or above through the survey. Long-term (more than 7 days) and 1-3 hours is the majority pattern of leasing.

There’re two kinds of rigid demand group through our survey. The first one is people who want to drive but without a car currently. The survey shows that many users tried to drive sharing car to practice driving. For there have been more than 2 million drivers who were waiting for buying a car from the statics of Beijing lottery system for car (Beijing, 2016). So there’re large number of people who have demand of driving in Beijing. The other group is people who own a car but cannot drive it temporarily. Usually, owing to car registration, weather cause (smog) or family need to drive.

Typical case analysis: UCAR
UCAR carsharing platform was founded in Beijing in 2015. All of the sharing cars in UCAR are battery powered. At the beginning, most of special parking places are mainly distributed around universities, research institutes in Beijing. Nowadays, UCAR has located both in Beijing and Guangzhou city in China. There’re more than 60 special
parking places in Beijing now. At present, UCAR use two types to fetching & returning the car, A-A and A-B.

**Analysis of the main process of PSS in UCAR**

As can be seen from the following diagram (Figure 3), besides “Auditing on line” and “cleaning up” (blue square), all necessary touchpoints (green square) and possible touchpoints (yellow square) are all above “Line of visibility”, which can be seen by users, and also, users can complete most of processes on smart phone and illustration in car. Hence, if there is no special need, user do not have to talk with the staff face-to-face. For most experienced users, self-service way is very convenient and efficient. While it is a little difficult for some fresh driver.

![Figure 3 main flowchart of PSS in UCAR. source: the author](image)

**Problems finding**

Since the B2C carsharing is a new thing in China now, many operators are groping forward. We found that there is great room for improvement.

**The problem of redistribution and use of existing resources in PSS of B2C**

The contradiction between existing limited parking spaces and new special parking spaces, and the related problems bear the brunt. Special parking space is the necessary infrastructure for the development of B2C sharing platform, but also a scarce resource in Beijing. The parking spaces in the centre of megalopolis are always quite under strain. However, the new sharing cars are bound to some of the parking spaces, and dense special parking places is one of the most important evaluation criteria of well leasing experience for user.

Vehicle is one of the most important resources of CSOs. After investigation and analysis, it is found that most of the CSOs have encountered some common problems in the operation about vehicle. Firstly, the contradiction between the large number of existing vehicles and the new sharing cars. Vehicle registrations restrain the rapid growth of
automobile, while B2C carsharing mode requires new cars. So it is very important to coordinate the growth of the number of private cars and sharing cars. In addition, the current models cannot fully meet the needs of B2C. Currently, most of CSOs use existing all electric vehicles for operation, yet they are not design for sharing. Although the installation of some hardware and software, many of the existing vehicles still cannot fully meet users’ needs. For example, most existing model is too large, Low brand recognition, and the hardware of car networking is easy to be stolen. Moreover, most platforms offer a limited range of models. Different from the traditional car rental industry or Peer-to-Peer mode, user can choose the type of vehicle is relatively limited on most B2C leasing platform, which cannot fully meet the needs of existing users.

**Issues about user experience in the PSS of B2C carsharing**

User experience counts for a great deal in the PSS of B2C carsharing. ISO 9241-210 (Ergonomics of human-system interaction) defines user experience as “a person’s perceptions and responses that result from the use or anticipated use of a product, system or service”. As for User experience of B2C carsharing, there is not an authoritative definition of it. The author suggests that it could be users’ (mainly driver’s) feeling, feedback of the whole process of renting, which including register, car choosing, picking up, starting up, driving, charging, parking and returning, etc. Driving is the most important part of the whole experience. Is self-service operation without any artificial services the only shape of things to come? Contradiction between a high degree of intelligence and driving safety is noteworthy. The intelligent service system make people travel more convenient and faster, however, is complete intelligent process a great user experience for everyone? It is a problem worth meditative. The safety of the vehicle driving is always the first priority. At present, most CSOs can provide complete intelligent PSS of B2C carsharing. Yet the vehicles are not familiar with most new driver, which may easily cause fault even danger.

Secondly, the current internet of vehicle system is not perfect, which need to be improved in the future. Especially from the process of fetching the car to returning it. For example, navigation for finding car is very necessary for users who are unfamiliar to road, which is worth to perfect. Otherwise, operation guidance system is essential for fresh drivers. Relevant signage system design is important. Moreover, due to few immoral users’ destructive behaviour to the car, monitor system should be pay more attention. Besides, public service platform and vehicle evaluation system is still not completed. So it is lack of channels to understand the specific condition of the car and operation details for users.

**Recommendations and Prospects**

**Integration or cooperation**

Density of special parking place greatly affects the user experience for the use of the whole system. Usually, small CSOs are difficult to bear a large number of vehicles, parking and other costs. Powerful CSOs always means more cars, special parking place and better technical support than small one for user. Therefore, we think that the integration or cooperation with others will play an important role.
There are two parts of notable powers, enterprises and government. Proper enterprise partners will provide technology, capital and human resource. And the strong support and in-depth cooperation of government departments can bring more policy support.

**Further perfection of the service system**
As the majority of B2C carsharing companies in the early stages of the establishment, with the further development of the industry and related technologies, many details of service system need to be improved and upgraded. For example, the relationship between intelligent control and face to face services in the platform system. We proposed to retain the important characteristics of the intelligent, at the same time, pay more attention to consider joining the necessary manual service from a security point of view. Appropriate face-to-face and voice communication is better than pictures and text for dissemination of information. In most cases, proper voice prompt and face-to-face service is very useful for fresh users. Simple training, detailed voice security tips, etc. for initial users may be helpful. In addition, it is noteworthy to establishment evaluation system, which will help users to understand the vehicle and the platform operation easily, and the platform can get timely feedback.

**Innovative car design for sharing**
Although the high cost of vehicle development, this paper suggests that overall design of the vehicle might be done for sharing from a new point of view, which may be considered from the following aspects: subdivision, appearance, Interior and brand. Based on the diversity of the group, user subdivision before design is very significant. Just like traditional vehicles, finding sub-groups according to research on different users’ purpose, income and habit to design different types of carsharing is necessary. It is able to meet the diverse needs of different groups. The appearance should be designed small and compact, so that it can be easy to drive and park in the crowded city. Furthermore, it would be better to be more characteristic on shape, colour and other aspects, which will help to distinguish carsharing on the road from other vehicles. Sharing car is kind of unique temporary private mobile enclosed space to the public. There are always different users to drive the car in it at different times. So we should fully take into account the behaviour and experience of different users in the car before designing interior. For example, more effective security tips, hardware concealment and other issues. Finally, Unified and distinctive brand design is also a great part of the product service system, ought to be put more effort, including App, the body of the car, special parking place and so on. So that vehicles will be more distinctive and recognizable. Currently, the overall design of the vehicle for the sharing is still relatively rare for China, a market with great potential, which might be paid close attention to.

**Conclusion**
Under the background of advocating harmonious development of economy, environment, society and science, carsharing mode is one of the most important sustainable development directions in auto industry in the future in China. Sharing car can’t replace traditional car, but is an important complement to existing travel modes. In addition, at present, the traditional models of automobile enterprises have been facing serious overcapacity in many countries. Transformation and upgrading is imperative, and sharing
car may be another export. Some forward-looking companies have begun to get involved in the field of carsharing, such as Mercedes Benz, Volkswagen, Honda, Nissan, etc.

In today's world, car is not only the symbol of status any more, but also it can bring a driver valuable personal space and convenient travel experience. So it allows people to continue to pay attention and exploration since invented. Drivers in Beijing area also have a huge demand for cars, yet at the same time, as a super big city, Conciliating and relieving the traffic contradiction is imminent in Beijing. And such a violent conflict has become inexhaustible power to push pioneer in this industry and users in Beijing region to jointly promote the development of B2C car sharing service system. Under the circumstances, there are more and more Beijingers have chosen sustainable carsharing.

Although the B2C car sharing service system in Beijing is still in the primary stage, but we believe that, along with further development of technology and constantly improvement of people's awareness of environmental protection, the service platform will have a more mature model and perfect system. At the same time, there are some other countries and regions all over the world are facing similar problems like Beijing. The relevant develop ideas, models and experiences of Beijing may be worth thinking about.

References


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Theme 3: Policy Making
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Introduction: Creative Intersection of Policies and Design Management

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How might we establish and sustain a discourse on design in policy-making and policy implementation?

The relationship that exists between design, policies and governance is quite complex and presents academic researchers continuously with new opportunities to engage and explore aspects relevant to design management. Over the past years, we have witnessed how the earlier focus on developing policies for design has shifted to an interest in understanding the ways in which design contributes to policy-making and policy implementation. Research into policies for design has produced insights into how policy-making decisions can advance professional impact and opportunities for designers and the creative industries. This research looked into how design researchers and design practitioners themselves can benefit from specific policies that support design activities and create the space for emerging design processes.

This track explicitly sought to address issues of design research and design practice in the context of the making of government policy and design related aspects of policy implementation. With this in mind, we were hoping to encourage authors to engage with the topic by identifying and articulating creative intersections in this area or by providing a critical academic reflection on creative intersections when we approach policies as a matter of design. In addition, we thought it relevant to explore and inquire into how policy-makers and public managers currently apply design and were hoping to elicit papers on these topics.

In addition, we wanted to experiment with the conference format in a way that would foster new forms of engagement and interaction to pursue the above questions. We broke with the usual conference format in order to enable a sustained conversation among researchers who want to advance this emerging area of design research and practice. For this reason, participants were asked to present their paper in a Pecca Kucha. That is, each
presenter was allowed no more than 20 slides and no more than 20 seconds per slide to communicate the essence of their paper (see www.pechakucha.org). Our aim was to focus the remaining session time on the implications of these findings that may give direction to further research in this area.

Figure 1: The distinctions between policies for design and design for policy indicates two different approaches to research at the creative intersection of policies and design management. This track intentionally focused on research into what design brings to policy-making and policy implementation.

Included papers and what they contribute to this emerging discourse

Fei Hu, Kun Zhou, Hongshi Zhou, and Jingsi Gong concern themselves with the difficulties involved in adapting national efforts to recognize design as an industrial asset on a regional level. Their paper „Design Policy Driven Development of Chinese Industry: The Experience from Guangdong“ traces “three turns of Chinese design policy.” Design policies, they argue, have already been recognized as important and effective on the macroeconomic level. Yet, the implications on the regional level are less well understood and the paper seeks to offer insights into how to enhance and perfect the current policy path. With that the authors mostly address issues that relate to policies for design, an area that is distinct from the emerging discourse about how policy-makers go about designing policies in the first place. Nonetheless, there are, “creative intersections” that hint at a larger role for design in the policy context beyond policies that benefit professional design and designers.
The two papers by Matthias Hillner further demonstrate the difficulty to establish a discourse around policy-making and design management that specializes in design for policy. His first paper „Managing Design IP — does the end justify the means?“ turns to law and “the value of design rights” as they effect designers. Law, of course, is essential in the policy context and law making is already being looked at from a design perspective (REF). But Hillner remains product-centered, using a product designed as a ride-on travel case for children to illustrate the implications of copyright law and intellectual property rights on design and designers – here “a small design firm”. This is a perfect example of research into policies for design.

Hillner’s second paper expands on this notion. Here, he strives for “a critical and detailed review of an investigation into design right infringement in the UK”. Titled „Design IP legislation in the UK — an opportunity to innovate?“ he reviews historic cases of design right infringements to draw conclusions on how designers and design IP stakeholders can cope with legal infringements. This work offers generally valuable and practical insights based on rigorous research but it does not engage in the issues on the role of design in policy-making and policy implementation. We can sense the creative intersections of policies and design management but the author does not attend to these.

A similar assessment could be made about the paper by Xiaojian Liu, Yingying Jiang, Yan Sun: “Why Chinese Industrial Designers Oppose Vocational Qualification Certification?” However, reading carefully beyond the linguistics one can glimpse the beginnings of a design critique of policy development that inquires into weaknesses in the design process and design methods in the production of a policy that falls short of its intent. This paper examines why the Industrial Designers’ Vocational Qualification (IDVQ) system created by the Chinese government the 2010 and now formally implemented in two provinces faces opposition by many Chinese industrial designers. The authors suggest that behavioral economics and social psychology including loss aversion, causal schema, availability heuristic, subjective probability and the misjudgment of representativeness, and fairness offer a key to understanding this outcome. Their findings reveal that subjectivity and emotional factors contributed tremendously to many industrial designers’ opposition to the IDVQ. Though the study methods itself remains wobbly and thus endanger the validity of their findings, the core of this research shows how and why design matters to policy-making, policy implementation and policy outcomes.

The paper „User-Involved Design for Direct Citizen Participation in Policymaking: Adaptive Values, Adaptive Conditions and Common Ground“ by Chorong Kim, Yeunyoung Kwon, and Ki-Young Nam demonstrates how one might employ a comparative analysis to explore the intersection of policy and design management. These authors compare and contrast the implications of adaptive values and conditions shared by user-involved design (UID) and direct citizen participation (DCP) within a policymaking context. This research is motivated by a quest to understand how design values can and do contribute to participatory policymaking. It is a worthwhile exercise that points to possible approaches and directions for design research to engage with theories and methods of design in the context of public policy.

Hong Peng and Wei Zhang offer insights into the „Research on the development of cultural and creative products in Hubei Provincial Museum.“ The authors turn to a policy
implementation model to discuss the struggles Chinese museums face in meeting standards introduced in 2016 through the National Museum Evaluation Management System. Once again, we can see the wobbly beginnings of something that has the potential to develop into something but will require more theoretical engagement with the policy implementation model they refer to.

Conclusion: Policy needs of designers and design still dominate design management research

It is noticeable that the papers submitted and accepted by the reviewers for this track remain vague about the kinds of policy they are concerned about. Policy, like the term design, means different things to different people: For some it represents a law; for others the outcome of a policy making process and for yet others the means by which a policy intent can be achieved. Most authors remain equally vague about where in the policy context they situate the design research and the design projects under study. This indicates that design management research has yet to develop this capability. It would be worrisome to think that authors consciously neglect these aspects because they deem them unnecessary.

Although we envisioned this track specifically to attract research on design issues, design practices and design methods in policy-making, we have received only a couple of papers that actually concerned themselves with these topics. To the detriment of our track and we feel also for the conference, we cannot present those papers because their authors were not able to attend the conference. As a result, most research presented here continues the traditional focus on the design implications of policy implementation and not on the policy implications of design. We can offer a few hypotheses as we try to make sense of this situation:

**Hypothesis 1: Design researchers are biased towards policy implementation.**

1. **Comfort:** Design researchers might be more comfortable engaging with policy issues when they concern aspects of implementation, as these actions of making are more familiar to them.
2. **Access:** Much of today’s design work in the public sector does indeed take place in the context of implementation. As a consequence few designers come in contact with policy-making and even fewer design researchers have opportunities to develop research projects in this area.
3. **Interest:** Design researchers are not interested or do not consider it important to apply principles, practices and methods of design to policy-making.

**Hypothesis 2: Research into design for policies is too new and has yet to become embedded in design education.**

4. **Skills and methods:** Design research in the policy context demands new skills and methods that have yet to be developed. Design researchers do not know how to engage with policies beyond implementation and do not receive adequate/appropriate training.
5. **Understanding:** Design research and education have yet to clearly distinguish between design for policies and policies for design.
6. *Exposure:* Research into design for policies is too new and has yet to become embedded in design education. Too few researchers are exposed to the principles and theories of design in the public sector with an eye to policy-making.

These are quick hypotheses drawn from reviewing papers (both accepted and rejected) for this track. We propose them in an effort to encourage future research into these topics. Perhaps the answer is indeed as simple as that: We are embracing a new area of research in a young research discipline that is still in search of its core. Regardless of what we agree is the explanation for the current situation, we do know this: to pinpoint the creative intersection with design management in policy implementation, we do need to advance our thinking, understanding as well as our methods and our practices in this area of design research. This work will be a prerequisite for defining design leadership within the policy context, which at present, remains rather unexplored and poorly understood. As design management emerges as a relevant profession and skill in the public sector, this is one creative intersection that deserves further exploration.

**Bibliography**


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Why Chinese Industrial Designers Oppose Vocational Qualification Certification?

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The Chinese government implemented the Industrial Designers’ Vocational Qualification (IDVQ) system since 2010 and has been formally implemented in two provinces. However, the execution of the IDVQ system has been opposed by many industrial designers. Three surveys were carried out in regard to the approval rating and usefulness of the IDVQ, in addition to concrete reasons for opposition. Analysis was carried out on the survey data and the reasons for opposition on the basis of several principles in behavioral economics and social psychology including loss aversion, causal schema, availability heuristic, subjective probability and the misjudgment of representativeness, and fairness. Some of the conclusions were further validated through surveys. It was discovered that subjectivity and emotional factors contributed tremendously to many industrial designers’ opposition to the IDVQ. On the basis of analysis and in combination with successful experience in the vocational systems of the United Kingdom and other countries, the following four suggestions were offered: building an environment of trust, increasing the probability of opportunities, uniting service objects, and cooperating on curricula education. These suggestions are expected to facilitate the implementation of the IDVQ and play a positive role in improving China’s vocational market of industrial design.

keywords: industrial design; vocational qualification certification; opposition; behavioural economics

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Introduction
The Industrial Designers’ Vocational Qualification (IDVQ) system is a state-run policy implemented for the purposes of promoting employment in industrial design and stabilizing the talent in the creative industry.

Industrial designers had no specific professional titles. Their professional titles have been appraised as engineers, and they are forced to spend much time preparing for unfamiliar engineer title examinations. Guangdong Province and Zhejiang Province issued the first IDVQ certificates in 2010 and 2013, respectively, becoming the first two provinces in China to implement the system.

Plagued by employment problems, most developed countries have built their own vocational certification systems. The experience of the United Kingdom, Germany, and Australia, among others indicates that a perfect vocational qualification certification system plays a tremendous role in promoting employment. The “National Vocational Qualification” (NVQ) that began to be implemented in the United Kingdom in 1986 has been regarded as the most typical and widely recognized vocational qualification certification (Jessu, P.G., 1991). Design vocational qualifications include design, design management, design support, applied arts and design, etc., belonging to the type “crafts, creative arts, and design”. Japan enacted the Human Resources Development Promotion Law in 1985. Australia has gradually promoted the unified Australian Qualifications Framework (AQF) and established the correspondence between the AQF and the diploma level since 1995. Germany’s vocational qualification certification was primarily based on the Vocational Education Law enacted in 1969, and the “dual system” and the “three certificates” system are used to definitively prove the level of one’s ability. In 1973, Korea enacted the National Technical Qualification Law, which was mandatorily defined as what must be passed for specialty education (Gill Helbyet,1999).

China’s IDVQ system is still in its infancy. However, many designers have voiced opposition and some voices of opposition had already been popular in various professional network communities even before IDVQ certificates were awarded in Guangdong Province for the first time in 2010. Through the observation of the voices in the network community of industrial design, it was found that most opposition was not based on emotional responses. It was these responses that prompted the surveys and subsequent analyses presented in this study.

Surveys on the Recognition of China’s Vocational Qualifications for Industrial Designers
Three surveys were carried out in China’s most active network community of industrial design (www.Billwang.net) through voting and group discussions, becoming the first domestic surveys in regard to this issue and resulting in abundant first-hand data.

The First Survey: Do you support the IDVQ?
The data of the first survey carried out in the forum of Billwang.net are shown in Figure 1. The subject of the survey was “Do you support the IDVQ?” and there were three options: support, oppose, and look on.
The data showed that only 43% of industrial designers supported the IDVQ and up to 33% opposed it. This percentage was a figure that could not be ignored.

**The Second Survey: Does the IDVQ benefit you?**
According to the statements in the forum for the first survey, most people’s attitudes towards certification were based on personal positions and they supported or opposed it from the perspective of whether it benefited themselves. The subject of the second survey was “Does the IDVQ benefit you?” The results are shown in Figure 2.

![Figure 2 Data of the survey “Does the IDVQ benefit you?”](image)

Unlike the first survey, the second survey studied designers’ understanding of the relationship between certification and personal interests and filtered out the effects of other factors. However, it can be said that industrial designers’ predictions and opinions about personal gains and losses were independently made.

The comparison of the results of the two surveys showed that the percentage of the respondents who believed the IDVQ benefited themselves exceeded the percentage of the respondents who supported the IDVQ (44%), reaching 51%. Only 21% of the respondents considered the IDVQ as “harmful” and this was 12% less than the percentage of the respondents who opposed the IDVQ (33%). In other words, 7% of the respondents admitted the IDVQ benefited themselves but did not support it, and more than one third of the opponents did not oppose the IDVQ on the basis of personal gains and losses. The difference between the data of the two surveys indicated that the IDVQ’s low approval rating among designers did not only result from the biases of personal benefits, but was also caused by other complex reasons.

**The Third Survey: Why you oppose the IDVQ?**
The data of the second survey indicated that 12% of the opponents were against the IDVQ for non-personal reasons. For a deeper understanding of the basis of their opposition, the
third survey was carried out. Through the analysis of the results of the first two surveys and the statements of the respondents, seven reasons for opposition were listed in a multiple-choice survey. The results are shown in Figure 3.

<table>
<thead>
<tr>
<th>Why you oppose the IDVQ?</th>
<th>Votes</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designer’s ability has no evaluation criteria</td>
<td>129</td>
<td>50.79%</td>
</tr>
<tr>
<td>Doubt about the authorities’ motivation</td>
<td>131</td>
<td>51.57%</td>
</tr>
<tr>
<td>Don’t believe the IDVQ can work</td>
<td>114</td>
<td>44.88%</td>
</tr>
<tr>
<td>I can prove my ability in other reliable ways</td>
<td>52</td>
<td>20.47%</td>
</tr>
<tr>
<td>Employment restriction without IDVQ</td>
<td>95</td>
<td>37.40%</td>
</tr>
<tr>
<td>It’s a constraint on designers’ creative activities</td>
<td>130</td>
<td>51.18%</td>
</tr>
<tr>
<td>Academic certificates are enough</td>
<td>30</td>
<td>11.81%</td>
</tr>
<tr>
<td>Other</td>
<td>26</td>
<td>10.24%</td>
</tr>
</tbody>
</table>

**Multi-items selection. Total votes : 254.**

**Figure 3  Data of the survey “Why you oppose the IDVQ?”**

According to the data of the survey, seven reasons for opposition covered nearly 90% of the votes and the “other” option only accounted for 10.24% of the votes. Therefore, it can be considered that these seven options appropriately summarized the reasons for opposition.

Through the analysis of the anonymous voters’ remarks, the reasons for opposing certification could be summarized as follows:

1) **The difference in the recognition of the industry.** Industrial designers recognize the industry as a service industry and most people consider that industrial design should be entitled to more tolerant evaluation criteria like the arts. Two options (the first option, 50.79%; the third option, 44.88%) examined industrial designers’ recognition of the industry and both obtained a great number of votes.

2) **The psychology of resistance to constraints.** The implementation of the certification system was considered as the government’s strengthened management, as well as a constraint on industrial designers’ creative activities (the sixth option, 51.18%).

3) **Doubt about the authorities’ motivation.** Negative public opinions and information about authorities on public media have given rise to designers’ distrust of the IDVQ. This was interpreted as the authorities’ excuse for charging application fees and training fees (the second option, 51.57%). According to the interviews, most designers didn’t understand the related vocational qualification certification systems in foreign countries and they believed foreign countries “are absolutely unlikely to have” the IDVQ.

4) **Misunderstanding of intention.** Certification was interpreted as the mandatory “threshold for access” to the industrial design industry, as in the cases of teachers, lawyers, and architects, etc. Industrial designers feared that restrictions would be imposed on their employment if they were without certification (the fifth option, 37.40%).

5) **The conformity effect.** Most of the opponents lacked confidence in the certification of their ability (according to the fourth option, only 20.47% of the opponents could certify their ability) and clearly knew that the role of education was limited (the seventh option,
The contempt of some accomplished, confident designers for rules affects a large number of new entrants and the people with ordinary abilities that follow their lead. As a matter of fact, certification can genuinely help individuals that lack professional experience.

**Analysis of the Surveys**

This section attempted to have in-depth discussions about the data of the three surveys on the IDVQ on the basis of psychology and economics, with a view to drawing some conclusions beneficial to the means of implementing this system.

*“The Re-Queuing Effect” and Risk Aversion*

This study tended to consider that the proportion of this survey datum roughly conformed to “the re-queuing effect”. That is, the instruction “to re-queue” will be supported by the people at the end of the queue but strongly opposed by the people at the head of the queue. The respondents’ words in surveys conducted in the community confirmed the above analysis. The majority of the designers with years of experience opposed the IDVQ. These designers were confident and accomplished, which objectively caused them to reject being managed and examined by any rule or regulation.

The requeuing effect can be interpreted as a reflection of the psychological “loss aversion”, which is an important aspect of the prospect theory in economics. It means that people are more unable to accept losses compared to possible gains, even if the gains are far bigger than the losses. Loss aversion causes people to give too much weight to “stop-loss” when making decisions, preventing the objective maximization of gains (Kahneman, Tversky, 1979/1991).

*Non-technical Problems Caused by the Evaluation of Industrial Designers’ Abilities*

Whether the ability of industrial designers can be evaluated was one of the most debated issues of the surveys. Over 50% of designers thought that their ability was “not evaluable”. This viewpoint also widely exists in other fields of the creative industry.

The key to this problem should lie in whether the “evaluation ability” of designers’ talents as knowledge assets can be enhanced through technical means, to enable human resources departments of enterprises to find a more efficient, low-risk way of identifying their desired talent beyond time-consuming interviews and countless resumes. This is essentially a technical problem. According to the surveys, the crux lies in that people who questioned the cognizance of designers’ abilities didn’t intend to discuss this problem in the field of technology. The opponents generally first give a negative judgment and then upgrade the costs to a level of trust: “The government is prepared to do something that is destined to fail and so there must be other hidden purposes.” The opposition caused by the technical problem was only the embodiment of the deeper issue of trust.

*Causal Schema and the Availability Heuristic: The Trust Problem Caused by Information Asymmetry*

51.7% of the opponents revealed their distrust of government agencies that implemented the IDVQ, and this distrust was the primary reason for opposition. The information in the public debate is mixed with the responses to the event itself and the responses to the environment of the event, both of which interact by varying degrees for different people.
In the analysis of the survey data, the first step was to identify whether the opposition was a response to the IDVQ itself or to other disturbance variables. In the third survey, designers’ distrust of the implementing agencies seriously affected their objective evaluation of the effects of this management policy itself.

Related comments showed that most people did not understand the motivation for implementing the IDVQ from the perspective of improving industrial designers’ employment. The opponents interpreted the motivation as the government taking the opportunity to collect application fees and training fees, and its improper interference in the development of the industry. The mistrust leads to the casual schema (Dirks & Ferrin, 2001) unfavorable to the government. In the study of the casual model in the judgment under uncertain conditions, Tversky (1973, 1974) pointed out that the frequency of focusing has a considerable effect on the estimation of the probability of the cause of an event. This principle is also referred to as “the availability heuristic”. That is, if an event is easily imagined or recalled, people will establish a causal relationship between this event and the issue being discussed on the basis of this heuristic (Tversky & Kahneman, 1974, 1982). There is much negative information about the government on networks and this information is frequently seized on.

**Subjective Probability and the Representativeness heuristic: The Opposition Caused by the Interference of Influence**

The most famous research on the representativeness heuristic was carried out by Tversky and Kahneman (Kahneman & Tversky, 1972). In short, they found that people’s estimation of “representativeness” differs greatly from the results of scientific probability calculations. The survey data indicated that the supporters of the IDVQ accounted for 43% and the opponents accounted for 33%. However, many speakers insisted that the voices of opposition represented the overall will of designers. This was because the proportion of the opponents that spoke was far greater than that of the supporters, as most of the supporters voted without voicing their opinions. The influence of the information expressed by concrete opinions was far greater than that of abstract (but objective) statistics. The earliest research on this was carried out in 1927. As far as the respondents of the surveys in this study were concerned, due to influence, the opinions of the senior designers in a minority were interpreted as representing the interests of most of the people in the industry and followed blindly. For mid-level designers in ordinary positions, the voices of opposition from senior designers who had achieved career success and serve as the “spiritual model” and “authority” in the industry had much greater influence on them than on low-level designers.

The results of the first survey indicated that the supporters of vocational qualification certification outnumbered the opponents. This is because the group of designers is in the shape of a pyramid like most hierarchical groups: senior designers are a minority and low-level designers are a majority. The supporters supported the IDVQ silently, while the opponents opposed it loudly, thinking that louder voices of opposition would be more unfavorable to the implementation of the new order and the maintenance of the status quo was the most favorable to them. Therefore, an illusion occurred—it seemed that the opponents opposed vocational qualification certification on behalf of the interests of most people.
**Fairness Constraints in the Distribution of Costs and Benefits: The Opposition Caused by Doubts about Fairness**

For the current mode of implementing the industrial designers’ vocational qualification system, costs are reflected in two aspects: one is the cost involved in the “marketization” of designers’ abilities, namely the development of a reasonable, effective system for assessing talent’s ability to be used by employers. This cost is primarily borne by the government. The second is the cost of using this “marketized” system. Currently, the cost of using the certification system is jointly borne by the government and designers: the government needs to organize the assessment and evaluation work, and designers need to spend money, time, and energy in preparing for certification.

From the perspective of the benefits of certification, the benefit to the government is obviously the normalization of the talent market and the improvement of employment (assuming that the assessment system is effective), and the benefit to enterprises is the significantly reduced costs of concluding transactions in talent, which is reflected by improved efficiency and reliability. However, for designers, the transparency of ability differs. Compared to an industry without certification, the certification system causes every designer to incur the costs of preparing for certification. However, the result of certification is not necessarily favorable to all, because after re-queuing, some people’s rankings will be worse than before. This situation is an inevitable phenomenon during the transition from an old order to a new order, as well as one of the important voices of opposition.

**Suggestions on the Implementation of the Vocational Qualification Certification System in China**

On the basis of the survey results, the following suggestions on the institutionalized management of industrial designers were put forward:

*Building an environment of trust in order to change the distorted causal schema*

Building a trust-based information environment for certification can improve the “visibility” of valuable information. It is a time-saving behavior for information processing, reducing the costs and improving the efficiency of information processing, which are very necessary in an age of fast-paced information. The building of an environment of trust includes three aspects: process transparency, information symmetry, and a foundation for understanding.

*Facing the actual situation of industrial design and reducing designers’ loss aversion by increasing the probability of opportunities*

Uncertain opportunities are an effective driving force to inspire a passion for creative work. Therefore, the method of assessment should consider the proper improvement of the proportion of non-cumulative accomplishments and the inclusion of knowledge, skills, learning abilities, and accomplishments in different certification levels in order to obtain all levels of designers’ recognition of the management system.

*Uniting service objects, realizing fairness, and building a reasonable system for the distribution of costs and benefits*
The industrial design industry essentially belongs to the service industry. Therefore, the service objects can be united to jointly implement institutionalized management. The statement that “there are no evaluation criteria for designers’ abilities” in the 51% of the approval rating clearly won’t be recognized by the service enterprises. Granting enterprises the right of assessment for certification is not only an honorary incentive to enterprises, but can also strengthen the communication and exchanges between creative people and the service enterprises.

*Cooperating on curricula education and focusing on serving the immediate beneficiaries of IDVQ*

The frequent reservations of “why is vocational qualification certification necessary with certificates of degrees” in the surveys indicated that there was not a clear understanding about the division of labour between curricula education and vocational education in China. For this, China can learn from the successful experience of the United Kingdom, Germany, Australia, Japan, and others, by increasing the acceptance and popularity of the vocational qualification management system among students.

**Conclusions**

The surveys in this study were carried out during 2010-2012. The industrial designers’ vocational qualification system began to be formally implemented in Zhejiang province in 2013. Since then, a total of 77 designers have obtained junior professional titles, 105 designers have obtained intermediate professional titles, and 21 designers have obtained senior professional titles. From the perspective of the public opinion concerning the one-year implementation, the IDVQ is gradually being accepted and the topic that is discussed has shifted from whether it should exist to how to prepare for examinations. The most compelling reasons for opposition listed in the surveys have not been continued topics. A number of senior designers resigned from design companies after obtaining certificates and went to colleges to teach. Of course, deficiencies and defects still exist. A few individuals reflected that the examination questions cannot fully represent the abilities of a designer, but this topic is basically under technical discussion and has not aroused negative emotions related to fairness. Designers who failed the examination were mostly reserved and did not blame their failure on the process of examination, possibly because the obvious fairness of the IDVQ examination inhibits this emotional viewpoint.

Now, the IDVQ is currently implemented only in Guangdong Province and Zhejiang Province. The in-depth analysis of the voices of opposition provided valuable references for subsequent promotional strategies for the certification system.

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Managing Design IP in the UK — does the end justify the means?

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This paper discusses the value of design rights using the example of UK’s most high-profile case of design right litigation: Trunki, a ride-on travel case for children. Rob Law MBE invented Trunki in 1996. He registered it as a design in 2002 in the UK, and in 2003 with the Office for Harmonization in the Internal Market (OHIM), now EUIPO. The design has since been emulated by competitors in countries across the globe. Law’s company Magmatic Ltd successfully challenged most imitators, until one succeeded in defending their rights on a product that was ‘inspired by Trunki’: PMS International and their so-called Kiddee case in 2012. This paper discusses lessons that can be learned from the case. Magmatic Ltd successfully defended their unregistered design right, but not their registered design right - Why? How do different forms of IP compare? How does a lengthy court process affect the running of a small design firm? How can IP legislation be enhanced to foster innovation more effectively?

keywords: Intellectual Property; strategy; infringement; innovation

Introduction
In a paper presented at the Design Management Institute (DMI) conference in London in 2014, and in the light of UK’s new design right legislation, the author has raised the question whether or not a ‘design-driven’ business development strategy that focuses on designs and design rights rather than technology and patents, could save costs and speed up the route to market for micro-businesses and SMEs in the design sector (Hillner et al., 2014). This question could not be resolved because there was not sufficient data to support an answer to the question. In 2015 / 2016, the author led a survey into design right infringement that was commissioned by the UK IPO. This survey was paralleled by
one rather extra-ordinary case of design right litigation, the Trunki case. The following paper seeks to complement the UK IPO survey in pursuit of an evaluation of the legislation surrounding designs. The paper is subdivided into six parts: an outline of the business development surrounding Trunki, an analysis of the case in the eyes of the law, an interview with the inventor of Trunki, Rob Law MBE, a contextualization of the findings through a review of existing studies into design rights, a comprehensive analysis of the findings, and a set of summative conclusions.

‘Design’s contribution to the UK economy cannot be underestimated.’ Baroness Neville-Rolfe, Minister for Intellectual Property (Acid website, 5 Sept., 2016)

What exactly constitutes design and what does not, has been debate for quite some time. Sir George Cox, for example, argues that ‘Design may be described as creativity deployed to a specific end’ (Cox, 2005, p.2). This would suggest a rather wide-ranging definition. In the eyes of the law, the concept of design is rather limited. In the UK the so-called design right protects ‘the shape and configuration (how different parts of a design are arranged together) of objects’, and it does so ‘for 10 years after it was first sold or 15 years after it was created - whichever is earliest’ (https://www.gov.uk/design-right). This description points towards the fact that the unregistered design right in the UK applies to three-dimensional designs only. It is somewhat comparable to the 3D copyright that exists in other countries such as Malaysia, Singapore, China. Concepts, processes, or functional aspects of a design object are not covered by the UK design right protection. Design registration can strengthen the IP protection for eligible designs, e.g. designs that are new and not owned by others. The protection of registered designs last for a maximum of 25 years in the UK, provided that the registration is renewed every five years. The registered design right bears some resemblance to the US Design Patent as well as the China Design Patent, although some regulations including the maximum life span differ here. This paper examines the strengths and weaknesses of the UK registered design right, and discusses how the legislation surrounding design IP can be improved.

**The aim of this paper:**

Using a case study of UK’s most high-profile cases of design right infringement, this paper discusses to what degree the existing regulations in the UK meet the needs of designers and the design industry, and it discusses weaknesses in the legal system which in turn lead to weaknesses in the UK registered design right. It concludes with a range of ideas which could help enhance the legal framework to better support design innovation in the UK and in comparable countries.

The paper examines the Trunki-versus-Kiddee case from three angles:

- **Section 2: From a legal point of view** — What were the outcomes and how did the courts arrive at their verdicts?
- **Section 3: From an inventor’s point of view** — How did Rob Law experience the litigation process?
- **Section 4: From a visual point of view** — Where and how did imitations appear on the international market? To what extent could imitations be challenged?
Section 1, 3, 4 and 5 are particularly interesting for design practitioners, inventors and design right owners, investors, and those who capitalize on design in general (retailers, licensees etc.), because these passages provide insights on how and to what extent design IP can be secured and enforced. Section 2, 4, 5 as well as the conclusion in section 6 are of particular interest to IP legislation makers and design industry associations who strive towards a more effective legal framework that enhances the strategic management and marketing of design, a system that encourages innovation and increases UK’s economic output.

The method of inquiry:
This study draws from a literature review that comprises not only academic papers and investigations that were commissioned by the UK IPO, but also online news feeds, newspaper articles, published court hearings and court judgments. A series of interviews were conducted in parallel to the literature review including two interviews with the inventor of Trunki, Rob Law MBE, himself. Interviews were conducted both over the phone and in person. Transcripts were analysed qualitatively in relation to the literature review findings. The visual materials discussed in section four were made available and explained by Magmatic Ltd during one of the interviews. Various correspondences with UK IPO, the UK IPO’s Research Expert Advisory Group (READ) as well as key industry stakeholders, such as Dids MacDonald OBE from ACID (Anticopying in Design) and Sebastian Conran have also contributed to a balanced view on the subject matter.

The objectives are to clarify:
- How and why the courts arrived at their verdicts in the Trunki versus Kiddee case (legal perspective)
- What IP strategic insights can be drawn from an inventor’s point of view
- How effective the legal framework is surrounding registered designs in the UK
- What value can be attributed to, and extracted from design IP for the perspective of an individual inventor / inventing firm as well as from a macro-economic angle
- How the UK Registered Design right compares to the EU Registered Design right (Community Registered Design)
- How design IP-related value can be enhanced through a revision of the legal framework in the UK
- Emerging challenges surrounding design IP (future perspective)

The paper concludes with a set of five recommendations which could help simplify and enhance the legal framework surrounding design IP in the UK, and lead to more effective and widespread use of the relevant protection methods.

Trunki — A case study
In 1997 whilst a design student at Northumbria University in the UK, Rob Law incepted a design of a ride-on suitcase called ‘Rodeo’ that was aimed at children. An updated version of the design was registered with UK IPO in 2002, and with the Office for Harmonization in the Internal Market (OHIM) in 2003. Six grey scale CAD renderings were used for the latter design registration.
Law licensed the design initially to a Chinese firm, and, in 2006, started taking Trunki to market himself after having obtained ownership over the production tools through trading in his royalties. Law transferred the production between four or five different factories in China until he transferred it to the UK in 2012 in pursuit of better quality control.

Mr. Law, who started his company Magmatic Ltd with just a £4,000 loan from the Prince’s Trust, explains that he did ‘a lot of the work by roping in family members and friends, paying them as little as possible, to help me do the work’ (Law, 2015). Although he ‘borrowed as much money as possible’ he refrained from equity investment after his famous BBC Dragons’ Den pitch had failed in 2003. During the TV program Law had pitched for £100K in exchange for a 10% equity share (BBC, 2009). In addition to a production flaw, investor Peter Jones pointed out that ‘This product is not patentable.’ (BBC, 2009) Rob Law confessed that it was not, and on those grounds Peter Jones subsequently declared the company as ‘worthless’. However, in 2009 Law raised £200,000 in exchange for 10%, and, during a second investment round in 2013, when Magmatic Ltd was valued at £12m, Law raised a further £4m worth of equity investment. In 2015 Magmatic employed 35 people in their head office in Bristol and 44 people in their factory in Plymouth (Law, 2015). The business was of value after all.

Profits reportedly diminished following the appearance of a competing design that bore close similarities with Trunki: The Kiddee case, which was introduced to the UK by PMS International in November 2012. Since some of the figures circulated in the popular press are thought to be wrong, one may want to be careful with quantifying the damage that Magmatic Ltd encountered. But there is little doubt that the company dropped from a six-digit profit in 2012 to a heavy loss in 2013. Magmatic Ltd issued proceedings against PMC International in February 2013, and successfully challenged the competitor in the UK High Court. However, Magmatic Ltd subsequently lost against PMS International in the Court of Appeal. Magmatic subsequently took the case to the UK Supreme Court. Whilst awaiting the hearing, Mr. Law revealed in an interview in 2015: ‘... if we lose, then it raises questions about everyone’s registered designs being valuable’ (Law, 2015). They lost. So how valuable are registered designs really?

The case in the eyes of the law

UK High Court found that the PMS International’s Kiddee Case infringed Rob Law’s / Magmatic’s Community Registered Design (CRD — also referred to as ‘European Registered Designs’ in the text below). PMS International appealed, which was allowed by The Court of Appeal. Magmatic subsequently filed an appeal with the Supreme Court. However, the Supreme Court unanimously dismissed Magmatic’s appeal.

The reasons

The judgment states that ‘a design shall be protected to the extent that it is new and has individual character [7]. What matters is the overall impression created by it, and that potential customers will appreciate it on the basis of its distinctiveness …’ (uksc-2014-0147-press-summary).
The following arguments were brought forward in support of Kiddee:

- Ears / Antennae instead of horns
- Leopard design
- Animal-like appearance
- Rounded ‘more cuddly’ body shape
- Wheel caps

In March 2016 the Supreme Court confirms the judgment of the Appeal Court, who claimed that High Court judge, Arnold J, ‘failed to give proper weight to the overall impression of the CRD […].’ Whilst expressing ‘sympathy for Magmatic and Mr. Law, as the idea of the Trunki case was a clever one, but Design Right is intended to protect designs not ideas’, the Supreme Court listed three key reasons for confirming the Appeal Court’s rejection of the initial verdict:

The first criticism was that the judge failed to give proper weight to the overall impression of the CRD as an animal with horns, which was significantly different from the impression made by the Kiddee Case, which were either an insect with antennae or an animal with ears [21]. The overall impression given by the CRD is indeed that of a horned animal; and the judge did not specifically refer to this when comparing the CRD with the Kiddee Case [37]. A trial judge cannot be expected in every case to refer to all the points which influenced his decision, but when a judge has given a full and careful judgment, conscientiously identifying a significant number of points which weigh with him, an appellate court can properly conclude that his failure to mention an important point means that he has overlooked it. This was the case here [39].

The second criticism was that the judge failed to take into account the effect of the lack of ornamentation to the surface of the CRD [21], i.e. that the absence of decoration reinforced the horned animal impression [40].
This has limited force; unless it simply consisted of items such as eyes and a mouth, any decoration could well detract from the animal impression and even such items could be said to distract attention from the horns [41]. The Court of Appeal’s second criticism was correct, although it is only a relatively minor point which mildly reinforces the first criticism [49].

The third criticism was that the judge ignored the colour contrast in the CRD between the body of the suitcase and its wheels [21]. He described the CRD as constituting a claim “evidently for the shape of the suitcase” and decorations on the Kiddee Case were therefore to be ignored [51]. The CRD consisted of CADs of an item whose main body appears as a uniform grey but which had black strips, a black strap and black wheels. The natural inference to be drawn is that the components shown in black are intended to be in a contrasting colour to that of the main body. Accordingly, the Court of Appeal was correct: the CRD claimed not merely a shape, but a shape in two contrasting colours [53] and the judge was wrong in holding that the CRD was simply a claim for shape [53].


Summary: The Supreme Court confirms the judgment of the Court of Appeal for the following reasons:

1. The difference in the overall impression which either of the two designs have on ‘the informed user’ (At para 55, [Arnold Judge] identified “the informed user” primarily as the parent, carer or relative of a three to six-year-old child)
2. The absence of surface decoration in the registered design
3. The colour difference between individual product components of the registered design

Inspiration versus imitation

The Squeeze argument: The squeeze argument means that if ‘the CRD covered the Kiddee Case then it also must extend to the Rodeo, and therefore it [the CRD] was invalid as it did not have “individual character” because it did not produce a “different overall impression” from the existing “design corpus” [i.e. the Rodeo]’ (Supreme Court, 2016, p.6). What this means is that in principle a UK unregistered design, if in the public domain for longer than the grace period, which is twelve months in the UK, can potentially invalidate a registered design that looks too similar.

‘Having compared the CRD with the Rodeo, Arnold J said that “PMS was right not to challenge the validity of the CRD except as part of its squeeze argument” (para 64).’ (uksc-2014-0147-judgment) Arnold J. further stated that ‘the Rodeo was a prior disclosure but that the relative obscurity of the Rodeo ensured that it did not form part of the design corpus of which the informed user would be aware’ (www.hogarthchambers.com). He also argued that since ‘Trunki was the first product of its type, the CRD is entitled to a broad scope of protection compared to a design in a more crowded design field.’ (www.hogarthchambers.com)

The Court of Appeal as well as The Supreme Court did not uphold the last point made by Arnold J, and ruled that PMS International had not infringed Magmatic’s CRD.
The unre gistered design rights involved

Arnold J. ruled that ‘the Kiddee Case also infringed four UK Unregistered Design Rights (UDR) which dealt with specific parts of the Trunki, namely the lock, tow strap and inside retaining straps.’ PMS International did not appeal against the infringement of UDRs involved. Rob Law claimed to have received around £3,000. According to Rob Law the legal case has cost the company nearly a million (Law, 2016).

The case in the eyes of the inventor
The author interviewed Rob Law on two occasions. Below are some of the responses received:

On marketing and working moral
Rob Law claims to ‘have had a lot of copies of ride-on suitcase concepts, many working very similarly to [his] product.’ He explains: ‘selling a product in the area what we call children’s travel is really difficult, because the category does not really exist. So all these copies seem to be failing at the first hurdle. They […] cannot get the buyers. There is not the marketing behind it that would grow the awareness for the product.’ (Law, 2016) It follows that the defense mechanism here is not the IP, but the value chain control, the established route to market, and brand recognition may be more important than design IP. So is it worth litigating despite market dominance?

Litigation can be straining for both the claimant and the defendant. Rob Law states that it ‘sucks away a lot of time and energy and resources that would have otherwise been spent invested in marketing.’ The Trunki case ‘has been a 3, close to a 4-year process.’ (Law, 2016).
On the other hand, Rob Law also explains that Trunki ‘got a lot PR out of it.’ ‘The morale of the business was hugely lifted by the press coverage on the day of the announcement [of the Supreme Court judgment], where we have never been in every single national newspaper with colour photos before on the same day. And they all went with our story and not with PMS’ story. Everyone was reading about Trunki. …’ (Law, 2016) Legal battles can improve brand recognition.

According to Rob Law ‘The Branding is the most important for us and for most markets, except for pharmaceuticals and high tech where brands cannot carry quite the same power. But in the business to consumer industry the brand is more powerful than patents and intellectual property.’ (Law, 2015).

**On overseas policing and IP strategies**

The UK design rights infringement study makes it clear that the majority of innovators rely on customers and suppliers for spotting possible infringement. Magmatic Ltd employ an online brand protection agency for monitoring overseas markets. ‘The frontline is the web [...] and second to that are the trade shows [...] After that you probably have to go directly to retailers and after that to factories themselves. But we have not yet gone after a factory, as this requires a huge amount of time and resource.’ (Law, 2016).

According to Rob Law ‘China is the biggest market and the biggest market for copying.’ Magmatic’s design patent in China protects the Trunki shape. ‘The bigger challenge in China — a bit like the registered community design — is that there is no check beforehand.’ Rob Law claims to have ‘had copycat factories register design patents identical to [the Trunki] shape, which clearly will be invalidated.’ However, the litigation process takes around 18 months. ‘So for 18 months they have got a piece of paper they can wave around, and it stops us from taking them off exhibitions, and it prevents us from removing their products from Alibaba. It is frustrating.’ (Law, 2015).

Registered design rights can be used as a basis for copyrighting in other countries. It can set a precedence which specifies the time of the inventive step. Magmatic’s copyright in China is rooted in their registered design in the UK and in the EU.

**On innovating IP**

When asked if he could envisage a different IP legislation that would protect designers better, Rob Law stated: ‘We need something very similar to what we have got in Europe which is an “Unfair Competition” rule. [...] We have ‘passing off’ [in the UK], which is notoriously difficult to pursue, and we were actually advised by the High Court Judge in the first case to drop our passing off claim, because it is so difficult to prove.’ (Law, 2016).

**On surface decoration**

Part of the legal argument surrounding the Trunki-vs-Kiddee case dealt with the question whether or not added decoration would alter the impression a product has on the user. According to Rob Las ‘It was the Apple-Samsung case that kicked off the whole surface decoration issue. Because that was about the “positive absence” of surface decoration, to which the appeal court, ruled on.’ (Law, 2016). According to the inventor ‘... a line drawing constitutes the absence of surface decoration.’ He had registered first a photographic representation of Trunki within the UK, and subsequently 3D renderings when filing within the EU. A line drawing would provide the most objective representation of a design object.
The question that remains is whether or not competitors should be allowed to adopt the design of the shape and alter the design through the addition of surface patterns. The three court judgements related to Trunki do not provide any clarity, since similarities and differences are judged holistically based on the overall impression. What is clear is that in the UK adding or changing surface decoration of an existing design can enhance an imitator’s chances to successfully defend a case in court. Whether or not this is desirable from the point of view of the individual designer, the design community, or from a macro-economic point of view is questionable. One could argue that a liberal legal framework encourages incremental innovation, in that it encourages the adoption of existing designs for re-design purposes. On the other hand, it is highly likely that inventors in pursuit of radical innovation are discouraged by weak IP legislation. So, the question could be reframed: Which is better for a nation’s economic output: radical or incremental innovation?

On the value of design registration
Rob Law’s view on registered design rights is twofold: ‘The Registered Design we have has been hugely powerful bar in the UK, and it has been successful in the UK when we sent it to UK retailers. It just has not been successful in court.’ (Law, 2016) He explains that ‘The Registered Design that was overturned in the Supreme Court was the same piece of paper that had 4 times listings removed from various global trade websites, and from around 150 odd retailers around the world. […] Only in or own country it seems to have no value.’ (Law, 2016).

What can be learned:
• Branding is a more effective IP protection method than design rights
• Prior art created through Unregistered Design Right can potentially impair the strength of Registered Design Rights in the UK, if the latter is registered after the twelve-month grace period has lapsed.
• The EU (or Community) Registered Design Right (CRD) is likely to be stronger a means of protection than the UK Registered Design Right. The former costs more to register €350 for online filing than the latter which costs £50 for online filing.
• The EU (or Community) Registered Design Right (CRD) can set a precedent to which innovators can refer back to when enforcing their informal IP overseas.
• Searching online trading platforms seems to be the most effective way to monitor infringement.
• It is not clear how to best represent a design (photo, rendering, outline drawing) when registering a design.

A visual journey — How different is different enough?
‘Copycat’ Designs: Rob Law uses the term ‘copycat’ in reference to designs that are similar or very similar with some more or less noticeable differences. So-called ‘fakes’ are identical copies that pretend to be the original. This usually involves adopting the branding elements such as the trademark. The vast majority of Trunki imitations are copycat products. The UK Design Right Infringement Survey 2016 revealed that only 16.2% of imitations are perceived as identical copies.
All of the products in Figure 3 are thought to have individual production tools somewhere in China. None of them have used the Trunki brand name. Trademark infringement is thought to be significantly easier to litigate than design right infringement. All designs shown above were successfully challenged through infringement letters, with the exception of the product on the top right, which is protected by a Chinese Design Patent that Magmatic failed to get invalidated. The courts decided it was dissimilar enough. Due to Trunki’s registered design, the Alibaba listing now has to say that the product is not available for sale in Europe.

In Figure 4, the design on the left, the so-called Vrum, is thought to be sufficiently different compared to the Trunki design. All the others fall within Trunki’s scope of protection, except the Kiddee case in the middle. After three court hearings the level of
difference has been judged as sufficient. Certainty about infringement can only be established in court. However, infringement letters can be very effective.

Magmatic’s 3D copyright is based on a grey scale photo which they filed with their 2010 registration of the Trunki case. The 3D copyright has been successfully enforced in all countries where look-alike-products appeared (China, Hong Kong, Canada, Australia. New Zealand, Russia, South Korea, Malaysia, Singapore, United Arab Emirates, Turkey). The question we need to ask ourselves is: How reliable would the 3D copyright be without the registered design right that provides documentary proof of the date of invention?
Rob Law explains: ‘With our Registered Design we have had this particular ride-on-suitcase de-listed in all these countries, and with all these retailers.’ For Magmatic, the registered design sets a precedent, provides documentary evidence which one can refer back to when enforcing copyright. When asked whether the enforcement of rights was achieved through warning letters or court proceedings, Rob Law answered: ‘All through warning letters, yes. [...] Well, none of them was through legal action. But letters would go back and forth quite a lot. They would fence. But when they did roll over, then what happens to the product? Is it going to get destroyed? Often they said that they would donate it somewhere. But you do not know about the safety of the product. And it is confusing. It is really hard to get them destroyed. Very very rarely do we recover our legal costs.’ (Law, 2016)

![Figure 7](source: courtesy of Magmatic Ltd.)

Figure 7 shows an example for the visual representation through line drawings. The Trunki case has caused a lot of debate surrounding the visual representation required for UK registered designs. No official guidelines exist. If we imagine 3 perspectives in addition to those shown in figure 7 — top view, front and rear view — the product would be perfectly illustrated from all sides. Seven views suffice the perfect visual representation of a product, but only if one mode of representation suffices the need to defend the design in court. If photographic representation and / or 3D renderings are required in addition, then the number of visual representations needs to be multiplied accordingly.
Figure 8 shows how Magmatic Ltd ‘decided to do some work with a design consultancy to try to widen [their] scope of protection. So, if someone was going to copy Trunki using some of the themes surrounding Trunki, then […] a further 10 designs in line drawings […] protect against anyone who would try to come up with one that looks visually different. …and someone did, and we had it removed.’ (Law, 2016):

Design right in the eyes of subject experts
The above presents one case only, and may not be representative of the design IP landscape in the UK, and certainly not of that in other countries. However, UK uses case law, which means that courts refer to precedent cases in their judgment, and Trunki constitutes a landmark case, which, no doubt, will impact future judgments. It also needs to be acknowledged that although IP disputes are rather common, the majority of them do not end up in court. To contextualize and critically evaluate the above findings, the
following review of secondary data discusses a number of key insights in relation to design rights.

**How ‘strong’ are design rights?**

The above interview touches upon IP strategies. How design right stakeholders make use of design right depends on how strong the latter is, or on its perceived robustness, both locally and internationally. It is difficult to establish how strong a design right really is, since design rights are probabilistic rights. This means that validity can only be established through a court judgment. As shown in the Trunki case, it may even require a series of judgments at different courts to establish absolute certainty. Design rights in the UK can be perceived as even more ‘probabilistic’ than patents, because the former are not examined for novelty upon filing (Hillner et al., 2014, p.8). Only during the process of litigation is the novelty aspect put to the test. In relation to SMEs and micro firms ‘The vast majority of IPR litigation [in the UK] takes place before the civil courts, where the IPR owner initiates the action.’ (Greenhalgh et al., 2010, p.2). This means that evaluating the effectiveness of design IP based on statistical data is challenging. The difficulties involved in the statistical examination of design IP also root in the large diversity of design firms, most of which are small in size. Greenhalgh et al. claim that ‘There are hundreds of thousands of SMEs with 10-250 employees in the UK economy and millions of micro firms with fewer than ten employees. All are different, and many have relatively short life spans.’ (Greenhalgh et al, 2010, p.4). Due to the short live spans of firms, it is difficult to reach a sufficient range of design right stakeholders in order to obtain a statistically representative amount of data in relation to design right infringement.

In ‘Intellectual Property Enforcement in Smaller UK Firms’, Greenhalgh et al examine the attitudes and practices of small and medium-sized enterprises (SMEs) and micro firms. The paper comprises three surveys including one that covers design right. Regrettably this part of the report examines design right in combination with copyright, which dilutes the research findings. According to the authors ‘the value of an IP right to a firm depends on its ability to enforce it’ (Greenhalgh et al, 2010, p.3). This leads to a contrasting scenario: firms, smaller firms in particular, who ‘protect their rights simply and at low cost’ and others who are ‘faced with a whirlpool of litigation costs when enforcing their rights’ (Greenhalgh et al. 2010, p.2). Greenhalgh et al differentiate between ‘IP-active and IP-inactive firms’ (Greenhalgh et al., 2010, p.5) and conclude that IP enforcement is ‘either a small scale, easily resolved dispute, or an expensive, time-consuming minefield’ (Greenhalgh et al. 2010, p.2). Magmatic is an IP-active firm and the Trunki case became a minefield. Magmatic needed to raise funds in exchange for equity in order to survive it. Greenhalgh et al refer to IP litigation as ‘a minority sport’, but also as a ‘large firms’ game’ (Greenhalgh et al., 2010, p.3). The authors refer to the very small number of Patents Court case listings per year and the fact that ‘SMEs and micro firms are rarely litigants’. (Greenhalgh et al., 2010, p.3) This should not surprise given the costs required to litigate perceived IP infringement against aggressive defendants. Given the fact that international infringement can be far more damaging than infringement in the UK, Greenhalgh et al. speculate that ‘UK infringement could be just the tip of the iceberg’ (Greenhalgh et al., 2010, p.2). For Magmatic this is not the case. Magmatic successfully prevents imports into the EU, and manages to mitigate overseas infringement, sometimes through employing
agents. Whilst Magmatic claim to police their IP outside the UK with relative ease, their IP is less strong in their home country.

Theoretically IP insurance policies could strengthen IP because they would increase the affordability of IP litigation. However, according to Greenhalgh et al. there is limited awareness of IP insurance in general. Only 25% of firms have an insurance policy that helps cover the costs involved. Little less than one third of respondents of the remaining 75% were unaware of the fact that IP insurance existed, and another third of those 75% considered insurances as too expensive. (Greenhalgh et al., 2010, p.1) Respondents also expressed concerns about restrictive clauses. One could argue that there is an educational need to raise awareness for IP insurances in the UK. However, information obtained during a conversation with Dids Macdonald from ACID suggests that IP insurances in the UK are not effective, since there is no sufficient funding model that attract underwriters in the long term (Macdonald, 2016).

### The value of design

The Hargreaves report, which was commissioned in 2011 by the British Prime Minister David Cameron to investigate the relationship between the UK’s IP framework, innovation and economic growth, is presumably the most comprehensive study into IP in the UK. Professor Hargreaves underlines the economic importance of UK designs pointing out that ‘In 2008 investment in design alone amounted to 1.6 per cent of the Gross Domestic Product (GDP)’ (Hargreaves, 2011, p.64). Haskel and Pesole reiterate Hargreaves’ claim and further explain that in the UK £23 billion are spent on design per annum (Haskel & Pesole, 2011). They argue that the figures would be significantly higher if all design activity was included in the calculation. The problem is a lack of a shared understanding of what sorts of activities the term *design* comprises. In pursuit of a definition of design, Haskel and Pesole explain a design as ‘a legal right which protects the overall visual appearance of a product or a part of a product in the country or countries where they were registered’, and proceed with the legal explanation of design as ‘the appearance of the whole or part of a product resulting from the features of, in particular, the lines, contours, colours, shape, texture or materials of the product or ornamentation’ (Haskel & Pesole, 2011, p.18). This provides us with a legal perspective of the matter. However, this legal definition does not tally with notions of design that are propagated in design theory and practice.

How do we evaluate the value of design IP if the definition of design remains undefined? The Big Innovation Centre report, which was published in 2012, states for example that ‘there is no such thing as the “design industry” in official datasets’ (Big Innovation Centre, 2012, p.12). The authors confirm that ‘The exact meaning and boundaries of the field of design are ambiguous’, and refer to evolving concepts of design thinking as propagated by Buchanan in the context of ‘strategic design’ (Big Innovation Centre, 2012, p.16f). This makes it clear that there is no widely shared understanding of what exactly constitutes design.

Given the pace at which design and design-related practices are changing at present, it is likely that the protective legal framework does not change in line with emerging concepts of design and design industry practices. Where the legal framework *does* correspond to the changes in the design industry, it may do so at too slow a pace. Reducing potential lag
could be useful for IP policy development, as this could increase the competitive advantage of individual nations, and consequently accelerate economic growth. Considering the shift in design away from products and artifacts to processes, services and customer experiences, one might speculate that the future stronghold of design is where knowledge is best managed. Processes and services do not rely on resources or on manufacturing to the same degree as physical products. They rely on insights, new knowledge and management decisions. Formal IP is only one form of knowledge management. This means that the problem which Trunki has brought to surface is much greater than the sum of issues that are discussed above, e.g. surface decoration, filing fees. The bigger question that emerges is: How can the IP framework refined, if not to say re-invented, to support the sorts of designs that are produced today, and in future?

Perhaps the design practitioners have already found a way: The Big Innovation Centre report highlights that some businesses prefer to rely on ‘the pace of their innovation’ rather than on IP. It confirms that ‘Small businesses often have limited resources to enforce their legal rights’ (Big Innovation Centre, 2012, p.3) The significance of ‘speed to market’ is likely to increase in the future, because crowd sourcing of suppliers, and crowd-funding as well as e-commerce add to the range of business strategies available to innovators, SMEs in particular. Even Magmatic, an established small firm, launched Jurni, a travel case for teenagers and adults through crowd funding whilst engulfed in the legal dispute surrounding Trunki.

**Community Registered Design Right versus UK registered design right**

The Big Innovation Centre report states that ‘the EU-wide OHIM design registration system offers benefits over the UK-based system’ and that ‘There is little evidence that strengthening the UK design rights system would provide significant benefits to international design businesses’ (p.5). What The Big Innovation Centre failed to identify is the low awareness for EU design rights amongst UK-based design stakeholders. Since almost 37% of UK owners of registered design right have not heard of EU Registered Design Rights (Hillner, 2017). This is presumably why the majority of UK-based designers rely on UK registered design rights rather than on EU registered design rights. It is also surprising considering Rob Law’s view that the UK registered design provides limited benefits for international protection by comparison to the EU registered design right. The Big Innovation Centre report claims that ‘the UK’s design industry is relatively export-facing. The design-intensive industries [...] export a higher proportion of their output than the economy as a whole ...’ (Big Innovation Centre report, 2012, p.48).

How much credibility individual forms of IP have within the international markets affects the distribution of market powers. If the UK completes their EU exit, UK-based designers may be disadvantaged, unless adjustments are made to the IP framework in the UK. Whether the glass is half full or half empty here is a matter of perspective. A newsletter distributed through ACID claims that ‘Brexit provides a unique opportunity not only to ensure the best possible IP design rights' negotiations but also create strengthened protection enabling UK designers to be on a par with their EU counterparts who can rely on Unfair Competition when UK IP law fails them as demonstrated by the high profile Trunki case.’ (ACID, 2016) At the same time British designers are at risk of being disadvantaged: Dids Macdonald confirms in the said newsletter that ‘EU unregistered
design is a much stronger design right and loss of access, potentially, could influence UK designers to launch new designs in alternative European locations to secure stronger design protection.’ What ACID is promoting here, is the UK’s opportunity to construct a new legislation in support of design rights, i.e. an Unfair Competition Law which currently does not exist in the UK.

Value distribution
The Big Innovation Centre report claims that just under one third (£198 billion) of the demand for design comes from consumer spending. The internationalization of design and production processes as well as the internationalization of distribution channels led to increasingly complex value chains and networks, which make it difficult to understand the ‘flows of goods and value’ (Big Innovation Centre, 2012, p.27). According to the Big Innovation Centre report ‘there is no data set that provides a comprehensive picture of design’s international supply chain’ (Big Innovation Centre, 2012, p.28). One of the key findings of the study is that ‘the balance between the costs and benefits of design rights do not encourage registration’. The study claims that benefits are limited because design rights are difficult to defend (Big Innovation Centre, 2012, p.66). Trunki case suggests that the latter is true. However, Trunki also highlights that the signaling effect of registered design rights, at least of the Community Registered Design Right, does justify the costs, since the majority of competing products could be removed from the market through liaising with distributors abroad. Magmatic also proves beyond doubt that commercially viable businesses can be built around design-driven strategies.

Number of design registrations
Hargreaves comments on the low number of design registrations pointing out that ‘Around 8,000-9,000 UK designs are registered annually, split roughly 50/50 between IPO and OHIM registrations’ (Hargreaves, 2011, p.65) This figure stands in contrast to the Design Right Infringement Survey 2016 which revealed that there are more than twice as many UK Registered Design Right holders (88.66%) than EU (OHIM) Registered Design Right Holders (39.7%) (Hillner, 2017). The overall figure stands also in contrast to some 30,000 designs that are added to the database of IP interest group ACID (Anti Copying in Design). The difference beckons the question why an independent register is more popular than an official one. One explanation might be the scope of eligible designs. A UK Registered Design Right as well as the EU Registered Design Right requires very specific criteria as pointed out in the introduction. Although not examined, novelty is a necessary prerequisite here. ACID on the other hand allows for a much wider range of design solution to be added to the database, including such that can be only protected through copyright or trade mark. Another reason for the considerable popularity of ACID may be the fact that ACID proactively engages with the stakeholders through educational activities, and advisory services. UK IPO have follow suit with the introduction of ‘opinion services’ and mediation services. However, ACID has become a brand and the attract their audience due to a 20-year track record of engaging in IP. Interestingly ACID membership fees are proportionate to the member’s annual turnover. What if design right filing fees, renewal fees and litigation costs were charged in proportion to a company’s revenues? A company like Magmatic Ltd might be much more inclined to litigate the perceived infringement through a large firm if costs were reduced. Conversely, a large firm may be
more hesitant to emulate existing designs if their legal costs were proportionate to their revenues. The market power equilibrium in the field of design and innovation would shift towards the ‘Small and young innovative firms [who] are of crucial importance in terms of growth and jobs’ (Hargreaves, 2011, p.3).

Under the present circumstances ‘It can often be hard for smaller businesses to use the intellectual property system effectively’ (Big Innovation Centre, 2012/14, p.83). Hargreaves claims that ‘the current intellectual property framework might not be sufficiently well designed to promote innovation and growth in the UK economy’ (Hargreaves, 2011, p.1) Part of the problem is that the definition of design in the legal context is too limiting. The results of design activities that focus on user experiences or on innovating services, user interfaces and platforms cannot be protected through formal IP. This might be a problem, because those design practices are gaining significance. If there is a direct relationship between IP and economic growth, then the latter will be increasingly compromised due to the fact that the designs of the future cannot be protected through formal IP.

**Redesigning design rights — towards a better system**

So how would one best ‘redesign’ the design right framework? Could there be an alternative system to UK’s current IP legislation, perhaps a fundamentally different system?

Weatherall and Webster, who investigated patent infringement in Australia in 2009, point out that ‘if the patent system did not exist, it is possible that another, perhaps cheaper system of third-party endorsement may arise’ (Weatherall & Webster, 2009, p.4). Might the same be applicable to design rights? Could it be that the separating designs (the visual aspect) from patents (the functional aspect) is counterproductive to innovation. Modernists have argued for decades in favour of a close relationship between form and function in design. The existing IP frameworks do not support this proximity.

Hargreaves refers to the current variety of forms of design rights as ‘a Patchwork of Protection’. He perceives ‘multiple alternative design rights and registers’ as an unnecessarily complex system. In the UK there are currently no less than four different design rights available, the Community Registered Design, the UK Registered Design, and the unregistered equivalents. Hargreaves claims that ‘It is improbable that a design rights framework optimised to support innovation and growth would feature a multiplicity of overlapping rights’ (Hargreaves, 2011, p.65). The confusion surrounding design rights and IP in general is wide spread. Even Rob Law seemed to be unaware that there is a EU (Community) Unregistered Design right. ‘The range of intellectual property protection used by design firms may make it hard for SMEs to assess which approach to managing their designs is most appropriate.’ (Big Innovation Centre, 2012, p.5) Simplifying IP frameworks is critical to improve their usability. ‘Less is more’ was once a guiding thought in design. Perhaps it should become a guiding thought for innovating IP legislation?

There are considerable overlaps between the EU and UK unregistered design right and copyright. This beckons the question why those forms of IP are not merged. Would it not be much better to convert unregistered design rights into a 3D copyright in order to connect it to existing copyright regulations? In search for an explanation why ‘The propensity for UK businesses to register designs rights both domestically and through
Office for Harmonization of Internal Markets (OHIM) seems to be significantly lower than its EU counterparts’, Haskel and Pesole speculate that UK design firms might be ‘consciously protecting their designs using an unregistered intellectual property right’ (Haskel & Pesole, 2011). But the authors are mistaken here: The awareness of unregistered design rights — less than 55% for UK unregistered design rights, and less than 46% for EU unregistered design rights amongst UK-based owners of registered design rights (Hillner, 2017) — within the design sector is low by comparison to registered design rights and copyright, and confidence in unregistered design is very low, too — 1.94 on a scale from 1 to 5 (Hillner, 2017). It is much more likely that the investment in registered design rights in the UK is lower than in other surrounding countries, because the legal system in which design rights are embedded, is less strong, as pointed out by Macdonald / ACID.

If unregistered design rights are converted into 3D copyright, the awareness amongst designers would automatically increase since they are much more aware of copyright than of unregistered design rights. The confidence in copyright is also higher than that in unregistered design rights, which suggests that there would be more uptake of 3D copyright than there is currently of unregistered design rights. Converting unregistered design rights into 3D copyrights would not only increase awareness for, and supposedly usage of this form of IP, it would also simplify the IP system which is currently too complicated. There are many overlaps between copyright and unregistered design rights, and these rights are often enforced simultaneously during litigation, in particular if cases are taken the UK High Court of Justice. A conversion of the unregistered design right into a 3D copyright would eliminate the confusion that arises from this overlap.

Form versus function
The rule that visual characteristics related to the functionality of a product cannot be protected through registered design rights seems surprising (competitors can easily get such registered design rights invalidated in the UK if they can prove that the form is connected to the product function). Modernist designers have spent decades promoting the idea that in design form and function should be connected. We see the registered design right to be severely limited in its scope. What if a visual feature was to be allowed to be supportive of design function? In the first instance, it would increase the scope of design right protection, and it would allow for some conceptual design attributes to be covered through formal IP. Those who seek to keep design rights distinct from patents may perceive this as a problem. On the other hand, one could argue that there is currently a large gap between the design right and the patent, whilst design right and copyright sit rather close to each other within the family of UK-based IP options. It is common for IP-active firms to use a variety of protection methods, such as design rights, patents and trademarks in combination — and when it comes to IP litigation in the UK, High Court litigations usually deal with a range of forms of IP. This means that IP litigation at High Court is often complex, and outcomes are very difficult to predict. Reducing the complexities involved in IP legislation, and thoroughly rethinking what is and is not covered by individual forms of IP and how these forms of IP correlate, will help
stakeholders better understand and utilize the IP framework, and consequently increase
the economic output of the countries within which these stakeholders operate.

A diagrammatic journey through possible IP frameworks:

Figure 10  The current ‘IP patchwork’ — some forms of IP are overlapping, others are far apart with respect to coverage. (Source: the author)

Figure 11  IP sandwich — An Unfair Competition Law, which can be articulated through new IP legislation, and a Fair Collaboration Rule, which can be supported through either legislation or through a charter, which innovators can opt in to, provide supportive layers that enhance the effectiveness of existing forms of IP. Unregistered Design Rights are converted into 3D Copyrights. The inclusion of functional aspects extends the coverage of 3D Copyrights and Registered Design Rights. Depending on their definition the Unfair Competition Law and the Fair Collaboration Rule could connect closely with existing forms of IP or their replacements. (Source: the author)

Figure 12  Ultimately the combination of Unfair Competition Law and Fair Collaboration Rule could make certain forms of IP unnecessary. A simplified tightly knit IP environment emerges. (Source: the author)

Conclusions
One big question which the analysis above does not resolve, is whether design right infringement enhances innovation or whether it limits innovation. With reference to the Annual Innovation Report 2010 by BIS and NESTA, Hargreaves states that ‘some argue that copying in the fashion industry may actually promote innovation in that once a design is copied this spurs the fashion houses that created the original to move on and design something new.’ (Hargreaves, 2011, p.65) We may here need to differentiate between
incremental and radical innovation. David Teece states that once an invention is established in the market, innovation shifts from radical innovation to incremental innovation, and from product innovation to process innovation (Teece, 1986, p. 288). This paper has examined the Trunki case which confirms Teece’s hypothesis. The invention of a ride-on suitcase was a radical step. No competitor emulated the design until the product was established on the market. Once competing products appeared on the market, none of them enhanced the design significantly. Instead the competition focused on price, keen on producing a product that is cheaper than the original. So innovation here may be related to a reduction in costs / price, perhaps at the expense of quality. One might also be inclined to argue that the competition surrounding Trunki may have motivated Magmatic Ltd. to re-innovate through either re-inventing Trunki or through developing another product (Jurni) in order to sustain their leadership position in the market. This also does not appear to be the case. When Kiddee came on the market, Magmatic were already in pursuit of Jurni in order to extend their product range. Instead of accelerating the route to market for Jurni, the legal battle surrounding Trunki slowed it down. This means that it is highly likely that the impact of competition on innovation is design-sector specific.

The Trunki case further reveals that registered designs and design patents can set a precedence to which designers can refer back to when enforcing their informal IP such as copyright or unregistered design rights on a specific design in the global markets. Registering in a great variety of countries may therefore not be necessary. However, the UK Registered Design Right is thought to be less effective than the EU (Community) Registered Design Right.

One does not need to be resident in the UK / EU to file in the respective territories. ‘Any natural person or legal entity from any country in the world may file an application’ (Through its definition the US Design Patent may be more robust than the European counterparts. But it takes longer to process an application and the costs are higher.) Given the pace at which design-led innovations, i.e. innovations that focus on the visual aspect of a product, are taken to market nowadays, the regulations surrounding the US Design Patent may not be preferable to the EU Registered Design Right. UK’s Brexit campaign may encourage more UK-based design right stakeholders to consider filing for EU (i.e. Community) Registered Design Rights. This would be to the benefit of the UK economy.

Design right today is not very clearly defined. The Trunki case led to a convoluted argument comprising the so-called ‘overall impression’, surface patterns, and visual representations. This argument has to some extent been dissected here in pursuit of insights into the weaknesses of current IP legislations. These weaknesses surrounding the UK IP legislation leads to my first set of recommendations:

1. **Surface treatment**: If imitators are permitted to establish visual differentiation through surface decoration, design IP will remain a weak method of protection, since it is very easily circumvented. Therefore separating surface decoration and color aspects from the shape and form of design artifacts would be highly desirable.

2. **Overall impression**: A visual impression is always subjective, or inter-subjective, if various assessors are employed. Judgments surrounding the UK Registered
Design Right are based on the impression which a design has on the ‘informed user’. In the Trunki case this impression is fundamentally different if the informed user is a parent or a child. As rightly pointed out by Rob Law during the interview conducted in 2016, the impression changes over time. The longer a design has been on the market, the more differentiated becomes the user’s visual perception because he or she will become more informed over time. The US design patent refers to the ‘ordinary observer’ to judge whether or not a design has been infringed. This is not necessarily the better solution, since it increases the range of possible perspectives. However, the decision on who is to be considered an ‘informed user’ leads to difficult questions. A better definition is needed in order to frame the concept of the ‘informed user’ more clearly.

3. **Visual representation:** How designs are to be represented visually in the UK remains unclear. Lessons can be learned from design patents in the way in which they are managed in the US and in China. Outline drawings lead to an increase in the objectivity. If multiple forms of visual representations are allowed, then the number of permissible visuals ought to increase accordingly. Systemising visual representations in terms of viewing angles, level of detail and mode of representation (outline drawing, grey scale rendering, photographs) is critical for the comparability of designs, and to narrow the number of different possible ‘impressions’ a design may have on the informed user. Currently the number of permissible visual representations in the UK is 7. This allows for all viewing angles needed to depict a three-dimensional object: top, bottom, front, rear, left side, right side, diagonal. But it does not suffice to show an object from all angles using three different modes of representation (photography, rendering, outline drawing). This would require 21 representations. It is also important to specify the diagonal angle(s) from which a design is to be depicted, as changing the viewing angle or the viewing distance may affect the impression which a design has on the informed user.

Problems that exist but are not resolved through the three recommendations listed above are:

- How do we manage IP ownership in relation to co-creative efforts?
- How do we manage IP ownership in relation to design activities that do not result in an object, such as service design solutions, and user experience design?

The IP framework itself needs innovating. Whilst the UK economy can be enhanced through strengthening the IP framework, incremental changes will make little difference to the overall situation. Introducing a law to prevent Unfair Competition, or replacing ‘passing off’ with such a law, would be the most important step in order to future-proof IP legislation in the UK and in comparable countries. If formulated in the right way, it is not inconceivable that a law against ‘Unfair Competition’ could absorb the current IP system, which is perceived as outdated by many, in the long run.

Given the growing significance of collaborative design, co-creative design, and open innovation, a law against Unfair Competition ought to be complemented with a regulation or a rule to promote ‘Fair Collaboration’. How exactly those two regulations are best formulated needs to be thoroughly examined. It may well be that nations, who do not
currently have a law against Unfair Competition, such as the UK, are at an advantage, since they have the opportunity to define such a law from scratch. ‘Fair Collaboration’ is a concept that currently does not exist outside the scope of Creative Commons. Whilst an Unfair Competition Law may regulate the dissociation of ownership, a ‘Fair Collaboration’ rule could be defined to make sure that ownership (or co-ownership) of IP is managed fairly amongst collaborators. Contracts can be extremely complicated and potentially disadvantageous for individual participants. Concise and coherent standards based on which collaborators agree to collaborate, as well as protocols for dispute resolution, would help to facilitate and encourage collaborative efforts.

The most important improvements to the UK design right system would be the following five:

1. Convert the unregistered design right into 3D copyright
2. Allow for visual characteristics that enhance a product function to be covered by 3D copyright (registered design rights).
3. Eliminate the concept of ‘positive absence’ of surface decoration from design right / 3D copyright law, and focus the latter on the form alone
4. Introduce a law against Unfair Competition
5. Introduce a charter to promote Fair Collaboration

An Unfair Competition Law next to a Fair Collaboration rule would embed the variety of IP options, Patent, Registered Design Right, 3D Copyright and Copyright, and it would enhance their effectiveness. Depending on how a law against Unfair Competition is drafted, it may also allow for new forms of designs such as service design solutions and user experience design concepts to be protected. A set of Fair Collaboration rules can provide an incentive for innovators to commit to collaboration in design and to embrace principles of open innovation. The above five suggestions could simplify the IP system and enhance its effectiveness in the UK and in comparable countries. The question we are left with is how an Unfair Competition Law and a Fair Collaboration Rule are best formulated to address the currently existing imbalance in the distribution of market power in the creative sector.

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Design IP legislation in the UK — an opportunity to innovate?

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This paper constitutes a critical and detailed review of an investigation into design right infringement in the UK. The original mixed-method study was commissioned by the UK IPO in 2015/2016 and led by the author throughout the first three of four project stages. This paper focuses specifically on the results obtained in relation to registered design right infringement. The paper comprises the following points:

- A discussion of older studies in the area
- An outline of the research methodology deployed for the design right infringement survey
- A discussion and analysis of key research findings

The conclusions drawn provide insight not only into how design rights are used and enforced in the UK. They also help to establish clarity about the level of robustness of design-related IP options. The paper provides orientation to designers and design IP stakeholders. It culminates in a range of ideas of how the IP system surrounding designs can be enhanced in the UK and in comparable countries.

*keywords: Intellectual Property; design management; IP infringement; litigation*

Introduction The motivation of the study

In 2011 the UK Prime Minister commissioned a report to investigate the relationship between the UK’s current IP framework, innovation and economic growth. In the first of his eleven recommendations, Professor Ian Hargreaves, the main author, states that ‘Government should ensure that development of the IP System is driven as far as possible by objective evidence.’ (Hargreaves, 2011, p.64). In 2015 the UK IPO issued a tender ‘for the Provision of Research into Designs Infringement’ (UK IPO, 2015). This paper, which is
authored by the person who led this second investigation, until the UK Brexit referendum brought the project to a temporary halt, discusses some insights gained through the methodology development as well as some of the findings related to the study of registered design rights. Silvia Baumgartner, Nick Coutts, Maxine Horn, Dr. Robert Pitkethly, and Professor Ruth Soetendorp have helped to generate the research methodology and insights discussed below, and the University of Hertfordshire have supported the investigation as UK IPO’s contractual partner. It is important to highlight that neither the co-investigators nor the University of Hertfordshire were not involved in the analysis of information which is discussed in this paper and may therefore not share all of the conclusions drawn here.

The aim of this paper:
This paper discusses attitudes towards, the use of, and the infringement of registered design rights. It is aimed at designers, entrepreneurs, IP experts, and innovation strategists. It will also articulate recommendations that could be of use to UK legislation makers.

The objectives are to assess:

• the strength of registered design rights as a form of IP, and how this compares to other forms of IP
• the impact of the infringement of registered design rights
• how design right owners perceive registered design rights
• the scale and micro economic impact of the infringement of registered design rights
• how design right owners tend to respond to infringement
• to establish how the value of design rights can be optimized through possible changes in the legislation

These insights are hoped to enhance the reader’s capabilities of managing design IP.

Design right infringement — a focus group study
The project started with a focus group meeting which was held in July 2015 and conducted under the Chatham House rule. Hence the statements made are not attributed to individuals in this paper. The aim of the focus group initiative was to generate insights in pursuit of the development of a research methodology for the investigation of design right infringement. In attendance were four members of the research team mentioned above, as well as one representative from the UK IPO and five delegates. The latter included one designer, who owns an SME (Small and Medium Enterprise) in the UK, two legal representatives from other British design firms, one large and one small, and two representatives of different UK design stakeholder groups. The following list provides an overview over the most important discussion points:

1.1. The focus group perceived 3D printing not as a threat, because of production implications. 3D printing is thought to be effective for the production of one-off products. But it is slow and too expensive for high volumes.

1.2. Costs were considered to be ‘the biggest issue’, in particular with respect to worldwide protection. Although ‘with design rights, the cost of protecting [i.e.
registering] designs is comparatively modest’, the costs of enforcing rights can be ridiculously high.

1.3. It was stated that the costs for legal protection ought to drop with the advent of digital technologies, because digital platforms can facilitate the process of design registration and monitoring of infringements. There was no perceived reduction in costs.

1.4. It has been highlighted that the many designers are unaware that design rights don’t protect functionality.

1.5. Design attributes

The focus group argued that if functionality determines the behaviour of a product two other key design attributes could be specified with respect to designs:

- Personality, which derives from the aesthetic qualities
- Performance, which depends on how it is made

Each of the three attributes, functionality, personality, and performance gives value to a product. All three features can be protected through different means. Whilst the functionality of a design is commonly protected through patents, the other two aspects can be protected through different means, including registered and unregistered design rights as well as copyright.

1.6. The majority of design right infringement cases are thought not to involve litigation. A lot of designers who consider their design as being infringed tend to ‘stick their head in sand’ or ‘move on’. At the same time infringers reportedly tend to back down when challenged that they are infringing.

1.7. The success in litigation is thought to be dependent on the size of the opposing party. A larger opponent may even challenge a design and try to invalidate it. Success can therefore be limited. One delegate stated: ‘If you hit the target 1 out of 5 you are doing great.’

1.8. It has been noted that infringement cases are easier to enforce in conjunction with licensing contracts, as the licensing contract serves as evidence. Breach of contract claims are considered easier to enforce than design rights infringement claims where no contractual relation exists between the parties involved.

1.9. The approach to protection is usually determined through the business model. The following four options are thought to be the most common.

- Assignment of rights to a client
- A company (usually a large company) that creates design for itself, e.g. in-house design or proprietary design firms.
- Licensing of rights to a client. In this case the obligation to protect needs to be negotiated amongst stakeholders
- Assignment of rights to an intermediary company that deals with licensee/rights enforcement. This can protect the design company.

The different approaches to managing design rights may result in different attitudes to protection / infringement. Reading the market and getting the timing right is important for the value of the design. The greater the life-cycle of a product, the more recommendable investing in a registered design right will be. However, judging the potential life-cycle prior to a product launch can be challenging.
1.10. Designers tend to find out about infringement through their peer network, often through email correspondence. Online sellers, in particular the market leaders, provide a popular additional source for those design right owners who commit to active searches.

1.11. Soft benefits: It has been highlighted that there is a keen interest amongst designers, sole traders and small companies in particular, to be credited for their creative influences on others. Receiving public acknowledgement for the inspiring influence on others helps reputation building. The value of design rights and of attribution depends on where the product is sold. The accreditation through up-market retailers provide stronger credentials for the originator of a design than a budget-retailer. Etiquette and attribution is often perceived as or more important than commercial rewards.

1.1. The so-called ‘soft benefits’ are counter-balanced by the soft damages, which the victims of design rights infringement may suffer. Infringement can be demoralising, lead to stress and anxiety. This has been highlighted as potential emotional damage.

The focus group was clear about the fact that the design rights system would benefit from a process of simplification. The improved use of digital technologies in the management of design registration would make systems easier to use and more cost-effective to operate.

So-called soft values such as attribution are currently not given sufficient attention. As design rights bare some similarities with copyright, it may be useful to examine the creative commons for the way in which legal terms are articulated, and also for the way in which rights are managed.

A review of existing studies

Greenhalgh et al (2010): Intellectual Property Enforcement in Smaller UK Firms
The study ‘Intellectual Property Enforcement in Smaller UK Firms’ examines the attitudes and practices of small and medium-sized enterprises (SMEs) as well as micro firms. It comprises three surveys, one of patents, one of trade marks and one that covers simultaneously copyrights and design rights. The design rights survey produced 57 usable responses, only one of which came from a large firm. 35 respondents were SMEs and the remaining 21 were micro firms or individuals. The way in which firms rated the importance of IP did not show any clear tendency. This may be due to the small sample size, or due to the fact that copyright and design right were investigated in a combined fashion. The Greenhalgh study does not differentiate between registered and unregistered design rights. The findings do not allow for insights specific to registered design rights infringement. This paper fills this knowledge gap.

Viability
According to Greenhalgh et al ‘the value of an IP right to a firm depends on its ability to enforce it’ (Greenhalgh et al. 2010, p.3). However, the financial costs involved in the litigation of IP infringement constitute ‘a significant deterrent’ (Greenhalgh et al. 2010, p.1). In another source Greenhalgh and Rogers acknowledge other value aspects such as market power and signaling effects (Greenhalgh, Christine, Rogers, Mark (2010):
Innovation, Intellectual Property, and Economic Growth, New Jersey, USA: Princeton University Press). These value aspects may well be interconnected, and their significance deserves investigating in addition to and in relation to enforceability.

**Litigation costs and damages**

Greenhalgh et al present a contrasting scenario: firms, smaller firms in particular, who ‘protect their rights simply and at low cost’ and others who are ‘faced with a whirlpool of litigation costs when enforcing their rights’ (Greenhalgh et al. 2010, p.2). The authors conclude that IP enforcement is ‘either a small scale, easily resolved dispute, or an expensive, time-consuming minefield’ (Greenhalgh et al. 2010, p.2).

**Dark figures**

Although ‘IP disputes are relatively common’ — 25% of firms were involved in a dispute in the previous 5 years — the majority of them do not end up in court. In relation to SMEs and micro firms ‘The vast majority of IPR litigation takes place before the civil courts, where the IPR owner initiates the action.’ (Greenhalgh et al, 2010, p.2)

**Litigation and firm sizes**

Greenhalgh et al refer to IP litigation as ‘a minority sport’, but also as a ‘large firms’ game’ (Greenhalgh et al, 2010, p.3). The authors refer to the very small number of Patents Court case listings per year and the fact that ‘SMEs and micro firms are rarely litigants’. (Greenhalgh et al, 2010, p.3)

The Design Rights Infringement Survey 2016 adopted Greenhalgh et al’s definition of dispute which comprises ‘any infringement, whether or not this ended in legal proceedings’ (Greenhalgh et al, 2010, p.1). The Design Rights Infringement Survey took the definition one step further in that it considers disputes as ‘any kind of awareness of, or correspondence (pre court, in court or out-of- court) related to the actual or potential infringement of IP’. The reason for extending the definition to the ‘potential infringement of IP’ is precisely the fact that a lot of cases do not reach court, and prior to court settlement it is not 100% clear who is the infringing party in design rights disputes.

The following insights concur with the points raised by the focus group:

- Litigation costs, not filing costs, constitute a deterrent for innovators to register a design.
- The size of the firm is perceived as significant. Design rights are thought to benefit predominantly larger firms.
- Based on this report one would hypothesise that smaller firms are less likely to litigate.


**The value of design**

Professor Hargreaves underlines the economic importance of UK designs stating that ‘In 2008 investment in design alone amounted to 1.6 per cent of the Gross Domestic Product (GDP)’ (Hargreaves, 2011, p.64). He argues that ‘Small and young innovative firms are of crucial importance in terms of growth and jobs but proliferating use of IP rights can push
up IP transaction costs and block these players from entering markets.’ (Hargreaves, 2011, p.3).

**The currency the existing design rights framework**

Professor Ian Hargreaves points out that ‘the current intellectual property framework might not be sufficiently well designed to promote innovation and growth in the UK economy’, (Hargreaves, 2011, p.3) and he highlights the fact that ‘Design right dates from the eighteenth century, and registered design right from the nineteenth.’ (Hargreaves, 2011, p.64)

Hargreaves refers to the large variety of forms of design right as ‘a Patchwork of Protection’. The Design Right Infringement Survey 2016 focuses on all four design rights available in the UK:

- A registered design right covering the UK (This will be referred to as UK Registered Design Right)
- A registered design right covering Europe that is available through the Office of Harmonization for the Internal Market (OHIM): This will be referred to as Community Registered Design Right
- An unregistered design right covering the UK (UK Unregistered Design Right)
- An unregistered design right covering Europe (Community Unregistered Design Right)

Hargreaves perceives ‘multiple alternative design rights and registers’ as an unnecessarily complex system. He acknowledges that ‘It is improbable that a design rights framework optimised to support innovation and growth would feature a multiplicity of overlapping rights’ (Hargreaves, 2011, p.65).

Hargreaves emphasizes the relationship between design in the UK and the country’s economy. At the same time, he questions the efficacy of the design right framework with respect to economic growth. Given its age, it may be outdated. Hargreaves criticizes the complexity of the system.

**The Big Innovation Centre (2012): UK Design as a global industry: Intellectual trade and intellectual property**

The authors of this report highlight that the ways in which designs are appropriated differ between industry sectors due to the differences how these sectors operate. The activities comprise sales, licensing and the provision of bespoke services. The fact that many companies rely on more than one of these design commercialization routes (The Big Innovation Centre, 2012, p.3) leads to multiple business models.

The report identifies the fact that ‘there is no such thing as the “design industry” in official datasets’ (The Big Innovation Centre, 2012, p.12) as a methodological challenge. It also makes it clear that there is no shared understanding of what exactly constitutes design (The Big Innovation Centre, 2012, p.15).

Design rights are mostly used in combination with copyrights, trademarks, and also patents can be used in combination with design rights. The Big Innovation Centre report also highlights that some businesses prefer to rely on ‘the pace of their innovation’ rather
than on IP. It states that ‘Small businesses often have limited resources to enforce their legal rights’ (The Big Innovation Centre, 2012, p.3).

The value of design registrations
The Big Innovation Centre finds that ‘design registration is [often] not perceived as particularly valuable for firms producing designs’ since design is ‘being embedded within broad processes of value creation and leveraged using a variety of forms of intellectual property protection and business strategies’ (The Big Innovation Centre, 2012, p.64). This manifests itself in the ‘predominance of design as a service’. Design services, in particular those that are bespoke, tend to rely on ‘tacit knowledge and expertise’ (The Big Innovation Centre, 2012, p.65) rather than IPR such as patents that are connected with individual proprietary design products.

One of the key findings of the study is that ‘the balance between the costs and benefits of design rights do not encourage registration’. The study claims that costs are higher than necessary due to ‘a paper-based filing system’ and that benefits are limited because design rights are difficult to defend (The Big Innovation Centre, 2012, p.66).

Despite the fact that the majority of firms in the design industry are small and micro firms, ‘It can often be hard for smaller businesses to use the intellectual property system effectively’ (The Big Innovation Centre, 2012, p.83). Although the existing IP system is complex, and perhaps too complex, it does not suit the variety of existing design business models.

Whilst the Hargreaves report largely comments on the macro-economic significance of design, the Big Innovation Centre report focuses on the micro-economic aspect, i.e. the significance for the individual user or design owner. In line with the focus group (1.9) the report states that the use designs and the value of design rights depends on the business model used by the innovator.

An investigation of design industry sectors in the UK shows that the impact of design right ownership and design right infringement is far-spread. Having used three-digit SIC industry codes (Standard Industrial Classification codes) which were identified as relevant for design activities by Haskel and Pesole (2011) on the one hand and by Trends Business Research Ltd (TBR, 2015) on the other, in combination with the industry codes to which companies involved in design right infringement cases belonged, the following insight could be obtained: Out of a total of 3,689,100 listed on the industry database FAME, no less than 2,254,775 UK companies belong to industry sectors where design IP is of significance.

The research methodology
The data was collected through a survey questionnaire which was designed in such a way that questions could be answered by both infringers and infringed designers/design companies. The terms defendant was used instead of ‘infringer’, because it was believed that respondents would be reluctant to identify themselves as ‘infringers’ or ‘potential infringers’.

In the first instance the questionnaires were sent to owners of registered design rights only. This is the part of the investigation discussed in this paper. Two contact databases were used, one that listed owners of designs that were registered in the UK, and one that
listed owners of designs that were registered with OHIM (Office of Harmonization in the Internal Markets) in Europe. Owners of design rights that had expired were not included in the survey, nor were those who were not resident in the UK.

As no email contacts were available to the research team, questionnaires were sent through the post. Where design right owners owned more than one design right duplicate entries were removed. Entries with incomplete postal addresses were also eliminated. Those contacts that were found in both databases were eliminated from one of the two to make sure that respondents would receive the survey form only once. Following the completion of all filtering processes the database listed 12,522 individuals who had registered a design in either UK or EU.

A pilot was conducted using 300 addresses. The responses to the pilot were rolled into the main survey. In total 680 responses were collected in due time. This equates to a response rate of + / - 3% at a confidence level of 95. However, the data collected was contaminated with responses of owners of unregistered design rights and of copyright owners, who according to their survey responses do not own any registered design right. In this study, which focuses on registered design rights only, those unwanted responses were eliminated. Following the elimination of responses from IP owners who do not own a registered design right, 530 responses remained. One of these 530 responses was disqualified as the respondent had claimed to have completed the questionnaire twice, on paper and online using the url given in the printed questionnaire. The duplication of responses had to be avoided to prevent skewed results. The 529 responses used equate to a response rate of + / - 5 % at a confidence level of 95. Four of the 529 responses were partial responses. The remaining 525 were complete responses.

46 questions were included in the questionnaire. It was not possible to construct a questionnaire that investigated multiple incidences of design right infringement in great detail with one questionnaire. To avoid confusion, those questions which were to examine the incident of the infringement were directed to ‘one particular dispute and preferably the dispute which best represents those [the recipient has] been involved with’.

Terminology: The questionnaire was designed to investigate perceived infringement, alleged infringement as well as actual infringement. This meant that questions needed to be designed to elicit situations where recipients thought to have been infringed with or without taking action, as well as situations where cases were taken to court. Therefore, the term ‘dispute’ was defined in a liberal way. The term was introduced as ‘any kind of awareness of, or correspondence (pre court, in court or out-of-court) related to the actual or potential infringement of IP.’ This was necessary in order to direct respondents to one representative sample case that could be discussed and examined in detail without creating confusion.

All data used in this paper was collected prior to the UK Brexit referendum.
The survey results
The following set of questions, diagrams and tables are an extract from the data collected in conjunction with the design right infringement survey. The word count limit does not allow to communicate the entirety of results.

General questions
The design industry sectors who own registered design rights

<table>
<thead>
<tr>
<th>Value</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertising and Marketing</td>
<td>4.36</td>
<td>23</td>
</tr>
<tr>
<td>Interior Design and Architecture</td>
<td>3.22</td>
<td>17</td>
</tr>
<tr>
<td>Crafts</td>
<td>6.44</td>
<td>34</td>
</tr>
<tr>
<td>Product / Industrial Design</td>
<td>54.73</td>
<td>288</td>
</tr>
<tr>
<td>Furniture Design</td>
<td>4.17</td>
<td>22</td>
</tr>
<tr>
<td>Graphic Design</td>
<td>1.52</td>
<td>8</td>
</tr>
<tr>
<td>Fashion Design</td>
<td>3.41</td>
<td>18</td>
</tr>
<tr>
<td>Film, TV, Video, Radio and Photography</td>
<td>0.38</td>
<td>2</td>
</tr>
<tr>
<td>IT, Software and Computer Services</td>
<td>1.14</td>
<td>6</td>
</tr>
<tr>
<td>Publishing</td>
<td>0.57</td>
<td>3</td>
</tr>
<tr>
<td>Museums, Galleries and Libraries</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>Music, Performing and Visual Arts</td>
<td>0.76</td>
<td>4</td>
</tr>
<tr>
<td>Service Design</td>
<td>0.95</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>18.37</td>
<td>97</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>527</td>
</tr>
</tbody>
</table>

Figure 1

Registered design rights are most commonly used in the field of product design. Copyright protection is more commonly used in the field of entertainment industries and in the publishing sector. Some areas of design may be more difficult to protect than others. The relatively high number of responses to others suggests that the use of registered design rights is widespread across industry sectors in the UK.
Design rights versus firm size

The smaller the firm, the more common is the use of registered design rights. It has to be said that in terms of numbers, smaller firms and sole traders dominate the design industry in the UK. There are only few medium and large corporations by comparison. So the distribution of registered design rights is vaguely proportionate to the number of small, respectively large design businesses in the UK. The filing costs which are low by comparison to patents, for example, attract businesses of all scales.
Design rights in relation to innovation

Here respondents were asked whether or not they had invented or developed products that were significantly improved or completely new to the market in the last 5 years?

![Pie chart showing responses to the question about innovation.](image)

**Figure 3**

This question relates to the relationship between the innovative capabilities of firms and the likelihood of infringement to occur. Whilst it needs to be acknowledged that the degree to which a product palette constitutes an improvement or a novelty is highly subjective. Nonetheless it appears that the owners of registered design right tend to focus on innovation to a large degree. Even though neither the registered design right in the UK, nor the EU registered design right is examined for novelty, 80% (421 out of 529) of owners of registered design rights rate their contribution to innovation in the UK as high.
Registering design rights in the UK is far more common amongst UK-based firms and individuals, than to register EU-wide. This comes as a surprise. Whilst the focus group had rated the value for money of both variants of IP as good, the scope of protection of EU (Community) registered design rights is far greater. It may be of benefit to UK’s export industry to promote an increase in the number of EU (Community) registered design rights. With a filing fee of €350 per design the EU registered design rights as opposed to £60 for a UK registered design (£50 for filing digitally online) the price difference should not constitute a barrier. The fact that 468 out of 529 respondents owned a UK registered design right and 210 a EU registered design right, makes it clear that some respondents filed for both, though not necessarily for the same design. If the UK exits the EU as indicated through the Brexit referendum, then designers will presumably need to file for both forms or registered design in order to secure exclusivity both in the UK and across the EU. It still waits to be seen how exactly the Brexit may affect existing EU registered design rights. The political debate surrounding UK’s EU exit provides the UK with an opportunity to improve the ‘unnecessarily complex system’ (Hargreaves, 2011, p.65) surrounding IP, and to enhance its efficacy.
**IP awareness**

Here respondents were asked which of the following Intellectual Property (IP) rights they had not heard of before.

![Figure 5](image.png)

This question provides some insight with respect to the low number of EU registered design rights amongst UK-based firms and individuals. A high percentage, over one third, do not know that a EU registered design right (formerly: Community Registered Design Right) exists. The awareness for UK registered design rights is very high on the other hand: 98.49%.

If there is a close link between design and the economy as claimed by Hargreaves in 2011 (see point 2.2), then the UK may be best advised to enhance the awareness for EU-registered design rights amongst UK-based IP stakeholders. Since ‘the majority of [UK] design exports go to advanced economies in Europe and America’ (Big Innovation Centre, 2012, p. 81), increasing awareness for EU registered design rights within the UK design community could be very beneficial for the UK economy. The Brexit may stimulate discourse surrounding design-related IP, which bears the opportunity to promote the EU-registered design right amongst UK-based firms.

About half of all respondents are unaware of the existence for an unregistered design right. Over 45% of respondents did not know of a UK unregistered design right, and over 54% were unaware of a EU registered design right. If the Brexit does go ahead the UK will presumably loose influence over EU legislation. At the same time the UK government would be in a better position to review its own IP legislation, and it would be advisable for the UK to follow the example of other countries such as Singapore and replace the unregistered design right with a 3D copyright, since over 99% of respondents are aware of
copyright protection. Enhancing awareness for specific forms of IP is likely to enhance the use of IP, which in turn will stimulate innovation in the UK.

**Investment in IP**
Here respondents were asked how much they spend each year on IP acquisition and maintenance.

![Figure 6](image)

Only 300 respondents could answer this question. Some 42% of respondents ticked ‘Don’t know’. Judging by the other responses it is clear that investment in IP is modest amongst the owners of registered design rights with almost a third spending less than £1,000 and just under 30% spending between £1,001 and £10,000 per year. A very small number of respondents invest significant sums of £500K or more. These candidates supposedly hold large IP portfolios with patents included. Whilst costs related to design rights can be an issue with respect to international protection and to litigation (see 1.2.), in terms of filing costs design rights are considered as an efficient means of IP protection (see focus group comments) and this perception is likely to affect the owners’ readiness to invest. The diagram suggests that design rights stakeholders invest modest sums in IP, but they may shy away from litigation in case of infringement due to the high costs required for the latter.
**Investigating the incidence of infringement**

Considering that the majority of design right infringement cases are not litigated in court, and since clarity about whether or not an infringement has actually occurred, the term dispute has been defined in conjunction with this study as ‘any kind of awareness of, or correspondence (pre court, in court or out-of-court) related to the actual or potential infringement of IP’.

The first question was set to identify the number of respondents in disputes related to design related rights. Multiple options were allowed.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Copyright</td>
<td>13.4%</td>
<td>71</td>
<td>441</td>
</tr>
<tr>
<td>(2) UK Registered Design Right</td>
<td>21.4%</td>
<td>113</td>
<td>396</td>
</tr>
<tr>
<td>(3) Community Registered Design Right</td>
<td>12.3%</td>
<td>65</td>
<td>439</td>
</tr>
<tr>
<td>(4) UK Unregistered Design Right</td>
<td>7.6%</td>
<td>40</td>
<td>460</td>
</tr>
<tr>
<td>(5) Community Unregistered Design Right</td>
<td>3.0%</td>
<td>16</td>
<td>481</td>
</tr>
<tr>
<td>(6) International (Non-UK / Community) Design Right or Design Patent</td>
<td>9.5%</td>
<td>50</td>
<td>453</td>
</tr>
</tbody>
</table>

The fact that there is a higher level of frequency of UK registered design rights (113) as opposed to EU registered design rights (65) should not surprise since twice as many respondents own a UK registered design rights as opposed to a EU registered design right (see Question 7).

170 respondents had been involved in disputes surrounding design right and / or copyright infringement within the EU/UK. 80% of those respondents were claimants (saw their rights as infringed), only 5.9% of respondents were defendants (had been alleged to have infringed the rights of others). 14.1% of respondents had been both claimants and defendants in the past. Only 49 respondents were involved in disputes over international design rights / design patent. The proportions between claimants (81.6%) and defendants (6.1%) is very similar with 12.2% of respondents having been both claimant and defendant. It is unsurprising that claimants are more likely to respond to a survey, since people are inevitably reluctant to admit having been accused of infringing the IP of others.
With respect to the following set of questions those candidates who had been involved in more than one dispute surrounding design right infringement were asked to answer the following 5 questions (Q17 – Q29) with respect to one particular dispute and preferably the dispute which best represented those they have been involved with. This was to avoid confusion and ambiguous responses.

First a distinction needed making between those who saw their rights as infringed, and those who had been accused of infringing the rights of others: 163 respondents (91.06%) stated that they were claimants with respect to the incidence of design right infringement, 16 respondents (8.94%) were defendants.

With respect to the territories involved, it could be established that over 50% of design right disputes involved other companies in the UK. 34.3% involved opponents overseas, and only 12.3% involved opponents in the EU. Infringement is most common a UK problem or subject to disputes involving counterparts overseas. This again suggests that the UK’s Brexit campaign will have little impact on the design community in the UK.

Design right disputes often involve a variety of forms of IP simultaneously. The respondents were asked which forms of IP were involved in the particular case mentioned above.

![Figure 8](image)

The data is fairly coherent between defendants and claimants with the exception of EU registered design right (Community Registered Design Rights). UK Registered Design Rights (UK RD) dominate the disputes. But this may be due to the fact that more than twice as many respondents invest in UK Registered Design Rights than in CRDs (see Q7). The low
outcome with respect to Unregistered Design Rights is not surprising given that around half of the respondents are unaware that such rights exist (Q8).

The following question addressed the sizes of opposing companies. Respondents were asked to assess the business size of the (main) opposing party in relation to their own company.

The first two sets of bars are unsurprisingly similar. This is because over 90% of respondents are claimants. In relation to patents, Weatherall et al. claimed ‘Larger firms are disproportionately represented in listed cases, while SMEs and micro firms are rarely litigants.’ (Greenhalgh et al, 2010, p.3). The data collected here does not suggest that this hypothesis can be transferred to design rights. The only discrepancy between defendants and claimants is that a higher proportion of defendants are confronted with similarly sized companies than the other way round. The defendants involved in this survey were not dealing with opponents that were ‘very much smaller’.

76.7% of respondents claimed that the design was used in a product, which you or your business were selling at the time of infringement. Infringement of design concepts that are not market ready or do not have proof of market is rare. The fact that only 4.8% of respondents stated that the design was licensed to another business may suggest that design right stakeholders are more aware or more protective of their rights if they trade the designs directly.

Investigating reactions to infringement
The investigation of people’s reactions to infringement still focused on the one particular dispute which the respondents had chosen with respect to the previous few questions.
In the first place, respondents were asked which action they took in response to the infringement.

Very few design right owners (only 5%) who are aware of a potential infringement situation choose to do nothing. A high percentage seek legal advice (solicitor: 40.2%, Contacted a patent or trade mark attorney: 39.1%) and send an infringement letter (67.0%). Only 16% of claimants issued a court claim. 12.5% of defendants issued a defense, and the same percentage issued a counter claim. However, the low response rate amongst defendants means that the defendants figures are not statistically representative.

![Graph showing actions taken in response to infringement]

**Figure 10**

The dominant reasons behind taking action in relation of a perceived infringement situation are:

- Defend potentially lucrative market (57.9%)
- Defend our Design Right(s) as a matter of principle (65.2%)
- Defend our business as a matter of principle (64.0%)

Those respondents, who took some sort of action were subsequently asked how the other party reacted. The question was formulated as follows: What response did you (as infringed party) receive from the other party? OR How did you (as allegedly infringing party) respond to the claim? [Please select all that apply]

In response to the claimants’ actions 39.9% of respondents claimed that the defendants had permanently stopped infringing, and 14.0% temporarily stopped infringing. In 25.8% of cases it was alleged that the design was invalid. This suggests that the success rate of infringement letters is considerably high with over 50%. This concurs with Greenhalgh et al’s claim that ‘solicitors’ letters often resolve disputes’ (Greenhalgh et al, 2010, p.1).
Design right stakeholders should feel encouraged to take action if they feel that their rights are infringed.

With respect to those cases which were litigated in court, 32 valid responses could be taken into consideration. Over a third of the cases involved were judged in favour of the claimant. 15.6% of cases were still pending, and another 15.6% were settled out of court, including one case that was reported by a defendant. One defendant stated that the case was ‘thrown out’. The other defendants did not respond to this question. This suggests that the success rate in relation to design right litigation is fairly high. However, the number of responses is too small to be statistically representative.

<table>
<thead>
<tr>
<th>Value</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case still pending</td>
<td>15.6%</td>
<td>5</td>
</tr>
<tr>
<td>Court judgment in our favour</td>
<td>34.4%</td>
<td>11</td>
</tr>
<tr>
<td>Court judgment in favour of the other party</td>
<td>6.3%</td>
<td>2</td>
</tr>
<tr>
<td>Out-of-court settlement</td>
<td>15.6%</td>
<td>5 (including 1 defendant)</td>
</tr>
<tr>
<td>Other (please state)</td>
<td>28.1%</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>

*Figure 11*

The next two questions were still related to the one particular incident chosen by the respondents. The questions asked how the design right holders felt about the litigation process, and about the outcome of the legal dispute.
It is clear that satisfaction levels are higher with respect to the outcome of legal disputes rather than with respect to the litigation process. Design right litigation may be a painful process. However, over half of the respondents are content or very pleased with the results.
Amongst those claimants who did not start court proceedings, 39.4% ticked that the ‘potential gains didn’t justify the cost’, 16.1% ticked that it ‘would take too long’. 29.2% ticked ‘other’ and gave a vast range of diverse reasons.

**The scale of infringement**
With this point of the questionnaire the respondents were asked to refer to multiple incidents of infringement if they have experienced more than one dispute surrounding design right infringement. Respondents were asked how much they had spent on legal fees when enforcing their registered and/or unregistered design rights.

![Figure 14](image)

Design Right enforcement is thought to be similarly costly compared to patent enforcement. The figures do not support this assumption at first sight. Cross tabulating the data with the previous question regarding the outcome reveals that those who paid nothing left no comments or very few with respect to satisfaction. 18 out of those who spent less than £1,000 did not take legal action. Either they gave in, or settled amicably. Some of them did not respond to this question. 9 out of the 37 who spent £5,000-£20,000 stated that ‘Potential gains didn’t justify the cost’ in the previous question. The same applied to seven from the group who spent £20K-100K.

The respondent who ticked over £1m had the court judgement in his / her favour, and was ‘reasonably content’ with both the outcome and the process.

The one who ticked £500K - £1m had the judgement in favour of the other party. They were ‘extremely disappointed’ with both the outcome and the process.

One of the two who sent £100K - £500K, received a court judgement in his / her favour and was ‘reasonably content’ with both the outcome and the process. The other of those
two stated that 'Potential gains didn't justify the cost'. They did not take action despite the fact that their spending on legal fees is quite considerable.

It seems fair to say that taking a design right infringement case to court can be considerably expensive, and does not warrant for success. Most stakeholders settle out of court or give in to mitigate the costs involved in legal disputes surrounding design right infringement.

The survey did not produce clear results with respect to the financial losses incurred due to design right infringement. These were difficult to judge. 36.3% ticked ‘Don’t know’.

In 2015 the UK introduced a new law according to which criminal proceedings could be issued against infringers who intentionally produced identical copies of registered designs. Hence the survey sought to establish how effective this new legislation would be.

<table>
<thead>
<tr>
<th>Value</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>An identical copy</td>
<td>16.2%</td>
<td>38</td>
</tr>
<tr>
<td>A nearly identical copy (differences are hardly noticeable compared with the original)</td>
<td>55.0%</td>
<td>88</td>
</tr>
<tr>
<td>Still a copy but with some noticeable differences</td>
<td>17.5%</td>
<td>28</td>
</tr>
<tr>
<td>Don't know</td>
<td>3.8%</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>160</td>
</tr>
</tbody>
</table>

*Figure 15*

The small number of ‘Don’t know’ responses suggests a high level of confidence here. The majority of infringements are related to nearly identical copies. Only 16.2% are related to identical copies. This means that the new law, i.e. the criminal sanctions which UK introduced, would apply to 16.2% of the cases at the very most, and only if the infringement can be proven as intentional. 75.2% of respondents stated that they perceived their designs as ‘intentionally’ infringed. Inadvertent infringement of registered design rights is thought to be very low with only 7.9% of respondents ticking this option. 17.0% of respondents stated that they did not know whether their registered design rights had been infringed intentionally or inadvertently. 165 respondents had replied to this question.

*The context of infringement*

Respondents were asked whether they perceived their infringed designs as radical or incremental. Radical innovative design was defined as a design that has a disruptive impact.
Very few design right stakeholders perceive their designs as incrementally innovative. If design is directly linked to innovation and economic growth, then weaknesses in the IP framework will have an adverse effect on the UK economy. It has to be noted here that a novelty attribute is a prerequisite for a registered design right. Although the novelty is not examined upon filing, designers who are aware of this requirement will refrain from registering a design right since they know that they will not be able to enforce it. To investigate the timing of infringement, respondents were asked approximately how many years after the design registration the infringement occurred.
This set of responses shows that the chance for design rights to be infringed diminishes over time. This may be because the value of design connects is dependent on the product life cycle. The closer to the end, the lower will be the cumulative value that can be appropriated from a design. The risk of infringement is lower in the first than in the 2nd and 3rd year. It appears that infringers wait until proof of market has been established.
4.6. How designers rate the design right system in the UK

IP robustness was here defined as the level of protection offered by the type of right, and respondents were asked to rate it on a scale from 1 to 5, one being least robust and five being the most robust. 526 responses to this question provided a very credible set of data.

Table 18

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered Design Right</td>
<td>7.4%</td>
<td>39</td>
<td>14.1%</td>
<td>74</td>
<td>24.3%</td>
<td>128</td>
</tr>
<tr>
<td>Unregistered Design Right</td>
<td>21.3%</td>
<td>112</td>
<td>17.5%</td>
<td>92</td>
<td>8.4%</td>
<td>44</td>
</tr>
<tr>
<td>Copyright</td>
<td>8.8%</td>
<td>47</td>
<td>10.3%</td>
<td>54</td>
<td>19.8%</td>
<td>104</td>
</tr>
<tr>
<td>Trade mark</td>
<td>3.6%</td>
<td>19</td>
<td>4.6%</td>
<td>24</td>
<td>12.5%</td>
<td>66</td>
</tr>
<tr>
<td>Patent</td>
<td>5.7%</td>
<td>30</td>
<td>2.7%</td>
<td>14</td>
<td>8.6%</td>
<td>45</td>
</tr>
</tbody>
</table>

Figure 18

Average mean:
- Registered Design Right: 3.27
- Unregistered Design Right: 1.94
- Copyright: 3.24
- Trade mark: 3.94
- Patent: 4.10

Unregistered Design Rights are perceived as the least robust form of IP. Registered Design Rights are perceived as more robust by comparison, but less robust than trade mark and patent. The latter received the highest scores with respect to robustness. Copyright is perceived as significantly more robust than Unregistered Design Rights. However, the scores here are difficult to compare to those of Registered Design Rights due to the high number of respondents (31%) who ticked ‘Don’t know’.

The respondents were subsequently asked to rate their level of confidence in both unregistered and registered design rights on a scale from 1 to 5, with one reflecting very low confidence and five very high confidence.
Confidence in Unregistered Design Rights is very low by comparison to Registered Design Rights. Almost half of the respondents are unable to express a point of view, and almost half of the rest gave it the lowest rating. It is likely that Unregistered Design Rights are not sufficiently understood by Design Right stakeholders. Confidence in Registered Design Rights is slightly above average. Confidence in Unregistered Design Rights could be enhanced if this form of IP were to be converted into a 3D copyright.

Lastly respondents were asked to rate registered design rights with respect to value for money.
Despite limited confidence respondents feel relatively positive about the costs involved in registering Designs. The question does not cover the costs involved in litigating infringement. The fact that the ratings are fairly positive with an average mean of 3.48 (between ‘Average’ and ‘Good Value for Money’) suggests that design right owners appreciate the low registration costs despite the fact that their confidence in this form of IP is very limited.

Respondents were also asked about their expectation towards future trends in relation to infringement. 54.4% of respondents expect the number of design rights infringement cases to increase in the next five years. 26.0% expect it to remain the same, only 2.1% expect a decrease, and 25.0% expect for it to remain the same. Only periodic surveys will help to establish clarity about fluctuations in the frequency of infringement cases.

5. Discussion of results

Design rights and the litigation of design right infringement is not a ‘large firm’s game’ as suspected by Greenhalgh et al. But litigation of design rights is a minority sport, with only 16% of infringed design owners issuing a court claim. The reason for this may be two-fold:

On the one hand 69.9% of claimants sent an infringement letter, and, court claims included, 53.9% of actions led to the permanent or temporary discontinuation of the infringement. So there is a reasonably high success rate. On the other hand, a limited level of confidence in registered design rights with an average mean of 3.2 out of 5 may discourage design right owners who are confronted with a potential infringement situation from taking court action.

It is highly likely that the commercial exploitation of design in the UK could be enhanced through raising awareness for EU registered design rights through educational initiatives, and through raising awareness for UK unregistered design rights through converting this form of IP into a 3D copyright.

The qualitative comments received suggest that litigating design right infringement is perceived as unaffordable by many, and success prospects can be limited:

- ‘The system favours those who have the deepest pockets or who are prepared to lie. We have had 10-20 different instances and only 1 good outcome.’
- ‘Defending rights is far too expensive and realistic hope of meaningful compensation is non-existent from our experience’
- ‘Any party has the right to challenge, and even if found in my favour, they have a right of appeal’

There are also concerns around the possibility to bypass design rights through the modification of existing designs:

- ‘not sure how robust the protection is if someone reproduced the items with slight design modifications.’
- ‘How close does another person's design have to be to a registered design before it is counted as an infringement?’
- ‘believe that there are a lot of similar designs registered and enforcement would be difficult.’
The case surrounding Trunki which was judged in favour of the inventor’s competitor PMS International in the Supreme Court of Appeal in 2016, reinforces skepticism towards the design right system in the UK (Hillner, 2016). The case was initially judged in favour of the inventor, Rob Law, in the High Court in 2013. But the verdict was overturned in the High Court of Appeal, and this verdict was later re-confirmed in the Supreme Court of Appeal.

One survey respondent stated that ‘there aren’t enough "prosecutions" to act as a deterrent’. Given the current legislation in the light of the Trunki case, it appears unlikely that there will be an increase in successful prosecutions in the foreseeable future. Perhaps less design right owners will litigate the perceived infringement of their rights, due to the low confidence in the robustness of registered design rights.

The introduction of criminal sanctions will have a limited impact, if any at all. This is because the percentage of cases involving identical copies is very low (16.2%). The legislation surrounding design rights in the UK does not compare well to that in other countries: One respondent claimed that ‘Our RCD [EU registered design right] has stopped over 100 companies and copies Internationally but has failed in the UK! UK registered design is next to pointless as we trade in a global economy.’

Rob Law, the inventor of Trunki claims in an interview that it has been easier to enforce design rights abroad than it has been in the UK (Hillner, 2016). It is believed that the absence of a law against ‘unfair competition’ in the UK makes it more difficult to successfully litigate design rights here. IP protagonists such as the British trade association ACID (Anti Copying in Design) are propagating the introduction of such a law in the UK. It is important to highlight that IP is a means not only for regulating competition, but also to provide a basis for collaborative initiatives. According to one focus group delegate monitoring the origin of designs is to be particularly important when it comes to collaborative design or design consortia. Determining what constitutes a noteworthy design aspect and what does not can be challenging, and lead to frictions between the parties involved. Fairness in competition and fairness in conjunction with collaborative design initiatives should be a guiding principle that informs decision-making in the context of design legislation.

**How to enhance the current design right system:**

One survey respondent claimed that ‘We need a visual way - a symbol - of signifying on our product photos on-line, that our products are protected as Registered Designs’. If a symbol was introduced to communicate the fact that a design right has been registered, then such a sign could be used in conjunction with an indication that the design right holder is committed to taking action against ‘unfair competition’ and / or is committed to adhere to principles of ‘fair collaboration’. The latter would require a set of protocols, which remain undeveloped, since the idea is somewhat unprecedented. That said, it is important to highlight that co-creative design incentives are likely to become increasingly prominent and the creative commons have shown how attitudes towards copyright can be communicated easily and effectively with a simple set of signs which may encourage collaboration on the one hand and deter infringement on the other.
Figure 20 proposition for a label to highlight the status of registered designs and design patents along with the IP owner’s intentions of defending and sharing the IP (© Matthias Hillner, Singapore, 2017)

A sign system could be established in line with current trade mark and copyright symbols in order to articulate whether or not a design is registered. This could be extended to patents and possibly combined with an articulation that expresses the IP holder’s readiness to challenge ‘unfair competition’ (in territories, where the legal framework allows for that), and another that commits the IP owner to principles of fair collaboration (to be established — perhaps through a charter) and invites likeminded potential collaborators to consider engaging in collaboration.

Future monitoring

Figure 22 towards a robust research methodology (© Matthias Hillner, Singapore, 2017)

Although the responses to some questions ought to be treated with caution due to the fact that the number of responses are not statistically reliable, in particular when it comes to court proceedings, the questionnaire design used for this study provides the foundation for a reliable research methodology, which could be adapted to investigate the infringement of other forms of IPR such as unregistered design rights, copyright, trademarks and patents. It would be useful to investigate the infringement of different forms of IP in order to produce a comparative study. It would also be interesting to investigate the infringement of IP periodically in order to establish trends and long-term changes to support the decision making of designers, innovators and legislation makers.

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Design Policy Driven Development of Chinese Industry: The Experience from Guangdong Province

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Governments all over the world are paying great attention to economic innovation and the development of design in modern society. They are spending more and more recourses on making rules for Industrial Design Policy and measuring its implementation. As a method to make macroeconomic regulation and control by the government, the effectiveness and importance of design policy has already been widely admitted. In a macro-background of the three turns of Chinese design policy, taking the design policy of Guangdong province as an example, this article will analyze how local/regional government should respond to the national design policy. Based on the investigation and analysis of the winners of the "Guangdong Governor Cup Industrial Design Competition", this paper discusses how industrial design competition as a part of the design policy to support the development of industrial design. After making a comparison with the design policy of the Yangtze River Delta area, this article tries to enhance and perfect the current policy path.

keywords: industry competitiveness; design policy; Chinese manufacture; design industry

Introduction
The industry competitiveness is the core symbolization of the competitiveness of a nation. Industrial policy is the main method for the government to actively intervene the economic activities, and the effect of which is directly related to the competitiveness of
the industry. Industrial policy itself is a comprehensive policy system, of which “the core is to promote the reasonable transition of the structure of the industry” (Li Boxi, 1990). There are many ways to realize the optimization of industrial structure by policies, and design policy is one of the feasible paths. As a method to make macroeconomic regulation and control for the government, the effectiveness and importance of design policy has already been widely admitted.

With the increasing attention to the economic innovation and the development of design in modern society, governments of nations all around the world are investing more and more on the research on the Design Industrial Policy, for its method of formulation and implementation. After the WWII, the design industry in Japan has prospered due to a series of industry promoting policies by Japanese government, such as establishing the Japanese Industrial Design Promotion Organization (JIDPO) and founding up G-mark Design Award. Since then, the Japanese brand began to capture the global market swiftly. Being a country that possesses a long history of design culture, British government had issued a series of policies aiming at greatly supporting and assisting design after it had realized the importance of design to its economic development. This has significantly promoted the development of British industrial design. Around the WWII, Finland has shaped its national image by design exhibition and exhibition design. Design has a very high position in Finland and it has been pushed as a political means of its nation. In the end of 20th century, Finnish government once more played an important role in the development process of Finnish design by issuing the policy “Design 2005”. For Korea, its former president Kim Dae-Jung has published “Declaration of Design Era of 21th Century” in 1998, and claimed that building Korea through design will be realized by his three 5-year plans. This has stimulated the innovation of Korean enterprises such as Samsung, Hyundai, LG, and Daewoo, and has established Korea’s leading position in design area. All the examples above indicate that the governments play an important and vital role in the development process of design and its related industries in many countries, and made profound influence on the prosperity of global design industry.

In a macro-background of the three turns of Chinese design policy, taking the design policy of Guangdong province as an example, this article will analyze how local/regional government should response to the national design policy and the result from it. Based on the investigation and analysis of the winners of the "Guangdong Governor Cup Industrial Design Competition", this paper discusses how industrial design competition as a part of the design policy to support the development of industrial design. After making a comparison with the design policy of Yangtze River Delta area, this article tries to replenish and perfect the current policy path.

Three Turns of Chinese Design Policy

In 2006, Industrial Design made its debut on the “Summary of 11th 5-Year Plan”. In the following years, Chinese government has issued all kinds of policies to fully support the development of industrial design. Two waves of design policies have formed during 11th 5-Year Plan period and 12th 5-Year Plan period, and China is now in the process of the third wave of design policy. (Figure1)
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Figure 1  Three Turns of Chinese Design Policy

11th 5-Year Plan period (2006-2010): Professionalization of design, clarification of the industrial position of industrial design

In 2006, industrial design has been issued in the “Outline of 11th 5-Year Plan” for the first time, being stated as “develop professionalized industrial design”. At that time, the development of Chinese industrial design was still not professional or normative, and this is why the government mentioned to develop “professionalized” industrial design. At the meantime, the understanding to industrial design was still at the stage of discussing the function, structure, form, and package of the product. The main object to industrial design was still industrial product and the core of industrial design was as equal to the product design. This understanding stays on the 1980’s definition of industrial design by International industrial design organization.

During the 11th 5-Year Plan period, pushing the establishment of industrial design park was the important method of Guangdong government to promote the development of design industry. In 2008, Shenzhen joined the UN’s global innovative city network, and has been granted the name of “Design Capital”. Depending on its strong economy and modern urban infrastructure, Shenzhen has always been developing its creative industry which is driven by design. In September 2010, Guangdong Industrial Design City was formally founded in Beijiao, and became the largest planned industrial design industry base in China. This created a positive driving effect to the industries and cities in Pearl River Delta area.
12th 5-Year Plan period (2011-2015): From comprehension to integration
The 12th 5-Year Plan period was the critical period to build well-off society in an all-around way, and the mainline at that time was still to speed up the shift of economic development mode. In 2011, “Outline of 12th 5-Year Plan” mentioned to “promote the shift of industrial design from appearance design to high-end comprehensive design service”. On 26th Feb 2014, the State Council published “Several Suggestions on Pushing the Integrate Development of Culture Creativity and Design Service with Related Industry” (Guofa〔2014〕N0.10). This is the first time that a systematic document on the integrate development of culture creativity and design service with related industry has ever been issued. This time, the connotation of industrial design has been shifted and would no longer be limited by product.
During the 12th 5-Year Plan period, the integrated development of industries has become the focus of people’s attention. In the December 2013, a strategical cooperation agreement was signed between Hair Group (http://www.haier.com) and Alibaba Group (http://www.alibaba.com), to mutually improve the respective disadvantages of internet resources technology and logistic field, and to establish a product service system that covers the whole nation from sale, logistic and installation. In December 2014, Xiaomi Tech (http://www.mi.com) and Midea Group (https://mall.midea.com) became capital partners, in order to share the platform and user resources and jointly develop the new products that face the future. These examples of the development of changing from industrial comprehension to industrial integration verified the positive feedback from the market to the government’s design policies.

13th 5-Year Plan period (2016-2020): Driving innovation
Public entrepreneurship and innovation became the new driving force to the development of design industries during the 13th 5-Year Plan period. Depending on its leading technologies and cutting-edge products, Shenzhen DJI (http://www.dji.com) has grown up to the world top level independent R&D and manufacturer of UAV flying platform and image system. In September 2015, Didi Chuxing (http://www.xiaojuekeji.com) and Yutong (http://www.yutong.com) started to cooperate to create the eco-system of internet buses. And again in January 2016, Didi and CMBC (China Merchants Bank) jointly announced their strategic cooperation in all fields including capital, payment and settlement, finance, service and marketing. This is also the first time that a commercial bank enters the mobile payment scenarios field by cooperating with a mobile internet company. Starting from communities, the cross-border E-business company -- XiaoHongShu (http://www.xiaohongshu.com) made its transformation to shopping review community and its sales has broken 700 million within half year. From the above we can see that, whatever it is the technological innovation that breaks the wall between industries, or the user need oriented business innovation that breaks the traditional organizational boundaries of different industries to create sharing economy, they all have manifested the driving force of various and symbiotic industrial innovation in the social environment of public entrepreneurship and innovation.
The aforementioned three turns of design policy have presented the changes of industrial design in China, which include three appearances. The shift of the connotation of design:
from designing product itself to the integrated development of design service and its related industries. The shift of the method of design: from the integration of product factors to the integration that cross the boundary of different discipline and different fields. And the shift of the value of design: from promoting added-value to driving innovation. All these shifts are the result of mutual influence and dynamic adjustment between design and industries.

Guangdong Government: Gradual Promotion of the Development of Design in a “Point – Line- Surface” Way

Guangdong province has the trend-leading position as one of the birthplace of the innovation business of Chinese industrial design. The Reform and Opening-up in the late 70s last century has founded the footstone of manufacturing industry to the Guangdong economy. When embracing the advanced idea of industrial design from developed countries and taking the lead to develop industrial design, Guangdong has formed its unique mode and presented outstanding results.

Guangdong province possesses the largest share of economic volume and the fastest speed of economic development in China, and manufacturing industry is the main part of its industry system. The structure of Guangdong industry is, at the moment, shifting from industry leaded to double-wheel driven by advanced manufacturing industry as well as modern service industry. In 2015, the R&D investment of industrial enterprises above state designated scale in Guangdong province occupied as much as 5.16% of the total industrial value-added. The increasing proportion of invested R&D resources shows that the industry pays enough attention to innovation. Being the pioneer of Made in China, when actively responds to the national policies, Guangdong government also correlate to the characteristics of industrial structure of its own. It utilized design as the driving force for the optimization and upgrading of industrial structure and realized the shift from a province being “big” in manufacturing to being “strong” in manufacturing. Under the guidance of national design policy, the development of design and industry in Guangdong province has been gradually promoted in a “Point – Line- Surface” way.

11th 5-Year Plan period (2006-2010): To develop design industry from breaking through household appliance industry

During the 11th 5-Year Plan period, the industrial growth has dropped to the lowest point since the Reform and Opening-up due to the impact from international financial crisis. Confronting this difficult time, Guangdong government has actively pushed the shift of mode the economic development. The “Government Report” in 2007 mentioned “to make breakthrough from household appliance industry, and to lead industry extend to the whole process from design, R&D, manufacturing, sale, and service”. In this way, the government hoped to accelerate the adjustment and upgrading of the industrial structure. During the 11th 5-Year Plan period, the structural adjustment of Guangdong industry has gained obvious progress. In 2010, the gross output value of the traditional dominant industries that are related to household appliances, such as electrical and mechanical industry and equipment manufacturing industry, has occupied 0.36% more in the total industrial output value of Guangdong compared to year 2005. This indicates that, in the national environment of design professionalization, the policy in Guangdong province that
leading the industrial development by breaking through its traditionally advantaged household appliance industry has attained quite a success.

12th 5-Year Plan period (2011-2015): Design as the line to string the healthy development of industry

At the beginning of the 12th 5-Year Plan period, the Guangdong economy was transmitting from high speed growth to medium high speed growth. The industrial value-added has increased from 2126.996 billion in 2010, to 3025.949 billion in 2015. With the increased 898.953 billion, it has realized the great step from 2000 billion to 3000 billion. During the 12th 5-Year Plan period, under the guidance of the design policy that to develop design industry from breaking through the household appliance industry, the production of domestic electric fan, electric cooker, microwave oven, and audio system in Guangdong province took around 90% of the total production in China, and the production of domestic gas cooking appliances and gas water heater accounted for a half.

In 2011, as the transitional point of the 12th 5-Year Plan period, the Guangdong province government report stated that “to push the development of industrial design, to build national level exemplary base of industrial design industry, and to lead the healthy development of the industry.” The reported also emphasized to “implement dual-system education mode with the cooperation between school and enterprise and the action plan of hundred schools and thousand companies; to launch industrial design competition”, and “to launch the pilot project of the professional qualification certificate of industrial designer”, hoping to promote the professionalization of design, to enhance the public awareness of design, and to improve the reserves of skills and technologies. Two documents have been issued one after another in 2011 and 2012, “The guidance on accelerating the development of cultural creative industries in Pearl River delta region”, and “Several opinions on promoting the development of Science and technology service industry”.

By the end of 2015, Guangdong Economic and Information Commission brought forward the “new four modernizations” strategy of industrial design in the 13th 5-Year Plan period, which is “designing of industry, industrialization of design, professionalism of talents, and internationalization of development.” The commission hoped to push the creative development of “Design +”, with the main line of promoting the industrial transformation and upgrade and leading the development of advanced manufacturing industry. Design, as a line, will connect the cooperation between institutions and push the development, and finally accelerate the shift from “Made in Guangdong” to “Created in Guangdong”.

13th 5-Year Plan period (2016-2020): Design as the surface to cove the innovation eco-system of all industries

During the 13th 5-Year Plan period, the “3rd industrial revolution” based on digitization, intelligentization and informatization will accelerate its process around the world. As a big province of manufacturing, Guangdong has actively responded to the strategy of “Made in China 2025” and issued a series of documents to make a series of corresponding implementation plans for the 13th 5-Year Plan, such as “Guangdong Intelligent Manufacturing Development Plan (2015-2025)”, “Work Plan of Guangdong industrial transformation and upgrading”, and “Three-year implementation plan for tough battle of
Guangdong industrial transformation and upgrading (2015-2017)”. It hopes to make design as a surface to cover the innovation eco-system of all industries, to push the deep integration of informatization and industrialization, to promote the independent innovation abilities of the industry, to enhance the efficiency of resource utilization, and to optimize the industrial structure.

Take Shunde as an example. In the spatial arrangement and design-industry integration arrangement of Shunde innovation design, the government focused on the development plan and orientation of Shunde region, with the consideration of three dimensions of industry, territory, and humanity. By centering the “Design +” as the core strategy, the government has arranged and built the innovation eco-system of the integration of design and its related industries from multiple dimensions, such as “Design + Intelligent Manufacturing”, “Design + Finance”, “Design + Internet”, “Design + Technology”, and “Design + Startups”.

Up till this, Guangdong government had completed its development path of design policy in a “Point – Line- Surface” way, that is to push the design industry from making household appliance industry as a starting point to lead the development of design industry, to making design as a line to string the healthy development of industries, to, finally, making design as a surface to cover the innovation eco-system of all industries. Thusly, the pattern of design development that is led by the government has eventually formed.

**Measures of Guangdong Government to Promote the Development of Design Industry**

Design policy is one of the main components of the driving innovation to the industrial transformation and upgrading. It has to be structural, institutional, and systematic. By analyzing the three 5-Year Plan periods, this article tries to construct the system of the promotion of design industry in Guangdong and how this system can promote the four-modernization development of the design industry in Guangdong (Figure 2), including strategic level, consulting and information level, and execution and organization level. Figure 2 shows the three levels of Guangdong's design policy and the subject, measures and design task of each level. Moreover, it illustrates how to achieve the “new four modernizations” strategy of industrial design.

![Figure 2: Measures of Guangdong Government to Promote the Development of Design Industry](image)
Strategic Level: planning the development mode of design industry

Strategic level is the decision maker of the whole system. Being in the center position of the system, this level makes the policy, issues the related politic subjects, considers the establishment of the policy goal, and designs the detailed policy plan (Chen Zhenming 2003). The top level work of Guangdong provincial government includes the making of policies, the promotion of Guangdong Industrial Design City, establishing and developing of the design colony of Guangdong-Hongkong-Macao design corridor, pushing the gathering of design industry, strengthening and perfecting the IPR system, and the political and financial orientation of providing platform and technic support.

Consulting and information Level: constructing the development path of design industry

In the middle is the consulting and information level. Being as the nervous system of the policy system, this level provides timely, accurate and suitable information for the making, execution, evaluation, and supervision of the policy (Chen Zhenming, 2003). By implementing the standard roadmap and guide, this level plays a role of industry management that serves, coordinates and supervises the industrial design industry and manufacturing industry. In Guangdong, Guangdong Industrial Design Association (GDIDA) acts as the bridge between the government, companies and schools. By presenting the research report of the industries as the basis for the government to make related industry policies, GDIDA has promoted the issuing and implementation of those policies. Its service has reflected the wishes and demands for the innovation of enterprises, protected the fair competition of design industry, supported the economic and technic communication and cooperation of both domestic and abroad, greatly popularized the knowledge of industrial design using the social resources, and promoted the development of industrial design career in Guangdong province. The activities it undertook, such as “Governor Cup Industrial Design Competition” and “Guangdong Industrial Design Week”, made design a lever for the development of industries, changing design from accompanying industry to leading industry, pushing the connection between companies and design results, and promoting the industrialization of design results.

Execution and Organization Level: implementing the construction of design industry

The bottom level is the execution and implementation level of policies that constituted by institutions. This level converts policy plans to policy benefits. It is realistic, comprehensive, detailed and agile. In Guangdong province, the main executive units are schools, design companies and design training bases. Establishing the company’s design training base can promote the cooperation with schools. The industry-university-research mode could strengthen the construction of design related disciplines, and push the revolution of design education and the innovation of talent education. Besides, the company itself can implement fundamental, general, and perspective design research, establish all kinds of cooperation with overseas design institutions, and import foreign design experts and scholars to China to conduct project cooperation, and teaching and training activities. Being invested and co-build by Dongguan City People’s Government and Guangdong University of Technology, Guangdong South China Institute of Industrial Design (GDSCIID) is a typical design innovation service institution that belongs to the basic
level. Taking innovation design as its measures, it promotes the design innovation of regional products and the construction of independent domestic brands by design services, design consulting, and product development and incubation.

Focusing on the main line of industrial structural adjustment, transformation and upgrading, Guangdong has established its development idea of “strong province of design”. It has issued the “new four modernization” development strategy of “designing of industry, industrialization of design, professionalism of talents, and internationalization of development”. And it has formed the strategic system of design development that is strategically guided by the government’s design policy, connected by the coordination and communication led by GDIDA, and implemented by the development of high schools, companies and design institutions.

**Case Study: “Governor Cup” Industrial Design Competition levers the Industrial Development**

In the policy system of Guangdong industrial design, the GDIDA in the middle level has fully played its role for connection, and realized the levering effect of design to the industry by all kinds of measure such as the “Governor Cup” industrial design competition. Guangdong “Governor Cup” industrial design competition is the first design competition in China that is entitled by the name of the government. It is held every two years and has already held eight terms in succession. It has also inspired subsequent “Mayor Cup” in Guangdong and other “Governor Cup” in other provinces. Today, “Governor Cup” has become a normalized platform for the “public innovation”. It motivates the partisanship of the companies, design institutions, schools and independent designers from the whole society, exploits the design creativities and independent innovation, stimulates the innovative energy of the society, creates the good environment of respecting original and advocating innovation, and thusly, promotes the “new four modernizations” of design and its related industries in Guangdong.

This articled has investigated awarded companies and personals by questionnaire investigation that has won the product award and concept award in the 5\(^{th}\) (2010), 6\(^{th}\) (2012), and 7\(^{th}\) (2014) “Governor Cup” by questionnaire. The result of the investigation shows that the awarded works has created huge business value and economic benefit. We released the 39 questionnaires by internet and finally called back 36 questionnaires available. The survey included Skyworth, Fiyta, Midea and other enterprises; Newplan and LKK and design teams from Guangzhou Acdemy of Fine Arts, Guangdong University of Technology and other universities. The results from these three terms have applied 620 patents for invention, 751 appearance patents, and 1136 utility model patents; and their direct economic benefit has reached as high as 5.908 billion RMB.
Conducting companies to establish its innovation system, and enhance its innovation ability

According to Figure 3, among all, the lifting of company’s popularity by “Governor Cup” is the most apparent one (47%). Besides, the production value is increased (28%) and the user reputation is gained (23%). The companies are strongly willing to participate “Governor Cup”: on one hand, good design work should be approved by the public and experts; on the other hand, participating the competition can prove the design ability of the company and increase the company’s value added. Moreover, the competition is also significant to the promotion of the innovation system and innovation ability of the company.

Conducting the establishment of scientific process system
The competition has established a scientific evaluation system that can help the research and design process of a company to be more scientific. The evaluation system of this competition has added the judging standard of “process evaluation”, which not only concerns the “result”, but also the rationality of its “process”. This will effectively reflect the rationality of the project and the innovation and R&D abilities of the company. “Process Evaluation System” stimulates and conducts the companies to pay attention to the process of its R&D, and promotes the companies to make its R&D and design process more scientific and regulated. The investigated companies highly approved the “Process Evaluation”. They believe that in the innovation design, the serious and scientific process, research and method can effectively enhance the efficiency of innovation, help the designers to find the rational and valid design innovation point or breakthrough in a shorter time, and guarantee the quality of innovation.

Promoting companies to pay attention to design and enhance their innovation ability
By gradually recognizing the reputation and potential effects that can be brought by the competition, companies will pay more and more attention to design. Not only the personals and companies that won the “Governor Cup” will be financially awarded, there are many other measures being made to encourage and stimulate innovation.
Actively participating design exhibitions and competitions. For example, Skyworth has been granted the national industrial design center. For many times they participate the domestic and overseas design exhibitions and competitions every year, and periodically, they implement and publish their design advanced research projects.

Making regulations, strengthening the design R&D. Haige Communications invests tens of millions into the R&D of new products. Guangdong Xinhui CIMC Special Transportation Equipment Co., Ltd. has upgraded its design software and has built a 3D design platform. Zhongshan Longcheng Daily Products Company has proposed the detailed implement and award regulations aiming at industrial design in its “Measures for the management of scientific research project and funds” and “Measures for the management of research and patent”.

Establishing research center, encouraging industry-university-research cooperation. The companies can establish its design R&D center and build long-term and broad technic cooperation with schools, research institutions and consultants. For example, the kitchenware department of Media Group has established its user experience research room and comparison room.

Being international and improving internationalized vision. The company will import outstanding designers from domestic and abroad, invite experts to make communication, and learn from international design idea. In the meantime, the company also encourages splendid young designers to go further study and visit abroad. For example, Dongguan TANITA holds inner training program as well as sends technicians to Japan for further education.

**Pushing the development by breaking through enhancing the industrial design level**

The competition has significantly pushed the industrial innovation by promoting the transformation and upgrading of traditional industries through concept innovation, technology integration and leading industries. Among them (Figure4), “leading industries” has the most influential effect. By designing new products, developing new technologies, and exploiting new fields, it has brought forward the new modes that promote the development of the industries.

![Figure 4](image)

*Figure 4  The influence of industries brought by “Governor Cup”*
Promoting the interaction and connection between design and manufacturing, and pushing the original innovation of the industry

Figure 5  Difficulties on industrialization for design works

On the aspect of industrialization of the awarded works, there are still places to be improved. From the investigation (Figure 5), we have learned that many design works cannot be industrialized, 37% of them are because of the lack of technological support, and another 37% of them are because of the lack of industrial connection. For example, the biscuit type coffee machine “Slow Life” designed by EASE Design (Guangzhou) has won the prize in the 6th “Governor Cup”, but did not industrialized because of the problem of industrial connection. The “Application of OLED or LED Light Resource” designed by Zhangxin in Art and Design School, GDUT, faces the same difficulty.

Pointing to this problem, “Governor Cup” provided the “Design + Finance” connection fair after the competition to industrialize the result from the competition. It aims at, but not limited to the outstanding concept design and product design from “Governor Cup”. By importing the resources like venture capital funds, crowd funding incubation platform and brand enterprises, it provides an opportunity to make face-to-face communications with the original designers or design team and promotes the industrialization of the results from the competition. Moreover, it also provides the design tasks trading center, which organizes all kinds of activities to introduce the design results, and push the good design and good innovation to the market.

Advocating originality, and improving the IPR protection of industrial design

Through the conducting of the participation from companies, the competition has created a good environment that protects originality and IPR. During the evaluation period of “Governor Cup”, the Provincial Economic and Information Commission has held the forum that invited the provincial education department, science and technology department, cultural department, department of culture, broadcasting, television, press and publication, intellectual property office, and provincial finance office, to discuss the improvements of IPR services and clarify the property ownership. GDIDA has fully played its role as the industry association to make the industrial IPR strategy, which advocates
from the inside of the industry the respect of knowledge, talents, and rights, and the value of integrity and win-win. Newplan industrial design company added IPR Legal Specialist in its position system.

Furthermore, “Governor Cup” and all other related competitions have also provided a platform of communication and learning for designers, and helped the designers in enterprises to study from outside. The significance and influence of “Governor Cup” have reached beyond the scope of an innovation design competition, to one of the most important measures to push the development of Guangdong industry.

Comparison: the Feature of Industrial Design Development in Yangzi River Delta Region and Pearl River Delta Region

After analyzing the three levels of Guangdong design policy and the results from “Governor Cup”, this article makes horizontal comparison with the design policy in Yangzi River Delta Region, and tries to find some referential experience and lessons. With its first-mover advantage from Reform and Opening-up, Pearl River Delta Region first brought industrial design into China. However, Yangzi River Delta Region has its late-mover advantage; the fast development of its industrial design has benefited a lot from the economic needs in recent years. As the two economic areas that possess the fastest increase speed and best investment environment, the innovation development modes of Pearl River Delta Region and Yangzi River Delta Region has attracted the close attention of many scholars.

Represented by Shanghai City (Hu), Jiangsu Province (Su) and Zhejiang Province (Zhe), Yangzi River Delta Region features rich cultural heritage, advanced education, and high openness. It has a rather longer experience of modern manufacturing industry, which provides better survival and development environment for industrial design as both a cultural creativity industry and a modern service industry. Through the research and analysis of Shanghai City, Jiangsu Province and Zhejiang province in Yangzi River Delta Region, we have found that because of the strong demand from manufacturing industry and the need from the manufacturing service industry itself, the local governments actively advocate the development of industry, implementing detailed measures to push the industrial transformation and upgrading by making industrial design as the innovative method.

Attention from the government and the collaboration from departments. The attention of industrial design from Su, Zhe, and Hu are all on the top-level design. Their industrial plans are featured by the solid fundamental works, clear development emphasis, and the deployed implement of policies. The major leaders directly coordinate the design related departments of the government, and build the collaboration system for the functional department. The clear division of work and functions formed joint force to guarantee the efficient implement of related industry policies. What’s more, within the joint system of these three city/provinces, their competent department and statistical department have created the corresponding industrial design indicator system and statistical accounting method.

Ramming foundation and emphasizing ideas. The emphasis on the idea of design innovation exists not only in the decision and execution level of the government, but more
importantly, in the body of independent innovation: the companies and the whole society. These three city/provinces have paid a lot of attention on the fundamental research of design, on the relevance of design, and on the formation of new mode and new business. They have raised their own development strategy according to their on respective characteristics and have established the corresponding political supporting systems.

**Integrating resources and focusing on key points.** During the process of pushing the development of local industrial design, Su, Zhe, and Hu emphasize on integrating all kinds of resources in a focused manner. These three city/provinces have successively cooperated with Ministry of Industry and Information Technology, Ministry of Culture, Ministry of Science and Technology, the Chinese Academy of Engineering (CAE), and China Industrial Design Association (CIDA) on the aspects of industrial design activities, importing subjects, and building research institutions and service center. The local governments have invested a lot to support the national-level big projects to be landed on their own regions.

**Connecting industries and establishing benchmark.** Industrial design is now being delicately forged as the important content of innovation industry. The industrial connection that realizes its value is mainly reflected on its service for the Yangzi River Delta Region, the whole nation, and even the whole world. Shanghai S.Point Design is now the biggest design service provider for Siemens around the world; and Shanghai MOMA Design has served a bunch of local featured industries and helped the creating of local brands under its idea of “design helps the development of towns”.

**Import talents and cultivate eco-system.** The abundant cultural heritage, the outstanding education resources, the high-speed economic development and the construction of innovation eco-system make it possible for design talents to gather in this area. Southeast University, Jiangnan University, Nanjing University of the Arts, Zhejiang University, China Academy of Art, Tongji University and Shanghai Jiaotong University have, in succession, gained the qualification of educating doctors in industrial design field. This formed a striking contrast to Guangdong province, in which no high school has gained the comparable qualification yet.

Compare to the Yangzi River Delta Region, the economic development in Guangdong province, which depends largely on the manufacturing industry, is facing huge pressure for its transformation and upgrading. It is confronting new mode, new business and their resulting new opportunities and new challenges. For foundation, up till today, Guangdong still doesn’t have a data monitoring and indicator statistic system that is based on the industrial development and being widely admitted by the public. For coordination, each region, each field, and each department works for self without an integrated and coordinated system. For public services, the platforms are scattered, the efficiency is low, lacking of fundamental research and generic technology research. For resource integration, the level of internationalization is not high enough, and seldom national level project is landed here. For attracting talents, the construction of cities and its soft environment dropped behind, leading to the shortage of high-end talents. For the high education and professional education of design, none of its high schools has gained the doctor educating qualification, which makes the design employees unwilling to pursue further education.
Conclusion

Institution construction promote the development of design industry

The development of industrial design industry in Guangdong Province can not be separated from policy. Guangdong Provincial Government in the formulation of design policies, financial system and the protection of intellectual property rights plays an important role. Although the current policy system is not perfect and comprehensive, but Guangdong Province has built a macro-environment which government, institutions and related social organizations are actively creating. In the comparison of design policy between Guangdong Province and the other area in Yangtze River Delta, it is found that for Strategic level of GuangDong Provence, it is crucial to perfect the planning and coordinating system and integrate resources. For Consulting and information level, it is crucial to build a data monitoring and indicator statistic system that is based on the industrial development and being widely admitted by the public. Moreover, increasing fundamental research and generic technology research and educating high-end talents are important tasks. (Figure6). At this point, Guangdong Province design policy-driven industrial development strategy system is gradually improving, and also to speed up the development of China’s design industry strategy, providing a better solution.

Figure 6  Design policy in Guangdong still needs to be improved

The enlightenment for the development of Chinese design industry

Providing successful case of integration of design with industry

Guangdong Provincial Government in combination with its own industrial structure characteristics is using industrial design as an approach to promote developments of design and industry step by step and to achieve the upgrade and optimization of industrial structure. The industrial design in Guangdong Province is swapping enterprise independent for a new situation that enterprises take charge but guiding by government,
industry integration and working together with different party. And it has got great success in China and the whole society. Guangdong Province used to be a ‘big industry province’, but now it has been becoming a ‘powerful industry province’. It provides successful cases and experience for combining design and relevant industries together.

Exploring a development pattern of Chinese design policy
In recent years, the Chinese government’s emphasis on the design industry has increased, and some policies have been introduced to promote the development of the design industry. However, in general, the development of China’s design industry is not yet mature and requires further efforts. The Industry Design Development System built by Guangdong Province includes: strategy level which the government belongs to, consulting and data level for enhancing and execution, organization level for basic research organizations and companies. It not only provides finance and consulting service to design industry but also supports relevant industries for promoting design development and explores new patterns for Chinese design policy by publishing new policies and setting up industry guiding departments. At area execution level, different area needs to build its own design policy system basing on its own development foundation and conditions. And in the macro-environment of industrial relocation and industrial transformation, different area should let design play a role in promoting industries development to achieve innovation in different area.

References


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This research attempts to identify the adaptive values and conditions shared by user-involved design (UID) and direct citizen participation (DCP) in a policymaking context. As a conceptual embarkation point, this research will help bring design values to participatory policymaking. A deductive content analysis of the relevant literature was conducted to extract, group and compare the respective requirements of DCP and UID. These requirements were then classified by function, objective and domain and finally categorized into common ground, adaptive values and adaptive conditions. The common ground belongs to both DCP and UID and is concerned with sensitizing the participants to achieve basic understanding. The adaptive values, which are distinct requirements of UID, promote generative thinking. The adaptive conditions, which emerged from specific context of DCP, require a democratic process and promote citizen awareness. The research’s main contribution is in identifying the conceptual values and conditions for applying participatory design methods and approaches to the public policy context.

keywords: participatory design; public policy; citizen participation; user involvement

Introduction
Citizen participation is an important task in the making of a government’s public policy; it is used to get stakeholders’ approval and to legitimize a policy so that it can be implemented (Fearon, 1998; Santos, Antunes, Baptista, Mateus, & Madruga, 2006). Direct
citizen participation (DCP) is a participatory approach to making public policy; it refers to citizens’ personal involvement and active engagement in the participation process (Roberts, 2004). DCP is considered the primary way to achieve the democratic ideal, as it transforms representative and elite-driven politics into direct and citizen-driven politics (Abelson et al., 2003). Scholars in policy fields have suggested various benefits of DCP: It is useful for gaining legitimacy, generating a wide range of views and alternatives, helping governments and citizens learn from each other, building trust and relationships, providing skills for active citizenship, and strengthening communities’ problem-solving capabilities (Bryner, 2001; Fearon, 1998; Irvin & Stansbury, 2004; Santos et al., 2006). Active studies have proposed requirements for DCP base on an understanding of the policymaking context. In the fields of policy science, including public administration, politics, public management and democracy, many scholars have argued that effective participatory policymaking tools are needed. Researchers from various other disciplines have tried to augment DCP processes with their own expertise. For example, Mostashari et al. (2005) proposed a computer-assisted visualization technique to help stakeholders in the fields of engineering and information and communication technology more easily understand complex information about public traffic issues and thus participate in policymaking.

In this context, user-involved design (UID) has also been suggested as an effective policymaking tool for enhancing the participation process itself. There are fundamental commonalities between UID and DCP; they both use target-centred problem-solving approaches, and both aim to create synergetic collaboration effects by involving people. UID in particular has generated its own methods for helping people express their thoughts in the participatory process. Design has methods for eliciting and comprehending users’ in-depth, personal and experiential responses by involving them in design processes (Brown & Wyatt, 2015; Muller, 2003; Ozcelik, 2007; Sanders & Stappers, 2008).

Practical applications of design methods to participatory policymaking have emerged. Singapore, for instance, carried out a series of design projects involving civil officers, designers, technology experts and citizens. The design methods that focused on user involvement enabled the participants to directly communicate, understand and empathize with each other (Teng, 2014). In South Korea, Yoon (Yoon, 2015) proposed a public-service design model for citizen-centred public policy based on the case study of the Citizen Design Group, a government initiative consisting of policymakers, service designers and citizens. The participants of the Citizen Design Group learned about service design methods and used those methods to propose new service-policy concepts. First, they gathered to discuss citizens’ needs for certain public policies. Subsequently, they shared their insights and developed new service-policy concepts. Finally, they proposed a new service-policy concept. These case studies, which also report the impacts that these design methods have on participatory policymaking, imply that DCP has the potential to enhance UID expertise.

However, UID and DCP have different contexts. The existing methods for UID are more focused on product and service development than on public policies. It is necessary to understand the differences between UID and DCP, as they could help in adaptively developing design methods for UID that fit in the context of DCP. Therefore, this research focuses on understanding the difference between UID and DCP (so as to identify the
values and conditions needed for adapting UID to DCP) rather than just applying existing design methods to DCP. Three research aims were formulated: (1) to identify the goals shared by DCP and UID, (2) to identify what DCP and UID require to achieve the same goals, and (3) to identify the commonalities and differences of these requirements.

To accomplish these aims, a literature review was conducted to identify the goals shared by DCP and UID. Subsequently, a deductive content analysis was conducted. The requirements of DCP and UID were comprehensively extracted from the relevant literature. These requirements were then grouped and compared based on their functions and objectives. Finally, the requirements were classified by domain and categorized into three groups: common ground, adaptive values and adaptive conditions.

**DCP and UID: Shared Goals**

An extensive literature review revealed that DCP and UID had the same goals. Furthermore, DCP and UID are both important parts of problem-solving, especially for humans. Further, both of them seek to involve the targets in their problem-solving processes. The shared goals of DCP and UID were to have 1) target-centred approaches with partnerships and 2) synergetic effects of collaboration based on face-to-face group meetings.

**Target-centred approaches with partnerships**

First, both DCP and UID seek target-centred approaches with partnerships. DCP targets citizens, and UID targets users. Both DCP and UID seek to work with their targets to solve a problem and do not only regard the targets as passive objects related to the problem. One focus of DCP is on sharing power with the public so as to make substantive decisions and take actions related to the community by helping citizens participate directly in a policymaking process that is based on citizenship as a legal concept (Roberts, 2004). The term *public* refers to the members of a society who do not have official rights regarding policy decisions (Cooper & Gulick, 1984; Roberts, 2004). The most important characteristics of DCP are 1) individuals’ involvement (not as representatives of groups) and 2) active engagement (i.e., doing more than just listening to alternatives and choosing one) (Roberts, 2004). In this context, UID and DCP are very similar concepts. UID also directly involves users and encourages them to carry out a series of activities in the design process. UID seeks to engage users and get them to express their aspirations and expectations more actively (Ozcelik, 2007). Moreover, UID considers users as individuals with unique needs and values rather than focusing on average users, as represented by demographics and statistics (Teng, 2014). In summary, both DCP and UID consider their targets (citizens or users) to be active partners in the problem-solving process rather than as mere targets on the receiving end.

**Synergetic effects of collaboration based on face-to-face group meetings**

Second, both DCP and UID seek to create synergetic effects through collaboration. This collaboration is executed through face-to-face group meetings, which are the basic and ideal form through which public deliberation is best enacted (Cleveland, 1974). Because the mechanism of DCP was developed based on the context of small-group meetings (Dahl, 1989; Fishkin, 1991), one of its purposes is making people work together, face-to-face, in a shared search for effective solutions to community problems (Roberts, 2004;
Many policy scholars have argued that the collective decisions in policymaking emerge from face-to-face dialogue and deliberation (Bohman, 1997, 1998; Dryzek & Torgerson, 1993; Elster, 1998). Burkhalter (2002) explained why: the “wicked and complex” nature of the policy problem itself is the fundamental rationale for collaboration, and this collaboration is more appropriate as a natural flow of face-to-face interaction, which is suited for dealing with the complex, morally conflicting, inescapable uncertainty regarding the wisdom of a final judgement.

In another revealing commonality, design has also been described in this way. The design problem is often characterized as a “wicked problem”, to use the expression famously coined by Buchanan (1992). Therefore, the problems handled in both policymaking and design commonly are wicked in that they address human problems that are not amenable to ultra-rational approaches such as engineering and computing (Durose & Richardson, 2016). Individual and in-depth interactions among stakeholders in face-to-face group meetings enable participants to understand and learn from each other and to formulate their problems. Therefore, the goal of UID in design, and of DCP in policymaking, could be more specifically described as follows: ‘to obtain insights from the user experience that can be used as powerful resources for solving the problem at hand’. This important commonality between DCP and UID has caused significant interest in applying design to policymaking (Allio, 2014; Bason, 2016; Boyer, Cook, & Steinberg, 2011; Burns, Cottam, Vanstone, & Winhall, 2006; Council, 2013). The rationale for applying UID to DCP is further substantiated by the fact that UID has developed unique methodologies for involving users in the problem-solving process; these include specific, highly developed methods for face-to-face group meetings, which are also important in DCP. There are several forms of UID activities, including focus group interviews, user workshops, and participatory group discussions (Bruseberg & McDonagh, 2005). These UID activities all involve participants from diverse target user groups working together in face-to-face group interactions. These interactions provide a forum through which the participants discuss common problems in depth, work through shared solutions and build consensus. This shared environment includes collaborative activities, shared information, and shared artefacts (Muller, 2003). UID practitioners enhance this shared environment by designing a series of activities, visualizing and organizing information, and developing tools and techniques for creating artefacts. Enhancing shared environments allows for rich communication—not only among users but between users and the designer—ultimately generating valuable resources for problem-solving in the design process (Muller, 2003; Ozcelik, 2007).

In contrast, DCP does not have such refined methodologies even though it shares UID’s goals. Therefore, there is a potent argument for applying UID methods to the DCP process, as UID has elaborate methodologies for creating synergetic collaborations through in-depth and rich communication among stakeholders. This provides solid ground for enhancing the DCP process, which seeks the same goals, albeit in a different context.

**Gaps between DCP and UID**

As established previously, DCP and UID have the same goals. Practitioners of both adopt target-centred problem-solving approaches and seek synergetic collaborations with their targets. However, DCP and UID have been developed within their own fields. UID has its own methodologies and processes for developing products and services, and DCP has its
own requirements for achieving the democratic ideal through citizens’ participation; these requirements are based on an understanding of policymaking contexts. Fundamentally, however, DCP and UID share their goals and have mutually complimentary characteristics (as discussed above), making it possible and even desirable to cross-fertilize. However, the cases in which UID methods are currently applied to the policymaking context tend to disregard the very different contexts in which they have been developed and deployed. Furthermore, most cases are one-off design projects that do not require the strategic-level involvement of design for policy generation—which is where design has the potential to bring the greatest benefits. In addition to such cases, there is abundant literature that discusses the mutual compatibility of policymaking and design (see Considine, 2012; Durose & Richardson, 2016). However, few academic or practical efforts have been made to build knowledge and develop UID methods that are more adaptive to a policy context.

Developing adaptive approaches for applyingUID methods to the DCP context requires a comprehensive understanding of the commonalities and differences of DCP’s and UID’s requirements. How can UID fulfil DCP’s requirements, and what should be considered when UID is applied to DCP? To answer these questions, the requirements of DCP and UID were extracted from the literature and were compared and contrasted to identify the touchpoints through which UID methods can be adapted to DCP. Ultimately, this contributes to the design of participatory face-to-face policymaking activities, thus bringing the value of design to the realm of policymaking.
Deductive content analysis based on shared goals

A deductive content analysis was conducted to compare the requirements of DCP and UID. This method of analysis is often used when applying existing concepts or models in a new context (Elo & Kyngäs, 2008). As mentioned above, DCP and UID have shared goals: to provide a target-centred approach and synergies of collaboration. The requirements for DCP and UID to achieve these goals were extracted from the literature in both policy and design. Subsequently, the requirements were grouped, compared and classified. For the purpose of the research, the content analysis was carried out in four steps: 1) extraction, 2) grouping, 3) comparison and 4) classification (Figure 1).

**Step 1. Extraction**
First, the authoritative literature related to DCP and UID was selected. For DCP, this included 36 journals that had been indexed as SSCI (Social Science Citation Index) or cited more than 200 times (e.g., *Policy Sciences* and *The America Review of Public Administration*). For UID, this included 45 journals and books that had been indexed as SCIE or A&HCI (Arts & Humanities Citation Index) or cited more than 100 times (e.g., *Design Studies*, *The Design Journal* and *Codesign*).

Subsequently, the content related to requirements for either of the shared goals was extracted. For example, Hart and David (1984) said that “it should be considered citizens’
ability to comprehend the management of complex public affairs and institutions..." in their article “The virtuous citizen, the honorable bureaucrat, and ‘public’ administration,” which was published in *Public Administration Review*. The authors suggested that the citizens must have the ability to manage complex policy issues for DCP to occur. Similarly, (Van Rijn, Bahk, Stappers, & Lee, 2006) said that “…context includes user’s concerns, memories, feelings, and experiences. Users are put in the position of ‘expert of their experiences’…” in their article “Three factors for context mapping in East Asia: Trust, control and Nunchi,” which was published in *Codesign Journal*. They suggested that users’ self-expression regarding their thoughts (i.e., context mapping) was as one of the requirements of UID. All these requirements were extracted and tagged as DCP or UID. Raw quotations were used to minimize potential researcher bias from interpreting the quotations. At the end of the content extraction stage, 99 DCP requirements and 86 UID requirements had been extracted.

The results showed that the UID requirements were more specific than the DCP requirements. For example, one of the DCP requirements related to the need to motivate citizens sufficiently (Irvin & Stansbury, 2004; Roberts, 2004), but the corresponding UID requirement related to the need to make participants empathize with the topic so that they are motivated; the UID studies also suggested appropriate design methods, including probe studies and personas (Horst, Bunt, Wensveen, & Cherian, 2004; Olsson, 2004). UID requirements have both functional aims and corresponding methods, but DCP requirements only have functional aims on the macro level. This is because of UID’s methodological characteristics. Various UID methodologies have been developed in the design field, but DCP remains predominantly aim-oriented; this could be the rationale behind adapting UID for DCP.

**Step 2. Grouping**

The purpose of the second step (grouping) was to reconstruct the contents of the requirements to enable comparisons. However, in the first step (extraction), the requirements were found to be on different levels. Most of the DCP requirements are only functional, but the UID requirements contain both functional aims and specific methods. Therefore, the requirements were grouped by their functions. The DCP and UID requirements were separately grouped (Figure 2). This grouping was conducted using the affinity diagram method that Beyer and Holtzblatt (1999) and Cohen (1995) proposed. The redundant requirements were eliminated in the grouping process to provide for efficient comparisons.

Nine skilled design researchers, including two Ph.D. students and seven MS.C. students, participated in the grouping. The two Ph.D. students had five years and three years of research experience, respectively, in design management. Four of the MS.C. students had two years of research experience in user-centred design methodologies, and the others had one year of experience in design management. All participants had experience applying UID methods to policy contexts in practice. Six of the participants had experience in running design-thinking workshops with a local public agency, and the other three had experience conducting government-university cooperative design projects. The researchers reviewed all of the requirements, grouped them based on the similarity of
their functional aims, and labelled the groups. This resulted in 31 DCP and 19 UID requirements by function.

**Step 3. Comparison (Group-Sets)**
The third step was comparing the requirements. The requirements that were grouped by function in the second step were grouped again using the affinity diagram method. The difference from the previous step is that the grouping was conducted without regard for whether a requirement belonged to DCP or UID. This was because the purpose of the comparison step was to compare the requirements of DCP and UID, but the purpose of the previous step was to simply group the requirements by function. As shown in Figure 1, DCP requirements were compared with UID requirements by regrouping them their objectives. Every requirement that was grouped by function in the previous step, contained an objective, which enabled this comparison at the objective level. For example, one of the DCP requirements was to provide basic information about problems, and some of the UID requirements emphasized users understanding of the problems. These two requirements then could be grouped into the same objective: deep understanding of the problems. In other words, the DCP and UID requirements could be compared by checking whether the objective-based groups contained DPC or UID requirements (or both). The nine design researchers who participated in the content grouping also participated in the objective grouping. They reviewed the requirements from the second step and regrouped them by objective. As a result, 10 requirements by objective were generated.

**Step 4. Classification (Group-Set Categorization)**
In the last step, the requirements were classified by domain: 1) both domains, 2) the UID domain only, or 3) the DCP domain only (Table 1). If a requirement by objective contained both DCP and UID requirements by function, it was classified as being in both domains. If
it contained only UID requirements by function, it was classified in the UID domain, and if it contained only DCP requirements by function, it was classified in the DCP domain. These three classes were labelled as common ground, adaptive values and adaptive conditions, respectively, to describe the role of each class in adapting UID to DCP.

Table 1  Overview of content analysis

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task</td>
<td>Extraction</td>
<td>Grouping</td>
<td>Comparison</td>
</tr>
<tr>
<td>Purpose</td>
<td>To comprehensively collect the requirements for DCP and UID</td>
<td>To group the requirements at the function level</td>
<td>To compare the requirements of DCP with UID at the objective level</td>
</tr>
<tr>
<td>Outcomes</td>
<td>Requirements by function</td>
<td>Requirements by objective</td>
<td>Requirements by domain</td>
</tr>
<tr>
<td>99 DCP requirements</td>
<td>31 DCP requirements</td>
<td>10 requirements</td>
<td>Both Domains (4 requirements)</td>
</tr>
<tr>
<td>86 UID requirements</td>
<td>19 UID requirements</td>
<td></td>
<td>UID Domain (3 requirements)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DCP Domain (3 Requirements)</td>
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Common ground, adaptive values and adaptive conditions

In summary, the research began with a content analysis to identify the requirements of DCP and UID. These requirements were grouped and compared by function and by objective. Finally, they were classified into three classes: those in both domains, those in only the UID domain and those in only the DCP domain. Four requirements were in both domains, three were in the UID domain, and three were in the DCP domain. This implies that there are varied implications for adapting UID for DCP (Figure 3).

First, the requirements shared by the two domains are the common objectives that are required in both DCP and UID; these act as a common ground. Both DCP and UID required support for sensitization to problems and to other participants, although UID has developed unique and varied methods for this. UID could be adapted to enhance sensitization in a DCP participatory process.

Second, the requirements for the UID domain include distinct objectives for UID that have not been considered for DCP. These UID values will be new in the DCP context. For instance, generative thinking was considered only in UID, for which various generative-thinking tools and techniques have been developed. Generative thinking could introduce adaptive values from UID to the DCP context.
Finally, the requirements for the DCP domain include distinct objectives from the DCP context. For instance, only DCP required the promotion of the democratic process and of citizen awareness. These ideas have not been considered in conventional UID, and they could provide adaptive conditions that bring UID values more in line with DCP contexts. The details of the content analysis results are presented in the following section.

**Requirements**

1. Both Domains
2. UID Domains
3. DCP Domains

**Adaptive Conditions**
- Democracy & Citizen Awareness
  - Democratic procedural rules
  - Ease of participation
  - Lesson for participants rather than hosts

**Common Ground**
- Sensitization
  - Deep understanding of problems
  - Motivation for participation
  - Deep understanding of others
  - Support for communication with others

**Adaptive Values**
- Generative Thinking
  - Active engagement in a process
  - Stretch the possibilities
  - Facilitate to envision vividly

*Figure 3  Intersections and Differences between DCP and UID Requirements*

**Sensitization: Common ground shared by both domains**

The research identified four requirements that both domains shared: 1) deep understanding of problems, 2) motivation for participation, 3) deep understanding of others, and 4) support for communication with others. These four were related to the requirements of engaging people in sensitization and for ensuring participation at both the personal and group levels. The personal level includes motivation for participation and a deep understanding of problems. The group level includes support for communication and a deep understanding of others.

**Deep understanding of problems**

The first requirement belonging to both domains is a deep understanding of problems. The DCP requirements focus on providing basic information so that participants can understand the issues and problems that they have to deal with and on making the information digestible for the citizens (Abelson et al., 2003). Likewise, UID requires participants to empathize with people to help them understand problems. This gives participants awareness and access to their own hidden needs regarding the problems (Bruseberg & McDonagh, 2005; McDonagh, 2003; Reich et al., 1996; Siu, 2003). However, UID requirements have more methodological details than do DCP requirements. UID
suggests self-documentation techniques (e.g., context mapping and probe studies) as methods for sensitization (Gaver et al., 1999; Hemmings et al., 2002; Horst et al., 2004; Mattelmäki, 2005) as well as storytelling techniques, such as the use of personas for empathy (“feel the problem’s world”) (Grudin & Pruitt, 2002; Olsson, 2004). In other words, UID could provide a deeper understanding of problems to engage people in DCP.

Motivation for participation
The second shared requirement is motivation for participation. DCP requires only sufficient motivation for participation (Roberts, 2004). Interestingly, the UID requirements in this are also included in the first shared requirement (deep understanding of problems). In other words, some UID functions required multiple objectives, such as sensitizing people and motivating them (e.g., probe studies enable people to be sensitized and to empathize, which in turn creates a willingness to solve the problem). This means that sensitization could cause people to participate in DCP. Empathy with others enables people to accept that huge and abstract social problems can be personal and individual problems. For example, people can view the social problem of youth unemployment on a personal level by engaging with personas that are struggling with employment. Hence, UID could provide motivations for participation by mapping social problems onto individual needs, thus engaging people in DCP.

Deep understanding of others
The third shared requirement is a deep understanding of others. DCP only requires mutual respect between participants (Roberts, 2004). Similarly, UID requires mutual empathy based on an in-depth understanding of people’s individual needs, including their behaviours, expectations, values and motivations (Mootee, 2013; Muller, 2003; Sanders & Stappers, 2008). UID practitioners view people as individuals with unique needs rather than as average users represented by demographics and statistics (Teng, 2014). Therefore, UID could help participants to understand others who have different (or even opposite) opinions as individuals—without the prejudices of the group to which the participants belong.

Support for communication
The fourth shared requirement is supporting communication with others. DCP requires moderators and facilitators to support appropriate discussions among participants (Box, 1997; Irvin & Stansbury, 2004; Roberts, 2004). Likewise, UID requires support for participants to express their thoughts, experiences and ideas in various ways. UID also suggests more complex methods of communication for use among participants and between participants and designers. These methods are based on visualization techniques (e.g., collages) and on creative activities (e.g., generative tools) (Bødker, 2000; Hummels, 2000; Keller, Pasman, & Stappers, 2006; McClelland & Suri, 2005; Mootee, 2013; Ozcelik, 2007; Sanders, 2000). Hence, UID could act as an effective moderating and facilitating tool to support communication among participants by engaging them in DCP.

Generative thinking: Adaptive values in the UID domain
Three requirements were placed in the UID domain: 1) active engagement in the process, 2) stretching the possibilities, and 3) facilitating to vividly envision solutions. These three
adaptive values are related to generative thinking, which has been extensively developed in the design field. This means that UID has unique values for promoting generative thinking that have not yet been considered in DCP.

**Active engagement in the process**

The first UID-only requirement is active engagement in the process. UID requires more active levels of engagement than DCP does. For instance, UID requires participants to perform sets of activities, especially creative ones, to ensure active engagement (Sanders, 2008). In contrast, DCP is more focused on basic forms of discussion, including thoughtful examinations of the issues, arguing, listening to others, counter-arguing, and making collective decisions (Abelson et al., 2003; Roberts, 2004; Yankelovich, 1991). UID suggests that participants make artefacts (e.g., freehand drawings, affinity diagrams, timelines or clay models) using generative tools (Bødker, 2000; Muller, 2003; Sanders, 2000). This could actively encourage participants to engage in DCP by asking them to make something by themselves in addition to participating in oral discussions.

**Stretching the possibilities**

The second UID-only requirement is stretching the possibilities. UID requires exploring a diverse dimension of design through methods that include using extreme characters and asking what if (Djajadiningrat, Gaver, & Fres, 2000; Ogilvie & Liedtka, 2011). Although DCP requires the inclusion of comprehensive opinions that represent the communities involved (Hart, 1984; Roberts, 2004), which seems similar to this UID requirement, UID focus is not only about covering comprehensive opinions but also about focusing on exploring a wide range of perspectives regarding an unknown future. One study supports the idea that this unique design characteristic could help DCP; Considine (2012) suggested that the design expertise from open-ended and disruptive thinking could expand the consideration of future states and thus reduce policymaking risks. The author argued that these ways of thinking can supplement the conventional means of making policy decisions, which rely upon policy experts’ heuristics (Considine, 2012).

**Facilitating to vividly envision solutions**

The third UID-only requirement is facilitating to vividly envision solutions. Both DCP and UID seek to reach consensus and shared solutions through participation. However, UID is more focused on the creation of new things—from novel insights to specific concept ideas—while DCP is more focused on deliberation about the given alternatives. UID requires that designers help participants vividly express abstract and ambiguous ideas through visualization and storytelling-based techniques, including scenarios and storyboards (Bødker, 2000; Buur & Matthews, 2008; Grudin & Pruitt, 2002; Suri & Marsh, 2000). UID suggests using improvisation techniques to facilitate sparks, such as ad hoc or serendipitous moments of ideation (Mootee, 2013; Svanaes & Seland, 2004). These requirements can better engage people in imagination, expression and envisioning.

**Democracy and awareness: Adaptive conditions in the DCP domain**

Three requirements were placed in the DCP domain: 1) democratic procedural rules, 2) ease of participation, and 3) lessons for participants (rather than hosts). These were related to the achievement of democratic ideals and the promotion of citizen awareness.
to ensure sustainable participation. These characteristics are unique to the policy context, and they can provide rich information about the conditions that designers should consider when adapting UID methodologies and processes to DCP.

Democratic procedural rules
The first DCP-only requirement is having democratic procedural rules. In the content analysis, organizing democratic procedures was one of the dominant requirements of DCP. Most of the UID requirements were more focused on generating new ideas and encouraging collective creativity in the participatory process. In contrast, DCP focuses on how to create equal and fair participation. DCP requires participants to have equal speaking rights as part of democratic communication procedures. The procedural rules in DCP require a structured sequence of activities: examining the issues, arguing, listening to others, counter arguing and collectively deciding. More than just conceiving novel and creative solutions, DCP seeks deliberative decision-making processes through participation. Therefore, when adapting UID for a policy context, the issue of democratic procedures should be considered. DCP also requires participant representation because one of DCP’s main purposes is to secure legitimacy when implementing polices by getting stakeholders’ approval (Fearon, 1998; Bryner, 2001). Hence, all participants’ groups should be represented. Furthermore, DCP requires community opinions to be comprehensively covered and to not exclude any target group. Statistical approaches such as sampling are required to secure an appropriate level of representation in DCP. Random or purposeful sampling techniques have been suggested to ensure a geographically and demographically representative sample (Abelson, 2003). Hence, the representation issue should be considered when configuring participants in the adaptation of UID to DCP.

Ease of participation
The second DCP-only requirement is ease of participation. This means that participation should be physically easy for community members. DCP requires that participants be geographically concentrated so that they can easily attend meetings and have the appropriate level of participation without disrupting their livelihoods (Irvin & Stansbury, 2004). This requirement is also crucial for DCP because easy participation enables every community member to participate, which can help leaders comprehend the community’s opinions and thus secure representation of the participants. Therefore, when adapting UID for DCP, ease of participation needs to be considered to increase accessibility and reduce the loads placed on participants.

Lessons for participants rather than hosts
The last DCP-only requirement is to provide lessons for participants (rather than hosts). In this distinctive characteristic of DCP, participants need to learn their own lessons from their participation; UID is more focused on enhancing understanding among designers themselves. In UID, users are invited to the participatory process and are asked to express their thoughts, inspirations and ideas. Generally, designers work with diverse clients in their projects, and the topics and target users vary by project. Thus, in UID, the participants change from project to project. The focus in UID is on immersing participants in the problems and on engaging them to generate outcomes that act as resources in the design process. UID does not have to focus on providing lessons for participants. However, DCP is not like this; it aims to utilize synergies between local knowledge and citizens’
experiential expertise to tackle complex community problems through sustainable citizen participation (Collins & Evans, 2002; Durose & Richardson, 2016; Yanow, 2004). DCP requires that people be provided with efficacious participatory policymaking and engaged in responsibilities regarding implementation. In other words, DCP requires participants to learn their own lessons through participation; this cannot be achieved at once, as it requires sustainable participation throughout a project (Irvin & Stansbury, 2004; Roberts, 2004; Santos et al., 2006). The lessons participants learn from their participation could provide motivation for their future participation, thus enabling sustainable participation. Hence, when adapting UID for DCP, the lessons that should be provided for sustainability and means of providing them are important considerations.

Conclusion
This research has identified the requirements of DCP and UID for policymaking. The common ground between DCP and UID, the adaptive values of UID, and the adaptive conditions of DCP were identified. First, both DCP and UID were found to require that people be sensitized to problems and to each other as part of a participatory process. Second, it was found that adapting UID to DCP would sensitize people to policy issues based on this common ground. Generative thinking is only required in UID, which implies that UID could empower existing DCP methods by adding value from generative thinking. On the other hand, it was found that only DCP requires a democratic process or the promotion of citizen awareness. This could help in adapting UID to better fit into the DCP context.

The main contribution of the research lies in providing a basic understanding of the commonalities and differences when comparing the methodological values of UID and the policymaking context of DCP. This could encourage the creation of a more adaptive approach for adapting UID to fit into DCP. To adapt UID for the DCP context, this research grouped the current requirements of DCP and UID into specific levels, finding requirements that formed common ground as well as values unique to UID and conditions unique to DCP. The results of this research could be used as a conceptual basis for further studies. Based on the results of this research, practical cases in which design is applied to participatory policymaking could be analysed more systematically to improve understanding of current trends and patterns. An analytical framework consisting of common ground, adaptive values and adaptive conditions could be established to identify the gaps in participatory policymaking and to provide opportunities for adaptive designs (e.g., coding schemes for case analysis). Furthermore, substantive tools and methods for DCP, such as a generative thinking tool for participatory policymaking, could be designed. In addition, the democratic process and citizen awareness could be also considered in the tool’s design. In other words, the results of the research could provide a framework to guide and develop design methods and tools more adaptively to the participatory policymaking context.

References


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Research on the development of cultural and creative products in Hubei Provincial Museum

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The State Administration of Cultural Heritage in China published the "museum evaluation standards" in 2016, it is the first time that cultural and creative products come into National Museum Evaluation Management System. The purpose of this research is to analyze the difficulty for general museums in China to meet the standards, also to give some practical suggestions from three aspects. Literature review, field investigation, depth interview, analysis and synthesis methods are used in this paper.

keywords: museum; cultural and creative products; museum evaluation standards

Introduction

In the 18th CPC National Congress Report, Xinhua News Agency (2012) noted that “create better cultural products to provide the people with more and better nourishments for the mind”. This report from central government encouraged local governments, enterprises and cultural workers. On May 11, 2016, General Office of the State Council transferred and agreed the document of promoting cultural and creative products' development. The document provided some macroscopic directions mainly for cultural institutions. Soon after, on July 21, 2016, “museum evaluation standards” were formally promulgated. In this time, detailed standards were listed, which was a great improvement in cultural undertakings.

Research background and research status

The prosperity of the museum undertaking indicates the civilization level of a country and a nation. Museum evaluation standards is a practical policy presenting the country's current mission in cultural development.
**Background: museum evaluation standards**

The following 3 tables are made to help you have a better understanding of standards. In table 1, there are three aspects to evaluate a museum. Firstly, integrated management and basic measures include museum buildings, organizations, staffs and so on. Secondly, collection management and scientific research include museum relics, heritage conservation and academic achievements. Lastly, exhibitions and social services includes museum reputation, public education, volunteers, etc. From Table 1, we can see 500 points in exhibitions and social services, it means great concern in services to the audience. To find out standards in exhibitions and social services, we make Table 2. Table 2 lists detailed standards mainly in social service, in 3.3.7 cultural and creative products score 40 points and account for the highest value in social service. High scores show a growing concern for cultural and creative products, not only in museums.

**Table 1  Assessment projects and points in “Museum evaluation standards”**

<table>
<thead>
<tr>
<th>Number</th>
<th>Assessment Projects</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Integrated Management and Basic Measures</td>
<td>200</td>
</tr>
<tr>
<td>2</td>
<td>Collection Management and Scientific Research</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>Exhibitions and Social Services</td>
<td>500</td>
</tr>
</tbody>
</table>

**Table 2  Exhibition Standards for Museum Grading in “Exhibition and Social Service”**

<table>
<thead>
<tr>
<th>Assessment Projects</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Influence</td>
<td>75</td>
</tr>
<tr>
<td>3.2 Display and Education</td>
<td>250</td>
</tr>
<tr>
<td>3.3 Social Service</td>
<td></td>
</tr>
<tr>
<td>3.3.1 Mass Organizations</td>
<td>10</td>
</tr>
<tr>
<td>3.3.2 Volunteers</td>
<td>10</td>
</tr>
<tr>
<td>3.3.3 Open</td>
<td>25</td>
</tr>
<tr>
<td>3.3.4 Traffic</td>
<td>10</td>
</tr>
<tr>
<td>3.3.5 Services</td>
<td>25</td>
</tr>
<tr>
<td>3.3.6 Websites</td>
<td>20</td>
</tr>
<tr>
<td>3.3.7 Cultural and Creative Products</td>
<td>40</td>
</tr>
<tr>
<td>3.3.8 Social convenience</td>
<td>5</td>
</tr>
<tr>
<td>3.3.9 Surveys</td>
<td>10</td>
</tr>
<tr>
<td>3.4 Audience Statistics</td>
<td>20</td>
</tr>
</tbody>
</table>

From Table 2, we find that mass organizations, open, traffic are also in social service, while display and education are in the same level with social service. Instead of questioning the classification in policy document, we put forward a new research question in the second part of this paper.
To find out specific standards making up 40 points, table 3 is modified from the government document. We can see that designing and marketing score 20 points each. Both of them have 5 rules.

Table 3  Rules and points of cultural and creative products in social service

<table>
<thead>
<tr>
<th>Rules</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>The product is qualified to represent the museum image, and can spread the museum culture constantly.</td>
<td>4</td>
</tr>
<tr>
<td>The product is well-made and can be used in daily life.</td>
<td>4</td>
</tr>
<tr>
<td>The product is of high state. It is well-accepted by the public and it is building a brand gradually.</td>
<td>4</td>
</tr>
<tr>
<td>There are various kinds of products to make them a series. An excellent and stable design team is also required.</td>
<td>4</td>
</tr>
<tr>
<td>Make sure to perfect intellectual property protection, and provide well-organized information when needed.</td>
<td>4</td>
</tr>
<tr>
<td>Have a special marketing team for the museum.</td>
<td>4</td>
</tr>
<tr>
<td>Have different strategy for different groups. Also, wise marketing plan, sales network are required.</td>
<td>4</td>
</tr>
<tr>
<td>Have more than one star product</td>
<td>4</td>
</tr>
<tr>
<td>Try to sell outside the museum, like airports, malls, etc.</td>
<td>4</td>
</tr>
<tr>
<td>Open and manage an online store for the museum.</td>
<td>4</td>
</tr>
</tbody>
</table>

There are in total 161 attachment files of detailed standards. Taking cultural and creative products for example, contents in Table 3 come from attachment file No.3051. From this point we can have a better understanding of museum evaluation standards. Museum evaluation standards are detailed and strict to promote the development of museums. Since the evaluation result is closely related to state appropriation, museums take the standards very seriously.

Research states
To clarify the research status of this topic, we used CNKI accurate search and made Table 4. We can easily see that museum is always a hot topic. Cultural and creative product is gaining more concern. Although “museum evaluation standard” was published a few months ago, the research achievements in museum evaluation were abundant as well.

When it comes to cultural and creative products in museums, there are 289 documents. Among these 289 documents, there are 189 documents from 2012, making up 65.4%. From 2012 a growing number of researchers pay attention to cultural and creative products.

Table 4  The research status of museum cultural and creative products’ evaluation criteria

<table>
<thead>
<tr>
<th>Key Words</th>
<th>Number of documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Museum</td>
<td>86503</td>
</tr>
<tr>
<td>Cultural and Creative Product</td>
<td>10905</td>
</tr>
</tbody>
</table>
How to develop and sell good products for museums? Yang Fan (2013) suggested that classic 4P theory (product, price, promotion, place) could be use in cultural development and marketing in museums. Xing Zhi-yuan (2014) concluded that professionals, incentives and financing are very important for museums. Zhang Ai-hong (2015) indicated that industrial chain should be perfected, besides the art market could also use the primary market, the secondary market and the third market to develop products. Xu Yan (2015) advised that experiential design could be used in cultural and creative products. Wang Jin-xiu (2016) suggested that relics could be transferred to visual symbols and then used in design. Wang Ling (2016) indicated that emotion design and differential design should be focused nowadays.

There are many excellent ideas from the literature review above, however, few of them are under the background of museum evaluation standards. Moreover, it seems to have more studies on design. After several investigations with experienced stuffs in Hubei Provincial Museum, we start to think about a new way to develop cultural and creative products in museums.

**Research object and research process**

*Why we choose Hubei Provincial Museum*

The Hubei Provincial Museum is a national museum built in 1953. Besides, it is also one of eight museums that are co-built by central government and local government. Hubei Province Museum locates in the East Lake, next to the Hubei Art Museum and Hubei Academy of Social Sciences. Hubei Provincial Museum is a popular museum and is famous for a 5A scenic spot. Every year lots of tourists from at home or abroad come to Hubei Provincial Museum and visit.

To sum up the external reasons, there are four main reasons.

- (1) Have a long history as a museum in China
- (2) A country-level museum
- (3) At a key location with good cultural atmosphere
- (4) A 5A scenic spot

In Hubei Provincial Museum, there are four treasures of the museum. They are “the human skull fossils from Yunxian County, the Sword of Goujian, the Chime bells from the Tomb of Marquis Yi of the Zeng State, and the Blue and White plum vase of the four loves in Yuan Dynasty” (Hubei Provincial Museum, 2016). Moreover, the lacquerware from Chinese Chu culture, various kinds of Bronzeware, fabulous Palace arts and crafts, etc. Besides treasures and relics, there are also many experts in the museum, especially experts in archaeological community. About cultural and creative products, there already has seven modes, some of which are creative and interesting. Of course, there are deficiencies. From the interview with an experienced supervisor, we are glad to know that the museum would like to develop culture and creative products. The supervisor also expresses great concern about museum evaluation standards and shares some opinions.
To sum up the internal reasons, there are also four main reasons.

• (1) Have 4 treasures with great reputation
• (2) Plenty of collections and cultural resources
• (3) Already have some good products
• (4) Access to primary-data from the museum

From the four main external and four main internal reasons, Hubei Provincial Museum is a good choice to study on cultural and creative products in museums. One choice might be a little weak to have a general knowledge of cultural and creative products in museums, but the research is based on common cognition on museum products in China. Instead of a fundamental research or a theoretical research, it is an application research giving practical suggestions to Hubei Provincial Museum.

What we do in the research
There a five main methods in this research, and they are used throughout the study.

• (1) Literature review
• (2) Field investigation
• (3) Depth interview
• (4) Analysis
• (5) Synthesis

Literature review is in the first part in the paper. As is concluded above, there are various kinds of aspects, levels and angles. It helps us to have a holistic consideration on the study.

In field investigation, we get plenty of information and inspiration. Moreover we talk to a supervisor, by whom we are encouraged a lot. Analysis and synthesis are typical methods used in researches. In our research, we try to combine ideas from different aspects and give practical suggestions to Hubei Provincial Museum. In the same time, we analyze the actual conditions of the museum and make some predictions.

Our viewpoint of the research: cultural and creative products form a big system, and the system is made up by tangible and intangible products.

Usually when talk about product, we mean something tangible. This kind of inertial thinking often ignore intangible products. Back to cultural and creative products, people are more likely to focus on tangible products. Actually in many museums, exhibitions, public activities and other experiencing projects are separated. Namely, tangible products in museums are called souvenirs, intangible products are classified into exhibition, academic research and education.

The traditional four social functions of museum are archaeological collection, exhibition, academic research and public education. We can see that except for archaeological collection, the other three functions mean the same as intangible products defined above.

During the talk time with stuffs in Hubei Provincial Museum, one of them cited some ideas from a famous curator: “except for archaeological collection, all the other things could be seen as cultural and creative products. When we talked about creative products in museums, we might see them as a big system nowadays”.

In this study, on the one hand, we are trying to associate museum souvenirs with museum activities. On the other hand, we separate tangible products and intangible products. It
seems to be contradictory but actually not. The reason why we put them together is to change a way of thinking in the museum. After reasonable planning for the museum, tangible products need to be well-designed and well-made, intangible products need careful planning.

Based on two approaches for museum products, we went to Hubei Provincial Museum again to get more primary-data. Detailed data and information in hand, we summed up general cultural and creative products in the museum. Besides we put forward several practical and creative ideals for Hubei Provincial Museum.

**Current cultural and creative products in Hubei Provincial Museum**

Based on the field investigation in Hubei Provincial Museum, there are seven kinds of cultural and creative products. According to our main idea, not only museum souvenirs, creative activities and other forms are also included.

**General view of current products**

Table 5 shows the current cultural and creative in Hubei Provincial Museum. Besides, products are divided into tangible products and intangible products. In Table 6, there are integrative comments for seven kinds of cultural and creative products, including contents, advantages and disadvantages.

<table>
<thead>
<tr>
<th>Tangible products</th>
<th>Intangible products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Souvenirs</td>
<td>Chime Bell show</td>
</tr>
<tr>
<td>Commemorative coins</td>
<td>Museum app</td>
</tr>
<tr>
<td>Children books</td>
<td>Children activities</td>
</tr>
<tr>
<td>Roof bookstore</td>
<td></td>
</tr>
</tbody>
</table>

**Table 6 Contents, advantages and disadvantages in current products**

<table>
<thead>
<tr>
<th>Form</th>
<th>Contents</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Souvenirs</td>
<td>Sell souvenirs in the shop and in the hall</td>
<td>Nice price, some are well-designed</td>
<td>Shop layout is a bit confusing</td>
</tr>
<tr>
<td>Commemorative coins</td>
<td>An automatic machine selling coins</td>
<td>Conspicuous, easy to use</td>
<td>Not so attractive</td>
</tr>
<tr>
<td>Children books</td>
<td>Books for children, mainly picture books</td>
<td>Beautiful picture books with traditional culture</td>
<td>Lack of classification by age groups</td>
</tr>
<tr>
<td>Chime Bell show</td>
<td>Performances with Chime Bell</td>
<td>Unique, completely new experience</td>
<td>Need more promotion</td>
</tr>
<tr>
<td>Museum app</td>
<td>An app providing museum information</td>
<td>Convenient, nice interactive experience</td>
<td>Much less useful when outside the museum</td>
</tr>
<tr>
<td>Children activities</td>
<td>For children to experience traditional culture</td>
<td>An advance idea, educational</td>
<td>Temporary activities</td>
</tr>
<tr>
<td>Roof bookstore</td>
<td>A bookstore to buy and read books</td>
<td>Beautiful environment</td>
<td>Few visitors</td>
</tr>
</tbody>
</table>

636
In order to make the table nice and concise, many detailed contents and opinions are simplified in Table 6. We can find that several aspects are coincided in Table 6, and this finding inspires us to the suggestions in the fourth part of the paper.

**Specific view of current products**

To analyze detailed contents of current cultural and creative products, specific view of seven kinds of products are analyzed in the following.

In Hubei Provincial Museum, there are two places selling museum gifts and souvenirs, in a shop store and at a corner of the hall. The gift shop sells all the souvenirs while the gift area in the hall sells hot products. When visitors come into the museum hall, gift area is on the left side of the hall, many practical commodities are displayed. Gift shop is beside the last exhibition hall. Visitors can buy some satisfying goods after enjoying the exhibition. The exhibition lines are reasonable designed. However, there are too many imitations of the classic collection. For example, twelve-piece set Chime bells (¥18000), wooden-body lacquer tray (¥1280) and man riding camel lamp (¥860). Of course these imitations of the classic collection have its own value and market, but there are 214 imitations in total as we counted. When it comes to designed products, there are 57 products in all, not 57 kinds. Compare two numbers, and we can conclude that cultural and creative goods need to be developed quickly.

In the center of the hall, there is an automatic machine selling commemorative coins. The machine is beside a central pillar, so almost every visitor can see it. The machine is as big as a regular ATM machine, but it has only one function, to sell commemorative coins. Other functions are not required; however, the commemorative coins should be better-designed.

The children books are displayed on the right side of the hall, opposite the gift area. Most of the books are picture books for children to read. Some of the books are well-designed and beautifully printed. Chinese idioms and ancient stories are re-created to vivid graphics. Undoubtedly, this kind of children book sells very well in Hubei Provincial Museum. As is concluded in Table 6 above, these books lack classification by age groups. If there are more books for different ages, the sales results will be doubled.

The Chime Bell show is a unique form not only in Hubei Provincial Museum, but also unique at home and abroad. After renovation in March 2016, there are some innovations in both in facilities and performances. There are now 412 seats for audiences. Ordinary Audiences pay 30 yuan for the ticket and can enjoy a 30 minutes show. In general, watching a Chime Bell show is a completely new experience, it is qualified enough to become a famous brand. As known in the supervisor, effective measures have been taken. They are considering about opening the show for free at night to let more people know and enjoy the performances.

The museum APP is developed for the public to get information about Hubei Provincial Museum. There are three main functions in the APP: listening, playing and enjoy. Listening audio guide in exhibition halls, playing puzzle games based on museum culture and enjoying original animation of national treasures. Museum APP is convenient and well-designed. The design in user interface, user experience are pretty good. Although there
are no statistical data, but many people are likely to uninstall it. The biggest challenge for museum APP is the number of users.

Children activities are held on the second floor, on a space between two exhibition halls. One recent activity is called children course. It is for primary school pupils. The courses pay more attention to process, experience and participation. There are several topics, like etiquette in China, painting lacquer, ancient writings, etc. Children activities are so advanced that some of them are extended to primary schools. It is a little pity that this project is a contemporary activity in Hubei Provincial Museum. If more children or pupils can take part in, it will become a fabulous educational experience.

The last cultural and creative product is on the roof of the museum, it is called roof bookstore. Compared to other six products talked above, roof bookstore is less popular in visitors. The bookstore has a beautiful environment. There are some academic books in different fields. Besides, there are children books the same as books in the entrance hall. The bookstore needs some relation to other projects downstairs. Re-planning is needed to make it a hot place in the future.

**Practical suggestions for Hubei Provincial Museum**

Under the background of museum evaluation standards, some measures should be taken to meet the standards as far as possible. How to develop culture and creative products? There are suggestions from the macro, meso and micro levels in the following.

**Suggestions from the macro level: present and future**

Museum evaluation standards have two main aspect in cultural and creative products. Namely, designing and marketing. As we know from the supervisor, there are no professional market team in Hubei Provincial Museum. The only work related to the market is the gift shop. However, stuffs in the gift shop are not very skilled in marketing strategies, they simply sell goods according to the price. At the same time, they take charge of timely replenishment. In conclusion, the museum needs a professional marketing group. Besides lack of market group, the design group needs to be rebuilt. There was a design group in Hubei Provincial Museum. They were in charge of developing and designing products for the museum. But the design group was disbanded sometime. In order to meet the museum evaluation standards, the museum is considering about gathering them and rebuilding the group again.

From the analysis of two groups related to museum evaluation standards, rebuilding two groups is of great importance. Only by improved groups can they do more for the museum. In this way, practical suggestions of the macro level is to decide present measures and future measures. Of course market group and design group are in present measures. Since it takes time to meet the standards, two groups can make plans to improve step by step. Based on field investigation and depth interviews, we make Table 7 to present and future measures. These contents are summarized from Table 3, in order to make wise decisions based on standards at the same time.

<table>
<thead>
<tr>
<th>Present measures</th>
<th>Future measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set up a market group</td>
<td>Different selling strategies for different products</td>
</tr>
</tbody>
</table>

Table 7 Present and future measures in Hubei Provincial Museum
Rebuild the design group   Form a design brand
Make Chime Bell show a brand   Have more than one star product
Manage the existing online store   Sell outside the museum
Integrating museum resources   Perfect intellectual property protection

The present measures on the left are corresponding to future measures on the right in Table 7. The first thing is to set up a market group and promote Chime Bell show. In the future, it will be possible to make different selling strategies for different products. In Hubei Provincial Museum, Chime Bell show is already a star product, in the future, there will have various kinds of star products. Besides, to rebuild the design group is urgent. After rebuilding the design group, more and more cultural and creative products can be developed. By years of efforts, maybe they can form a design brand. As for sales online or outside the museum, it is a little difficult to set up stores outside the museum at present, so perfecting and managing the existing online store is a good choice at present. Last but not least, about online museum resources and intellectual property protection. To have a complete intellectual property protection system is very difficult for only one museum. There are lots of studies, adjustments and changes. On the one hand, museum resources can be integrated from now. On the other hand, alliance of museums is a good idea for intellectual property protection in the future.

**Suggestions from the meso level: tangible and intangible**

In the macro level, measures are divided into present and future. In this meso level, we will talk about basic approaches in present measures. In next micro level in 4.3, we will discuss the specific methods of how to design and plan for the museum.

In 2.2 what we do in the research part, we conclude our point of view of the research. Our viewpoint of the research: cultural and creative products form a big system, and the system is made up by tangible and intangible products. In brief, one system and two products. When it comes to what we should in present measures, one system and two products is the answer.

A cultural and creative system in a museum means a Cultural and Creative Center. In China, the Palace Museum, the National Museum of China, the Nanjing Museum have Cultural and Creative Centers as we know. But for Hubei Provincial Museum, there are still several challenges to build a Cultural and Creative Center at present. It should be noted that Cultural and Creative Center in these three museums are built up in recent years. The centers are parallel to other groups in the museums. Learning from examples of other famous museums, a system including cultural and creative products, public education, exhibitions and publication is much more difficult that we expected. The words from the supervisor: except for archaeological collection, all the other things could be seen as cultural and creative products, are very advanced ideas. Instead of setting up a center including different museum services, we start to change the way of thinking.

The title in 4.3 explains our new way of thinking. Since it is an advanced idea to build the system. We put forward tangible and intangible products. Although they are divided into two parts, they are connected tightly in our viewpoints. Based on current cultural and creative products in Hubei Provincial Museum in Table 5, tangible products are sold in a
shop or with a carrier. What’s more, intangible products like a show, an APP or an activity, are a special carrier by coincidence. So we consider to connect tangible and intangible products together. Let the shows, the exhibitions, or the activities be the carrier of tangible products.

For example, many creative products can be designed based on the Chime Bell show. After a wonderful experience of Chime Bell performances, many visitors will be pleased to buy some souvenirs. However, it is easier said than done. Designing an attractive product from Chime Bell show is a challenging work. As for creative products in exhibitions, there are two kinds of exhibitions in Hubei Provincial Museum: long-term exhibitions and short-term exhibitions. Long-term exhibitions are relics from museum collections, while short-term exhibitions are organized with others. Products in exhibitions are often presented in publication or printing form. Postcards, custom-designed notes, exhibition albums, printed-shirts, etc. Since there are various of exhibitions in the museum per year, the creative products for museum collections need to be more competitive.

In conclusion, where there has intangible products, there has corresponding tangible products. They cope with each other to have better cultural and creative experiences for visitors.

**Suggestions from the micro level: designing and planning**

In the meso level in 4.2, the connection between tangible and intangible products has been explained. In this part, we will talk about how to design tangible products and how to plan intangible products.

Designing and planning correspond with souvenirs and activities. There are several detailed methods in the following.

Before product design, usually there will be a design investigation before it. In the design investigation, designers get primary-data to decide target groups and other details. We get some information on souvenir prices during field investigation, see Table 8.

<table>
<thead>
<tr>
<th>Price range</th>
<th>Number(kind)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ~ 100 yuan</td>
<td>29</td>
</tr>
<tr>
<td>101 ~ 200 yuan</td>
<td>10</td>
</tr>
<tr>
<td>201 ~ 500 yuan</td>
<td>11</td>
</tr>
<tr>
<td>501 ~ 2000 yuan</td>
<td>3</td>
</tr>
<tr>
<td>More than 2000 yuan</td>
<td>1</td>
</tr>
</tbody>
</table>

We can see from the numbers that souvenirs under 100 yuan are more popular. The result is as same as we can predict. Products in Table 7 do not conclude imitations of the classic collection. Products under 100 yuan are called practical commodities. Practical commodities are popular in any other museums or sighting spots.

In practical commodities, there are many different kind of products. Popular practical commodities in museums are bookmarks, U-disk, key-chains, etc. Except for common
products, more creative products need to be improved. How to find inspirations in designing for Hubei Provinical Museum? We conclude two techniques in the following.

Technique 1, designer can find inspirations from social division of labor of general people. Namely, classify people based on what they are doing. Then predict what they like to buy in the museum. In this way, rational questionnaires are needed. Whether in studies or businesses, effective questionnaire results are of great importance. Designers can start their work based on intuitive data. Besides, the sales of those products will be guaranteed.

Technique 2, designers can find inspirations from culture resources from Hubei Provinical Museum. There are already many design competitions based on museum culture, but we come up with more ideas. Usually in design competitions, it is unrealistic to provide much museum resources. As mentioned in 4.1, intellectual property protection is very difficult in museums. So we think about building a special design team for Hubei Provinical Museum. Except for official design group in the museum, Hubei Provinical Museum can select excellent designers from the schools or companies. The selected designers can have access to culture resources and have the chance to work in a museum. Some agreements on resources and rewards can be signed for a better cooperation.

There are many challenges in two techniques, as well as chances. Since designing is very important in the development of museum products, it is worth a try in Hubei Provinical Museum in the future.

The second aspect in micro level is about planning. Planning activities in museum needs to consider all kinds of conditions. In brief, activity planning is full of challenges and changes. At the same time, a successful activity can please and educate many people. How to plan for a meaningful activity? We come up with three good ideas in the following.

Firstly, for children under the age of 12. Except for activities in Hubei Provinical Museum, well-planned activities can also be held at home for more families. It will be fantastic for parents and children to study or experience traditional culture at home. They can use the internet to keep up the progress or keep in touch.

Secondly, in the academic field, Hubei Provinical Museum can take full advantage of its excellent location. As mentioned in 2.1 why we chose Hubei Provinical Museum, it is located in the East Lake, next to the Hubei Art Museum and Hubei Academy of Social Sciences. There is every reason to cooperate with the other two institutions.

Lastly, in protection of intangible cultural heritage. There are 16 research centers for intangible cultural heritage in Hubei province. Hubei Provinical Museum can become a gathering place for professors and folk artists.

In summary, designing and planning are core contents in cultural and creative development in museums. Ideas and suggestions mentioned have gathered a lot of hard work. It is the same with the museum innovation in China, there is still a long way to go.

**Conclusion and outlook**

In this research, we put forward the topic on the back ground of museum evaluation standards. Then we explained the main contents in policy document and made a literature review. Next we concluded the reasons why we chose Hubei Provinical Museum and summarized the current products in the museum. Finally, we gave practical suggestions.
from macro, meso and micro levels. The suggestions are from different kinds of aspects, levels and angles. We are very thankful for the support of Hubei Provincial Museum.

There are some advanced ideas from the depth interview. The idea “cultural and creative products form a big system”, inspires us in cultural and creative industry in museums. Since cultural and creative industries in China still have a long way to go, the industry in museums will have more difficulties. Moreover, the idea “except for archaeological collection, all the other things could be seen as cultural and creative products”, can be seen as a prediction in museums.

There are three other factors that are important to the development of cultural and creative products in Hubei Provincial Museum. They are Hubei Provincial Department of Culture, social cultural organizations including enterprises and universities, finally, museum visitors. Hubei Provincial Department of Culture is able to provide more suggestions or policy supports for Hubei Provincial Museum. Social enterprises can cooperate with the museum in business, while universities can cooperate with the museum in researches. Moreover, museum visitors are significant. They are the customers of cultural and creative products. These three aspects cannot be ignored in the development of products in the museum.

In China, cultural undertakings and cultural industries have developed a lot in the past few years. But there are lots of predictable and unpredictable challenges in Chinese cultural renaissance. Cultural reforms, studies from western developed countries are needed to make better decisions. Through joint efforts, Chinese cultural renaissance will be realized some day in the near future.

References
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