SOCIAL INNOVATION DIFFUSION FROM THE PERSPECTIVE OF SYSTEMS THINKING: CASE STUDY OF CIRCULAR DESIGN GUIDE-BASED WORKSHOP

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Abstract - In recent years, as diverse issues and social innovation flourish, people have become more aware that new methods of thinking will become catalysts for social progress, and have become more accepting of changes in lifestyle. Design thinking (proposed by IDEO) is a human-oriented approach to problem solving. It is aimed at satisfying people's needs and aims to find innovative solutions for various issues and to create more possibilities. However, with the complex development of today's society, the solutions obtained through the design thinking methodology are often not fully implemented. Nowadays, Circular Economy is a hot topic in social innovation, and IDEO has specifically developed "The Circular Design Guide"concerning this, which is regarded as design thinking 2.0. The purpose of this paper is to explore how design thinking can be effectively implemented, and how issues relating to social innovation can be diffused from the perspective of system thinking. With the above objectives in mind, "The Circular Design Guide" launched by IDEO has been selected as a case study. This research aims to use qualitative research methods. In early stages, "Document Analysis" was used as one of the qualitative research methods to verify that "The Circular Design Guide" does apply systematic thinking thinking to solving social innovation issues. In later stages, the researcher integrated the results of the previous analysis and planned the action research. Finally, the action plan was implemented in the form of “Full Participant Observation Study”. In the end, the results will be recorded and discussed through questionnaires and in-depth interviews for the future willingness to develop social innovators as a reference.

Index Terms - Circular Design Guide, Design thinking, Social Innovation Diffusion, Systems Thinking

I. INTRODUCTION

Every day, we are exposed to multitudes of information. This information usually only extracts the main important points just like a snapshot of an event. Such snapshots often only explain the bare facts, and the detailed reasons for why the incident occurred, and the story behind it are brushed over. However, this results in making people unable to think on a deeper level when faced with dynamic shifts, and the complexity of the changing world. It is also because of the challenges arising from the rapid development of the world that international efforts are made to try and break through the limitations of traditional thinking, and to find more efficient and sustainable solutions to create a win-win situation for the economy, society, and environment. This has also created the rise of social innovation.

Design thinking is human-oriented at its core, and it is aimed towards creating positive social influences. From the perspective of desired results, design thinking has the same goal as social innovation. In other words, design thinking can also be said to be the engine that drives social innovation. As the social system becomes more and more complicated, design thinking faces huge challenges that cannot be effectively implemented. In recent years, literatures mentioned that design thinking can be combined with system thinking to adjust and update. However, how to know whether it can be effectively combined can refer to the results of this study? The researcher will hold a workshop in the later stages of the research. Through the workshop the feedback from experts and participants can be collected. In the end of the paper, researcher will analyze and summarize the collected data to verify whether the combination of design thinking and system thinking can effectively promote the diffusion of social innovation.The ultimate goal of this research is to propose a system-oriented design thinking process for circular economy of social innovation topic.

II. THE RISE OF DESIGN THINKING

A. Design Thinking for Social Innovation Approach

Design Thinking promotes social innovation and is adaptable for different fields, such as business [1]. Design thinking is considered as an effective way to generate ideas [2]. On the other hand, design thinking can also be seen as a way for multi-disciplinary teams to apply to a wide range of innovation challenges [3]. The ultimate goal of design thinking is to create a solution that is desirable, feasible, and viable. This means that the final product or solution should not only meet the needs of the user, it should also be easy to implement and have a business model. It is regarded as a system consisting of three overlapping aspects (Figure2.1), where viability refers to DT's business perspective, desirability reflects the user's point of view, and feasibility represents a technical perspective. Solving all three aspects of the problem will lead to innovation. In the process of innovation, solutions can also be promoted through design thinking tools. However, in existing research, how the tools of design thinking promote social innovation has received little attention. What is the process of design thinking? How does it help social innovation?

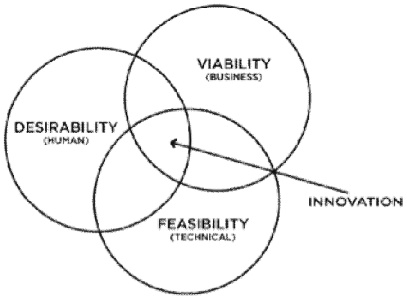


Figure 2.1 Three Objectives of Design thinking

B. Design Thinking Process

A large number of design methods and tools can assist the process of design thinking. Alves and Nunes surveyed various sources from industry and academia and collected more than 164 related methods and tools [4].The DT process consists of five phases: Empathize, Define, Ideate, Prototype and Test [5].

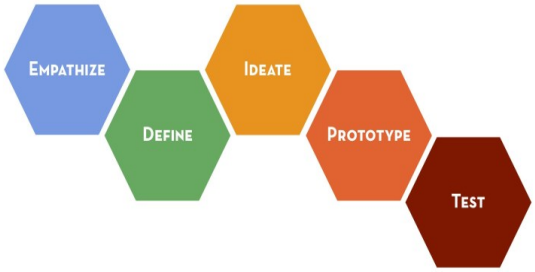


Figure 2.2 Design Thinking Process (d.school Stanford,2010)

Empathize: There are three key points during the empathize process. First is Observe, observing the user's lifestyle; in addition to understanding what the user is doing, how they do it, what methods they use, and why they do it are observed. The ripple effects of these actions can be helpful for future designs. Next is Engage; through conversation with users, questionnaires, etc., their true ideas are explored as much as possible. Finally, Immerse is to actually experience what users feel.

Define: After fully understanding the user through empathize process, the next step is to produce a Problem Statement to illustrate the point of view (POV) of the individual or team. POV can be defined using a very simple sentence to describe the basis and core values of the project.

Ideate: After defining the problem is how to solve. As many different solutions as possible are thought up through Brainstorming and this may possibly involve people, events, materials, etc. The results are simplified and consolidated into an explicit method.

Prototype: This stage prototypes the product based on the solutions above and emphasizes the need to identify problems as well as find factors that may affect success.

Test: Re-examine the product by testing the prototype, this phase may include modifying the POV set out earlier.

The above outlines a direct and linear design thinking process. After the completion of one phase, proceed to the next phase, and a logical conclusion is obtained during the user test phase. However, in practice, this process is actually carried out in a more flexible and non-linear way. In addition, the results of the testing phase may also inspire some insights about the user, which may in turn lead to another brainstorming or new prototype development.

III. DIFFUSION OF SOCIAL INNOVATION

A. Definition of Social Innovation

"Social innovation is a novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals" [6].The other definition states that "Social innovation is the process of developing and deploying effective solutions to challenging and often systemic social and environmental issues in support of social progress" (Centre for Social Innovation, Stanford).

B. Mechanisms of Social Innovation

The mechanisms of social innovation— the underlying sequence of interactions and events—change as a society and its institutions evolve. Early social innovations were driven by a more expansive and direct role of government in solving social problems. In recent decades, the dominant trends shaping social innovations are very different. More and more private and nonprofit sector work together to solve the social problems affecting us all. This cross-sector cooperation underlies three critical mechanisms of social innovation: exchanges of ideas and values, shifts in roles and relationships, and the integration of private capital with public and philanthropicsupport.

Exchanging Ideas and Values:Because non-profit organizations, businesses, and governments are relatively insular, many innovative ideas have no chance to sprout and also their links with governments are often confrontational. In recent years, governments and companies have actively sought out the wisdom of non-profit organizations regarding social and environmental issues, grassroots organizations, philanthropy and advocacy, which has also led commercial and non-profit organizations to work with governments to develop public policies. Due to this cross-pollination, many social innovations have emerged.

Shifting Roles and Relationships:Companies are leaders in solving many social issues and work with governments and non-profit organizations. Similarly, non-profit organizations also work with businesses and governments. At the same time, the government has moved away from the confrontational roles of regulator and taxman, switching to a more cooperative role regarding partners and supporters. This has also

led to role shifts and relationships between government, business and non-profit organizations.
Integrating Private Capital with Public and Philanthropic Support:According to the second point above, nonprofits, governments, and businesses are blending sources and models of funding to create sustainable, and sometimes even profitable, social innovations. It involves the creation of new business models that can meet the needs more efficiently, effectively, and if not profitably, at least sustainably. They do this by having lower cost structures and more efficient delivery channels, in particular by combining commercial revenue with public or philanthropic financial support. These hybrid business models overcome many of the limitations purely commercial or charitable organizations face when attacking social problems and needs.

C. Social Innovation Diffusion

Diffusion theory first came from communication studies, proposed by Bass (1950). It mainly involves the evolution of a new concept, thing, or technological innovation when it is introduced into the social system. Later, scholar Rogers (1983) systematically developed this innovation diffusion into a complete diffusion model. He defines the diffusion of innovation as the process by which innovation spreads among members of the social system over time in a certain way. Therefore, the conditions that affect the process and effectiveness of the diffusion will include the characteristics of the innovation itself, communication channels, time, and social systems [7].

IV. AFFECTING SOCIAL INNOVATION DIFFUSION

A. Criticism of Design thinking

With the establishment of IDEO, design thinking began to be widely promoted and implemented. But at the same time, there are also immense challenges to be faced. When an idea is popular and widely used, it is inevitable that it becomes a victim of its own success. To some extent, this has happened in the application of design thinking. After 2001, the problems that IDEO was asked to solve were increasingly difficult and challenging, and it also showed that the development of social innovation was faster than imagined. However, as its popularity grows, the core principles of design thinking fade or are misused, causing implementation difficulties and lessened effect. Another key point is that top-down standardization should be avoided. The standardized process is effective in the short term, but in complex social systems, adaptability needs to be strengthened. More importantly, as the world becomes more and more complex, the version of design thinking made by the previous generation needs to be constantly amended to cope with these huge changes. In other words, design thinking needs to be adjusted and updated [10]. Many social enterprises have unconsciously used certain methods of design thinking. The biggest obstacle to adopting design thinking is the fear of failure. The use of design thinking often means that user must cycle through the three stages of “insight, inspiration, and implementation”. They need to make continuous attempts, and it means success only after repeated failures. This is unacceptable for many organizations, both at cultural and at organizational levels. How to find the right place to implement and achieve desired effects in today's complex social system deserves deep thought and research.

B. The scaling up and diffusion of social innovation

In view of the expansion of design thinking, especially in the field of social innovation, most of today's research is to explore the scaling of social innovation rather than diffusion [8]. The biggest difference between expansion and diffusion is that scaling-up emphasizes the growth of social innovation providers themselves or the influence of social innovation achievements. However, this does not mean that more people adopt this social innovation or that its scope of influence is more diversified. There is varying discourse in traditional research regarding the expansion of social innovation. Davies and Simon (2013) believe that the scaling of social innovation emphasizes only the scaling of organizational hierarchy; that is, the growth of social innovation providers, but not the propagation or spread of the results of social innovation. Therefore, the scaling of many social innovations only enhances the impact. Ultimately, it cannot attain system change or sustainability of social innovation. Davies and Simon (2013) suggest that emphasis should be placed on social innovation diffusion rather than just scaling. But also because the lack of shared indicators to measure the impact of social innovation is often cited as the reason for the particular difficulty of spreading innovation in the social sphere [9]. Perhaps the most important limitation of the diffusion framework is practical application.

C. Rethinking Design Thinking

Steve Vassallo believes that "design thinking is one of the most important dangerous ideas of the 21st century" [10]. It has far-reaching implications for product design, how organizations can solve problems, and impact on everyday life. Under the extensive use of design thinking, universities, enterprises, non-profit organizations, etc. all carry out design projects according to design thinking principles. In this process, anyone can become a so-called design thinking instructor, which means it is difficult for practitioners to clearly define the term, which is also reflected in various case-oriented observations and analyses. More importantly, as the world becomes more complex, the design thinking paradigm needs to evolve to cope with these huge changes. Steve Vassallo is also aware of this problem and proposes two directions for these crucial modifications[10].

Empathy Overload:Empathy is at the heart of design thinking and is a broader definition of innovation. It has also been touted as a key leadership skill that can influence others in the organization, anticipate stakeholder concerns, respond to social media fans, and even run better meetings. However, empathy as an emotion has its limitations. Over time, excessive use of empathy may stifle new ideas, new projects, and even a company, as shown in the far right of Figure 4.1.

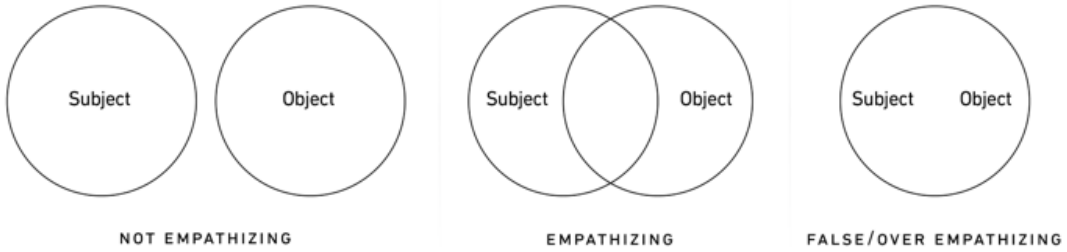


Figure 4.1 Three states of using empathy

As Steve Jobs said: “A lot of times, people don't know what they want until you show them." Listen to the voice of the user at the right time, but don't become a slave to narrow the consumer's desire.

Systems Upgrade:We live in a large, complex global system. The challenge for designers is to learn how to balance sophisticated capabilities with the threat of possible breakdown. This is why many works believe that design thinking should emphasize solving problems as a whole, and that it is necessary to look at a more complex whole by combining another ideology: system thinking. Although most designers are not familiar with it, system thinking is not a new concept. System thinking is an analysis method that has existed for decades, and is a way of thinking; a way of treating and talking about reality, and can be used to identify the interrelatedness of things. System thinking can be used to explain and understand diverse issues ranging from inventory changes in supply chains to the changes in bacteria and host population.

There are two key concepts of system thinking to understand: emergence and leverage points. First, emergence is the interrelationships between components and dependencies that creates a feedback loop which changes the behavior of the system. In fact, these relationships define the behavior of the system. An approach that designers can use to deal with socio-economic, technological and political complexities is to analyze systems with a focus on finding leverage points, which is the second key concept in system thinking. Generally, it would be better to effect incremental changes instead of trying to design a new, perfect solution. These incremental changes eventually lead the system towards major changes, and small adjustments may end up having the largest effects. In actual cases, it is not always possible to reasonably model very complex systems in a way that leads to good design strategies and outcomes. Designers usually focus on a single, discrete design problem, but when appropriate, applying system thinking to design thinking will provide designers with a powerful tool for generational problems. Although this non-linear way of thinking may seem strange at first, it will soon feel like second nature.

V. SYSTEMS THINKING

A. Brief definition of systems thinking

Systems thinking is a way to understand, design, and systematize the value streams across all aspects of an organization in the value chain to ensure synchronization, consistency, consolidation, and maximization between people, activities, processes, policies, locations, and resources. Its application ranges from both inside the organization and the external value chain. Systems thinking aims to manage change and integration based on a “top-down” overall profile, and it's easy to understand and express through taking a panoramic view of the situation and visualization details. In fact, it goes beyond the organization itself, affecting external stakeholders, the environment, regulations, and how these systems work together to achieve a better systems vision than existing systems. Systems thinking and design thinking complement each other rather than completely replacing one or the other.

B. Innovation for sustainability

In the context of sustainable innovation, the advantage of design thinking is to emphasize the different processes that generate alternative solutions before adopting alternative solutions, while traditional optimization methods and alternatives choose the best solution. But design thinking can only fully play out its potential to address sustainability challenges when combined with systemic thinking, as these two approaches complement each other in achieving systems innovation.Systems thinking looks at the history and current state of the systems to analyze and understand them. Design thinking, though, focuses on the current state of the systems and regulates the requirements so that they can be oriented toward future issues in order to innovate and transform the systems. On one hand, systems thinking has

qualitative and quantitative tools and methods that help reveal patterns and structures in the systems to explain how events (the problems we observe) are generated over time. On the other hand, design thinking has several tools and methods to reveal the mental model of creating structures and historical patterns.

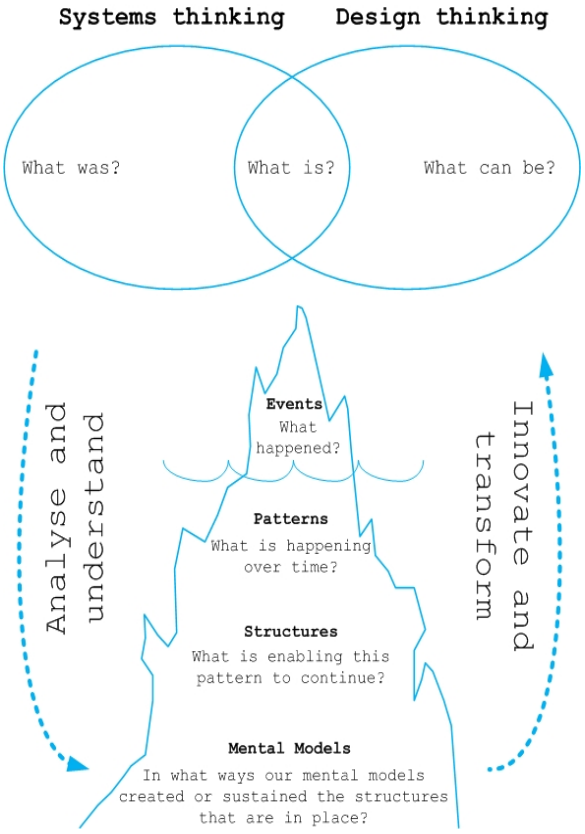


Figure 5.1 Conjointly using systems thinking and design thinking (Coughlan and Ponto, 2012)

C. A methodological framework for systems thinking

The general methodological approach to systems thinking and modeling used in this paper is based on a systems dynamics approach. Many researchers have contributed to the development of systems thinking and systems dynamics.

The following are the five main stages involved in the development of Systems Thinking and Modeling (ST&M) [12]:

Problem Structuring:At this stage, the situation or problem at hand is defined and the scope and boundaries of the study are determined. This is a common step in most problem solving methods.

Causal Loop Modelling(CLD):During this stage, the conceptual model of the problem is created, called the causal cycle diagram (CLD). This is the main and most commonly used part of the systems thinking approach.

Dynamic Modelling:This phase follows the causal cycle modeling phase. Although this stage can be directly entered after the problem is structured, first performing the causal cycle modeling phase will enhance the conceptual rigor and learning ability of the systems approach. Scenario Planning and Modelling:In this phase, various policies and strategies are assumed and tested. “Policy” here refers to changes to a single internal variable, such as recruitment, quality or price. A strategy is a combination of a series of policies, therefore involving internal or controllable changes.

Implementation and Organizational Learning:One of the most beneficial and lasting results of systems thinking and modeling is organizational and team learning. Once the simulation models have been developed, they can be enhanced by extending them to the micro scale and used to test hypotheses and mental models designed to create individual and group learning.

VI. CASE STUDY

A. Definition of The Circular Design Guide

The Circular Design Guide was released in 2017 by the Ellen MacArthur Foundation and IDEO. The Circular Design Guide clearly defines circular design and its practical application. This is a tool that uses systems thinking and design thinking in the product redesign process. Design is a way of applying the concept of circular economy, which is produced by different trends of thought. Traditionally, linear economy has been followed, and its life cycle is separated into four states of manufacturing, production, consumption, and waste [11]. Because this situation leads to ecological problems, the circular economy solution involves a new way of design thinking. The Circular Design Guide is sometimes seen as an advanced version of design thinking, which contains some management and innovation principles, especially: human-oriented approaches, co-creation and multidisciplinary collaboration, willingness to innovate, finding the solution to the problem, visual use and rapid prototyping.

Tim Brown, CEO and President of IDEO said: “The scale of our design has shifted from products and companies to economic systems.” People who are designing now have expanded from a single user to a network which is close connections across the globe.

The original business model established by the global economy is encountering intermittent and subversive technological challenges. That's why IDEO created "The Circular Design Guide": to help innovators create simpler, more effective and creative solutions for the circular economy. As the basis of this guide, design thinking enables people to create new methods containing sustainable, adaptable and unvarying values of thinking through combining systems thinking in the process of exploring a circular economy. A number of activities are listed in The Circular Design Guide to help innovators understand, define, make and release circular innovations.

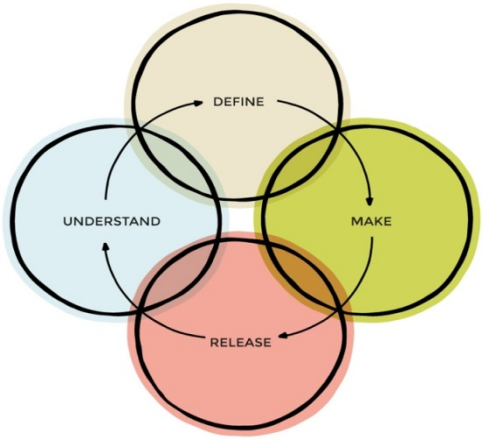


Figure 6.1Four Steps of Circular Innovation (The Circular Design Guide, 2017)

Everyone has a different starting point, perhaps just a designer who has just started a career, an emerging entrepreneur looking for a startup, or someone who is trying to change his organization from within. There are two starting points in the Circular design guide: Find a problem to solve and Get buy-in to get going. Find a problem to solve: There's a lot of context surrounding each one, but as you apply the different methods against them you should develop your own unique understanding of the issue. Under the guidance of system thinking, we will not stay in the prototype testing stage, but will continue to develop. Think about other parts related to the product, such as: service, user experience, etc.

Get buy-in to get going:This part is aimed at already existing products but hopes to expand the service and system integration. Here are three key points: First, Demonstrate the potential of your circular innovation, such as offer desirability, commercial viability, organizational and technical feasibility. Second, Identify and involve key stakeholders and task them to explore new questions around how circularity can better meet user needs, business needs, and be technically feasible. Last, demonstrate you can manage risks.

C. System-Oriented Design Thinking Process

According to the research objectives mentioned in the first chapter of the beginning: propose a system-oriented design thinking process for circular economy of social innovation topic. The table 6.1 below is a correspondence of the goals summarized and organized for this purpose.

In the beginning, the concept of the five steps of design thinking and the tools used are explained. Next, based on the perspective of system thinking, elaborates on the shortcomings of the design thinking steps. Finally, by comparing the results obtained above with the five steps of the cycle design guide and the tools used, concluded that: it is a new tool with system-oriented thinking and combines with design thinking.

		Emphathy	**Define**	**Ideate**	**Prototype**	**Test**	**-**
Design Thinking	**How**	To empathize, please view users and their behavior in the context of their lives, interact with and interview users and experience what your user experiences	Two goals of the define mode are to develop a deep understanding of your users and come up with an actionable problem statement	Ideate is the mode during your design process in which you focus on idea generation. The goal is to explore a wide solution space	A prototype can be anything that takes a physical form. keep your prototypes rough, learn quickly and investigate a lot of different possibilities	Testing is the chance to refine our solutions and make them better. Prototype as if you know you're right, but test as if you know you're wrong	-
	Tools	• Empathy Map • Journey Map • User-based Studies • Interviews • Sharing Inspiring Stories • Persona	• Empathy Mapping • Point of view • Problem Statement	• Brainstorming • Mind Map • Business Model • Storyboard • SCAMPER • Bodystorming	• Guidlines : Just start building, don't spend too much time, remember what you're testing for and build with the user in mind	• Guidlines : Let your users compare alternatives, show and don't tell, ask users to talk through their experience and always follow up with questions	-
System Thinking	**Problem Structuring**	-	Interview multiple stakeholders and consider their perspectives	-	-	-	-
	Causal Loop Modelling (CLD)	-	-	Accurately describe the contour of the problem - Structure of System	-	-	-
	Dynamic Modelling	-	-	Find the breakthrough point of the problem accurately through the CLD	-	-	-
	Scenario Planning and Modelling	-	-	-	Consider the general scenario, including time frame, external environment and factors that may affect the strategy	Simulate positive and negative scenarios. Then Evaluate each scenario to ensure compliance with the target strategy	-
	Implementation and Organizational Learning	-	-	-	-	-	Communicate results and insights to stakeholders and examine mental models to facilitate organisational and team learning.
		Understand	**Define**	**Make**			**Release**
Circular Design Guide	**How**	Gain insight around circular design solutions as well as a deeper understanding of how you can shift from linear to circular thinking. Get inspired by looking at categories outside of your sector.	Articulate the challenge you are looking to explore and establish some goals for your project. Find ongoing opportunities for circularity, whether you're just getting started or revisiting an existing solution.	Understand the needs of all the users in your chain, spot opportunities to brainstorm ideas then develop and select concepts. Get tangible by building prototypes and learn through testing.			Understand how to explore new partnerships as well as create change in your organisation. Launch your concept to market and evolve your product, service and business.
	Tools	• Understand Circular Flows • Regenerative Thinking • Service Flip • Insides Out • Digital ystems • Learn from Nature	• Define your Challenge • Find Circular Opportunities • Building Teams • Circular Buy-in • Circular Business Model • Create Brand Promise	• User-Centred Research • Circular Brainstorming • Embed Feedback Mechanisms • Smart Materials Choices • Concept Selection • Rapid Prototyping			• Product Journey Mapping • Launch to learn • Imagine New Partnerships • Create your Narrative • Align your Organization • Continous Learning Loops

Table 6.1 System-Oriented Design Thinking Process

CONCLUSION

This research is to explore how design thinking can be effectively implemented, and how issues relating to social innovation can be diffused from the perspective of system thinking. In the final stage of the research can propose a system-oriented design thinking process. Based on the above objectives, this study selected the "The Circular Design Guide", which was developed by IDEO as a case study. In Chapters 6, concluded that Circular Design Guide is a new tool with system-oriented thinking and combines with design thinking. But this is not the final result.

In the future research, workshop will be held following the concepts and methods in the Circular Design Guide. The users and experts who have participated in the traditional design thinking workshop will be invited. Finally, through in-depth interviews and questionnaires, discussed whether the combination of design thinking and system thinking can effectively solve problems and make social innovation diffusion.

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