

Stakeholder Engagement: Applying Dechnology in a Technology-Oriented Organization

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Abstract. Technology revolution and the subsequent innovation can bring about a multitude of benefits for the society. However, innovation derived from a single technology push is no longer sufficient to meet the needs of the current market. While past studies have suggested that an ideal environment for innovation involves the engagement of multiple stakeholders, in practice, this ideal has remained a major challenge for many technology-oriented organizations. In 2010, the Industrial Technology Research Institute (ITRI) launched a project called Dechnology, where service design and design thinking were incorporated into the R&D process. The project developed the Dechnology innovation model, and successfully engaged stakeholders in the innovative process, which helped the collaboration between ITRI and corporations. This study looked at three cases from the Dechnology project and investigated the mechanisms applied in the Dechnology innovation model. This study further illustrated that the Dechnology project utilized three main mechanisms, which were (1) to apply the end-user voice properly, (2) to build a multidisciplinary facilitation team, and (3) to establish visualized co-creation environments.

Keywords: Stakeholder engagement · Service design · Innovation · Co-creation

1 Introduction

Innovation through technology push has been suggested by past studies (Brown et al. 2002; Lo 2005) to have a multitude of benefits for the development of the economy and society. In fact, many countries have established national level technology research organizations, such as the National Research Council in Canada and the Netherlands Organization for Applied Scientific Research, aimed at enhancing the competitiveness of their respective economies. Nevertheless, with the perpetually changing market of today, a number of studies (Rothwell 1994; Stefano et al. 2007; Verganti 2009) have suggested that technology push alone is no longer sufficient for achieving the innovation demanded by the market. Several studies (Chesbrough 2003; Lee et al. 2012) emphasized the

importance of breaking an organization's boundaries, being flexible in utilizing resources from inside and outside of an organization, and engaging different stakeholders for value co-creation.

However, Anthony et al. (2014) argued that, if an organization lacks the appropriate mechanisms for stakeholder engagement and value co-creation, it may impede the innovation process. Furthermore, Yang et al. (2014) highlighted that it might not be an easy feat for a non-technology oriented expertise to cast influence on the R&D process in a technology-oriented organization. In light of this situation, the main purpose of this study was to answer the following question: how to facilitate value co-creation among the internal and external stakeholders in a technology-oriented organization so as to enhance the efficiency of the innovation process?

In 2010, with support from the Taiwan government, the Industrial Technology Research Institute (ITRI), launched a project called Dechnology (an acronym from the words 'design' and 'technology'). The project utilized the methods of "service design" and "design thinking" (Hong and Haung 2013; Yang et al. 2014) and developed the innovation model (hereinafter referred to as the Dechnology innovation model) for ITRI, and helped ITRI to engage internal and external stakeholders in the innovation process. As a way of answering the aforementioned question, this study looked at the three cases from the Dechnology project to extract the mechanisms applied in the Dechnology innovation model that improved the innovation efficiency at ITRI.

The first part of this study was a literature review on the theoretical foundations of stakeholder engagement in technology push innovation and the Dechnology innovation model. Secondly, the case study research method was conducted on three cases of the Dechnology project to extract the mechanisms applied in the Dechnology innovation model. Lastly, this study compiled the mechanisms into a framework diagram as a reference for similar technology-oriented organizations looking to develop the related innovation models in the future.

2 Literature Review

The present study reviewed studies in the literature about the influence of stakeholder engagement in technology push innovation. Then, this paper illustrated the rationale and theories behind the Dechnology innovation model.

2.1 Stakeholder Engagement in Technology Push Innovation

Brown et al. (2002) and Lo (2005) pointed out that technological innovation might bring about new commercial opportunities and exert revolutionary impact on mankind's economic and social development. However, various studies (Rothwell 1994; Stefano et al., 2007; Verganti 2009) have suggested that in order to enhance the efficiency of the innovation process, organizations should consider multiple sources for innovation (such as market pull, design driven innovation) to facilitate the direction of technological innovation effectively in this rapidly changing market. Furthermore, Chesbrough (2003) indicated that for an organization to achieve both time to market

and differentiated innovation, there should be effective stakeholder engagement and value co-creation mechanisms aimed at maximizing the benefits of the organization's core innovation capacity.

However, Gould (2012) noted that a lack of a proper system structure during the innovation process might lead to a loosely bound stakeholder relationship network, and may not only hamper the effectiveness of multidisciplinary resources but also lower the quality of innovation, or even heighten the risks of innovation. Moreover, research suggested that stakeholder management is a crucial factor for the success of an organization's operations (Evan and Freeman 1988; Sautter and Leisen 1999). On achieving effective stakeholder management, several studies (Ayuso et al. 2011; Gould 2012; Smith et al. 2011) advocated that an organization should not focus solely on pleasing the stakeholders; instead, it should adopt practical engagement to promote stakeholder networks and consensus.

Nevertheless, Yang et al. (2014) mentioned that it might not be an easy task to influence R&D in a technology-oriented organization with a non-technology oriented approach. Although there are plenty of studies that illustrated the need for stakeholder engagement, this study found that few studies suggested how to facilitate stakeholder engagement in a technology-oriented organization. Thus, this study illustrated the Dechnology innovation model and cases in the following section.

2.2 The Dechnology Innovation Model

ITRI was founded in 1973 with mission of creating economic value, and promoting social well-being through technology. Being the largest R&D organization technology in Taiwan, ITRI contributed to the advancement of the society and economy by sharing the fruits of its research with industries via IP transfers spin-offs, etc. Past studies (Arnold et al. 1998; Lo 2005) have pointed out that ITRI played a key role in the development of Taiwan's industry. However, with the onset of the experience economy (Pine II and Gillmore, 2003), the industries became eager to break away from the mindset of an original equipment manufacturer (Yang et al. 2014). Meanwhile, the 'technology push' that ITRI had always relied upon for innovation became less and less effective at meeting market needs.

In 2010, ITRI was supported by Taiwan's Ministry of Economic Affairs to implement the Dechnology project aimed at adding value to technology through design (Hong and Huang 2013). To meet market needs and facilitate stakeholder engagement, the project combined the methods of design thinking (Brown 2002) and service design (Mager and Sung 2011) and developed the Dechnology innovation model (Fig. 1), which were: (1) human centered for experience Design (HCED); (2) human centered for technology commercialized design (HCTCD); and (3) human centered for industrial technology development (HCITD). Together, they enabled ITRI to accelerate industry transformation in Taiwan.

Over the course of five years, a Dechnology team was formed with members from the fields of design, technology, and business. Through their efforts, over 30 traditional corporations have found innovation directions and established deep connections with

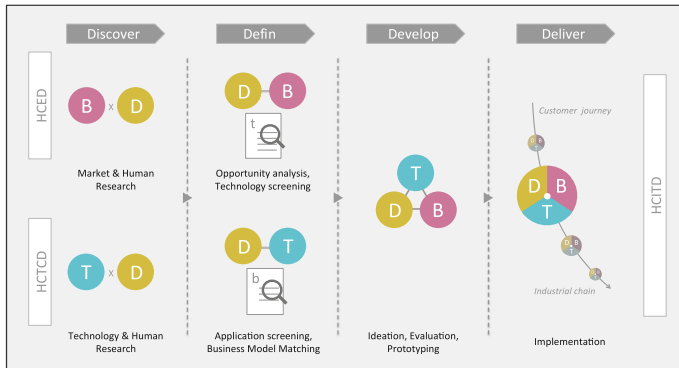


Fig. 1. The Dechnology innovation model

ITRI. Moreover, recently, the Dechnology team stepped up to introduce the external stakeholders to give impact on the R&D directions in ITRI. Thus, in order to understand how the Dechnology innovation model facilitated stakeholder engagement, this study investigated three cases of the Dechnology project in the next section.

3 Methodology

3.1 Research Process

This study, firstly, applied participant observation and in-depth interviews to find out about the progress of the three cases from the Dechnology project. Secondly, during the research process, this study collected the feedbacks from the interviewees (see Table 1), in order to extract the mechanisms that were applied in the Dechnology projects. Finally, based on these findings, this study established a framework to illustrate the mechanisms applied in the process of the Dechnology innovation model.

3.2 Three Cases in the Dechnology Project

The three cases from the Dechnology project were: (1) Case A: applying HCED in 2011 to adopt the FluxMerge thin motor technology into a home-use stairlift; (2) Case B: applying HCTCD in 2014, in exploring new value-added services for a gene chip technology; and (3) Case C: applying HCITD in 2014, in aiding the skincare industry to develop radical innovations and spur its transformation.

3.2.1 Case A: HCED

Responding to the upcoming aging society, Company A began importing stairlifts since 2001. However, Company A found that the size of stairlifts overseas were too large for installation in an average home in Taiwan where space is limited, so it is hard to enter the market. Given the situation, Company A started to develop its own stairlifts to accommodate the needs of senior citizens in Taiwan.

Table 1. Descriptions of the five interviewees

Interviewee	A1	A2	A3	A4	A5
Organization	ITRI	ITRI	Company A	Company B	ITRI
Department	Strategy and R&D Plan Office	Planning & Management Division	General Manager Office	General Manager Office	Business Development Division
Position	Deputy general director	Deputy division director	General manager	General manager	Administrator
Seniority (year)	28	10	23	2	5
Relationship with the Dechnology project	Resource allocation for the projects in ITRI	The project leader of the Dechnology project	The leader of Case A in Company A	The participant of the workshop in Case B	The project manager of Case C

Later, Company A collaborated with ITRI to build the FluxMerge thin motor technology (a technology won the R&D100 Award in 2013) into a compact size of stairlifts for Taiwan. However, during the cooperation between company A and ITRI, the development reached a halt due to their different value cognition. When the R&D team from ITRI hoped to emphasize the ‘thinness’ feature so as to promote the technology, the team from Company A reckoned that it would create problems in cost as it would require modifying other existing technologies. Nevertheless, when the Dechnology team intervened, the cooperation moved forward effectively (See Fig. 2).

Firstly, with HCED, the Dechnology team surveyed the preferences and needs of the target users, and the technology limitation. Next, the Dechnology team proposed a set of strategies and visualized the concepts accordingly which included: lowering the mechanical impression of the product, reducing the size of the product, and improving the overall user experience. Since the proposals were aimed at user experiences that could enhance the competitiveness of the product, Company A agreed to modify other existing technologies according to the proposal. Also, the ITRI team agreed to focus on user needs and deliver good expereince instead of insisting on emphasizing the feature of ‘thinness’,. The product was later launched and became the number one selling product in Taiwan with a 23 % market in 2014.

3.2.2 Case B: HCTCD

Company B was a corporation devoted to the research of gene chip technology. In order to expand the scope of its business, in recent years, Company B entered the field of prenatal diagnosis to enable pregnant women to detect earlier on if a fetus has the condition of hereditary disease. Although the company’s technology had been in the market for more than one year, it still faced obstacles in capturing the market. Therefore, Company B worked with the Dechnology team in hopes of finding new opportunities and value for the company’s core technology. (See Fig. 3).

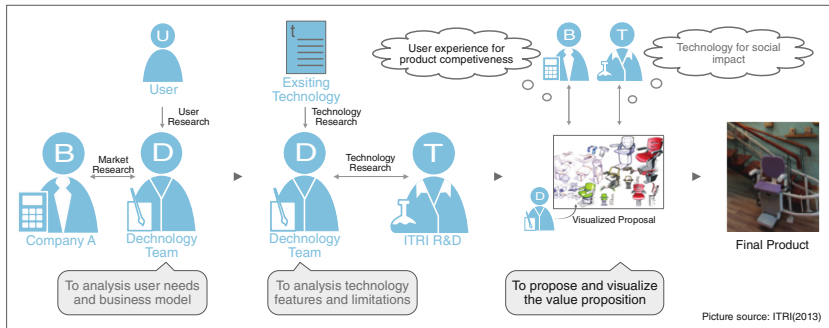


Fig. 2. The development of the stairlifts of Company A

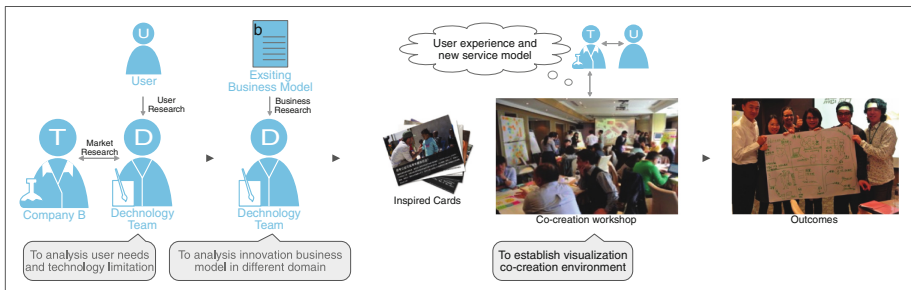


Fig. 3. A prenatal gene chip innovative application workshop

With HCTCD, the Dechnology team began by gaining an in-depth understanding of the core technology of Company B and the related service models. The team also conducted user interviews to understand the behavior of pregnant women and their views and experiences regarding gene chip analysis. In addition, the Dechnology team interviewed different stakeholders (such as the medical doctors) to find out about their views on gene chip analysis. Having carried out the interviews and technical assessment, the Dechnology team found that although gene chip technology was valuable for older pregnant women or women with a family hereditary disease, it was limited by the current service model. The technology relied upon medical doctors as its mediator, whose recommendations often determined user decisions and may have affected the value of gene chip technology. Moreover, lacking an appropriate design for the service of the prenatal diagnosis, Company B caused the users to feel unease and anxiety during the waiting period for the examination results.

The Dechnology team then sorted the user needs and sought out other related cases in domains other than prenatal diagnosis market. Then, the aforementioned customer needs, procedural issues, and similar cases were compiled into a physical innovation toolkit, which included: a customer journey map, customer insights, and inspired cards. Finally, the Dechnology team hosted a co-creation workshop with participation from the company chairman, the general manager, the departmental managers, and the target customers of Company B.

Through the facilitation of the Dechnology team during the workshop, the senior management of Company B broke through their past technology-oriented mindsets. They developed six innovation concepts, which may help them make direct connections with the end-users, and also the directions for their gene chip technology research roadmap. Company B is currently assessing these concepts and has expressed its desire to cooperate with the Dechnology team on realizing them.

3.2.3 Case C: HCITD

With changing consumer attitudes, skincare products are nowadays considered as daily necessities rather than luxuries, and the Taiwan government listed the skincare industry as a key development area for Taiwan since 2003. However, the government found that the industry has been bottlenecked by its lack of certain key resource.

In 2014, the ITRI conducted a project to find the gaps in the skincare industries so as to develop the corresponding market opportunities and future R&D directions. The project originally followed ITRI’s traditional innovation approach: gathering the profiles of benchmark companies to define the gaps, and then exploring the opportunities with technology professionals. However, halfway through the project, it was found that almost all of the findings were related to either ‘cost reductions’ or ‘me too solutions’. These implied that there was little room for radial innovation. In turn, the team in charge of the project sought cooperation with the Dechnology team. (See Fig. 4).

Firstly, the Dechnology team investigated the users’ behaviors during the skin care process, and found that the users were significantly influenced by ‘brand marketing’. Also, the users were relatively unmoved by the skincare benefits solely brought about by technology innovation. Therefore, technology-oriented efforts such as developing new ingredients may not be sufficient to improve the industry. However, on the other hand, the Dechnology team found that there were potential needs in terms of auxiliary behavior, such as consultation, recording, and testing. Thus, the application of R&D for developing the related products may create new opportunities for the industry.

Secondly, based on the findings about user needs, the Dechnology team looked for the innovative cases from different fields to serve as sources for inspiration. A co-creation workshop was organized with participants including ITRI staff members and heavy users of skincare products (such as models) to explore innovation opportunities. By applying these materials, the workshop gave rise to 6 major innovation directions,

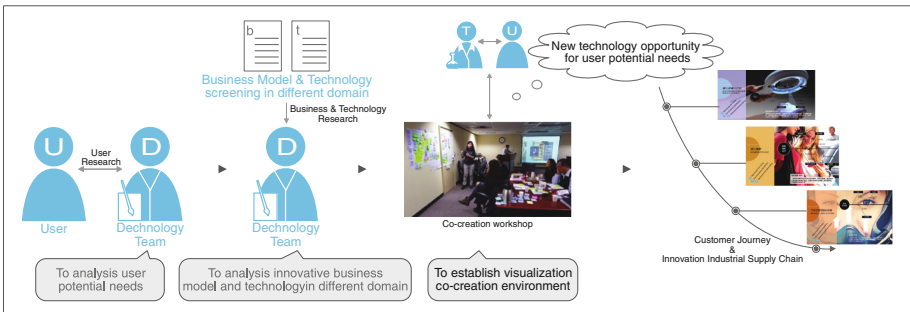


Fig. 4. Co-creation workshop and outputs

Table 2. Mechanisms and values of Dechnology innovation model

Mechanism	Value	Project
To apply the end-user voice properly	<ul style="list-style-type: none"> • Bridging the gap for value co-creation • Providing value proposition and vision for innovation 	A, B, C
To build a multidisciplinary facilitation team	<ul style="list-style-type: none"> • Integrating considerations from different stakeholders • Setting strategies and goals for multidisciplinary and collaborative innovation projects 	A, B, C
To establish visualized co-creation environments	<ul style="list-style-type: none"> • Facilitating communication among the stakeholders • Facilitating co-creation among the stakeholders 	A, B, C

26 innovative concepts and related technology roadmap. Currently, the proposal from Case C has been approved by the senior management of ITRI and might become an important way of convergence for defining the future R&D direction for ITRI.

4 Discussion

The core value of a technology-oriented organization lies in technological innovation. However, technology push alone may be no longer adequate at meeting the demands of industrial transformation. Combining methods of design thinking and service design into the technology push process, the Dechnology project gradually introduced a different innovation model for ITRI (Yang et al. 2014). This study investigated three cases of the project and found that the Dechnology innovation model utilized three major mechanisms (see Table 2) to facilitate stakeholder engagement in a technology-oriented organization, including: (1) to apply the end-user voice properly; (2) to build a multidisciplinary facilitation team; and (3) to establish visualized co-creation. Finally, this study compiled a framework of the three major mechanisms of the Dechnology innovation model into a diagram.

4.1 To Apply the End-User Voice Properly

Norman (2010) suggested that multidisciplinary cooperation among stakeholders might benefit the innovation process; however, the difference in value cognition between researchers and practitioners may lead to unsuccessful outcomes for multidisciplinary collaboration. Other studies (Stickdorn and Schneider 2011; Osterwalder et al. 2014) have pointed out that a “user-centered” approach may serve as a common language among the stakeholders, which can facilitate collaboration and co-creation and in turn to build up consensus. For example, in Case A, since the Dechnology team introduced the voice of end-users, the two parties were able to put focus on the same value proposition so as to achieve consensus.

Furthermore, Richardson (2010) has pointed out that as the challenges faced by corporations escalate in complexity, it is important to address the right issues at the initial stages of innovation processes. Therefore, rather than applying traditional marketing methods, corporations may need to immerse themselves into the users' live to discover the minute, yet unfulfilled needs. In both Case B and C, by introducing the users' behavior into the projects, the teams were able to find the hidden problems. Interviewee A5 mentioned, "*the past practices only explored the industrial gaps and technological opportunities, which were prone to the limitations of the operation mindsets, and hampered innovative thinking. However, with the user research conducted this time, it did allow us to rethink the innovation direction.*"

These findings suggested that with the Dechnology innovation model of properly using of the voice of end users, the organization could shorten the distance from research to commercialization. Moreover, the applications of end-user voice uncovered the hidden problems that led technology-oriented organization to re-evaluate the gaps from different aspects so as to explore the potential innovation directions.

4.2 To Build a Multidisciplinary Facilitation Team

Many studies (Driver et al. 2011; Perks et al. 2005) have pointed out that the roles of the designers have changed in modern innovation projects; the designers may need to possess skills including: holistic consideration, diverse information acquisition, facilitation, integration, and interpretation. With the growing complexity of needs in the market, when corporations attempt to integrate an innovative technology into a specific product, they may need to consider information from a variety of aspects. However, SMEs may often be constrained by limited resources and lack the capability of integration. Thus, even if they have found an innovative technology from ITRI, they may not be able to incorporate it into their products or services. Interviewee A1 has mentioned that "*in the present-day market, ITRI should no longer offer only technology support, rather, it should provide total solutions to effectively facilitate industrial transformation*".

In Case A, the Dechnology team considered more than just the technology aspect of the case. Rather, the team applied the expertise from multiple fields to integrate diverse information into a few concepts. This enabled the team to resolve the differences between ITRI and Company A. As interviewee A2 pointed out, "*in Case A, since the Dechnology team understood the technology and the ingenuity of the design effectively, it enabled the technical team and Company A to see the opportunity and ensured the successful implementation of the case.*"

In Case B, as the multidisciplinary Dechnology team possessed expertise in technology, business, and design, the team was able to see the limitations of the technology, the viability of the business, and the needs of the user. This enabled the team to facilitate Company B in developing concepts that were both logical and creative. Interviewee A4 pointed out that "*the facilitation efforts by the Dechnology team enabled the different departments to express their concerns and view the issues clearly, which in turn changed our way of applying our core technology.*"

On the other hand, in Case C, with Dechnology team involved, the project was able to match the user needs to technology categories and industrial supply chain in an

effective way. In fact, the Dechnology team itself consisted of professionals from the fields of technology, design, and business. It was the main reason why the team was able to understand the considerations and limitations of different disciplines, and then offer the appropriate interpretations to facilitate effective communication among the stakeholders for them to reach positive co-creation results.

4.3 To Establish Visualized Co-creation Environments

Stickdorn and Schneider (2011) has suggested that co-creation is an open development model, which, if arranged properly, may promote desirable ideas that may serve as sources of inspiration later on for the core team. Moreover, Clatworthy (2011) have pointed out that by employing physical visual stimuli in workshops (such as Lego building blocks, memo stickers, and inspiring cards), it could enhance the stakeholders’ imagination and communication, so as to lead to more effective co-creation.

For example, in Case A, B, and C, the Dechnology team visualized the customers’ needs, the concepts, the related cases and technologies. It enabled the multidisciplinary team to effectively focus on topics one at a time and carry out in-depth discussions. Interviewee A3 pointed out that *“in the past, we’ve never had an opportunity to engage in such in-depth discussions. Yet, this time, with the aid of visualization, we were all able to view the issues holistically and understand each other’s thoughts.”*

The findings of this study suggested that through establishing visualized co-creation environments in the Dechnology project, it promoted stakeholder communication during the innovation processes and facilitated value co-creation among stakeholders, which in turn improved the effectiveness of innovation.

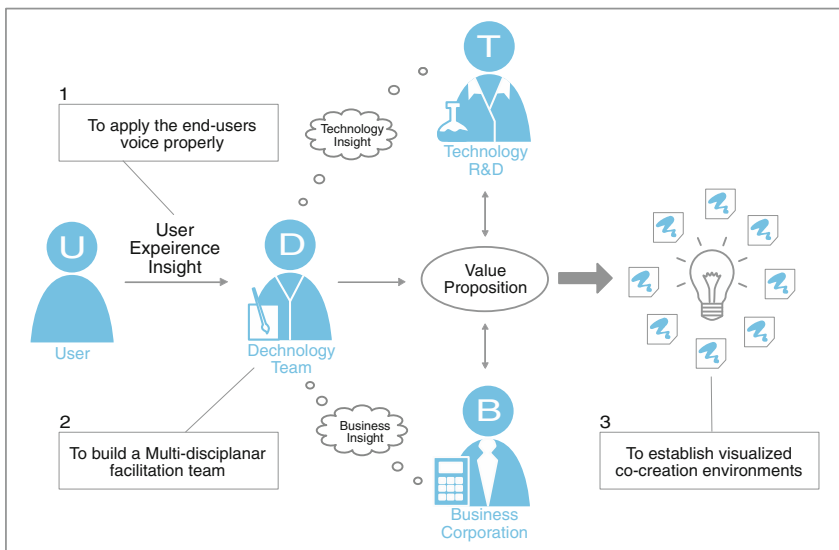


Fig. 5. A framework diagram of stakeholder engagement mechanisms in the Dechnology innovation model.

4.4 Stakeholder Engagement: The Dechnology Innovation Model

To sum up the aforementioned three mechanisms, this study compiled a framework diagram (Fig. 5) that illustrated how the Dechnology innovation model facilitated stakeholder engagement and co-creation in the innovation projects that led to improvements in the efficiency of innovation processes.

5 Conclusion

In recent years, rapid changes in the market implied that innovation derived from a single technology push is no longer sufficient. At the same time, technology-oriented organizations faced the major challenge of facilitating stakeholder engagement to promote innovation. In 2010, ITRI launched the Dechnology project that developed the Dechnology innovation model aimed at engaging multiple stakeholders in an innovation project. Therefore, in order to extract the methods, this study investigated three related cases and found three major mechanisms applied in the Dechnology innovation model, which were: (1) to apply the end-user voice properly; (2) to build a multidisciplinary facilitation team; and (3) to establish visualized co-creation environments.

The Dechnology innovation model so far has promoted the success of several innovations. However, some areas warrant further investigation. Firstly, the methodology for connecting from needs to the development of technology should be further investigated. Secondly, the way (such as web-based innovation platform) to attract stakeholders from wider areas to engage for the innovation co-creation should be established; and lastly, due to the fact that the cases in this study were mostly from Taiwan, the results of this study may require further verification and support from similar studies carried out in other countries in the future.

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