

Embed Design Thinking in Co-Design for Rapid Innovation of Design Solutions

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Abstract. This paper presents a detailed research study that explores how a design thinking inspired co-design approach was applied to creating and evaluating design artifacts of an intended system. A prototype system so called Art Lab was created for the use of an art community for online engagement and collaborative decision-making. The prototype system was designed based on selective user community ideas picked up using an integrated idea generation and prototyping process. The results of this study suggest that the integrated ideation governance process and an active end-user involvement in idea generation and prototyping deliver effective human-centered, and user agreed design solutions. The significance of the paper is that it presents a well-detailed Ideation Governance process and a prototyping approach designated as the Idea Lab process for effective idea generation, idea selection, and prototyping.

Keywords: Creativity · Design thinking · Ideation · Innovation

1 Introduction

The design driven by user needs is termed as “Human-Centred” [1], and it aims to gain a deeper understanding of all stakeholders, context of use, and to involve users throughout the design process, development, and long-term monitoring of the artifact (product, system or service) [2]. Accordingly, Human-Centred Design (HCD) shows a direct relevance to the sustainability of information systems. HCD is constrained by many challenges, and one of the important issues is how to gain sufficient knowledge of the users, and all contextual requirements. Design Thinking (DT) is an approach that can be applied effectively to gaining a deeper knowledge of users and the context. Such knowledge is beneficial for HCD in creating user agreed design solutions. Moreover, DT blends an end-user focus with multidisciplinary collaboration and iterative improvements in creating artifacts [3]. DT has been recognized as an iterative process consists of five key activities [4]: 1. (re) Define the problem, 2. Need finding and benchmarking (understand the users, design space), 3. Brainstorm (ideate), 4. Prototype (build), 5. Test (learn). The success of all these activities is dependent on the extent to which users are involved in each activity with their ideas and idea-oriented tasks. Accordingly, ideas and idea management are important for DT.

In recent years, the idea management for innovation has become prominent and significant [4–7]. Ideation is referred as the process of creating new concepts or ideas and develops them further [8]; hence ideation is fundamental to the innovation. Ideation is significant for imposing business value and competitive advantage. Ideation makes an important contribution to the successful and constructive design of business processes and systems. The distinction between innovation and creativity has been highlighted by many authors [9–11] where creativity is identified as producing novel and useful ideas that can be used to develop processes, products, systems, or services [12, 13]. On the otherhand, the innovation is defined as the successful implementation of artifacts developed on creative ideas within an organization [14]. These definitions emphasize the relationship between ideas, and creativity and innovation showing that ideas are the primary source of innovation. According to Sawyer and Bunderson [15], creativity is the ideas or products generated by individuals and innovation is the successful execution of a new product or service by an entire organization. Accordingly, creativity can be viewed as the ability of people to generate useful ideas that exhibit business value and great promise. On the other hand, innovation is concerned with the successful implementation of those useful ideas to create business artifacts such as products, systems, and services. Figure 1 presents an abstract view of the innovation process that highlights the relationship between ideas (creativity) and implementation of ideas (innovation).

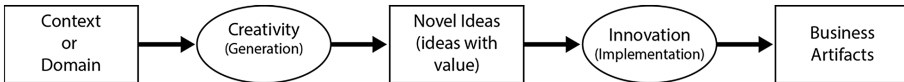


Fig. 1. Innovation process – relationship between ideas and innovation

In an enterprise, ideas from different sources help to form knowledge constructs that can be useful for creating new business artifacts or improving existing ones. In this respect, it is beneficial for the enterprise to collect and preserve useful ideas that show business value as they can be significant for developing new opportunities. However, every idea deemed useful for the enterprise may not have the potential to be invested in with financial or human resources. Accordingly, those ideas identified as the useful need to be investigated beforehand to determine the suitability in terms of business value, feasibility, viability, and desirability to ensure: (a). Efficient utilization of resources, (b). Providing a satisfactory return on investment, (c). Sufficient buy-in or adoption by stakeholders in the enterprise. Idea management systems and its relevance to the innovation management have been widely discussed in the recent literature [16–18] with a variety of models and frameworks in support of innovation management [19–21]. However, a literature review published in 2012 concluded that there was not much research conducted on how people interact with idea management in their daily work practices [22].

The aim of this paper is twofold: first, to present an ideation governance process model intended to generating and capturing ideas to explore and redevelop selected ideas in a type of incubator. Second, to show an effective ideation management process

to collect ideas from different sources and reviewing them for a shared and agreed decision for further redevelopment and implementation through redesign, prototyping, and evaluation.

2 Ideation Governance Process

In an enterprise, there are many sources for idea generation such as internal employees, research and development staff, customers, suppliers, competitors, etc. Idea generation is an iterative cycle of idea production, reflection, and building new ideas on existing ideas or those ideas being discovered. Figure 2 shows the proposed Ideation Governance Process Model consists of three main functionalities: (a). Idea Generation and Collection, (b). Idea Selection, (c). Idea Lab.

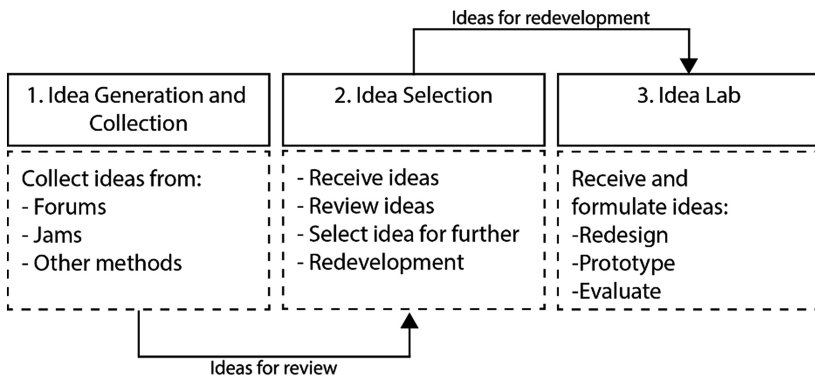


Fig. 2. Ideation governance system

The Idea Generation and Collection functionality is operated by skilled facilitators for effective idea generation, where idea based concepts are created as potentials for various design solutions. The user participants engaged in idea generation sessions are from different backgrounds. Accordingly, the diversity of the knowledge and experiences of the user participants helps to foster creativity in design. During the Idea Generation and Collection process, the ideas that show significant business value are sent to the Idea Selection where ideas are reviewed, selected and prioritized for further redevelopment. The prioritized ideas are received by the Idea Lab where those ideas are redesigned, prototyped and evaluated in collaboration with end-users to create agreed design solutions. The Idea Lab aims to create a minimum viable solution that addresses essential elements of the overall design challenge or problem.

2.1 The Idea Lab Process Model

The Idea Lab embraces collaborative and co-design approach and uses a collection of techniques, tools and a range of business design activities. The co-design approach is aimed at generating collective creativity by engaging designers and user participants

together in the design process where user participants become a partner in the design. The primary objective of the Idea Lab is to evaluate ideas for creating agreed design solutions for the implementation in the organizational context. The main functionalities of the Idea Lab are: (a). Receive and formulate ideas, (b). Redesign ideas, (c). Prototype ideas, and (d). Evaluate ideas. The Agreed Design Solutions are the final output of the Idea Lab. The process model of the Idea Lab is shown in Fig. 3.

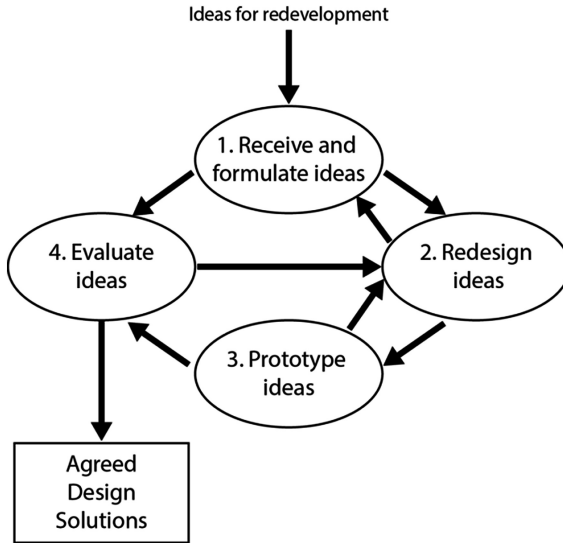


Fig. 3. Idea Lab process model

Close collaboration, active engagement of user participants with designers, rapid prototyping, and evaluations during the co-design help gain a deeper understanding of users, user and system requirements, and the context of use. Accordingly, the co-design approach is significant in providing the guidance to create and evaluate business artifacts towards Agreed Design Solutions. Idea Lab provides a test environment for evaluating prototypes of ideas to determine the usefulness and business value for the enterprise. Prototyping allows designers to work with user participants to test and improve ideas rapidly through an iterative process. Hence, prototyping helps designers and user participants to discover new knowledge and to identify potential design issues early and provide effective solutions through experimentation. Accordingly, Idea Lab provides the means to test ideas effectively to determine which ideas are best for the enterprise to invest in for further development.

3 Experimental Study

This section presents the details of a Human-Centred experimental study conducted over five weeks in designing an Information System for the use of artist community. The study aimed to design an Information System that encourages artists and art

enthusiasts of all level of knowledge to learn, share and further enhance their knowledge, skills and expertise of art through online collaboration in a safe environment. This study was motivated by the need for the artist community to learn and share art, but their needs and expectations were restrained by (a). Lack of time, (b). Cost, and (c). Lack of knowledge on how to collaborate, and share art among peers.

3.1 The Idea Generation and Collection

The engagement of cross-functional team consists of user participants from different backgrounds with designers benefits the design of innovative systems. The diversity of a cross-functional team gives many different, useful ideas, hence, the facilitation and capturing information effectively is vital to realizing the contextual needs and wants accurately. The Idea Generation and Collection functionality of the Ideation Governance Process Model was operated by a management team consists of a skillful facilitator and an information designer. A group of people consists of artists, art students, parents of students, art teachers, a User Interface (UI) designer, a business analyst, and a software developer attended the idea generation sessions.

For this study, only one idea generation session was held. The aim of the idea generation session was to uncover good ideas that support delivering a learnable, enjoyable, and safe sharing platform that help artist people improve socialization, collaboration, and interaction with others. The facilitator led the idea generation session, and the group engaged in collaborative discussions to generate design ideas based on following key points:

- What do you see as ART and not ART?
- How do you categorize ART?
- What are your top three favorite forms of art?
- What is your art experience - e.g. artist, interest, learner, etc.?
- What are the significant limitations that prevent you from enjoying ART more?
- How would you like to share your art and art experience with peers?
- What do you suggest how to promote ART?
- How would you like to showcase your artwork? If not, what are the reasons?
- What do you enjoy most about your chosen art form(s)?
- Do you like to teach others what you know about art? Why and why not?

During the session, participants engaged in a brainstorming activity and proposed a variety of ideas based on the key topics given by the facilitator. The management team also uncovered other participant attributes such as group dynamics, behaviors, knowledge, experience, and attitudes. In agreement with participants, the management team then grouped ideas into logical categories and each category was given a theme name. These Themes represented some intended functionality by participants. The management team administered a voting among participants and selected following themes (functionalities) that had most votes.

- Registration (registration of artist users)
- User Profiling (setting up artist user profiles)
- Sign-in (logging into the system)

- Register Events (registration of new events by users)
- Find Events (finding the desired events by users)
- Book Events (registration of participants for events)
- Log-out (signing out of the system)
- Feedback (Providing feedback by users about the system at any time)

Participants emphasized that their passion for art inspired them to use the Internet to find better ways to make it easier for people to connect with others who have similar interests. One of their commonly agreed preference was to have a collaborative space that provides a safe environment for people to learn and share, ranging from intimate concert halls through to people's very own music rooms. All design ideas generated by participants were captured by the management team to be passed over to the Idea Selection functionality.

3.2 Idea Selection

The Idea Selection functionality was managed by a committee (called as the Management Committee) consists of a Senior User (a representative of the artist community), and an Executive (who represents the business interests of the proposed system and who has the authority to make decisions). The primary role of the Management Committee was to record and assess all ideas received from the Idea Generation and Collection functionality to determine the suitability of each idea for further development. Ideas are evaluated based on their business value, feasibility, desirability, and viability and the selected ideas that deemed promising enough for prototyping are then passed over to the Idea Lab for further development.

3.3 Idea Lab Process

The iterative Idea Lab process is shown in Fig. 3. The Idea Lab was led by a design team consists of a design facilitator, a business designer, and an Information Designer. In this study, the Idea Lab sessions were attended by a group of artists (three female artists, and three male artists who had over three years of professional art experience), and they actively participated in prototyping, redevelopment and evaluation activities. The processes Redesign ideas, Prototype ideas, and Evaluate ideas were conducted iteratively in consultation and collaboration with participants until they are agreed on the design solutions. The active engagement of participants in the whole design process gave them the opportunity to experience the prototypes, react to the design and task flows, and finally to provide a feedback of their interactive experience to the designers in the Idea Lab. The first step of the Idea Lab was to formulate the received ideas to match the order of the intended system task flows. The second step was to redesign ideas to improve idea clarity and relevance to the system task flows. During the third step Prototyping, all ideas were realized into low-fidelity artifacts such as rich pictures, post-it notes, storyboards, and the participants and designers developed a shared understanding of selected ideas.

4 Results

The evaluations of the prototypes during the Idea Lab produced a number of agreed design solutions for the intended system, which was designated as Art Lab. The participatory discussions during the idea lab process also led to an agreed end-to-end user pathway that represents the each user task of the overall design. User tasks are represented in prototype screens, and collectively these prototype screens form the minimum viable solution for the Art Lab. Figure 4 shows the end-to-end process view of the Art Lab from the first process Registration to the last process Log-out. For simplicity, Fig. 4 shows a sequential user pathway of the Art Lab. In practical terms, there are many non-sequential or alternative paths a user can follow to navigate through the system such as a user can provide Feedback immediately after the Registration, or Log-out from the system at any time after Sign-in.

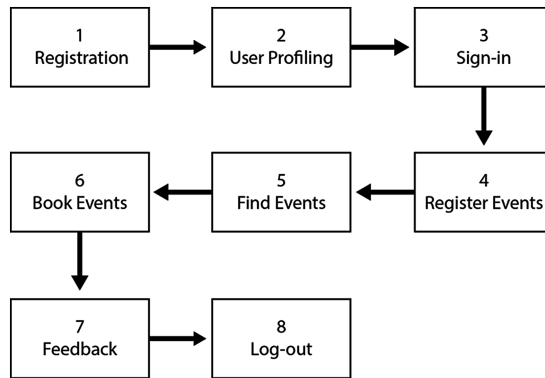


Fig. 4. End-to-end user pathway of the proposed system (Art Lab)

Figure 5 shows the prototype screen of the first process of the Art Lab: Registration. It shows different main menu options that were discussed and agreed in unison by the user participants during the prototyping sessions.



Fig. 5. Prototype screen for the registration process

The first screen also shows navigational paths to additional resources such as Copyright and Privacy, Frequently Asked Questions (FAQ), Forum, Contact, etc.

Figure 6 shows the prototype screen of the second process: User Profiling where a user registers their personal details and interests in the system.



Fig. 6. Prototype screen for the User Profiling process

This screen also provides a statement that describes how the system handle user provided information. The intention of such a statement is to ensure trust and confidence among users of the system about privacy and protection of user data.

Figure 7 shows the prototype screen of the third process: Sign-in where the user enters an email address and a password to login to the system.



Fig. 7. Prototype screen for the Sign-in process

Figure 8 shows two prototype screens for the fourth process: Find Events. By default, these screens inform the user of the events that have been already booked in by the user. This aims at minimizing the effort spent on finding an event already booked in. If users wish to book an event, they will be able to search by Art Sector, Music Instruments, Country, State, Town, etc.



Fig. 8. Prototype screens for the Find Events process

Figure 9 shows two prototyping screens for the fifth process: Book Events. The first screen shows the prototype for booking events and the second screen shows the prototype where a user confirms the booking.



Fig. 9. Prototype screens for the Book Events process



Fig. 10. Prototype screen for the Feedback process

Figure 10 shows the prototyping screen for the sixth process: Feedback where a user can provide a feedback of the system. The need for an effective Feedback process was agreed upon by participants as crucial to improving the system continuously.

Figure 11 shows the prototype screen for the last process of the system: Signing-out. Importantly, during the signing-out, the user is prompted with the message “Before sign out, would you like to provide any feedback?” This allows user another opportunity to provide a feedback of the system.



Fig. 11. Prototype screen for the Sign-out process

In summary, the active user engagement in idea generation and throughout the design process was significant in generating useful ideas and concepts with greater business value. These ideas and concepts were fundamental in forming new user tasks and navigational paths of the intended system. The end-to-end user pathway of the Art Lab (see Fig. 4) along with other alternative user pathways, and associated prototype screens (see Figs. 5 to 11) were the outcome of the user agreed design solutions that emerged from the idea generation sessions, and subsequent prototyping and evaluation sessions.

5 Conclusions

The main objective of this paper was to explore how the design thinking inspired co-design approach could be used for idea generation, and prototyping for creating user agreed design solutions for an intended information system. The paper reported a well detailed Ideation Governance process and an Idea Lab process for effective idea generation, idea selection, and subsequent prototyping to create design solutions agreed by users of the intended information system. Results of this study suggest that prototypes and design solutions provide more human-centeredness as a result of active user engagement in idea generation, prototyping, and evaluation.

References

1. Niemelä, M., Ikonen, V., Leikas, J., Kantola, K., Kulju, M., Tammela, A., Ylikauppila, M.: Human-driven design: a human-driven approach to the design of technology. In: Kimppa, K., Whitehouse, D., Kuusela, T., Phahlamohlaka, J. (eds.) HCC11 2014. IFIP AICT, vol. 431, pp. 78–91. Springer, Heidelberg (2014)
2. Johnson, M.: Towards human-centred requirements management in distributed design. In: Smith, M.J., Salvendy, G. (eds) Systems, Social and Internationalization Design Aspects of Human-Computer Interaction, vol. 2, pp. 642–646 (2001)
3. Gabrysiak, G., Giese, H., Seibel, A.: Towards next-generation design thinking II: virtual multi-user software prototypes. In: Plattner, H., Meinel, C., Leifer, L. (eds.) Design Thinking Research: Studying Co-Creation in Practice. Understanding Innovation, pp. 107–126. Springer, Heidelberg (2012)
4. Meinel, C., Leifer, L.: Design thinking research. In: Plattner, H., Meinel, C., Leifer, L. (eds.) Design Thinking Research: Understand – Improve – Apply. Understanding Innovation, p. xiv. Springer, Heidelberg (2011)
5. Alessi, M., Camillò, A., Chetta, V., Giangreco, E., Soufivand, M., Storelli, D.: Applying Idea Management System (IMS) approach to design and implement a collaborative environment in public service related open Innovation processes. *Complex Syst. Inf. Model. Q.* **5**, 26–38 (2015)
6. Westerski, A., Dalamagas, T., Iglesias, C.A.: Classifying and comparing community innovation in Idea Management Systems. *Decis. Support Syst.* **54**(3), 1316–1326 (2013)
7. Sadriev, A.R., Pratchenko, O.V.: Idea management in the system of innovative management. *Mediterranean J. Soc. Sci.* **5**(12), 155–158 (2014)
8. Yock, P.G., Zenios, S., Makower, J., Brinton, T.J., Krummel, T.M., Kumar, U.N., Denend, L.: *Biodesign*, p. 176. Cambridge University Press (2015)
9. Bilton, C., Cummings, S.: *Creative Strategy: Reconnecting Business and Innovation*, p. 16. Wiley, Chichester (2010)
10. Cropley, D.H., Cropley, A.J.: *The Psychology of Innovation in Organizations*, p. 14. Cambridge University Press, New York (2015)
11. Shalley, C.E., Gilson, L.L.: What leaders need to know: A review of social and contextual factors that can foster or hinder creativity. *Leadersh. Quart.* **15**(1), 33–53 (2004)
12. Shalley, C.E.: Effects of coaction, expected evaluation, and goal setting on creativity and productivity. *Acad. Manag. J.* **38**, 483–503 (1995)
13. Woodman, R.W., Sawyer, J.E., Griffin, R.W.: Toward a theory of organizational creativity. *Acad. Manag. Rev.* **18**, 293–321 (1993)
14. Amabile, T.M.: A model of creativity and innovation in organizations. *Res. Organ. Behav.* **10**(1), 123–167 (2004)
15. Sawyer, R.K., Bunderson, S.: Innovation: A review of research in organizational behavior. In: Thakor, A. (ed.) *Innovation and Growth: What Do We Know?*, pp. 13–55. World Scientific Press, Singapore (2013)
16. Boeddrich, H.: Ideas in the Workplace: A New Approach Towards Organizing the Fuzzy Front End of the Innovation Process. *Creativity Innov. Manag.* **13**(4), 274–285 (2004)
17. Flynn, M., Dooley, L., O’Sullivan, D.: Idea management for organizational innovation. *Int. J. Innov. Manag.* **7**(4), 417–442 (2003)
18. Nilsson, L., Elg, M.: Secure spread-spectrum watermarking for multimedia. *IEEE Trans. Image Process.* **6**(12), 64–69 (1997)

19. Brem, A., Voigt, K.: Integration of market pull and technology push in the corporate front end and innovation management - Insights from the German software industry. *Technovation* **29**(5), 351–367 (2009)
20. Hrastinski, S., Kviselius, N.Z., Ozan, H., Edenius, M.: A review of technologies for open innovation: characteristics and future trends. In: *Proceedings of the Annual Hawaii International Conference on System Sciences* (2010)
21. Xie, L., Zhang, P.: Idea management system for team creation. *J. Softw.* **5**(11), 1187–1194 (2010)
22. Jensen, A.R.V.: A literature review of idea management. In: *Proceedings of the 9th NordDesign Conference, NordDesign 2012, Aalborg University, Denmark, 22–24 August 2012*