Exploration of Ideas for Sustaining Digital Innovation Management: A Case Study in the Ostrobothnia Region of Finland

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Emergent Research Forum (ERF)

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Abstract

Disruption of technologies, climate changes and epidemic crises have significantly affected individuals, organizations, and society. These phenomena force organizations to extend and innovate their business models to adapt to new circumstances. However, literature provides a limited coverage on how sustainable innovations ideas form and evaluate in practice. We thus focus on this issue in the present study. We used nominal focus group technique, C-K design theory for innovative design with citizen sciences as our study's lenses. Data collection was from three groups of 81 participants who live in three cities in the Ostrobothnia region of Finland. The findings illustrate the process of establishing a sustainable innovation management idea and lesson learned on how to facilitate innovation groups in practice.

Keywords

Digital innovation, transformation, citizen science, case study, nominal focus group, Finland.

Introduction

Disruption of technologies, climate changes and epidemic crises have significantly affected individuals, organizations, and society. For example, these phenomena force organizations to extend and innovate their business models to adapt to new circumstances, which result in changed organizational structures to provide or improve new services, products, customers engagement, and processes (Dang and Vartiainen 2019; Sebastian et al. 2020). However, the results of innovations are far from expectations. For example, about 70% of all digital innovations and transformation initiatives do not reach their goals and lead to waste billions of dollars (Tabrizi et al. 2019). Even if those innovation initiatives are successful, there is approximately 45% chance of delivering less profit than expected (Bughin et al. 2019).

It is argued that the process of digital innovation within an information systems (IS) context is not well understood (Carroll 2020). In particular, literature provides a limited coverage on empirical research that can explain the process of innovations, such as how innovations ideas establish and how innovations ideas become implemented, embedded, integrated, and evaluated in practice. This raises questions on how innovations are managed and how to better sustain them in practice (Hassan et al. 2019). In a similar vein, the energy sector is changing at a rapid pace due to the disruptive changes of digital technologies and climate changes. For example, there is an increasing ratio of renewable and decentralized energy generation around the world (Varela 2018). This trend also brings challenges to managers for seeking sustainable innovation ideas for organizations as they do not want their initiatives to fail.

As a result, in this research we try to answer the following research question: How is an innovation idea formed for sustainable innovations in practice? We used interpretive case study as our research approach.

We established three groups of 81 participants who live in three cities in the Ostrobothnia region of Finland. The findings of this study illustrate the process of establishing a sustainable innovation management idea and lesson learned on how to facilitate innovation groups in practice.

Background and Theoretical Framework

Digital Innovation Management

Digital innovation management refers to the practices, processes, and principles that underlie the effective orchestration of digital innovation (Nambisan et al. 2017, p.424). Theories in innovation management are primarily based on three key assumptions: innovation is a well-bounded phenomenon (c.f., Ulrich and Eppinger 2011), agencies can organize for innovation (Nambisan et al. 2017), and innovation processes and outcomes are distinctly different phenomenon (Ahmad et al. 2013). However, these assumptions are being challenged in digital innovation. In particular, boundaries on an innovation outcome and innovation processes are unpredictability in digital innovation (Lyytinen et al. 2016; Yoo et al. 2010). Innovation can occur outside the control of the primary innovator, meaning that digital innovation shifts toward less predefined and more distributed innovation agency (e.g., distributed innovation, open innovation, work-centric innovation) (West and Bogers 2014). Finally, innovation processes and innovation outcomes are complex and dynamic in digital innovation, both are not necessarily distinctly different (Dougherty and Dunne 2012). As a result, literature calls for more research to address these challenges. For example, Nambisan et al. (2017) called for more research on explaining how innovation collectives form a shared innovation agenda. We focus on this issue in the present paper.

Nominal Focus Group and Citizen Science

Nominal Focus Group (NFG) is a technique based on the Focus Group (FG) and the Nominal Group Technique (NGT). FG refers to a face-to-face small-group technique that enables the exploration of participants' perceptions of given topics (Varga-Atkins et al. 2017), while NGT refers to a group process model for problem identification, solution generation, and decision making (Delbecq and Van de Ven 1971). NFS helps to deal with ill-structured problems. Figure 1a illustrates the process of making decisions using NFG. The first stage consists of an FG, in which the facilitator guides participants. The second stage is an NGT, in which individuals giving their views with explanation, groups then discuss, and members proceed to rank solutions. The solution with the highest total ranking is selected as the final decision.

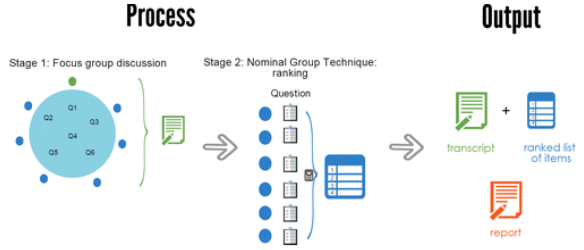

Figure 1a. Nominal Focus Group (Varga-Atkins et al. 2017)

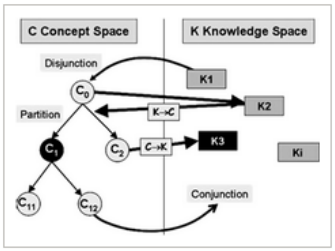

Figure 1b. C-K dynamics (Gillier et al. 2010, cited Hatchuel and Weil 2003)

Citizen science refers to partnerships between scientists and the public in scientific research (Mäkipää et al. 2020, p.4640). Citizen science provides research on a phenomenon with the involvement of people in their everyday lives and it allows researchers to look at various aspects of society (Levy and Germonprez 2017). Citizen science thus fits well in our research as we use this approach to collect ideas from citizens. In this research, we follow the guidance of interaction models between scientists and members of the public (Shirk et al. 2012). We chose co-creation as the interaction model for our research: members of the public develop a study and work with input from scientists to address a question of interest or an issue of concern.

C-K Design Theory for Innovative Design

The C–K theory of design provides a framework for innovative design (Hatchuel and Weil 2003). There are two spaces: a space C of concepts and a space K of knowledge (Figure 1b). Space K includes established

propositions and all the designers' available knowledge, while Space C contains concepts about partially unknown objects (x)- "*undecidable*" in K (neither true nor false) (Gillier et al. 2010). The aim of the design process is transforming *undecidable* propositions into true propositions in K. The external operators (C→K, K→C) and the internal operators (C→C, K→K) are expanded during the process of design. The design process ends when a proposition that was previously *undecidable* becomes *decidable* in K.

Case Settings and Research Methods

Ostrobothnia is situated on the west coast of Finland. The region is seeking ideas to sustain innovation from different stakeholders. As a result, the CS3-Innovation project was piloted aiming at promoting realization of innovation opportunities related to citizen involvement, citizen science and consumer innovation, as well as strengthening the provincial learning process related to smart specialization. Three areas are considered: sustainable and energy efficient city; energy efficient food production; and new services related to energy use. This study responds to this call by focusing on how innovation ideas are formed from different perspectives: ordinary people, customers, and consumers. The variety of participants may provide rich and diverse knowledge in innovation and provide potential solutions that would be used more effectively.

Due to the nature of our work, we used interpretive case study, we applied NFG with citizen science. We first recruited and established three group represent to three cities in the Ostrobothnia's region, including Pietarsaari (N=34, age 16-18), Närpiö (N=20, age 25-50), and Vaasa (N=19, age 21-28) cities. We then conducted workshops from Feb. 2018 to Dec. 2018. To gather ideas of innovations, we organized workshops in each city. In Pietarsaari and Närpiö, we were seeking digital innovative ideas of sustainability and energy efficiency in the city, energy efficient food production, and new energy services. In Vaasa, we followed the same procedure, but we were seeking ideas for information system development. During the workshops, FG was used with facilitators, participants can contribute their own issues, not just those pre-determined by the facilitator. Then, NGT was used citizen with science's co-creation between participants and scientists (e.g., one of the authors and the project staff). The procedure first included collecting problems and challenges. Next, the most severe problem was chosen. Then, we collected the opportunities and solutions to address this problem, and lastly, the best solutions for further development were chosen (Figure 2a).

Figure 2a. An example of outcomes

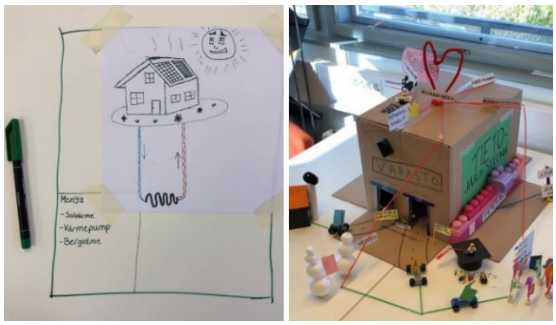

Figure 2b. Examples of the prototypes

After choosing the best solution, participants built a sketch or a low-fidelity 3D mockup (a prototype) of the solution using craft supplies and materials in order to discuss and develop further the group's idea (Figure 2b). While participants were working during the workshop, the researchers observed different groups of four to five participants (and participated if necessary). The aims were proposing a new model of citizen-centered innovation and testing it with different user groups.

Findings and Discussions

Using NFG with citizen science for seeking sustainable innovation ideas

In each workshop, we followed the following steps to seek innovation ideas from participants by using citizen science. Figure 3 shows our proposed steps and timelines to conduct a workshop to seek sustainable innovation ideas. It is noted that after every workshop we adjusted settings (e.g., time, guidance, other factors) to find an optimal procedure for the next workshop. First, the innovation ideas to be investigated are identified according to the study's aims aligned with three areas of Ostrobothnia region's strategies.

Also, the researchers together with participants identify existing knowledge relating to three mentioned areas. This were done during discussions at the workshops by matching K-space of C-K theory among participants (#1 Figure 3). Second, in the development of new knowledge (K-space) and concepts (C-space), participants developed ideas by using trees to break down ideas as shown in C-K theory. This process resulted in several ideas being discovered and defined, those proposed ideas meet study's aims and variants (e.g., resources, time constraints). Different groups of participants might have different ideas/projects (#2 and #3 in Figure 3).

Figure 3. The process of seeking ideas in the workshop

Third, participants conduct deeper research on their ideas (e.g., R-D, prototyping). In this step, concepts (C-space) will be divided into two groups: restrictive (supported by existing knowledge) and expansive concepts (based on new knowledge). Knowledge is organized into three categories: existing knowledge, knowledge produced, and future knowledge to acquire (#4 in Figure 3). Fourth, all ideas and associated concepts and knowledge are presented. The researchers and project team then evaluated them. This activity helps identify values of ideas, their relations, gaps, as well as identifying the most interesting ideas. At the final activities of this step, participants get feedback on their proposals (#5 in Figure 3). Through the process, ideas are produced through citizen science's co-creation between scientists and participants to address issues of concerns. Also, through the interactions between participants and activities organized by the researchers, the best practices (ideas) were identified with different processes, time, and communications. Those ideas were built by considering participants' culture, background, ages, and society. We found an important step in our study that differs from Varga-Atkins et al. (2017), which is building a prototype. This activity puts the groups to think about their solutions more carefully and produce a concrete solution. The accuracy of the ideas presented by the prototype differed significantly from the idea chosen in the third stage. We found that the ideas in the third stage are still on a general level e.g., often existing in K-space, but making a prototype generates second step innovations related to the implementation of the idea e.g., partially unknown object C-space (Hatchuel and Weil 2003).

Lessons learned

Several conclusions have been drawn from our study. **(1) Provide support and guidance.** The groups were able to work in the workshop with a dynamic, we found that it is good to support and guide those groups to work on the idea forward efficiently. It is important not to enter a feed that is too broad or too detailed because it may exclude those participants who are not interested in exactly the given topics. However, the topic should not be left without the subject completely. **(2) State a clear and limited time goal but be flexible as appropriate.** To effectively organize the workshop, a time limit should be set for the steps. However, it is important that the organizers are flexible with time and follow at what stage the groups are to adjust a new time limit if necessary. **(3) Clock the steps.** Although time can be flexible, it is important to foster groups to produce ideas and innovations by giving time pressure by clocking steps. **(4) Build clear modular steps.** Steps should be presented to participants at the beginning of the workshop so that participants can orient themselves to produce a certain number of thoughts at once. This strengthens the concentration of participants to achieve the stage goal. **(5) Provide additional material and, if necessary, additional feed.** In our workshops, some of the groups got stuck in producing ideas or did not work well at the beginning. For those groups we asked guiding questions (e.g., what they have experienced as problematic when living in this area). Also, in some cases we also gave additional feed. For example, in cases where we noticed the group's interest in mobile applications, we suggested them to seek solutions that can be addressed with mobile applications. **(6) Know your audience.** For the preparation of the workshop, it is important to know whether the participants have some special needs related to time, place and materials. **(7) Recruit a suitable group for a total of 20-25 people per workshop, with small groups of 4-6 people.** We recommend keeping the number of workshop participants relatively

small so that participants can concentrate well, and facilitators are more available to help participants if necessary. However, a group that is too small, the dynamics of the group will be lacking.

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REFERENCES

Ahmad, S., Mallick, D. N., and Schroeder, R. G. 2013. "New Product Development: Impact of Project Characteristics and Development Practices on Performance," *Journal of Product Innovation Management* (30:2), pp. 331–348.

Bughin, J., Deakin, J., and O'Beirne, B. 2019. "Digital Transformation: Improving the Odds of Success." (https://www.mckinsey.com, accessed September 14, 2021).

Carroll, N. 2020. "Theorizing on the Normalization of Digital Transformations," *ECIS 2020 Proceedings*.

Dang, D., and Vartiainen, T. 2019. "Digital Strategy Patterns in Information Systems Research," *PACIS 2019 Proceedings*.

Delbecq, A. L., and Van de Ven, A. H. 1971. "A Group Process Model for Problem Identification and Program Planning," *The Journal of Applied Behavioral Science* (7:4), SAGE Publications Inc, pp. 466–492.

Dougherty, D., and Dunne, D. D. 2012. "Digital Science and Knowledge Boundaries in Complex Innovation," *Organization Science* (23:5), INFORMS, pp. 1467–1484.

Gillier, T., Piat, G., Roussel, B., and Truchot, P. 2010. "Managing Innovation Fields in a Cross-Industry Exploratory Partnership with C–K Design Theory*," *Journal of Product Innovation Management* (27:6), pp. 883–896.

Hassan, N. R., Mathiassen, L., and Lowry, P. B. 2019. "The Process of Information Systems Theorizing as a Discursive Practice," *Journal of Information Technology* (34:3), pp. 198–220.

Hatchuel, A., and Weil, B. 2003. *A New Approach of Innovative Design: An Introduction to C–K Theory*, presented at the International Conference on Engineering Design, Stockholm, August 19, p. 16.

Levy, M., and Germonprez, M. 2017. "The Potential for Citizen Science in Information Systems Research," *Communications of the Association for Information Systems* (40:1).

Lyytinen, K., Yoo, Y., and Boland Jr., R. J. 2016. "Digital Product Innovation within Four Classes of Innovation Networks," *Information Systems Journal* (26:1), pp. 47–75.

Mäkipää, J.-P., Dang, D., Mäenpää, T., and Pasanen, T. 2020. "Citizen Science in Information Systems Research: Evidence from a Systematic Literature Review," *HICSS-53 Proceedings, 2020*.

Nambisan, S., Lyytinen, K., Majchrzak, A., and Song, M. 2017. "Digital Innovation Management: Reinventing Innovation Management Research in a Digital World," *MISQ* (41:1), pp. 223–238.

Sebastian, I. M., Ross, J. W., Beath, C., Mocker, M., Moloney, K. G., and Fonstad, N. O. 2020. "How Big Old Companies Navigate Digital Transformation," in *Strategic Information Management* (5th ed.), Routledge.

Shirk, J., Ballard, H., Wilderman, C., Phillips, T., Wiggins, A., Jordan, R., McCallie, E., Minarchek, M., Lewenstein, B., Krasny, M., and Bonney, R. 2012. "Public Participation in Scientific Research: A Framework for Deliberate Design," *Ecology and Society* (17:2).

Tabrizi, B., Lam, E., Girard, K., and Irvin, V. 2019. "Digital Transformation Is Not About Technology," *Harvard Business Review*. (https://hbr.org, accessed September 14, 2021).

Ulrich, K. T., and Eppinger, S. D. 2011. *Product Design and Development*, (5th edition.), New York: McGraw-Hill Education.

Varela, I. 2018. "Energy Is Essential, but Utilities? Digitalization: What Does It Mean for the Energy Sector?," in *Digital Marketplaces Unleashed*, C. Linnhoff-Popien, R. Schneider, and M. Zaddach (eds.), Berlin, Heidelberg: Springer, pp. 829–838.

Varga-Atkins, T., McIsaac, J., and Willis, I. 2017. "Focus Group Meets Nominal Group Technique: An Effective Combination for Student Evaluation?," *Innovations in Education and Teaching International* (54:4), Routledge, pp. 289–300.

West, J., and Bogers, M. 2014. "Leveraging External Sources of Innovation: A Review of Research on Open Innovation," *Journal of Product Innovation Management* (31:4), pp. 814–831.

Yoo, Y., Henfridsson, O., and Lyytinen, K. 2010. "The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research," *Information Systems Research* (21:4), INFORMS, pp. 724–735.