Design for Value in a Digital Supply Chain Ecosystem

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Abstract
Design for Value is a new research program focusing on supply chain digitalization in business-to-business environment. This paper describes the purpose and general structure of the program, as well as examples of the research questions and research approach. Special attention is placed on the changing role of experience design in automation and business ecosystems that are forming around autonomous systems.

Author Keywords
Digitalization; supply chain; business ecosystem; experience design.

Introduction
Digitalization transforms and disrupts current business models and business ecosystems. Digitalization has already enabled formation of new value chains and business ecosystems [1] that cross existing industry boundaries [2, 3]. Even though it is generally agreed that disruptions affect supply chains and ecosystems, there is a limited amount of information on how to manage this transformation from the perspective of partners involved [4].

Value creation today takes place in digital ecosystems that increasingly utilize robotics or other autonomous,

non-human actors in business operations [5]. While digitalization offers opportunities to create new value through a more dynamic integration and reconfiguration of resources, it also adds complexity and change on the level of the ecosystems.

As a result, there is a need for research that helps actors of an ecosystem to create value through new business models, but also to align their joint activities in a complementary and synergistic manner to maximize value creation throughout the ecosystem.

Design for Value Research Program

Design for Value (D4V) is an industry-driven research program (12/2016 - 12/2019) led by DIMECC[1] and funded by Tekes[2] that combines research and practice to implement a fully autonomous supply chain, starting from a factory and ending to a client company. D4V program transforms supply chain ecosystems by featuring novel value creation and attractive value sharing through introducing ecosystem level business models and digital platforms that enable scalable, replicable, digitalized, and autonomous door to door supply chain processes.

Obviously, a multidisciplinary consortium is required to make this change happen. The D4V researchers include experts of business models, sociotechnical systems, blockchain databases, cyber security, risk analysis and management, work analysis, service design and experience design. Altogether, the D4V consortium consists of 9 research organizations and 11 company partners in Finland.

[1] https://www.dimecc.com

[2] https://www.tekes.fi/en

Examples of the general research questions include:

- *What are the business models and ecosystems to enable business growth during and after digital disruption?*
- *What are the key technology solutions to enable, drive or restrict digital disruption?*
- *How to engage companies and their employees in the new ecosystem, and external stakeholders in the change?*

From human perspective, the change of work is a major research theme. The fate of the workers whose job will disappear or dramatically change is an issue of interest on a societal level. It is foreseen that there will be strong resistance from individual workers' and labor unions' side, which calls for collaborative design, e.g., facilitation of collaborative futuring sessions.

From interaction design perspective, an entirely new set of digital services is needed to serve the business ecosystem stakeholders. The ecosystem is visible through its services. The applications needed are not limited to utilitarian services, such as ordering transportation, but it is important to innovate services that differentiate the ecosystem and make it attractive to business partners and other stakeholders.

From business model innovation perspective, the key theme is the change towards fully autonomous business operations, which also means redefinition of the roles and relationships of the partners involved. This inevitably leads to the need to innovate the business models of the partners. The challenge is how the interrelated but still independent partners can innovate their business models, so that they are feasible and

sustainable at the company level, but also form a synergistic and complementary value add at the ecosystem level.

The three main research tracks in D4V program follow the Weiss' innovation engine with business viability, technical feasibility, and stakeholder desirability [6]. The authors of this paper are responsible of the business viability and stakeholder desirability tracks in D4V. Since the two tracks have much in common, we work in collaboration with the researchers in both tracks, as well as with practicing managers and experts of the partner companies. Discussions, interactive business model workshops and managerial sparring sessions support the more formal interviews. Both tracks will also investigate the legal and risk management topics. This project differs from the main business model research stream in two fundamental aspects: First, whereas business models are typically analyzed from the point of a single company, this project changes the investigative locus from company to intercompany and ecosystem level. Second, we see that innovation activities requires cyclical creation process paying attention to design of business models, technology and experience in an iterative manner (Figure 1). Especially, few researchers have addressed the interplay between business model innovation and experience design [7].

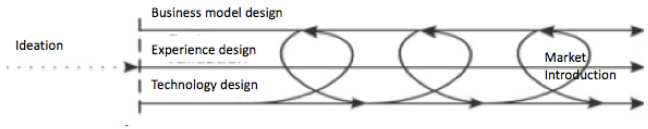

Figure 1 Cyclical Innovation process

Experience Design in Context of an Autonomous Supply Chain Ecosystem

Experience design refers to a design approach where an intended user experience is the primary driver of product or service design [8,9]. It seems obvious that designers of autonomous systems do not have to care about user experience, as there is no user any longer. However, autonomous systems do not arrive at once, but typically many phases of automation and work transformation are required until the system can become fully autonomous (if at all). There are users even for an autonomous system. In the case of an autonomous supply chain, there are people who want to send items to be transported, people receiving them, and people who want to monitor the transportation status. Management wants to monitor efficiency of the system and external stakeholders may urge to see statistics of sustainability or reliability of transportation. Such services are the face of the autonomous system, and experience design is essential in order to compete with other similar systems.

Experience design is hardly used in the design of autonomous systems. While business-to-consumer (B2C) industry has understood the importance of user experience in long-term business success, business-to-business (B2B) industry seldom pays attention to the experiential aspects of product and service design. Instead, value in B2B and in business ecosystems is too often seen as plain monetary value, i.e., the price versus utilitarian benefits of products. However, the customer company also values the reputation, location, innovativeness and future capabilities of the supplier [10], and end-user experience is slowly gaining more attention as a new means to deliver value for the customer also in business-to-business context [11].

When designing for value in this project, we are not only after the monetary value, but also after a desirable ecosystem where experiential value plays an important role. Experiential value in a business ecosystem comes, e.g., from enjoyable services, community feeling, trust in the ecosystem, and pride of being part of it. Thus, experience design in the business ecosystem combines designing for user, customer, and brand experience. Using experience design in the formation of a new business ecosystem is an intriguing research opportunity. Compared to product design, where the technology competence of a company determines its design space, business ecosystem design provides better chances to first determine the experience goal and then choose the means to enable the experience. There are many options, e.g., to make an autonomous supply chain feel more human in different touchpoints.

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