Journal of Business Models

2020

Vol. 8 - No. 2

Journal of Business Models (2020), Vol. 8, No.2
Editorial staff: Robin Roslender, Marco Montemari, Mette Rasmussen

Graphics:

Font: Klavika

ISBN: 978-87-7112-126-1
ISSN: 2246-2465

Published by:

Aalborg University Press
Skjernvej 4A, 2nd floor
9220 Aalborg
Denmark
Phone: (+45) 99 40 71 40
aauf@forlag.aau.dk
www.forlag.aau.dk

... IN THIS ISSUE

Journal of Business Models (2020), Vol. 8, No. 2, pp. i - ii

JOBM
Journal of Business Models

A message from the editorial team

Robin Roslender, Editor- in-chief; Christian Nielsen, Consulting editor

---

Welcome to the first standard issue of volume 8 of the Journal of Business Models. Despite the current restrictions on everyone's activities, the team has been able to assemble an issue that includes eight papers, five full length and three short papers.

The opportunity to include three short papers is particularly welcome and the hope is that going forward each standard issue will incorporate one or more of them. Responsibility for short papers was recently assumed by Dr Marco Montemari (m.montemari@staff.univpm.it) of the Universita Politecnica delle Marche in Ancona, Italy. Marco has previously had editorial responsibility for the special issues of short papers presented at the Business Model Conferences in 2018 and 2019. The word limit for short papers will increase in the future and they will continue to be subject to external peer review but we aim to complete the review process within an appropriate timescale.

Special issues of the Journal of Business Models have become more numerous in recent volumes, something the editorial team wish to continue. Responsibility for special issues now resides with Professor Lorenzo Massa, who recently joined Aalborg University Business School. Suggestions for and enquiries about future special issues should be directed to Professor Massa at lorenzo.massa@buisness.aau.dk.

Full length submissions remain the responsibility of Professor Robin Roslender, now also a faculty member at Aalborg University Business School. All submissions are subject to a double-blind peer review process which, while being lengthy, is designed to ensure the quality and enhance the impact of the papers published in the Journal of Business Models. Reviewers are drawn from the journal's editorial boards together with a pool of ad hoc reviewers, all of whom have a demonstrated expertise in the business model and related fields. Enquiries about prospective submissions should be mailed to me at rroslender@business.aau.dk.

As many readers will know, the Fourth Business Model Conference scheduled to be held in Copenhagen in early June of this year was cancelled as a result of the Covid-19 epidemic. The event has now been rescheduled for 3 and 4 November, with a PhD workshop on 2 November, at Aalborg University's Copenhagen campus. Submissions are still invited, with the existing submissions being carried forward. Dr Montemari will again take responsibility for receipt and processing submissions on behalf of the Scientific Committee. Full details of the event are available on the conference website.

The conference will provide the opportunity for an inaugural meeting of the journal's editorial boards, at which we will discuss a publication strategy for the next three years. Details of this strategy will be added to the journal website by the end of the year as part of a comprehensive overhaul of its structure and content. The meeting will also provide the opportunity to formally thank our colleagues and former senior editors of the Journal of Business Models, Colin Haslam and Petri Ahokangas, who together with Christian Nielsen founded the journal in 2013 and have worked tirelessly to establish its current reputation.

One member of the editorial team merits particular mention, the Managing Editor Mette Rasmussen. Many readers will already have communicated with Mette in her support contact role, one of many she undertakes conscientiously in connection with the Journal of Business Models. This work is only one part of her portfolio of responsibilities at Aalborg, all of which she performs in similar manner. Many, many thanks Mette

Hope to see many of you in Copenhagen in November

Professor Robin Roslender, Editor-in-chief

Professor Christian Nielsen, Consulting editor

JOBM
Journal of Business Models

AI and Business Model Innovation: Leverage the AI Feedback Loops

Evangelos Katsamakas[1] and Oleg Pavlov[2]

Abstract

Purpose: The article analyzes the effects of Artificial Intelligence (AI) on Business Model Innovation (BMI), focusing on the platform business model.

Design/Methodology/Approach: Proposes a CLD (Causal Loop Diagram) model and analyzes the model to discuss insights about the structure and performance of the business model.

Findings: Shows that AI enables key strategic feedback loops that constitute the core structure of the business model.

Practical Implications: Managers and entrepreneurs who seek to leverage AI should invest in the AI feedback loops. An AI strategy for BMI should seek to create, strengthen, and speed-up AI feedback loops in the business model.

Originality/Value: Analyzes the effects of AI on BMI while accounting for dynamic complexity as a business model property to be understood and leveraged. Contributes to our understanding of the business value and impact of AI.

Keywords: AI strategy, Business Model, Platforms, Digital Transformation, Dynamic Complexity.

Please cite this paper as: Katsamakas, E. and Pavlov, O (2020), AI and Business Model Innovation: Leverage the AI Feedback Loops, Vol. 8, No. 2, pp. 21-30

1 Gabelli School of Business, Fordham University, New York, NY, USA
2 Worcester Polytechnic Institute, Worcester, MA, USA

Introduction

AI is expected to have a transformative impact on the economy and society (Brynjolfsson and McAfee, 2016). However, companies are struggling to make sense of the business impact of AI and create a coherent AI strategy. This article brings together the concepts of AI and Business Model Innovation, analyzing the effects of AI on Business Model Innovation. BMI can be seen as a process and an outcome, the innovative business model (Foss and Saebi, 2017). To make the analysis specific and useful, the article focuses on the platform business model (Economides and Katsamakas, 2006; Parker and Van Alstyne, 2005), the most innovative business model archetype in the digital economy (Abdelkafi et al., 2019; Parker, Van Alstyne, and Choudary, 2016).

An extensive literature on business models spans across fields such as management, strategy, innovation, and information systems. In early work, (Osterwalder, Pigneur and Tucci, 2005) called for a clarification of the business model concept. In simple terms, a business model is "a blueprint of how a company does business," and it defines "the logic of the firm": how a company creates and delivers value to customers and how it captures value.

Business model innovation (BMI) is crucial to business viability (Demil and Lecocq, 2010). Several authors propose normative frameworks for practitioners, such as the business model canvas (Osterwalder and Pigneur, 2010), a template of nine building blocks: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, cost structure.

Zott, Amit, and Massa (2011) note the business model concept is emerging as a new unit of analysis, emphasizing a holistic approach to how a firm does business. Moreover, firm activities play an essential role in a business model, "a system of interconnected and interdependent activities that determines the way the company does business with its customers, partners and vendors."

In most recent reviews, (Massa, Tucci and Afuah, 2017) suggest three interpretations of business model (attributes of firms; cognitive schemas; formal representation of how a business functions) and discuss the relationship with the rest of strategy literature. (Foss and Saebi, 2017) identify issues of construct clarity and research gaps and recommend future research related to complexity and entrepreneurship. (Täuscher and Abdelkafi, 2017) review the value of visual tools in BMI. (Wirtz and Daiser, 2017) explore an integrative BMI framework in which technology and firm dynamics are important dimensions. It also discusses BMI at Google as an illustrative example.

The closest article to our approach is (Casadesus-Masanell and Ricart, 2010), which clarifies the difference between strategy and business model, and proposes that Causal Loop Diagrams (CLDs) are a useful representation of business models illustrating an old-economy airline example.

This article contributes to a rigorous understanding of business model dynamics in the digital economy. It provides a framework to understand AI effects on business models, adding to the literature related to the dynamic impact of technology on business (Georgantzas and Katsamakas, 2008). The critical motivating question is: How can we analyze the effects of AI on BMI while accounting for dynamic complexity as a feature of business that needs to be understood and leveraged?

Approach and Model

We build a framework to explore business models using Causal Loop Diagrams (CLDs). A positive link between two variables in a CLD means that an increase of the first variable leads to an increase of the second variable.

The research focuses on key feedback loops that drive business model performance and sheds light on the dynamic complexity of digital business models. We focus on the platform business model, which is the most important new form of business model enabled by the Internet and digital technologies (Bakos and Katsamakas, 2008; Sorri *et al.*, 2019).

The availability of more content, apps, and services on a digital platform attract more users, which in turn attract even more content, apps and services (Eisenmann, Parker and Van Alstyne, 2006; Hagiu, 2014;

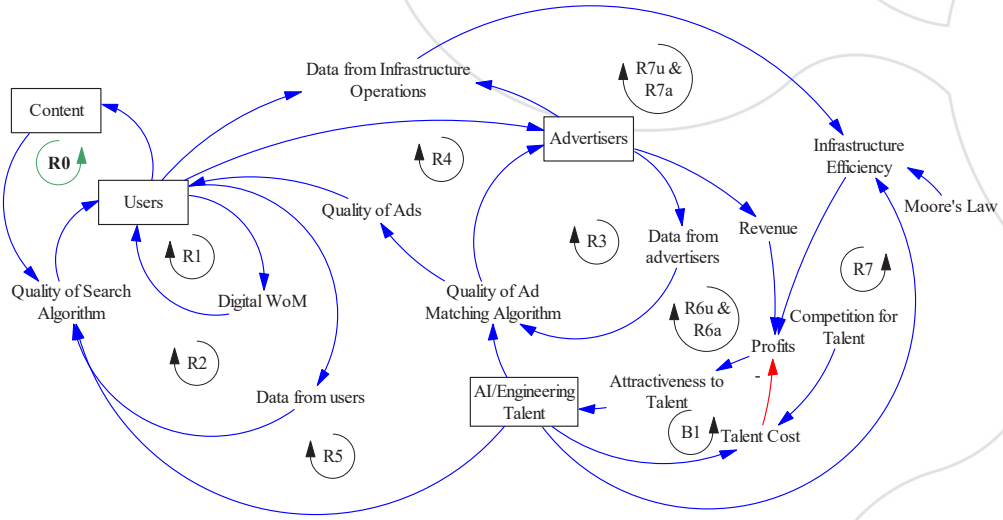

Figure 1: Advertising based digital content and services platform business model (e.g., Google)

Katsamakas and Madany, 2019). This mechanism of two cross-side network effects constitutes a reinforcing feedback loop, depicted at the top left corner of our model (R0 feedback loop in Figure 1). Our model (Figure 1) illustrates the structure of one type of digital platform, an advertising-based content and services platform (e.g., Google). The platform provides users with access to digital content and services and makes revenue from advertisers.

We describe some of the critical feedback loops that constitute the core structure of the business model. *Users* bring more users to the platform through *Digital WoM (Word of Mouth)* (R1 reinforcing feedback loop). This feedback loop is an important mechanism for platform adoption and growth.

More *Users* mean that the platform collects more *Data from users*, which drives higher *Quality of Search Algorithm*, which provides more relevant organic search results, hence attracts more users (R2 reinforcing feedback loop).

Advertisers are attracted by platform *Users*. More *Advertisers* and more *Data from advertisers* help improve the *Quality of Ad Matching Algorithm*. This has two effects: it directly attracts more *Advertisers* (R3 reinforcing feedback loop), and it improves the *Quality of Ads*, which helps attract more *Users*, thus more *Advertisers* (R4 reinforcing feedback loop).

More *Advertisers* raises the platform *Revenue* and *Profits*, which helps attract *AI/Engineering Talent*, which further helps drive a higher *Quality of Search Algorithm*, which brings even more *Users* and more *Advertisers* (R5 reinforcing feedback loop).

AI/Engineering Talent brings improvements to *Quality of Ad Matching Algorithm*, which leads to more *Advertisers* (R6a feedback loop), as well as higher *Quality of Ads* and more *Users* (R6u feedback loop).

AI/Engineering Talent is also crucial for improving *Infrastructure Efficiency*, as they optimize digital infrastructure at scale, aided by Moore's Law. This helps increase *Profits*, which helps attract event more *AI/Engineering Talent* (R7 feedback loop).

Moreover, serving more *Users* and *Advertisers* leads to more *Data from Infrastructure Operations* (e.g., running sophisticated data centers), which is used to further improve *Infrastructure Efficiency* and *Profits*, with associated positive effects on *Users* (R7u feedback loop) and *Advertisers* (R7u feedback loop).

All these reinforcing feedback loops provide the core structure of the ad-based platform business model and drive its performance, growth, and sustainability. The business model performance can be measured by *Profits*, as well as by market-share (number of *Users* and *Advertisers*).

Figure 1 also shows one balancing feedback loop that may moderate the effect of the reinforcing loops. As the platform attracts more *AI/Engineering Talent*, and has to pay higher salaries due to *Competition for Talent*, the *Talent Cost increases* and this hurts *Profits* (B1 balancing loop).

Analysis and Key Insights

AI as a field aiming to build and understand intelligent systems, has a long history and applications, such as expert systems, natural language processing, robotics etc. (Russell and Norvig, 2010). But recent advances in AI, especially in the form of machine learning and neural networks (deep learning), allowed for more innovation and elevated the use of AI in business as a primary concern of business leaders (McKinsey, 2018). For example Google has been using algorithms that learn from data in search since the company's inception.But most recently, Google has substantially improved the quality of search results using deep learning algorithms, such as BERT (Nayak, 2019).

Several researchers have written about the business effect of AI, exploring issues such as the future of work, bias and trust, and the economics of AI (Raj and Seamans, 2019). For example, (Agrawal, Gans and Goldfarb, 2018, 2019) argue that AI lowers the cost of prediction, and this has significant implications for managers. The unique perspective of our article is that it looks at the effect of AI at the level of the business model. We use the proposed framework to understand the effects of AI on business model innovation, focusing on the platform business model.

Figure 1 shows that AI has a crucial effect on a platform business model, because it enables new reinforcing feedback loops that constitute the core structure of the business model and drive its growth and profitability. AI may also strengthen, or speed up, existing reinforcing feedback loops. Table 1 summarizes the effects of AI in a template of three elements: **AI for User Experience**, **AI for Advertiser Experience**, **AI for Efficient Infrastructure at scale**. Each element is a cluster of feedback loops. In all three elements, *Data* is a strategic resource connecting AI with Business Model Innovation. We summarize selected insights from each element.

AI for User Experience: *Data from Users* is a key resource in this cluster of feedback loops that reinforces an improvement of user experience over time. *AI/Engineering talent* leverages *Data from Users* to improve the *Quality of Search Algorithm*, which improves the user experience concerning access to *Content* (R0, R2, R5). *AI/Engineering talent* leverages *Data from Advertisers* to improve the *Quality of Ad-matching Algorithm*, which enhances the user experience for relevant advertising (R4). Other secondary feedback loops that help attract *AI/Engineering talent* (either through more revenues or lower infrastructure costs) also contribute to better user experience (e.g., R6u, R7u).

AI for Advertiser Experience: *Data from Users* is a crucial resource in this cluster of feedback loops that reinforce an improvement of user experience over time. *AI/Engineering talent* leverages *Data from Advertisers* to improve the *Quality of Ad-matching Algorithm* (R3), which improves the targeting of *Users*. Feedback loops, such as R4, that increase the number of *Users* are

AIBM Template Element	Key Feedback Loops	Primary data resources	Other key resources
AI for User Experience	R0, R2, R5, R4	Data from Users, Data from Advertisers	AI/Engineering Talent, Search Algorithm, Ad-Matching Algorithm
AI for Advertiser Experience	R3, R4	Data from Advertisers	AI/Engineering Talent, Ad-Matching Algorithm
AI for Efficient Infrastructure at scale	R7, R7u, R7a	Data from Infrastructure Operations	AI/Engineering Talent, Infrastructure Optimization Algorithms

Table 1: AIBM template – Key effects of AI on business model

crucial to the business model. Other secondary feedback loops that help attract *AI/Engineering talent* also contribute to better advertising experience (e.g., R6a, R7a).

AI for Efficient Infrastructure at scale: *AI/Engineering talent* leverages *Data from Infrastructure Operations* to improve the *Efficiency of Infrastructure*, which increases *Profits* and help attract even more *AI/Engineering talent* in a competitive market for talent (R7). Other secondary feedback loops that help attract more *Users* and more *Advertisers* help the company collect more *Data from Infrastructure Operations,* contributing to improved economies of scale (R7u, R7a).

We can now generalize these mechanisms into two high-level AI-related processes that apply to all business models: data accumulation and data exploitation.

Data accumulation is the process of aggregating data from serving customers and other business processes and operations. Figure 1 shows how *Data from Users, Data from Advertisers*, and *Data from Infrastructure Operations* accumulate in the platform business model. Data from external sources (data acquisition) can support data accumulation when necessary.

Data exploitation is the process of using Artificial Intelligence (AI) to leverage accumulated data to create business value. Data exploitation helps improve the quality of platform services and business processes, as well as the overall performance of the business model. Figure 1 shows how the platform business model exploits data to improve the *Quality of Search Algorithm*, *Quality of Ad Matching,* and *Infrastructure Efficiency*.

Our causal model shows that data accumulation and data exploitation are crucial processes. Most importantly, those two processes reinforce each other: the more data a platform accumulates, the more data it can exploit, which helps collect even more data.

Discussion and conclusion

The unique contribution of this article is that it brings together the BMI and AI concepts, and it analyzes the effects of AI at the level of business model.

This article makes progress towards understanding business models as complex systems (Massa, Viscusi and Tucci, 2018). We focused on the dynamic, not the combinatorial, complexity of a business model. We presented a framework for describing the structure of digital business models using causal loop diagrams (CLD). The framework brings together key platform resources, such as *data*, *algorithms*, *AI talent*, and *infrastructure*. We proposed a three-element template (AIBM), and we showed that the feedback loop concept is critical in understanding the effects of AI at the level of business model. We generalized our discussion into data accumulation and data exploitation processes that reinforce each other.

Our research provides several insights for managers and entrepreneurs. First, mapping the business model using CLDs can be very powerful in the fast-changing digital economy, where platforms and platform ecosystems are prevalent (Jacobides, Cennamo, & Gawer, 2018; Katsamakas, 2014; Parker, Van Alstyne, & Choudary, 2016). A focus on feedback loops can help managers map the core structure of their business model that drives behavior and business performance. Moreover, it supports communication and assists managers and entrepreneurs to refine their mental models (Groesser and Jovy, 2016; Moellers *et al.*, 2019).

Second, managers need to understand and invest in the AI feedback loops in their business model. An AI strategy for BMI should seek to create, rewire, strengthen, and speed-up AI feedback loops in the business model. Managers and entrepreneurs need to ask: *Do the "AI feedback loops" work for our company? Or they work against our company? How can we best leverage the "AI feedback loops" in our BMI initiatives?*

Third, managers need to invest in the reinforcing mechanism of data accumulation and data exploitation to maximize the value of AI in their company.

We call for more research that accounts for the dynamic complexity in the context of BM and AI. Future research could map and analyze the CLDs of more business models, and synthesize that knowledge into generic patterns. Moreover, future work could take the analysis a step forward, building computational models.

References

Abdelkafi, N. *et al.* (2019), Multi-sided platforms, *Electronic Markets*, 29(4), pp. 553–559. doi: 10.1007/s12525-019-00385-4.

Agrawal, A., Gans, J. and Goldfarb, A. (2018), *Prediction Machines: the simple economics of artificial intelligence*, *Harvard Business Review Press*. doi: 10.1016/0166-3615(86)90070-9.

Agrawal, A., Gans, J. S. and Goldfarb, A. (2019), Exploring the impact of artificial Intelligence: Prediction versus judgment, *Information Economics and Policy*, 47, pp. 1–6. doi: 10.1016/j.infoecopol.2019.05.001.

Bakos, Y. and Katsamakas, E. (2008), Design and ownership of two-sided networks: Implications for internet platforms, *Journal of Management Information Systems*, 25(2), pp. 171–202. doi: 10.2753/MIS0742-1222250208.

Brynjolfsson, E. and McAfee, A. (2016), *The Second Machine Age*. New York: W. W. Norton & Company.

Casadesus-Masanell, R. and Ricart, J. E. (2010), From strategy to business models and onto tactics, *Long Range Planning*, 43(2–3), pp. 195–215. doi: 10.1016/j.lrp.2010.01.004.

Demil, B. and Lecocq, X. (2010) Business model evolution: In search of dynamic consistency, *Long Range Planning*, 43(2–3), pp. 227–246. doi: 10.1016/j.lrp.2010.02.004.

Economides, N. and Katsamakas, E. (2006), Two-sided competition of proprietary vs. open source technology platforms and the implications for the software industry, *Management Science*, 52(7) pp. 1057-1071. doi: 10.1287/mnsc.1060.0549.

Eisenmann, T., Parker, G. and Van Alstyne, M. W. (2006), Strategies for two-sided markets, *Harvard Business Review*, 84(10), pp. 92–101.

Foss, N. J. and Saebi, T. (2017) Fifteen Years of Research on Business Model Innovation: How Far Have We Come, and Where Should We Go?, *Journal of Management*, 43(1), pp. 200–227. doi: 10.1177/0149206316675927.

Georgantzas, N. C. and Katsamakas, E. (2008), Information systems research with system dynamics, *System Dynamics Review*, 24(3), pp. 274–284. doi: 10.1002/sdr.420.

Groesser, S. N. and Jovy, N. (2016), Business model analysis using computational modeling: a strategy tool for exploration and decision-making, *Journal of Management Control*, 27(1), pp. 61–88. doi: 10.1007/s00187-015-0222-1.

Hagiu, A. (2014), Strategic decisions for multisided platforms, *MIT Sloan Management Review*, 55(2), pp. 71–80.

Jacobides, M. G., Cennamo, C. and Gawer, A. (2018), Towards a theory of ecosystems, *Strategic Management Journal*, 39(8), pp. 2255–2276. doi: 10.1002/smj.2904.

Katsamakas, E. (2014), Value network competition and information technology, *Human Systems Management*, 33(1–2). doi: pp. 7-17 10.3233/HSM-140810.

Katsamakas, E. and Madany, H. (2019), Effects of user cognitive biases on platform competition, *Journal of Decision Systems*, 28(2), pp. 138–161. doi: 10.1080/12460125.2019.1620566.

Massa, L., Tucci, C. L. and Afuah, A. (2017), A critical assessment of business model research, *Academy of Management Annals*, 11(1), pp. 73–104. doi: 10.5465/annals.2014.0072.

Massa, L., Viscusi, G. and Tucci, C. (2018), Business Models and Complexity, *Journal of Business Models*, 6(1), pp. 59–71. doi: 10.5278/ojs.jbm.v6i1.2579.

McKinsey (2018), *An executive's guide to AI*, *Report*.

Moellers, T. *et al.* (2019), System dynamics for corporate business model innovation, *Electronic Markets*. Electronic Markets, pp. 387–406. doi: 10.1007/s12525-019-00329-y.

Nayak, P. (2019), *Understanding searches better than ever before*, *Google Blog*. Available at: https://www.blog.google/products/search/search-language-understanding-bert/ (Accessed: 1 May 2020).

Osterwalder, A. and Pigneur, Y. (2010), *Business Model Generation*, *Wiley*. Hoboken, NJ: Wiley.

Osterwalder, A., Pigneur, Y. and Tucci, C. L. (2005), Clarifying Business Models: Origins, Present, and Future of the Concept, *Communications of the Association for Information Systems*, 16(1), pp. 1–25. doi: 10.17705/1cais.01601.

Parker, G., Van Alstyne, M. and Choudary, S. (2016), *Platform Revolution*. New York: W.W. Norton & Company.

Parker, G. G. and Van Alstyne, M. W. (2005), Two-sided network effects: A theory of information product design, *Management Science*, 51(10), pp. 1449–1592. doi: 10.1287/mnsc.1050.0400.

Raj, M. and Seamans, R. (2019), Primer on artificial intelligence and robotics, *Journal of Organization Design*, 8, 11 (Note: it is online article so it does not have pages, it is just issue 8, article 11) doi: 10.1186/s41469-019-0050-0.

Russell, S. and Norvig, P. (2010), *Artificial Intelligence: A Modern Approach*. 3rd editio, *Pearson*. 3rd editio. New York: Prentice Hall. doi: 10.1017/S0269888900007724.

Sorri, K. *et al.* (2019), Business Model Innovation with Platform Canvas, *Journal of Business Models*, 7(2), pp. 1–13.

Täuscher, K. and Abdelkafi, N. (2017), Visual tools for business model innovation: Recommendations from a cognitive perspective, *Creativity and Innovation Management*, 26(2), pp. 160–174. doi: 10.1111/caim.12208.

Wirtz, B. W. and Daiser, P. (2017), Business Model Innovation : An Integrative Conceptual Framework, *Journal of Business Models*, 5(1), pp. 14–34.

Zott, C., Amit, R. and Massa, L. (2011), The business model: Recent developments and future research, *Journal of Management*, 37(4), pp. 1019–1042. doi: 10.1177/0149206311406265.

About the Authors

Evangelos Katsamakas is Professor of *Information, Technology & Operations*, at Gabelli School of Business, Fordham University. Professor Katsamakas' research analyzes the strategic and economic impact of digital technologies focusing on digital transformation, platforms and ecosystems, network effects, open source and open innovation, business analytics, and dynamics of complex systems. His research interests include economics of technology and analytical modeling, machine learning and computational modeling of complex business systems. Prof. Katsamakas' research appeared in *Management Science*, *Journal of Management Information Systems, System Dynamics Review, International Journal of Medical Informatics, Electronic Commerce Research and Applications, Business Process Management Journal* and in multiple other scholarly journals, conference proceedings and books. He served as guest editor of the special issue on *Information Systems Research and System Dynamics* (*System Dynamics Review*, 2008). His research on digital innovation received the 2016 Best Academic Paper Award from SIM (Society of Information Management). He received the 2018 Dean's Award for Teaching Innovation for his contribution to curriculum innovation. He served as Department Chair from 2012 to 2018. Professor Katsamakas holds a Ph.D. from the *Stern School of Business*, *New York* University, M.Sc. from the *London School of Economics* and a Computer Science and Engineering degree from the University of Patras, Greece.

About the Authors

Oleg Pavlov is an Associate Professor of Economics and System Dynamics at Worcester Polytechnic Institute (WPI) in Massachusetts, USA. He uses simulations and systems thinking tools to study causal feedback effects in complex social and economic systems. His research has been published in the *System Dynamics Review, Computational Economics, Journal of Economic Issues, Journal of Economic Dynamics and Control, Journal of the Operational Research Society*, and the *Handbook of Service Science*. He serves on the editorial boards of the *System Dynamics Review and Entrepreneurship Research Journal*. Dr. Pavlov is a past President of the Economics Chapter of the International System Dynamics Society and he was a Coleman Foundation Faculty Entrepreneurship Fellow. He has taught in the U.S., Finland, China, Russia, and the UK. Dr. Pavlov received an MBA from Cornell University, and a PhD and MA in Economics and a BS in Physics and Computer Science from the University of Southern California.

Journal of Business Models (2020), Vol. 8, No. 2, pp. 31-38

JOBM
Journal of Business Models

Can the Blockchain Lead to New Sustainable Business Models?

Francesca Dal Mas[1,*]
Maurizio Massaro[2]
Juan Manuel Verde[3]
Lorenzo Cobianchi[4]

1 Lincoln International Business School, University of Lincoln, Lincoln (United Kingdom)
2 Department of Management, Ca' Foscari University of Venice, Venice (Italy)
3 Institute of Image-Guided Surgery Institut Hospitalo-Universitaire (IHU) Strasbourg (France)
4 Department of Clinical-Surgical, Diagnostic and Pediatric Sciences, University of Pavia, Pavia (Italy)
** corresponding author. Email address: email.dalmas@gmail.com*

Abstract

New technologies can foster the development of new sustainable business models (SBMs). Our paper wants to investigate how the blockchain can facilitate the development of new SBMs by analyzing some real-world case studies. Findings highlight how the characteristics of the blockchain can extend existing theories in leading to new SBMs.

Introduction

New technologies and the development of new SBMs

New technologies enable economic, social, and business transformation (Cohen *et al.*, 2017). First studies focused mainly on the impact of new technologies for enhancing the organizations' competitive advantage to increase profits and the value for the shareholders (Melville *et al.*, 2004). Later studies highlighted the need to enlarge the benefits gained with technological innovation to a new dimension, fostering sustainability. Technologies could so enhance environmental sustainability by, for instance, reducing the use of non-renewable resources, and social sustainability, by promoting equality and inclusion (Bagnoli *et al.*, 2018,

Keywords: Blockchain – Sustainable Business Models – Technologies

Please cite this paper as: Dal Mas et al. (2020), Can the Blockchain Lead to New Sustainable Business Models?, Vol. 8, No. 2, pp. 31-38

2019; Cancino *et al.*, 2018). In doing so, the need for developing new business models emerged, calling for a business model innovation (Lewandowski, 2016), and not only the creation of new sustainable products and processes.

New sustainable business models (SBMs) have the characteristics of bringing value not only to shareholders and customers but also for the whole society (Cosenz *et al.*, 2020; Massaro *et al.*, 2020), following the triple bottom line of principles of People, Planet, Profit (Wilson and Post, 2013). SBMs incorporate "concepts, principles, or goals that aim at sustainability, or integrating sustainability into their value proposition, value creation and delivery activities, and/or value capture mechanisms" (Cosenz *et al.*, 2020, p. 1). A different definition sees them as "A holistic and systemic reflection of how a company operationalizes its strategy, based on resource efficiency (through operations and production, management and strategy, organizational systems, governance, assessment and reporting, and change), so the outputs have more value and contribute to sustainability more than the inputs (with regard to material and resources that are transformed into products and services, economic value, human resources, and environmental value)" (Lozano, 2018, p. 1164).

Technological innovation may enhance sustainability both by providing a new value proposition or increasing resource efficiency (Angeles, 2019; Vafaei *et al.*, 2020). For instance, Presch et al. (2020) discuss how platform business models or so-called "platfirms" (Presch *et al.*, 2020) can create new SBMs through the circular economy. Dal Mas et al. (2020) highlight how platform business models can enhance social sustainability through data analytics by reducing decision-making biases, also in critical sectors like healthcare. Biloslavo et al. (2020) discuss how digital technologies and innovation can radically bring a new value proposition to organizations, turning the business model into a SBM one.

The blockchain technology and the development of new SBMs

Among the new disruptive technologies, the blockchain has been placed among the top five technology trends in 2018 (Panetta, 2018; Ruzza *et al.*, 2020). The European Commission has defined the blockchain as "a technology that allows people and organisations to reach agreement on and permanently record transactions and information in a transparent way without a central authority" (EU, 2020). The European Union Agency for Cybersecurity has given a more technical definition, as "a public ledger consisting of all transactions taken place across a peer-to-peer network. It is a data structure consisting of linked blocks of data, e.g. confirmed financial transactions with each block pointing/referring to the previous one forming a chain in linear and chronological order. This decentralised technology enables the participants of a peer-to-peer network to make transactions without the need of a trusted central authority and at the same time relying on cryptography to ensure the integrity of transactions" (Enisa, 2020). According to the European Commission, the blockchain "has been recognised as an important tool for building a fair, inclusive, secure and democratic digital economy" which will have "significant implications for how we think about many of our economic, social and political institutions" (EU, 2020). According to Iansiti and Lakhani (2017), blockchain "has the potential to create new foundations for our economic and social systems" becoming more than a disruptive technology and fostering, therefore, the development of new business models. Following Tapscott and Tapscott (2016) blockchain is "the first native digital medium for value, just as the internet was the first native digital medium for information ... and this has big implications for business and the corporation". However, despite its implications, most of the attention on the blockchain is concentrated on its use in the crypto economy fostered by bitcoins and other cryptocurrencies. A research on the scientific database Scopus shows that while there are more than 7,500 papers published on the blockchain, only 1,100 of those focus on business management and accounting. Therefore, we argue that there is a need to foster the development of the theoretical implications of blockchain technology for the creation of new SBMs. As a brand new domain, further empirical research is needed. Thus, building on this premise, our research question (R.Q.) is:

R.Q. How can the blockchain technology facilitate the development of new SBMs?

Approach

To develop our analysis, we employ a multiple case study approach to test how the blockchain can extend the existing theories to create new SBMs. We collected data from secondary sources such as company whitepapers, investors' opinions published online, newspaper articles, corporate websites, and video interviews of the founders, managers, and experts in the field. Starting from the real-world cases, we try to identify which features of the blockchain can have an impact to foster the creation of new SBMs. Results presented in the paper are the preliminary findings of a study conducted analyzing 5,967 startups presented in the website icobench.com. From the study, a group of researchers focused on top-rated companies according to the website evaluation. A sample of 516 startups was considered. Secondary material from each company was downloaded, such as the whitepaper, investor comments, and founders' interviews.

A crucial step in multiple case study research is the selection criteria, that should be developed on the theoretical relevance of the case rather than using a statistical sampling technique (Eisenhardt, 1989). As suggested by Eisenhardt (1989), we defined a theoretical sampling approach based on a selection of cases that we believed likely to extend existing theories staying within the range of 4-10 cases suggested by Eisenhardt. Therefore, we defined a selection protocol focusing on the following key elements: 1. Clear connection with an existing theory; 2. The global value of the company to avoid companies that lost all their value form the initial quotation; 3. Availability of further documents such as funders interviews. Following that procedure, we shortlisted a group of five companies/cases.

The data analysis was developed by collecting all the material in a Nvivo database. An In Vivo Coding process was employed (Miles *et al.*, 2019). Results were then discussed among all the authors to assure reliability (Massaro *et al.*, 2019). The following sections present the key insights of the preliminary analysis.

Key Insights

Asset tokenization and stakeholders' engagement

According to Tapscott and Tapscott (2016) "at its most basic, blockchain is a vast, global distributed ledger or database running on millions of devices and open to anyone, where not just information but anything of value – money, titles, deeds, music, art, scientific discoveries, intellectual property, and even votes – can be moved and stored securely and privately". The possibility of creating unique data exchangeable through the web created what it is called the "internet of value" (Tapscott and Euchner, 2019) allowing companies to digitalize some of their assets and exchange them through the web into specific tokens. Additionally, when the assets tokenized give specific rights to the owners, they might be used to create transparent and shared decision processes, allowing stakeholders to participate in the company's decision. For example, with the specific aim to create fan engagement, some major football clubs are creating "fan tokens" to involve fans and followers in the company decision process (see: www.socios.com). Following those examples, the blockchain can support the development of more participated business models, where stakeholders are actively involved in a company's decisions, making the overall decision process more transparent and shared with external stakeholders. The blockchain allows the stakeholders' engagement formally and clearly, ensuring maximum trust. Although several other modern technologies, like the internet and smartphones, can promote participated business models, the level of trust, transparency, and the possibility to set specific rules, are indeed more rigorous in the case of the blockchain, as in the case of Socios.

Transparency and social proof

One of the main characteristics to allow asset tokenization is that the overall chain of the transaction is transparently observable (Schmitz and Leoni, 2019). Interestingly enough, this can create imitation processes. Previous studies developed in sustainable food consumption releveled that quality signals coming from other consumers work as social proof and have

a significant influence on other consumer behaviours (Sigurdsson *et al.*, 2019). Other tools, commonly used to create social proof, are experts' opinions, testimonials, accreditation badges/shields, and customer feedback (ConsumerAiffairs, 2016).

Building on the "social proof theory", the company Vouchforme (see: https://vouchforme.co/) aims to create a transparent approach were people vouch for other drivers allowing everyone to see drivers perceived quality. The company's tokens award the backing, but car accidents caused by the endorsed person will lead to vouchers obligations. According to the company's white paper, transparency and social proof will lead to a more sustainable system that changes the insurance sector and influences drivers' behaviours. Fostering people to drive safer, Vouchforme is showing how transparency of the blockchain can be used to develop new SBMs.

Due to its transparency, blockchain technology is gaining more and more interest also in the healthcare and medicine sector. The American Food & Drug Administration (FDA) held a public meeting back in 2016 to evaluate some design objectives of potential pilot initiatives that would "explore and evaluate methods to enhance the safety and security of the pharmaceutical distribution supply chain"[1]. The result was the draft of the Drug Supply Chain Security Act (DSCSA) Interoperability Pilot. The goal was to provide end-to-end transparency of the pharmaceutical supply chain, making it possible to digitally verify a drug product and its journey, as well as eliminate data siloes among supply chain actors. Thus, accreditation badges can be used to create trustworthiness and support sustainability, eliminating risks of the fake drugs trade, which is worth 10% of the total market of drugs in developing countries[2]. A new way of managing the supply chain supports thus social sustainability. First of all, the blockchain-based business model ensures that all the pharmaceutical products in the market are not counterfeit, preserving so the health and safety of patients. The financial aspect assures that the public, as well as private money spent, are paid for real drugs, and not wasted. Last but not least, the new business model ensures the efficacy of the distribution in case, for instance, of defected or expired products to be withdrawn from the market.

Absence of middleman and the transaction costs

The trust mechanisms provided by the blockchain technology does not require the presence of a middleman. Immutable data registered in the blockchain allow reaching a system where people trust the mechanisms. Additionally, the introduction of smart contracts within the blockchain permitted the automation of transactions. In all, the overall transaction process within the blockchain technology is developed with no need to involve an intermediary, with a significant impact in terms of transaction costs (Andreassen *et al.*, 2018). The reduction of the transaction cost and the asset tokenization will allow the development of new forms of sharing economy. For example, the company Golem.network (see: www.golem.network) offers a new approach to share unused computational power, offering, therefore, an alternative and more sustainable approach that allows utilizing unused resources.

Distribution and the democratization of entrepreneurship and innovation

Interestingly, while the sharing economy is not new (see for example Airbnb, Zipcar, and other similar services), the blockchain allows the development of a democratic process where everyone can participate, and profits are not massively retained by the middleman. In the blockchain system, the overall process is organized through "smart contracts," that allow the automation of the transaction process and the reduction of fees. Additionally, everyone can participate in the system, offering the required technology to develop the transaction, resulting in a democratization entrepreneurship process (Chen, 2018). For example, the company DAV network (see: https://dav.network/) offers an automatic drone delivery system. Autonomous drones need recharging stations to cover the delivery systems. Instead of building recharging stations all over the cities, DAV network uses blockchain technology to allow everyone to participate in the system. People offering recharging stations will be rewarded using tokens issued by the company creating a shared system.

[1] Source FDA at the following link https://www.fda.gov/drugs/drug-supply-chain-security-act-dscsa/dscsa-pilot-project-program

[2] See https://www.reuters.com/article/us-pharmaceuticals-fakes/tens-of-thousands-dying-from-30-billion-fake-drugs-trade-who-says-idUSKBN1DS1XJbv

Discussions and Conclusions

To end our paper, we want to start from the premise that inspired it. New technologies foster the creation of new SBMs by providing a new value proposition or increasing resource efficiency. The blockchain is defined as one of the most disruptive technologies, and the analysis of real-world examples from several sectors allowed us to claim how it can enhance the creation of new SBMs extending existing theories, thanks to its unique features.

The asset tokenization influences the stakeholders' engagement theory. The blockchain allows the development of participated business models, in which stakeholders can be actively involved in the organization's decision-making process. Such engagement is more trustable, clear, and rigorous, thanks to the technological features of the blockchain than other available modern technologies.

The transparency of the distributed ledger can build on the social proof theory, positively affecting the consumers' behaviour, thus leading to more sustainable approaches.

The absence of intermediaries or middlemen has an impact on transaction costs, allowing the more sustainable use of extra resources and reducing waste. The overall sharing economy is enhanced at a lower price. As in the case of Golem.network, unused computation capacity can be shared, reducing the need to build new data elaboration centres. Differently from other solutions based on the sharing economy such as Airbnb, Golem.network works as a peer-to-peer system. The system operates automatically; the infrastructure allows to split the computational request into parallel sessions. The automation enables to reduce the transaction costs. Additionally, even though a centralized data centre might be more efficient in terms of energy consumption, it would also require a specific building and the needed plants. Therefore, even though energy consumption cannot be optimized in a distributed solution, the sharing economy has proved to be more sustainable compared to more traditional solutions.

The distribution of the ledger builds on the democratization of entrepreneurship and innovation. The possible distribution and diffusion of investments and profits allow more people to participate in the business idea offering new ways for financing startups.

The following table summarizes the blockchain's features, the theories used, the impacts on sustainability, and some real-world examples from different fields.

Further studies may investigate how the single blockchain's characteristics may enhance the development of SBMs more in details.

Blockchain characteristic	Theories used to develop new SBMs	Sustainable impacts	Examples	Sector
Asset tokenization	Stakeholder engagement	Participated business models where stakeholders can take part into companies' decisions	Socios.com	Sports and leisure
Transparency	Social proof	Consumer behaviors are driven though more sustainable approaches	Vouchforme/DSCSA Pilot	Insurance – Healthcare/ Pharma
No middleman	Transaction cost	Utilization of unused resources leading to waste reduction	Golem.network	ICT
Distributed	Democratization of entrepreneurship and innovation	Distributed investments and profits allowing more people to participate the business idea	DAV network	Transportation

Table I: Blockchain characteristics, theories, and examples

References

Andreassen, T.W., Riel, A.C.R. Van, Sweeney, J.C. and Vaerenbergh, Y. Van. (2018), "Business model innovation and value-creation : the triadic way", *Journal of Service Management*, Vol. 29 No. 5, pp. 883–906.

Angeles, R. (2019), "Internet of Things (IOT)-Enabled Product Monitoring at Steadyserv: Interpretations From Two Frameworks", *Journal of Cases on Information Technology*, Vol. 21 No. 4, pp. 27–45.

Bagnoli, C., Dal Mas, F. and Massaro, M. (2019), "The 4th Industrial Revolution and its features. Possible business models and evidence from the field", *International Journal of E-services and Mobile applications*, Vol. 11 No. 3, pp. 34–47.

Bagnoli, C., Massaro, M., Dal Mas, F. and Demartini, M. (2018), "Defining the concept of business model: Searching for a business model framework", *International Journal of Knowledge and Systems Science*, Vol. 9 No. 3, pp. 48–64.

Biloslavo, R., Bagnoli, C., Massaro, M. and Cosentino, A. (2020), "Business Model Transformation Toward Sustainability: The Impact of Legitimation", *Management Decision*, Vol. In Press.

Cancino, C.A., La, A.I., Ramaprasad, A. and Syn, T. (2018), "Technological innovation for sustainable growth : An ontological perspective", *Journal of Cleaner Production*, Vol. 179, pp. 31–41.

Chen, Y. (2018), "Blockchain tokens and the potential democratization of entrepreneurship and innovation", *Business Horizons*, "Kelley School of Business, Indiana University", Vol. 61 No. 4, pp. 567–575.

Cohen, B., Amorós, J.E. and Lundyd, L. (2017), "The generative potential of emerging technology to support startups and new ecosystems", *Business Horizons*, Vol. 60 No. 6, pp. 741–745.

ConsumerAiffairs. (2016), *The Top 5 Tools for Social Proof. And why they matter now more than ever.*, available at: www.consumeraffairs.com/brands.

Cosenz, F., Rodrigues, V.P. and Rosati, F. (2020), "Dynamic business modeling for sustainability: Exploring a system dynamics perspective to develop sustainable business models", *Business Strategy and the Environment*, Vol. 29 No. 2, pp. 651–664.

Dal Mas, F., Piccolo, D. and Ruzza, D. (2020), "Overcoming cognitive bias through intellectual capital management . The case of pediatric medicine .", in Ordonez de Pablos, P. and Edvinsson, L. (Eds.),*Intellectual Capital in the Digital Economy*, Routledge, London.

Eisenhardt, K.M. (1989), "Building Theories From Case Study Research", *The Academy of Management Review*, Vol. 14 No. 4, pp. 532–550.

Enisa. (2020), "Blockchain", *Csirts in Europe, glossary*, available at: https://www.enisa.europa.eu/topics/csirts-in-europe/glossary/blockchain (accessed 25 May 2020).

EU. (2020), "Blockchain Technologies", *Shaping Europe's digital future*, available at: https://ec.europa.eu/digital-single-market/en/blockchain-technologies (accessed 25 May 2020).

Iansiti, M. and Lakhani, R.K. (2017), "The Truth About Blockchain", *Harvard Business Review*, No. January-February, pp. 1–17.

Lewandowski, M. (2016), "Designing the Business Models for Circular Economy – Towards the Conceptual Framework", *Sustainability*, Vol. 43 No. 8, pp. 1–28.

Lozano, R. (2018), "Sustainable business models: Providing a more holistic perspective", *Business Strategy and the Environment*, Vol. 27 No. 8, pp. 1159–1166.

Massaro, M., Dal Mas, F., Chiappetta Jabbour, C.J. and Bagnoli, C. (2020), "Crypto-economy and new sustainable business models: Reflections and projections using a case study analysis", *Corporate Social Responsibility and Environmental Management*, Vol. in press, doi:10.1002/csr.1954.

Massaro, M., Dumay, J. and Bagnoli, C. (2019), "Transparency and the rhetorical use of citations to Robert Yin in case study research", *Meditari Accountancy Research*, pp. 44–71.

Melville, N., Kraemer, K. and Gurbaxani, V. (2004), "Review: Information technology and organizational performance: An integrative model of it business value", *MIS Quarterly: Management Information Systems*, Vol. 28 No. 2, pp. 283–322.

Miles, M.B., Huberman, A.M. and Saldana, J. (2019), *Qualitative Data Analysis A Methods Sourcebook*, SAGE Publications Inc., Newbury Park, 4thed.

Panetta, K. (2018), *5 Trends Emerge in the Gartner Hype Cycle for Emerging Technologies, 2018 - Smarter With Gartner*, *Gartner*.

Presch, G., Dal Mas, F., Piccolo, D., Sinik, M. and Cobianchi, L. (2020), "The World Health Innovation Summit (WHIS) platform for sustainable development. From the digital economy to knowledge in the healthcare sector", in Ordonez de Pablos, P. and Edvinsson, L. (Eds.),*Intellectual Capital in the Digital Economy*, Routledge, London.

Ruzza, D., Dal Mas, F., Massaro, M. and Bagnoli, C. (2020), "The role of blockchain for intellectual capital enhancement and business model innovation", in Ordonez de Pablos, P. and Edvinsson, L. (Eds.),*Intellectual Capital in the Digital Economy*, Routledge, London.

Schmitz, J. and Leoni, G. (2019), "Accounting and Auditing at the Time of Blockchain Technology: A Research Agenda", *Australian Accounting Review*, Vol. 29 No. 2, pp. 331–342.

Sigurdsson, V., Magne Larsen, N., Alemu, M.H., Karlton Gallogly, J., Menon, R.G.V. and Fagerstrøm, A. (2019), "Assisting sustainable food consumption: The effects of quality signals stemming from consumers and stores in online and physical grocery retailing", *Journal of Business Research*.

Tapscott, D. and Euchner, J. (2019), "Blockchain and the Internet of Value", *Research-Technology Management*, Vol. 62 No. 1, pp. 12–19.

Tapscott, D. and Tapscott, A. (2016), "The Impact of the Blockchain Goes Beyond Financial Services", *Harvard Business Review*, Vol. 10, p. 7.

Vafaei, A., Yaghoubi, S., Tajik, J. and Barzinpour, F. (2020), "Designing a sustainable multi-channel supply chain distribution network: A case study", *Journal of Cleaner Production*, Vol. 251, p. 119628.

Wilson, F. and Post, J.E. (2013), "Business models for people, planet (& profits): Exploring the phenomena of social business, a market-based approach to social value creation", *Small Business Economics*, Vol. 40 No. 3, pp. 715–737.

About the Authors

Francesca Dal Mas, MSc, JD, PhD is a Lecturer in Strategy and Enterprise at the Lincon International Business School of the University of Lincoln, UK. Her research interests include the impact of new technologies on sustainable business models, knowledge management, and knowledge translation. She is a member of the Editorial Advisory Board of JOBM.

Maurizio Massaro, MSc, PhD is an Associate Professor in Digital Management and Control at the Department of Management of the Ca' Foscari University of Venice. His research interests include the impact of new technologies on sustainable business models, innovation, and knowledge management. He is the Scientific Chief of the MIKE – Most Innovative Knowledge Enterprise Award for Italy.

Juan Manuel Verde, MD, MSs is an Associate Researcher in Surgical Innovation and Image-Guided liver procedures at the Institute of Image-Guided Surgery Institut Hospitalo-Universitaire (IHU) of Strasbourg, France. His research interests include the impact of disruptive technologies in the field of minimally-invasive and image-guided hepatobiliary surgery. He is also interested in the use of blockchain technology in healthcare.

Lorenzo Cobianchi, MD, PhD is an Associate Professor in General Surgery at the Department of Clinical-Surgical, Diagnostic and Pediatric Sciences at the University of Pavia, Italy. Besides his clinical research topics about mini-invasive surgery, oncology, new integrated approaches for the treatment of pancreatic cancer and regenerative medicine, he is interested in the impact of new technologies on surgery and healthcare, knowledge translation, and co-production in medicine and surgery.

JOBM
Journal of Business Models

Seizing the Business Opportunities of the MyData Service Delivery Network: Transforming the Business Models of Health Insurance Companies

Minna Pikkarainen[1,*], Timo Koivumäki[2], and Marika Iivari[3,*]

Abstract

Purpose: This paper discusses how personal data-driven service delivery networks based on MyData phenomenon may impact and transform the business models and offer new kinds of business opportunities especially for health insurance business

Design/Methodology/Approach: This research is a case study / empirical

Findings: This study demonstrates how health insurance organizations are heading towards acting as active members of human centric, collaborative service delivery networks. The biggest opportunity transformation from transaction based to service-based businesss

Research limitations/implications: As the use of personal data is still a paradigm in Europe, the results of this study address the potential use and implications and cannot be validated through large-scale empirical studies.

Practical Implications: This research highlights how companies should build adaptable service architecture that are easily connected or disconnected from the other organizations in their business ecosystems in order to allow smooth data usage and sharing. The service delivery network approach may offer insurance companies the needed structure and role in the emerging MyData business.

Originality/value: This study contributes to the discussion of data-driven business models via an emergent phenomenon. Especially in occupational healthcare sector, use of personal data can open up new kinds of business opportunities with networked or ecosystemic business models.

Keywords: Business model, MyData, Personal data, service delivery network, Data-driven, health insurance business

Please cite this paper as: Pikkarainen, M., Koivumäki, T., and Iivari, M. (2020), Seizing the Business Opportunities of the MyData Service Delivery Network: Transforming the Business Models of Health Insurance Companies, Vol. 8, No. 2, pp. 39-56

1 Professor of Connected Health, Martti Ahtisaari Institute, Oulu Business School and the Faculty of Medicine, University of Oulu, and VTT Technical Research Centre of Finland, Minna..pikkarainen@oulu.fi
2 Professor of Digital Service Business, Martti Ahtisaari Institute, Oulu Business School, University of Oulu
3 D.Sc., Oulu Business School, P.O. Box 4600, 90014 University of Oulu, Finland, marika.iivari@gmail.com
* corresponding author

Introduction

Increasing healthcare costs have become a global challenge which has led countries and healthcare providers to the point where healthcare systems and the underlying business logic of actors providing healthcare services must be reinvented. At the same time, technological development has created new ways to monitor health and wellbeing and has provided the means to focus healthcare on a more personalized and preventive direction (Hood & Galas, 2008). Consequently, the use of data in the healthcare sector has become increasingly important, and "discovering a game-changing relationship previously hidden in the data" (Redman, 2015) is seen to lead to data-driven innovations. People are embracing a future healthcare system that allows them to control and share their personal health information for receiving improved personalized care (Hood & Galas, 2008). The adoption of cloud technologies and mobile devices, for instance, enable novel ways to generate, access, and manage personal health data (Wang et al., 2016). People voluntarily agree to vast amounts of personal data being stored and utilized by companies in exchange of services. For the use of personal health data, the MyData paradigm has therefore emerged to address and strengthen digital human rights. Simultaneously, MyData is also opening new network-based opportunities for businesses for developing personal data-driven services.

These novel service delivery networks based on sharing an individual's data for better, tailored healthcare services, require new kinds of networked business models because collaboration is not only seen as a way to differentiate from the competition but also to ensure better services for customers. Network-based business models have been researched in recent studies looking at the perspective of the business model evolution (Lund & Nielsen, 2014), partnering portfolios (Rindova et al., 2012), and interdependent innovation (Kleinbaum & Tushman, 2007). While the open innovation literature has been focusing on the use of organizational models and resource combinations (Chesbrough, 2003a, 2003b), there is still a lack of understanding of the influence of data on networked business models. New kinds of service networks sharing individual's data between actors are crucial, especially in preventive healthcare services (Pikkarainen et al., 2018). Yet there are still only a few available research studies on the context of human-centered personal data management (see, e.g., Kemppainen et al., 2019; Huhtala, 2018; Pikkarainen et al., 2018; Koivumäki et al., 2017).

Service delivery networks include a group of actors that do not necessarily have natural boundaries but who have a target to create a connected, overall service adopting a customer-centric approach. In the service delivery network, a customer assembles the relevant set of actors. In the service delivery network, "the customer acts as the ''hub'' or focal node and the network includes as nodes the set of actors (service providers) who directly touch the customer in his particular service journey, with the customer's encounters represented by ties between the customer and the providers" (Tax et al., 2013). The MyData scenario of a personal data network is based on a transition from an organization-centered model towards human-centered personal data management and towards a service delivery network in which the individual is in the position of being his or her own data controller (see, e.g., Gnesi et al., 2014; Papadopoulou et al., 2015). In other words, MyData refers to an approach that seeks to transform the current organization-centric system to a human centric-system to use personal data as a resource that individuals themselves can access, control, and share based on mutual trust (Koivumäki et al., 2017). In the MyData model, the importance of personal data ownership is highlighted as a potential channel for the increase in individual health data (Häkkilä et al., 2016). In the healthcare sector, this transformation means that the focus shifts from reactive disease treatment to proactive wellness maintenance, emphasizing an individual instead of population-based disease diagnosis (Hood, 2013).

Scrutinizing the emerging MyData-based healthcare services from the service delivery network perspective enables the investigation of relationships, interactions, and interdependencies between actors, and the examination of how these actors adapt to and evolve due to environmental changes (Frow et al., 2016). The MyData phenomenon is highly focused on service delivery networks, as it both enables and requires active collaboration among healthcare businesses for fulfilling the human-centric service perspective through technological solutions. A shared MyData infrastructure enables decentralized management of personal data, improves

interoperability, makes it easier to comply with tightening data protection regulations, and allows individuals to change service providers without proprietary data lock-ins (Poikola et al., 2014).

Data processing technology has grown since the 1960s. Data privacy rules and regulations have been evolving together with an increasing organizational capability to collect, process, and interlink data in an expanded way. Many players have already started to use the data for the development of personalized services and marketing (Tikkinen-Piri et al., 2018). Increased customer-centricity and efficiency can also be seen as a competitive advantage for companies (Brownlow et al., 2015). In the changed situation, it is important to (1) understand the value of the novel personal data driven ecosystem, (2) explore roles in the value network, and (3) stress the importance of collaboration, regulations, and institutional ecosystem practices between ecosystem players (Huhtala, 2018).

For insurance companies in Europe, personalized data can be seen both as a risk and an opportunity. In many countries, lack of trust among individuals has been showering down related to the development and innovative use of new technologies (Reding, 2010) and related to the management of personal data (Tikkinen-Piri et al., 2018). People are often afraid that health insurance companies will start to use personal data strategically for profit maximization, for instance by excluding risk patients. As a part of the data misuse against them, people are often worried about the level of data security through the whole service continuum. It is no longer enough that data management is only done by one network partner. Standardization of data protection requires a different level of collaboration between different network players (Huhtala, 2018). The sharing and use of data between health professionals—including insurance companies—could contribute, however, to increased health and wellbeing through preventive healthcare and result in lowered insurance costs, bringing positive added value as well to the individual client. In this situation, it is important to increase understanding of how organizations, such as insurance players and other network players, are adapting to the changes in personal data usage and are addressing the related risks (Tikkinen-Piri et al., 2018).

Therefore, how MyData eventually impacts insurance companies in service delivery networks and how the potential change in insurance business is going to influence other players' business models in the same network are very topical and relevant questions. Therefore, the aim of this study is to increase knowledge about how MyData influences business models in the field of occupational healthcare, in the case of health insurance companies and their service delivery network. The primary unit of analysis in this study is the service delivery network, which we are looking at from the perspective of European insurance players. In our analysis, we are focusing specifically on the MyData phenomenon and the influence of MyData on the business models of insurance players. Building on the business model literature, the primary research question of this study asks: *How is MyData transforming health insurance companies' business models in service delivery networks?*

In order to answer the research question, this paper first discusses the theoretical foundations of business models in data-driven business. It then dives deeper into MyData as a human-centric approach to healthcare. Research methodology and the empirical case are described next. The study ends with a discussion of research results, findings, and conclusions.

Data-Driven Business Models

One of the buzzwords of contemporary business is the concept of the business model (Zott et al., 2011; Onetti et al., 2010). Previous literature has described and defined business models in various ways, such as a structure, an architecture, or a business frame: a representation of a firm's relevant interactions and activities (Wirtz et al., 2016). Although scholars are debating over a unanimous definition of the concept, the common view is that business models act as pathways to fulfill unmet needs, profitability, and the promise of service (Wirtz et al., 2016) that will lead to competitive advantage (Zott et al., 2011; Teece, 2010). Thus, business models are to "create and capture value in an inimitable way and through rare and valuable resources that are utilized efficiently" (Ahokangas et al., 2014). This means that a business model is a system of specific activities conducted to satisfy the perceived needs of the market, as well as specifying who does what (whether it is the firm or its partners), and how these

activities are linked to each other. From a collaboration perspective, a business model also acts as a system of interconnected activities that determine the way a company does business with its customers, partners, and vendors (Zott & Amit, 2010).

Business models are often imposed by technological innovation that creates the need to bring discoveries to market, and the opportunity to respond to unmet customer needs (Teece, 2010). From this background, the concept of the data-driven business model has emerged to address connectivity issues, the Internet of Things, and Big Data (Pujol et al., 2016). Hartmann et al. (2014) define data-driven business models as business models that rely on data as a key resource. According to Hartmann et al. (2014), the source for this data can be either internal or external, the offering can consist of the data itself, information, or a non-data product or service. *Data* may be packaged, retrieved, or sold (Sorescu, 2017). Revenues can consist of sales, licensing, or subscriptions, but their definition does not consider data-sharing and re-use (Pujol et al., 2016), as implied in the MyData paradigm. According to research conducted by Pujol et al. (2016), data sharing is still uncommon in current data-driven business, to which this research contributes from the business model perspective.

Using data has become a necessity for many organizations in order to remain competitive or survive in their field (Brownlow et al., 2015). In healthcare, the most successful services should place the sensing and supporting technologies around the needs of individuals in a manner that is highly personalized and makes the person a driver of his own health and wellbeing. The key challenges of integrating personal data are both data availability from different silos and consumer protection laws that currently hinder data usage especially in the health sector. Recently, open source solutions around modern Web interfaces or database solutions have started to break the data silos in different sectors. This has resulted in the "API economy" (Anuff, 2016), which means that companies separately create revenues through application programming interfaces (APIs)—either licensing, use-for-fee, or other monetization models—very much on personal data sets. On the other hand, an aggregator model emphasizes the controlling role of a central organization. In an open business environment, a shared MyData infrastructure enables decentralized management of personal data, makes it easier for companies to comply with tightening data protection regulations, and allows individuals to change service providers without proprietary data lock-ins (Poikola et al., 2014). MyData model means that organizations are moving from traditional, technology, and aggregator models towards a human-centric data management approach (Figure 1.)
In the traditional "structureless" API economy, there is no clear infrastructure or platform in place for controlling and organizing the use of data in a logical manner. Organizations do not systematically collaborate, and the ecosystem is governed by closed business models. Aggregating data control would make life easier for organizations and individuals, but different aggregators do not have a built-in incentive to develop interoperability between them. In this model, there is an ecosystem in place, however it is a closed system, dominated by large corporations. Compared to the aggregation model, MyData is a resilient model because it does not depend on a single organization but works as a shared open infrastructure (Poikola et al., 2014). MyData can been seen as a way to convert data from

Figure 1: MyData model (adapted from Poikola et al., 2014).

closed silos into an important, reusable resource. It can be used to create new services that help individuals to manage their lives. The providers of human-centric services can therefore create new data sharing based service ecosystems and new business models, leading to economic growth in whole society (Poikola et al., 2014).

Data-driven business models in a networked environment

There has been much research during the past decade from different perspectives on company networks (see, e.g., Rindova et al., 2012; Hallen, 2008; Zott & Huy, 2007). Moving from the above-defined service delivery network and the defined roles of business models, it is also necessary to define and describe the actors involved (Mettler & Eurich, 2012). However, the roles are highly dynamic, flexible, and service-context specific, as noted by Möller and Svahn (2009); and the identification of the core actors, their roles, and corresponding relationships is a challenging task, especially in the case of emerging human-centric MyData service delivery networks. To tackle this challenge, we must first identify the focal firm in the service network and take the underlying flows in the network as the starting point of the analysis. In MyData networks, there are three types of flows (Poikola et al., 2014): (1) consent flows between the MyData operator, data sources, and data using services, which specify the flows of data from their sources to the services using the data, (2) actual data flows between the sources and the services, and (3) monetary flows between different network actors. The actors involved in each flow depend on their roles. These flows are the underlying drivers of the interactions and transactions between the focal firm and the other actors, which in turn are at the core of business models.

Thus, business models can be seen as the focal firm's boundary-spanning transactions with external parties (Zott et al., 2011). Indeed, collaboration of the focal firm with its network can be considered as one of the main functions of the business model. This approach is well-captured in the MyData paradigm, yet it brings a lot of challenges for organizations to realign their current strategies and business models for a human-centric approach. As Ahokangas and Myllykoski (2014) state, the transformation of an existing business brings special challenges for business models. Business model transformation is about transforming an existing organization through repositioning the core business and adapting the current business model into the altered market place (Ahokangas et al., 2014; Ahokangas & Myllykoski, 2014). The emergence of data sharing and the control of individuals over their health data will transform healthcare business. This means shifting away from the transactional fee-for-service model towards strategic value-based care (Kaiser et al., 2015). Yet, academic research has not widely addressed issues related to business model transformation in spite the business model being an actionable concept that includes an underlying assumption of a process (Ahokangas & Myllykoski, 2014; Juntunen, 2017). Here, applying value-based care provides an opportunity to "better understand their true customer, the patient-consumer; tailor products to meet their needs; and to capture a high share of distinct customer subsets who will pay for and be loyal to their brand" (Numerof, 2015). Of course, transforming the whole logic of value creation is not painless. Transforming an organization requires a lot of commitment from the management, as the old ways of doing things may become a challenge (Giannopoulou et al., 2011). The activities and logic related to the new business model may be incompatible with the status quo (Chesbrough, 2010). Therefore, business models should always be assessed and attuned against the business context so that an optimal fit with the environment can be found (Teece, 2010).

Often, the traditional approach for business model research is to focus on the supply side, not the demand side, of value co-creation (Massa et al., 2017). However, working together as a business ecosystem, the service delivery network players are provided with better possibilities to create value that none of the players in the ecosystem can create alone. The ecosystemic business model, as a type of networked business model, uses the ideology of open innovation supporting complementarity and coopetition. The business model wheel is a tool to understand ecosystemic and networked business opportunities and future contexts (see, e.g., Ahokangas et al., 2014, Ahokangas et al. 2019). In this model, the business opportunity is at the heart of business model. The wheel includes relevant elements of WHAT? (customers are offering, value proposition, and differentiation), HOW? (to sell the solution to the market, delivery, key operations, and basis of advantage), WHY? (basis of pricing, way of charging, cost drivers,

and cost elements), and WHERE? (to do business–internal or external local firms) (Figure 2) (Ahokangas et al., 2019).

In today's turbulent business environment, companies are challenged in how to alter their business models and service development (Palo & Tähtinen, 2013). It is therefore important to acknowledge that a firm does not have to bind itself to a single business model but should experiment with several simultaneously (Trimi & Berbegal-Mirabent, 2012). In fact, testing and validating a new business model often requires a period of co-existence with the current and new model(s) (Chesbrough, 2010). It is not clear what the new business model will be like, but by experimenting, the data needed to justify the transformation can be gained. Business models become fully comprehensible for firms only through action in the business context in which they emerge (Ahokangas & Myllykoski, 2014). According to Numerof (2015), the main actionable strategies driving the transformation of health insurance companies start with (1) developing partnerships with the right parties, moving away from volume towards limited partnerships, and innovative treatment pathways. (2) Predictive care paths, when correctly executed, are the true offerings for future hospitals and physicians. Insurance businesses can play a key role in building such collaborations that have the power to achieve measurably better health outcomes at lower overall costs. In the (3) systematic transformation, payers will have a significant role to play in bridging the divide between providers and patients (Numerof, 2015).

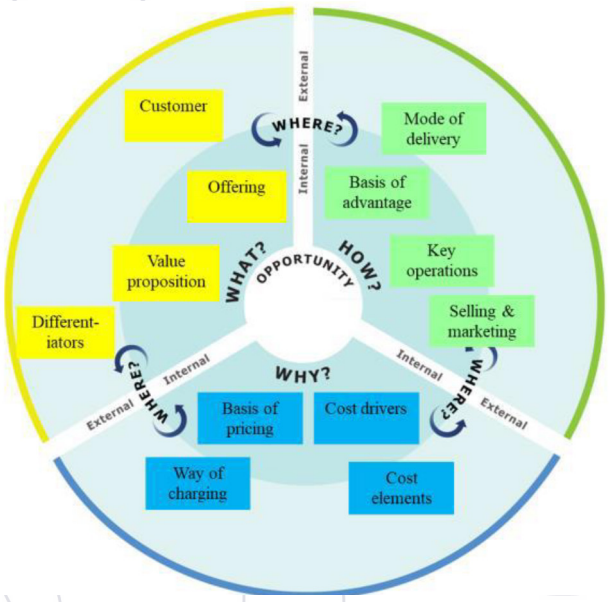

Figure 2: Business model wheel (Ahokangas et al., 2019).

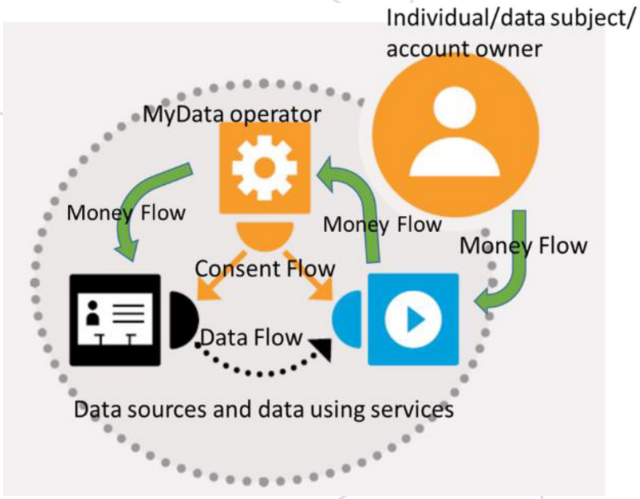

Figure 3: MyData network roles (Adapted from Poikola et al., 2014)

MyData and networked business environments

Poikola et al. (2014) defined four roles that are inherent in MyData delivery networks. These roles include (1) the individual, i.e., a person who is the creator and owner of a data account which is used in the MyData-based services and who authorizes the use of the account; (2) MyData operators, who orchestrate the MyData-based service provision by data account provision, consent management, and authorization; (3) data sources, who provide data about the individuals to the service; and (4) the actual services using data in service personalization. The network is depicted in Figure 3.

Methodology, Data Collection, and Analysis

As this study seeks to gain an in-depth understanding of the mechanisms of change in an organizational setting, an action-based research methodology was applied for data collection (Ballantyne, 2004). Daniel et al. (2003) suggest that action research is a valuable method to study dynamic and turbulent environments. As the MyData paradigm shift is still evolving, the method enables researchers to get close to the current business reality. Thus, it fosters the development of deep and rich insights into the complexities within (data-driven) decision-making (Carson et al., 2001) in the context of MyData. The data utilized in this study is

COMPANY	KEY BUSINESS DOMAIN	INTERVIEWEE	DURATION (Min)
SME	Technology provider	CEO	106
Health provider	Healthcare	Development Director	45
Insurance player	Banking, finance, healthcare	Chief actuary	60
SME	Wellness training and coaching	CEO and Director of International Growth	75
SME	Wellness training and coaching	Personal trainers	45
Insurance player	Insurance	Business developer	35
Insurance player	Insurance	Manager	45
Large company	Mobile network operator	Innovation Manager	45
Large company	Technology provider	Head of Research	73
SME	Technology provider	CEO	56

Table 1: Data collection of the study.

part of a wider European research project on healthcare service ecosystems, Digital Health Revolution DHR2.

The action research approach was applied based on abductive reasoning, which can be characterized as an iterative and recursive loop between empirical and theoretical insights. Dubois and Gadde (2002) refer to this approach as "systematic combining," where the theoretical framework, empirical fieldwork, and data analysis are evolving at the same time. The primary data was collected from ten semi-structured in-depth interviews with insurance company representatives and stakeholders related to the insurance business during 2016 (Table 1). The 10 actors included in the sample were initially brought together in the DHR2 research project. We intentionally selected both insurance players and their stakeholders in order to understand the business of insurance companies from different perspectives. Before the data collection, the MyData approach was introduced to all network players. In this presentation and discussion, the MyData model was explained in detail and how it differs from the aggregation model. In early 2017, the data collected from the interviews was further elaborated during a joint 3-hour workshop with insurance companies and their stakeholder ecosystems to validate the potential impact of MyData on business models.

In the data analysis, statements were identified, sorted, and structured to identify the impacts of MyData on healthcare insurance companies and their service delivery network actors. The business model wheel (Ahokangas et al., 2014) was used as a tool to analyze the derived data in order to thematically identify the potential impact and use of the MyData model on healthcare insurance business within service delivery networks, as this business model tool helps to identify the points of action and network collaboration in a simplistic manner. The template addresses the following elements: (1) what—comprising offering, value proposition, customer segments, and differentiation; (2) how—covering key operations, basis of advantage, mode of delivery, and sales and marketing; (3) why—describing the pricing basis, method of charging, cost elements, and cost drivers; and (4) where—all these items are located, internally or externally to the firm, as each part of the business model can be executed through collaborating with outside partners (Ahokangas et al., 2014) .

The data analysis was based on the thematic analysis approach (Guest, 2012). First, the interview transcripts were analyzed and categorized and coded by two researchers using NVivo and the business model wheel framework. Secondly, all the findings from both researchers were combined together and further analyzed a second time to discover commonalities and patterns in order to identify new contextually specific themes and categories.

Findings

In exploring how MyData will potentially impact the business models of health insurance companies and

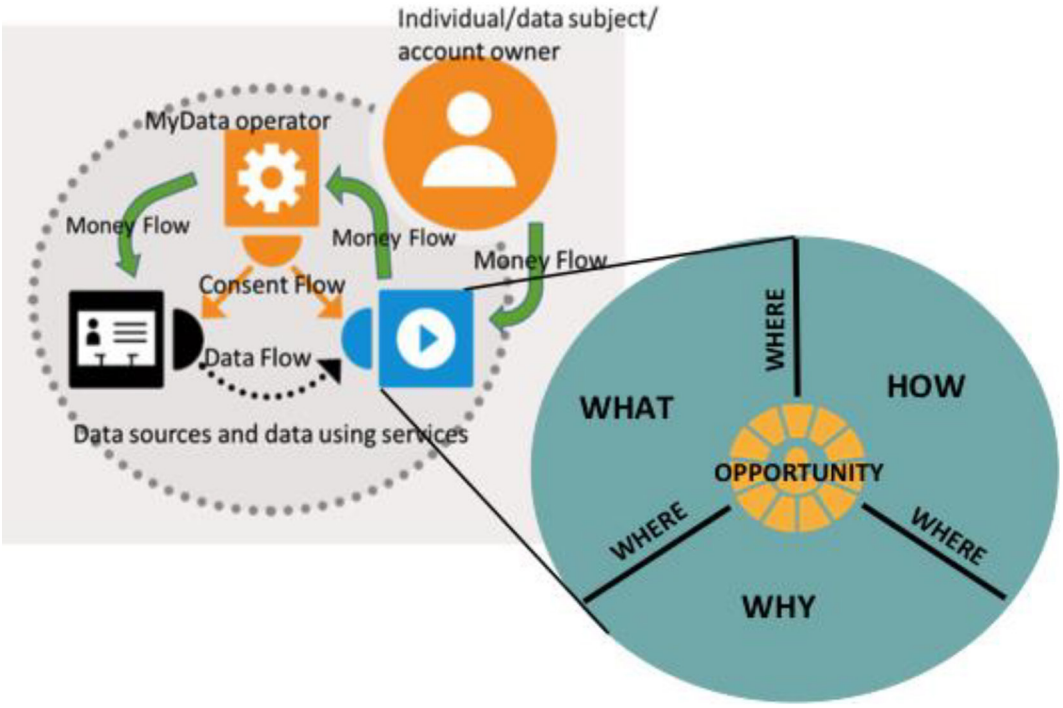

Figure 4: MyData service delivery network and the health insurance service business model.

the related network players, we thematically categorized our interview findings and mapped them together with the themes discussed in the joint workshop. The results are summarized in Figure 3 and discussed in more detail below through business model elements, where collaboration is addressed in all components.

Business Opportunities of MyData

A new type of access to human-centric data provides a novel possibility for insurance companies to take a bigger role in the preventive healthcare field. In this service delivery network, the aim for insurance companies is to help their end-customers live a more healthy and safe life, which will also support the insurance business by decreasing compensation costs related to chronic disease and accidents. In this new field, insurance companies see that:

"Our role is not anymore just to buy compensation, it is more to help to make sure that everything is fine with the individual."

At a concrete level, insurance companies consider that

"The MyData approach will offer us new opportunities to give better and updated information, for example, about the value of their property or risks for future accidents and the like."

But, MyData is seen as also enabling a more general approach to wellbeing:

"As soon as end users buy from us, we can start to offer the services that help them to improve their health and life style."

This is based on some initial work that insurance companies have conducted in the field:

"We have noticed in our research that it is important to offer a bonus or some price for people when they are changing their lifestyle" ... "smoking is a good example, if you get 3,000 to stop it, perhaps people will do it."

This indicates that in the future system, the insurance companies can be characterized more as a service provider than as a player that buys compensation for general risks or issues that have already occurred.

Value and Competitive Advantage of MyData for Insurance Business

What. MyData was seen as enabling extended and novel offerings based on the collaborative use of data: *"the data sharing would make it possible that both insurance company and doctor sees the same information, and we could better serve individuals."*

From the medical doctor perspective, people are already now coming to see them with data about themselves, e.g., the data they have been collecting using mobile applications or different tracking devices. Data management services through MyData operators would allow them to

"enter pre-information, e.g., about the insurance coverage before the appointment, which would save everyone's time." Director at a health service provider.

New players will also emerge to collect and analyze data. First, insurance companies aim to use data to achieve close to real-time customer insights to better align themselves with customers for better services. Value could be captured especially in situations when a person has been using one service provider for 10 years and then decides to change.

"that could be the case in which the end user could make some effort to be able to transfer information easily."

Secondly, insurance companies could base the costs of insurance on real, not estimated, situations. This means that people with a high-risk profile will have higher costs, whereas those who are living a healthy life could get some compensation. Costs would be based on a person's lifestyle and activity level, which is not currently possible due to legal regulations. Thirdly, with MyData, insurance companies could offer a feeling of safety, such as using data from sensors and devices to detect the likelihood for potential accidents.

Additionally, early risk detection services can be an opportunity for the insurance business.

"... if we could use the sensor and personal data with the permission of the end-user to check if something is wrong with the car tire and it is better to fix it before a long journey."

Insurance services can also be customized based on the data. For example, in many cases the insurance companies are supporting groups in employee organizations. *"The use of the MyData approach will especially change the role of employer organizations in the occupational health business sector during the next 10 years."*

Indeed, employer organizations were seen as a core player that would benefit the most from the transformation to MyData-enabled healthcare:

"In the new MyData-based model, employee organizations should be able to better take into account the coping, energy level, wellbeing, and health of their own employees."

Other important players in this new business model could be banks, food stores, aviation industry, utilities, and housing companies.

How. Utilizing collaborative service networks were identified as the key strategic approach in MyData, as it is not possible to build open access to data open business or innovation models.

"We have opened the interfaces and helped developers to build interfaces and open data sources." "We have organized hackathons targeted to give developers a possibility to use their data as a basis for new application development."

However, insurance companies also highlighted the importance of a MyData operator in the service network. They mentioned that there is a key player missing in this field—an operator who could be responsibile for data sharing and offer needed collaboration interfaces. Supporting customers in deciding what data to share is important in the MyData transformation. Without an operator in place, it might be difficult for insurance companies to get access to the personal data without legal problems. Insurance companies have an interest in leading this, but their challenge is that citizens could see it as scary.

Hence, in the current business environment, they felt that they cannot take the role of the MyData operator in the service network. Insurance companies aim to develop rapid data usage as a source of competitive advantage:

"the faster we can use the data, either as a service or information or to do better pricing, the better we can manage in the business compared to our competitors." Combining personal data with environmental data such as for cars or housing, insurance players could maximize the probability of customers finding products they

want to buy. It was also mentioned in the interviews that data usage is not only a competitive advantage but a must-have for insurance players in the future if they want to survive:

"The basic model in which we just send bills and compensation does not work anymore in the current digital world. If we cannot use the data, we will stay behind in the insurance market."

Why. From the revenue perspective, the individual was highlighted as the most important player in the future MyData-driven business. In the new insurance business model, individuals can get discounts for their insurance if they are improving their lifestyle. At the same time the assumption was that the insurance companies should pay less compensation for chronic diseases and accidents. However, insurance companies do not yet have evidence that costs actually decrease if data is better used. One approach could be reciprocal data sharing within the service network that also includes the end-customer:

"I think some players are also ready to buy the data from individuals." Equally, "You need to buy if you want to get valuable services based on your data."

Help is needed from other players such as individuals, developer organizations, and data operators. A key issue is who owns the data and who has the right to use or sell the data within MyData–based collaborative networks. It was mentioned in the interviews that *"consumers need someone who can take responsibility for their wellbeing during their whole life."*

However, the manager of an insurance company noted that "the insurance companies cannot take this role because people are so suspicious of insurance players." … *"They think that we just want to decrease our own costs."* This will leave room for private or public healthcare providers to create revenue through the new services that can be created through the MyData approach. It was evaluated that the key players who will buy new MyData-based services are individuals and employee organizations who will clearly benefit financially from new data-driven services.

Insurance players and health service providers can achieve the MyData transformation by opening the interfaces and organizing hackathons to help developers build solutions. This means that in order to attract and retain customers, insurance companies can offer lowered prices for those who voluntarily share their health data. This results in lowered income in the form of insurance payments (the higher the risk indicators, the more one has to pay), but equally lowers the compensation paid to individuals. Thus in general, both losses and profits will decrease.

Discussion and Conclusions

Individuals cannot see or control the recorded data because of the outmoded business model that supports the current relationship between doctors and patients (Nash, 2018). A change is also happening through legislative changes, for example, the European data protection regulations called GDPR (https://eugdpr.org/). In fact, it is predicted that in the future, individuals or patients should no longer deny access to their own data because it will help them make better choices about their lives, get better decisions about their treatment, or in the preventive domain, about their health-related actions (Nash, 2018). The central goal of this article is to understand the business of insurance companies with a broader network view that emerges when the individuals' providers and data management approach of related services are taken into account.

Tax et al. (2013) note that gaining individuals' trust and confidence may be dependent on the firm's coordination and a harmonized approach to operate its network. This is in line with our study, which showed that the emergence and actors of the MyData operator and healthcare service providers direct affect the opportunity of insurance players to operate in its network where the MyData approach is used. MyData as a way to utilize data from individual organizational silos into an important, reusable, and shared resource was also acknowledged by insurance companies in order to build better, preventive healthcare services (Hood & Galas, 2008). *The* providers of human-centric services are thereby able to develop their service delivery networks even further into a sustainable sharing-based service network, which eventually leads to economic growth in the society as a whole (Poikola et al., 2014), but especially leading to improved and personalized health in all of us.

Implications

The results of the study thus indicate that the use of personal data and the coming of MyData may dramatically transform the business models of health insurance companies from a transaction-based to a service-based business. This will also influence business models of the other actors such as employee organizations, healthcare, service data and platform operators that are working in the same service delivery network. Thus, this study contributes to the business model transformation literature and practice by highlighting how insurance businesses are able to explore alternative business models by operating in service delivery networks.

On a practical level, our research shows that business model changes are difficult to conduct, especially in the health insurance market. Although the interviewed insurance players and their service delivery network actors could clearly see that the transformation towards MyData approach would clearly benefit individuals, allowing them better preventive support with a more coherent service offering, it was impossible for the interviewed insurance players to change the business model because of people's concerns and lack of trust related to data misuse as well as the lack of platform operator players in their network. This is the case, although data misuse is illegal for insurance players in many countries. Therefore, the only way insurance players have progressed with personal data use is through small test pilots in which people have collected personal data and given their permission for its use as well as organizing hackathons allowing app developers to build their solutions using health insurance data. Besides insurance players, it has been revealed in previous studies that it is also equally important also for the other players in the service delivery network or ecosystem that data protection issues are strongly communicated to the stakeholders so that people and professionals could really trust the handling of their personal data. Thus, similar concerns related to regulations and practices in the use of data applies to all stakeholders also in different contexts (Huhtala, 2018). As Ahokangas & Myllykoski (2014) noted, it is not clear how the eventual business model will turn out, but by experimenting, the data needed to justify the transformation into a service business can be gained. In our analysis, we went beyond the basic conceptual categorization of the business model and focused on a future approach of business models networked or in an ecosystemic context that targets operation in the commercial market as a way to achieve social goals to support healthcare for individuals. This is a research area that has only recently begun in the business model domain (see, e.g., Francis Gomes et al., 2017; 2018). In this context, the business model design is made using resources from different network actors (Zott & Amit, 2010), and the individual can be seen as a central resource provider of his own personal data.

According to Tax et al. (2013), the main reason for the importance of adopting a service network perspective is that individuals encounter many providers in pursuit of achieving their service goals. In our study, the service delivery network and customer-journey thinking helped participating players in the service delivery network to understand the potential opportunities as well as the risks in the MyData approach. To deliver a better customer experience, firms need to understand the entire constellation of service providers and their activities that help customers achieve their goals (Tax et al., 2013). In the MyData service networks, insurance companies could take a leading role. But in that role, they might have a competitive advantage in securing a customer's trust and confidence. Our findings show that while MyData offers insurance players many new opportunities to gain more information from individuals and create new type of services, it is also driving insurance companies to work more closely with MyData operators, data provider, organizations and healthcare providers in their networks. From a broader perspective, in the EU area, GDPR has already identified specific conditions for personal data processing and consent that is making the MyData approach possible. According to this new law, organizations can already use personal data (1) if they have the proven consent for the potential data usage, and (2) if they take care of proper data portability and properly maintain the data (Tikkinen-Piri et al., 2018).

Because the MyData approach mixes players from the public and private sectors, there are important policy implications for data regulation and legislation, as consent and control in the use of personal data is a central

aspect of MyData in its use by for-profit companies for business gains. By addressing an emergent phenomenon, this study contributes to the business model literature, especially on data sharing within data-driven business models. Thus, this study also contributes to data-based aspects of the sharing economy discussion as well.

Limitations and Future Research

The main limitations relate to empirical validity. As MyData is a still a paradigm, the results of this study still address the potential use and implications and cannot be validated through large-scale empirical studies. Similarly, as the project took place in the occupational healthcare sector, the implications for revenue models and competitive advantages for organizations also involve public institutions and healthcare providers. Hence, larger-scale future scenario work would be useful to validate the business potential of MyData, especially from the regulation and legislation points of view. The role of data protection laws are relevant, as they directly impact how companies may utilize private and sensitive data. Who eventually controls the use of and access to data?

It seems that data-driven business models will be mandatory in future insurance business. They will open new opportunities for new services and therefore help insurance players to remain a significant player in the preventive healthcare business. As Palo and Tähtinen (2013) noted, companies are challenged in how to adjust their business models and service development to the ever-changing business environment. In order to survive the upcoming change, the companies need to build a service architecture and platforms that are adaptable and easily connected or disconnected from the other organizations in their business ecosystems in order to allow smooth data usage and sharing. The Service delivery network approach may offer insurance companies the needed structure and role in the emerging MyData business. We have yet to see whether the findings of this study will soon become a reality in the health insurance business. In the meantime, further research in the design and orchestration of networks around MyData would be extremely valuable, especially from the point of view of the MyData operator business. Moreover, the voice of individual consumers from a user-driven innovation perspective could contribute to human-centric data management. Thus, more research is needed to understand what kind of role the individuals will play in MyData-based service networks.

References

Ahokangas, P., Juntunen, J., & Myllykoski, J. (2014) Cloud computing and transformation of international e-business models. *Research in Competence-Based Management*, Vol. 7, pp. 3–28.

Ahokangas, P. & Myllykoski, J. (2014) The practice of creating and transforming a business model. *Journal of Business Models*, Vol. 2 No. 1., pp. 6–18.

Ahokangas, P. Matinmikko, M. Yrjölä, S. Seppänen, V. Hämäläinen, H. Jurva, W. Latva-Aho, M. (2019) Business Models for Local 5G Micro Operators, DOI 10.1109/TCCN.2019.2902547, IEEE *Transactions on Cognitive Communications and Networking*.

Anuff, E. (2016) Almost everyone is doing the API economy wrong, *TechCrunch*, 21 March 2016.https://techcrunch.com/2016/03/21/almost-everyone-is-doing-the-api-economy-wrong/

Ballantyne, D. (2004) Action research reviewed: A market-oriented approach. *European Journal of Marketing*, Vol. 38, No. 3-4, pp. 321-337.

Brownlow, J., Zaki, M., Neely, A. & Urmetzer, F. (2015) Data and Analytics – Data-Driven Business Models: A Blueprint for Innovation. University of Cambridge Service Alliance, working paper, pp. 1–15.

Carson, D., Gilmore, A., Perry, C., & Gronhaug, K. (2001) Action research and action learning. Qualitative Marketing Research. London, Sage.

Chesbrough, H. (2010) Business model innovation: opportunities and barriers. Long Range Planning, Vol. 43, No. 2–3, pp. 354–363.

Daniel, W. & Wilson, H. (2001) The role of dynamic capabilities in e-business transformation. European Journal of Information Systems, Vol. 12, No. 4, pp. 282-296.

EU GDPR Portal, accessed 10.6.2019 (https://eugdpr.org/).

Francis Gomes, J. Pikkarainen, M. Ahokangas, P. Niemelä, R. (2017) Towards business ecosystems for connected health. *Finnish E-Health Journal*, Vol 9, No 2-3.

Francis Gomes, J., Iivari, M. Pikkarainen, M. Ahokangas, P. (2018) Business Models as Enablers of Ecosystemic Interaction: A Dynamic Capability Perspective. *International Journal of Social Ecology and Sustainable Development* Vol. 9, Nro. 3, p. 13.

Frow, P., McColl-Kennedy, J. R. & Payne, A. (2016) Co-creation practices: Their role in shaping a health care ecosystem. *Industrial Marketing Management*, Vol. 56, pp. 24-39.

Giannopoulou, E., Yström, A. & Ollila, S. (2011) Turning open innovation into practice: open innovation research through the lens of managers. *International Journal of Innovation Management*, Vol. 15, No. 3, pp. 505–524.

Gnesi, S., Matteucci, I., Moiso, C., Mori, P., Petrocchi, M. & Vescovi, M. (2014) My Data, Your Data, Our Data: Managing Privacy Preferences in Multiple Subjects Personal Data. Lecture Notes in Computer Science. 8450, pp. 154-171

Guest G. (2012) Applied thematic analysis. Thousand Oaks, California: Sage.

Hallen, B.L. (2008) The causes and consequences of the network positions of new organizations: from whom do entrepreneurs receive investments? *Administrative Science Quarterly* 53(4), pp.685–718.

Hartmann, P.M., Zaki, M., Feldmann, N., Neely, A. (2014) Big Data for Big Business? University of Cambridge Service Alliance, working paper, pp. 1–29.

Hood, L. (2015). The wellness revolution. *Policy: A Journal of Public Policy and Ideas*. Vol. 31 No. 3, pp. 3–5.

Hood, L.E. & Galas, D.J. (2008) 4P Medicine: Personalized, Predictive, Preventive, Participatory: A Change of View that Changes Everything. December 12, 2008. A white paper prepared for the

Computing Community Consortium committee of the Computing Research Association. http://cra.org/ccc/resources/ccc-led-whitepapers/

Horgan, D., Romao, M., Torbet, R. & Brand, A. (2014) European data-driven economy: A lighthouse initiative on Personalised Medicine, *Health Policy and Technology*, Vol. 3, No. 4, pp. 226-233.

Juntunen, M. (2017) Business Model Change as a Dynamic Capability. Doctoral Dissertation, Acta Universitatis Ouluensis.

Häkkilä, H., Alhonsuo, M., Virtanen, L., Rantakari, J., Colley, A., Koivumäki, T. (2016) MyData Approach for Personal Health – A Service Design Case for Young Athletes, 2016 49th Hawaii International Conference on System Sciences.

Kaiser, L.S. & Lee, T.H. (2015) Harvard Business Review Turning Value-Based Health Care into a Real Business Model, 08 October 2015. https://hbr.org/2015/10/turning-value-based-healthcare-into-a-real-business-model

Kleinbaum, A.M. and Tushman, M.L. (2007). Building bridges: The social structure of interdependent innovation, *Strategic Entrepreneurship Journal*, Vol. 1, pp. 103–122.

Kemppainen, L. Pikkarainen, M. Koivumäki, T. Poikola, A. (2018), Emerging Revenue Models for Personal Data Platform Operators: When Individuals are in Control of Their Data, *Journal of Business Models*.

Koivumäki, T., Pekkarinen, S., Lappi, M., Väisänen, J., Juntunen, J., Pikkarainen, M. (2017), Consumer Adoption of Future MyData-Based Preventive eHealth Services: An Acceptance Model and a Survey Study, *J Med Internet Res*. Vol 19, No 12 (2017): December.

Lund, M. & Nielsen, C. (2014), The Evolution of Network-based Business Models Illustrated Through the Case Study of an Entrepreneurship Project, *The Journal of Business Models*, Vol. 2, No. 1, pp. 105-121

Massa, L., Tucci, C.L., Afuah, A. (2017) A critical assessment of business model research, *Academy of Management Annals*, Vol. 11, no. 1, pp. 73-104.

Mettler, T. & Eurich, M. (2012) A "design-pattern"-based approach for analyzing e-health business models. *Health Policy and Technology*, Vol. 1, No. 2, pp. 77 –85.

Möller, K. & Svahn, S. (2009) How to influence the birth of new business fields – Network perspective. *Industrial Marketing Management*, Vol. 38, No. 4, pp. 450-458.

Nash, I. (2018) It's My Heart. Why Not My Data? *Circulation*, Vol 137, No. 1, pp. 4–6. DOI: 10.1161/CIRCULATIONAHA.117.031392

Numerof, R. (2015) 3 strategies for changing the health insurance business model. FierceHealthcare, 26 October 2015. http://www.fiercehealthcare.com/payer/3-strategies-for-changing-healthinsurance-business-model

Onetti, A., Zucchella, A., Jones, M.V. & McDougall-Covin, P.P. (2010) Internationalization, innovation and entrepreneurship: business models for new technology-based firms. *Journal of Management and Governance*, Vol. 16, pp. 337–368.

Palo, T. & Tähtinen, J. (2011) A network perspective on business models for emerging technology- based services, *Journal of Business & Industrial Marketing*, Vol. 26 Issue: 5, pp. 377–388, doi: 10.1108/08858621111144433

Papadopoulou, E., Stobart, A., Taylor N.K. & Williams, M.H. (2015) Enabling data subjects to remain data owners. *Smart Innovation, Systems and Technologies*, Vol. 38, pp. 239-248.

Poikola, A., Kuikkaniemi, K. & Honko, H. (2014) MyData – A Nordic Model for Human-Centered Personal Data Management and Processing. Ministry of Transport and Communication, Open Knowledge Finland.

Pujol, I., Osimo, D., Wareham, J. & Porcu, F. (2016) Data-driven business models in the digital age: the impact of data on traditional businesses. Paper presented at the 3rd World Open Innovation Conference, Barcelona, 14–15 December 2016.

Pikkarainen, M. Pekkarinen, S. Koivumäki, T. Huhtala (2018) Data as a driver for shaping the practices of a preventive healthcare service delivery network, *Journal of Innovation Management*, Vol 6, nro 1.

Redman, T.C. (2015) 4 Business Models for the Data Age, *Harvard Business Review*, May 20, 2015, https://hbr.org/2015/05/4-business-models-for-the-data-age

Rindova, V.P., Yeow, A., Martins L.L. and S. Faraj. (2012) Partnering portfolios, value-creation logics, and growth trajectories: A comparison of Yahoo and Google (1995 to 2007), *Strategic Entrepreneurship Journal*, Vol. 6, pp. 133–151.

Reding, V. (2010) The upcoming data protection reform for the European Union. *Int Data Privacy Law 2010*, Vol. 1, pp. 3-5.

Sorescu, A. (2017) Data-Driven Business Model Innovation. *The Journal of Product Innovation Management*, Vol 34. No. 5, pp. 691-696.

Tax, S., McCutcheon, D., & Wilkinson, I.F. (2013) The Service Delivery Network (SDN): A Customer-Centric Perspective of the Customer Journey, *Journal of Service Research* Vol. 16 No. 4, pp. 454-470.

Teece, D. (2010) Business models, business strategy and innovation. *Long Range Planning*, Vol. 43, pp. 172–194.

Tikkinen-Piri, C. Rohunen, A., Markkula, J. (2018) EU General Data Protection Regulation: Changes and implications for personal data collecting companies, *COomputer Law & Security Review* 34 (2018) 134–15.

Trimi, S. & Berbegal-Mirabent, J. (2012) Business model innovation in entrepreneurship. *Internatonal Entrepreneurship Management Journal*, Vol 8. pp. 449–465.

Wirtz, B., Pistoia, A., Ullrich, S. & Göttel, V. (2016) Business models: origin, development and future research perspectives. *Long Range Planning*, Vol. 49, No**.** 1, pp. 36–54.

Zott, C. & Amit, R. (2010) Business model design: an activity system perspective. *Long Range Planning*, Vol. 43, No.2, pp.216–226.

Zott, C., Amit, R. & Massa, L. (2011) The business model: recent developments and future research. *Journal of Management*, Vol. 37, No. 4. , pp. 1019–1042.

Zott C, Huy Q.N. (2007). How entrepreneurs use symbolic management to acquire resources. *Administrative Science Quarterly* 52, Vol 1, pp 70–105.

About the Authors

Dr. Minna Pikkarainen is a joint Connected Health professor of VTT Technical Research Centre of Finland and University of Oulu / Oulu Business School, Martti Ahtisaari Institute and Faculty of Medicine. As a professor of connected health Minna is doing on multidisciplinary research on innovation management, service networks and business models in the context of connected health service co-creation. Professor Pikkarainen has extensive record of external funding, her research has been published large amount of journal and conference papers e.g. in the field of innovation management, software engineering and information systems. During 2006-2012 Professor Minna Pikkarainen has been working as a researcher in Lero, the Irish software engineering research centre, researcher in Sirris, collective "centre of the Belgian technological industry" and business developer in Institute Mines Telecom, Paris and EIT (European Innovation Technology) network in Paris and Helsinki. Her key focus areas as a business developer has been in healthcare organizations. Previously, Minna's research has been focused on the areas of agile development, software innovation and variability management.

About the Authors

Dr. Timo Koivumäki is a professor of digital service business at Martti Ahtisaari Institute, University of Oulu Business School. Previously he has worked as a research professor of mobile business applications at VTT and at University of Oulu, as a professor of information and communication business and as a research professor of electronic commerce at the University of Oulu. Koivumäki has over 20 years of experience in the field of digital business. His research interests include consumer behavior in digital environments, user-driven innovation, digital service business, digital marketing and strategic networking. Koivumäki has been active in various duties (e.g. planning, managing and conducting research) in many national and 2 international research and development projects. Koivumäki has also published in numerous top level academic journals.

Dr. Marika Iivari (Econ. & Bus. Admin) has been a Postdoctoral Researcher within Martti Ahtisaari Institute at Oulu Business School. She defended her doctoral dissertation on business models, open innovation and ecosystems in 2016. She has been involved in projects related to digitalization, demand-driven co-creation, innovation collaboration, as well as knowledge management in healthcare.

JOBM
Journal of Business Models

From Structure to Process: Dynamic Aspects of Business Model Change

Irina Atkova [1,*], and Petri Ahokangas[2]

Abstract

Purpose: Extant research on business models does not address the question of business model evolution. Therefore, the purpose of this paper is to explore *how we can capture the dynamism of business models*.

Approach: We examine the applicability of the principles of complexity theory as an approach to capture the dynamic aspects of business model change. Longitudinal single case study was chosen as a methodological strategy.

Findings: Complexity theory allows capturing dynamics of the business model evolution. It does not picture a business model as a static snapshot but reveals how a new business model comes to be as a result of an intricate interplay between business model elements. In turn, it allows tracing the connection between the elements. This perspective assists in capturing emerging, as well as disappearing business model elements enabling us to understand and explain how business model evolves. Additionally, complexity theory helps to comprehend the connections between different business model elements. The complexity theory approach emphasizes the multi-dimensional nature of a business model allowing to understand the dynamics of the business model evolution by looking at the different levels. Additionally, complexity theory perspective reveals that dynamics of the business model evolution is predicated on different processes. It implies that contrary to the current attempts of the extant research to develop business model kinds and types, complexity theory allows appreciating unique nature of any business model without trying to classify or categorize it.

Value: Understanding the dynamics of business model evolution helps to reflect on business model design and anticipate consequences of change.

Keywords: business model, complexity theory, case study

Please cite this paper as: Atkova, I., and Ahokangas, P. (2020), From Structure to Process: Dynamic Aspects of Business Model Change, Vol. 8, No. 2, pp. 57-72

1-2 University of Oulu, Oulu Business School, irina.atkova@oulu.fi; petri.ahokangas@oulu.fi
* corresponding author

Introduction

"For a moment, nothing happened.
Then, after a second or so, nothing continued to happen."
– Douglas Adams,
The Hitchhiker's Guide to the Galaxy

The extant literature on business models is very diverse: the concept has been employed in different contexts to address different research questions, prompting some scholars to claim that business model research lacks formalization and structure (Zott, Amit and Massa, 2011; Casadesus-Masanell and Ricart, 2010). Yet, a review by Zott *et al.* (2011) has revealed that the business model has been mainly used to address and explain such phenomena as e-commerce, value creation and value capture, and technology innovation. These streams of research brought about two different uses of the business model concept—static and instrumental. The former approached the business model as a representation of firm activities emphasizing the coherence between core business model components; the latter implied using the concept as a tool to address change and innovation (Chesbrough, 2010; Demil and Lecocq, 2010). Massa, Tucci and Afuah (2017) concluded that fundamentally different business model notions address either how firms do business, how the way firms do business is interpreted by organizational members, and how a business model could be represented by means of formal conceptualizations, whether symbolic, mathematical, or graphical depictions.

Dynamism is an essential feature of a business model concept (Doganova and Eyquem-Renault, 2009; McGrath, 2010; Demil and Lecocq, 2010), yet none of the approaches discussed above allows it to be directly captured. The static approach does not aim for it in the first place, while the instrumental approach allows discussing change but not looking at how business models evolve themselves. Both approaches conceptualize the business model as a snapshot, "*a quantum of information that is revealed in a flash*" (Winter and Szulanski, 2001, p. 731). The static and instrumental perspectives discuss the business model at a particular point in time that does not allow addressing and explaining the evolution process. Yet, understanding the dynamics of business model evolution would allow reflecting on business model design and anticipating the consequences of change. Hence, this paper explores *how we can capture the dynamism of business models*. To arrive at an answer to this question, our aim in this paper is to examine the applicability of the principles of complexity theory (Anderson, 1999) as an approach to capturing the dynamic aspects of business model change. Regardless of how we see or try to depict a business model, it can always be seen as a system (Zott and Amit, 2010; Morris, Schindehutte and Allen, 2005; Tikkanen, Lamberg, Parvinen and Kallunki, 2005; Massa, Gianluigi and Tucci, 2018) consisting of interrelated components, as exemplified by the many business model canvas tools available today. Our aim, however, is not to discuss business model components as such, but rather the properties these components might possess in relation to depicting change. As a business model is proclaimed to be an appropriate boundary-spanning unit of analysis (Zott *et al.*, 2011), a means of innovation (Foss and Saebi, 2017), a dynamic capability (Teece, 2007), as well as a practical implementation of strategy (Osterwalder and Pigneur, 2002; Richardson, 2008), we see it as having potential for unfolding and depicting dynamism in business.

The rest of the paper is organized as follows. We start by discussing our theoretical antecedents, describe the research methodology applied, and exemplify our view by presenting an example of a case company that has 45 years of experience in developing and manufacturing innovative and unique playground equipment. At the end, we present our findings and conclusions.

Theoretical framework

Basic tenets of business model research

Whilst being a contested concept, a business model is nonetheless frequently defined as a representation of a firm's activities that explains how it creates and captures value by exploring and exploiting opportunities (Demil and Lecocq, 2010). A model is a tool that allows simplifying and representing complexity by eliminating the unnecessary or insignificant. The contents of a business model are reflected in sub-components (Wirtz, Pistoia, Ullrich and Göttel, 2016). However, as with the definition of the business model concept, there is no unanimity between scholars with regard

to the essential business model components. For instance, Hamel's (2000) framework includes customer interface, core strategy, strategic resources, and value network. Amit and Zott (2001) distinguish between the design of transaction content, structure, and governance as the key business model components. Osterwalder and Pigneur (2010) created the 'Business Model Canvas' with nine building blocks: value proposition, partners, activities, resources, customer relationships, channels, customer segments, cost structure, and revenue streams. In turn, Mason and Spring (2011) discuss technology, market offering, and network architecture as the major constituent parts of a business model. From the above follows that resource structure, transaction structure, and value structure tend to be the common denominators for the seemingly diverse business model frameworks (George and Bock, 2011). It is noteworthy that Massa *et al.* (2017) emphasize that traditional approaches towards business model research focus largely only on the supply side of value creation without considering the demand side.

Though the literature on business models is highly fragmented (Foss and Saebi, 2017), there are several arguments that unite scholars in the business model research field. First, as mentioned before, a business model is progressively associated with value creation and capture activities. Teece (2010, p. 173) posits that "*a business model articulates the logic and provides data and other evidence that demonstrates how a business creates and delivers value to customers*". Second, business models are increasingly acknowledged as new boundary-spanning units of analysis (Zott *et al.,* 2011), allowing a common ground to be created between business model researchers. Third, a business model tends to be perceived not only as a vehicle for innovation but also as an object of innovation (Foss and Saebi, 2017). This requires a business model to be flexible in order to be easily calibrated to the constantly changing external environment (Teece, 2010). In turn, business model innovation is closely tied to business scalability. For instance, Chesbrough and Rosenbloom (2002) perceive business models as vehicles for scaling technology into a viable business. In other words, business model innovation supports business scalability.

Packing complex phenomena into simple models frequently implies compressing nonlinear behavior with intricate interconnections and feedback loops into a linear model that is easier to grasp (Anderson, Meyer, Eisenhardt, Carley and Pettigrew, 1999; Anderson, 1999). It implies that any attempt to model firm activities leads to representation distortions. The question is, how else might we comprehend such a complex phenomenon as a business model? Täuscher and Abdelkafi (2017) and Havemo (2018) tried to look at the visual sides of business modeling, but no attempts have been made so far to theorize the business model-related processes from the complexity theory perspective. It can be partially attributed to the fact that the use of complexity theory in entrepreneurship studies is quite recent (Steyaert, 2007). However, complexity theory may warrant new insights into business model transformation as it focuses on the dynamics between the external and internal as new relations are created rather than on isolated actions (Steyaert, 2007; Massa *et al.,* 2018). It allows business model transformation to be depicted as "*a non-linear outcome resulting from phase transitions which are caused by adaptive tensions and by process of positive feedback*" (McKelvey, 2004, p. 316).

Business models from the complexity theory perspective

Complexity theory suggests that some systems with multiple interactions and feedback loops between different parts can produce simple and forecastable effects, whereas others generate behavior that is impossible to predict (Anderson, 1999). Though complexity theory draws inspiration from many streams of thought, five basic principles of complexity theory can be identified. The *connectivity principle* suggests that elements of a system are partially connected to each other by feedback loops, and thus mutually influence each other (Anderson, 1999). A system can be defined as a whole whose elements are interconnected (Ison, 2008). In the business model context, it implies that each choice with regard to a business model will have implications for the whole structure and will involve a different business model; that is, different business model elements, activities, resources, and capabilities (Zott and Amit, 2010). In turn, finding the most effective business model structure involves a lengthy process of market experimentation and trial-and-error learning (McGrath, 2010; Sosna, Trevinyo-Rodrigez and Velamuri, 2010). Of note, Graud and Van de Ven (1992)

and Van de Ven and Polley (1992) found no support for adaptive trial-and-error learning in the innovation process. It implies that business model experimentation through trial-and-error may not generate learning. The connectivity principle is closely linked with a notion of co-evolution that suggests that elements of a system are evolving in close symbiosis (Anderson, 1999). In other words, change in one element influences system fitness, triggering continuous adaptation. It is recognized that the business model is emerging as a new unit of analysis bridging multiple levels—individual, firm, and industry (Zott *et al.,* 2011). Thus, in the business model context, it implies that change in one business model element will have implications for the business model as a whole and will inevitably involve transformations on different levels.

The *principle of reinforcing cycles* implies that positive feedback loops amplify the existing behavior, whereas negative feedback loops result in dampening out change. It suggests that positive feedback loops allow for fitness optimization within a system and between a system and the external environment (Anderson, 1999). In the business model context, the loops of feedback facilitate calibration of the business model to the business context and external environment, and allow for the harmonizing of the elements of the business model to enhance its performance potential (Teece, 2010; Zott and Amit, 2010). In a similar vein, Zott and Amit (2010, p. 216) define a business model as "*a system of interdependent activities that transcends the focal firm and spans its boundaries*".

The *principle of self-organization* stems from the principle of reinforcing cycles. The cycles of the reinforcing positive feedback make groups of system components locked (Anderson, 1999). In turn, this leads to predictable collective behavior. In other words, systems self-organize by means of feedback loops that generate stable structures (Drazin and Sandelands, 1992). This order revolves around so-called attractors. "*An attractor is a limited area in a system's state space that it never departs*" (Anderson, 1999, p. 217). The major function of a business model is to explore and exploit opportunities (Zott and Amit, 2010; Teece, 2010; McGrath, 2010). In other words, a business model can be seen as being built around an opportunity (Ahokangas and Myllykoski, 2014), an opportunity to create and capture value. George and Bock (2011, p. 99) define business models as "*the design of organizational structures to enact a commercial opportunity*". Thus, in the business model context opportunity plays the role of an attractor that orchestrates the process of business model evolution via "*a never-ending series*" of feedback loops (Anderson, 1999, p. 217). In a similar vein, McGrath (2010, p. 248) claims that a business model is "*a job that is never quite finished*".

The *non-linearity principle* suggests that there is no direct relationship between input and output. Surprisingly, scholars tend to eliminate nonlinear interactions for the sake of analytical tractability, yet such interactions are essential for pattern emergence (Anderson, 1999). According to Weick (1979), too few components or interactions between them can hamper pattern emergence. Anderson (1999, p. 222) suggests that instead of "*modelling complex building blocks with few interactions, we can make them understandable by modelling simple building blocks with many interactions*". In the business model context, it implies that it is impossible to fully predict what influence change in one business model element would have on the individual, firm, and industry levels. However, we can understand business model dynamics by modeling anchoring elements with many interactions.

The *principle of sensitivity to initial conditions* logically stems from the idea of non-linearity, which means that a small change in the initial conditions can lead to a completely different result. From the business model perspective, it entails a need to pay special attention to the business opportunity evolution—a business model is a delicate system where small changes to a few elements can send it off to a new attractor. In the extant literature, the dynamic perspective within the business model context is frequently discussed either with regard to the dynamic interaction between business model components or business model innovation (Wirtz *et al.,* 2015). For example, Demil and Lecocq (2010) claim that business model dynamics is revealed by "*... interactions between and within the core model components*". Casadesus-Masarell and Ricart (2010) approach business models as a set of relations and feedback loops between elements that strengthen parts of the model over time. In turn, Cavalcante, Kesting and Ulhøi (2011) establish the missing links between business model

dynamics and innovation, emphasizing the importance of individual agency. Similarly, van Putten and Schief (2012) discuss business model dynamics in conjunction with business model innovation. Overall, in the extant studies on business model dynamics, an evolutionary and radical approach toward business model innovation is discussed (Wirtz *et al.,* 2015). Sosna *et al.* (2010) take a step further and approach the dynamics of business model evolution from a learning perspective. We claim that by approaching business model evolution on a meta-level, complexity theory ensures more holistic understanding.

Approaching the dynamics of business models from the complexity theory perspective allows systemic understanding to be achieved (Ison, 2008). The complexity theory perspective allows not only the elements of a business model to be depicted, but it also enables us to pay attention to the connections between business model elements (Phillips and Ritala, 2019). By elucidating the structure and processes related to business model dynamics, the complexity theory perspective gives us an opportunity to capture the dynamic aspects of business model change, i.e. how a business model emerges and develops over time. The above discusses business models from the complexity theory perspective and sets up the basis for our empirical study.

Methodology

Ahokangas and Myllykoski (2014) emphasize that when divorced from the context business model related processes cannot be fully understood. Thus, the emphasis of this study is on understanding business model dynamics as they unfold in the context. Therefore, a case study research strategy was chosen as it allows providing "*an analysis of the context and processes which illuminate the theoretical issues being studied*" (Hartley, 2004, p. 323). Additionally, the case study approach is appropriate for capturing emergent and changing properties (Hartley, 2004). A case study research strategy allows for two different approaches with regard to the research design: single case study and multiple case study. This research is conducted as a single case study. According to Yin (1994), a single case design is appropriate under several circumstances: when a case represents a critical, unique, typical, revelatory, or longitudinal case.

Our research case company, Lappset, was established more than forty-five years ago with the idea to reinvent the play environment for children. This was to be done by creating equipment that would allow them not only to have fun but also to develop physically and mentally. Today, Lappset is an international group with subsidiaries in five different countries. It exports to more than 40 countries, resulting in most of the group's turnover coming from overseas. The organization strives to create sustainable play-friendly areas for people of different ages. The case company has more than 45 years of experience in the industry, providing a unique opportunity to follow and capture the process of business model transformation in a longitudinal manner.

Within this longitudinal research strategy two methods were employed: document analysis and semi-structured interviews. Document analysis is frequently used to support other qualitative research methods and to achieve triangulation – "*the combination of methodologies in the study of the same phenomenon.*" (Bowen, 2009; Denzin, 1970, p. 291) According to Bowen (2009), document analysis is particularly suitable for qualitative case studies. In a similar vein, Merriam (1988, p. 118) emphasized that *"documents of all types can help the researcher uncover meaning, develop understanding, and discover insights relevant to the research problem."* For the purposes of this study, document analysis involved analyzing seven presentations between 2005 and 2015. The presentations included company and product presentations. The company presentations covered, among others, such aspects as the company history, strategy, internationalization process and branding. The product presentations elaborated on the company product portfolio. Also, the information provided on the company website, including the website history, was analyzed. The authors examined mainly what the company offers to their customers, how and where it does it in practice, and how the company can do it profitably. These are the key questions that cover the main elements of any business model engaged in value creation and capture processes (Ahokangas and Myllykoski, 2014). These documents allowed for a preliminary depiction of the dynamics of the business model transformation and provided the basis for the semi-structured interviews.

There are three types of interviews: structured, unstructured, and semi-structured (Longhurst, 2009).

Semi-structured interviews have "some degree of predetermined order" but still ensure "flexibility in the way issues are addressed by the informant." (Dunn, 2005, p. 80) In our study, the semi-structured interview revolved around uncovering the story of the case company together with the informant (see Appendix 1). We have followed the semi-structured research method as it fosters reciprocity and reflexivity, engaging both the researcher and the informant in clarification, meaning-making, and critical reflection (Galletta and Cross, 2013). It was particularly important for our study as it allowed us to unmask the dynamics of the company business model by encouraging alternative explanations and multiple perspectives (Galletta and Cross, 2013). For the purposes of this study, two semi-structured interviews with the chairman of the board of the case company and with the CEO were conducted in July 2016, which lasted one and three hours respectively. The interviews were transcribed using Listen N Write software. To ensure the validity of the research, the data was analyzed soon after it was collected and transcribed. In order to depict the elements and transformation of Lappset's business model, the focus was on the scalable business model elements engaged in value creation and capture processes. To draw the complexity map, the data was organized around key themes that were developed based on the documents. In the process of data analysis, the themes were refined and developed that allowed for deeper understanding of the case company business model dynamics. Finally, to enhance research validity the findings were checked with the case study participants.

Findings and discussion

Case overview

The following case overview is based on the analysis of the presentations, web-site information and interview data. Lappset (lappset.com) as a company name comprises parts of two words, Lapland (the land of the Lappish people) and lapset (*children* in Finnish). The Lappset entrepreneurs started their business by using unique Lappish wood to develop and manufacture innovative and unique playground equipment, with the novel idea of furnishing living environments with warmer and softer-looking play equipment. In the new environment, children could have fun by climbing and playing independently. Before long, the company was known throughout Finland and even beyond: by the 1970s, the company was already making sales calls in Scandinavia, the Benelux countries, and even Japan. Long delivery distances and the demands for efficient production presented challenges for the young company. In response, Lappset began to develop new innovative solutions, such as modular construction, and invested heavily in product and business development with a keen eye on market trends. A modular design and a special grooving were introduced to the products. The special type of grooving increased the quality of the products, and modular design provided children with the opportunity for playful learning. At that time, the public sector was seen as the main paying customer. The export logic applied by the company was innovative: Where most companies would start exporting to familiar, close markets, the company chose to enter the most difficult and demanding countries first. The 1990s marked a strong international expansion for the company. China, Greece, Italy, Taiwan, Thailand, and South Korea were included as new export countries, and a subsidiary was set up in Sweden. By the end of the 1990s, Lappset had grown into one of the biggest players in the industry.

The new millennium brought about digitalization. A financial crisis in Europe had triggered fierce price competition and expansion to new countries had started to slow down, growing bigger required new means. Simply being different and effective was not enough anymore. The company decided to "include a microchip in the wood" and make playgrounds "smart." The results took the company further than expected. A series of new tailored, modular product lines was introduced to enter new end-user groups, including in the private sector. The idea was not to sell sets of individual playground products, but rather to provide customers with an opportunity to build fully equipped and versatile playgrounds anywhere. With the new offering, Lappset became the benchmark for the industry, the first one to introduce digital content, concept thinking, and new materials to the markets.

In 2010 the company was contacted by a global brand in the mobile games industry. The company had to start reconceptualizing their offering in terms of stories, characters, and themes that also placed increased demands for the design, manufacturing, marketing, and selling capabilities of the company. The standard

existing elements, the playground equipment with a modular digitalized design, formed the core of the new product concept—activity theme parks—combined with an external brand. Parallel to the reconceptualization of the offering, the internationalization strategy of the company changed from seeking new entries to increasing sales and penetration in existing markets. Customer segmentation was renewed and prioritized.

Business model component depiction

Figure 1 below depicts change in the components and logic of the business model over time in the company. This transformation can be roughly divided into three phases: the 70s, the period between 80s and 2000, and from 2000 onwards. It illustrates how company value creation and value capture processes evolved over time, thereby triggering and supporting innovation of the business model structure. In turn, structural changes in the business model induced further modifications to the value processes (Teece, 2010; Foss and Saebi, 2017). In the first phase, Lappset's business model components (first pillar in Figure 1) were straightforward and traditional in the sense that suppliers provided the material (Lappish wood) to produce designed products that were then manufactured, marketed, and sold, delivered, installed, and exported to customers in domestic and export markets. The uniqueness of the business model was in the differentiated products that were sold mainly to public-sector customers.

"The company started in 1970 and we didn't have our own production…And [company name] was the one who was producing for us… and 1974, that was when we started building our own production. At the end of the 70s, Lappset started exporting to Belgium."(Chairman of the board)

Over time, as the company grew, modularization became more important. With the introduction of new product lines and bringing digital components to the products, the original idea of design transformed to modular design thinking, which was strongly supported by branding activities (pillar 2 in Figure 1).

"In the 80s, Lappset built modular structures." (Chairman of the board)

"The SmartUS innovation came in early 2000. And that was because my father [the founder of the company] said that you have to include the microchip into the wood. And we said he was crazy." (Chairman of the board)

"We have a product line that we call interactive products, which means that we combine the digital and electronic worlds with traditional play." (CEO of the company)

"My father [the founder of the company] has always known the value of the brand. And he has always known how to market. He went out from Rovaniemi with his wolf coat and he only rented it because he wanted to make sure that everybody remembered that he came from the north. And he made sure that his phone number was short, the same length as they were in Helsinki. He got a 4-digit phone number for the company so that together with the Rovaniemi area code it was as long as a normal Helsinki normal number. So he knew that everything was important as the brand and things." (Chairman of the board)

Lappset's branding activities, together with its increasing international presence, necessitated a new kind of organization for growth. Sales communication activities, as well as installation and maintenance, were seen as being locally managed in different countries, but were guided by the brand and directed from headquarters.

"We first changed Germany, the UK and then France so that we had 100% ownership. They are separate companies and management comes from here [headquarters]." (Chairman of the board)

In the third phase (pillar 3 in Figure 1), modularization was applied to branding as the company started to build theme parks for other brand owners. At the same time, the role of design transformed into a wider set of conceptualization and marketing activities that were seen to create value to customers. Packetizing solutions and selling could be done anywhere in the same way as manufacturing and assembly, as well as installation and maintenance. A new, close-to-customer activity was realized in the form of data services through which the customers could start to optimize their investments in the company's products and services.

"…and then when we came to 2010, Angry Birds came to our backyard. I think that was a remarkable thing. And it started a new era." (Chairman of the board)

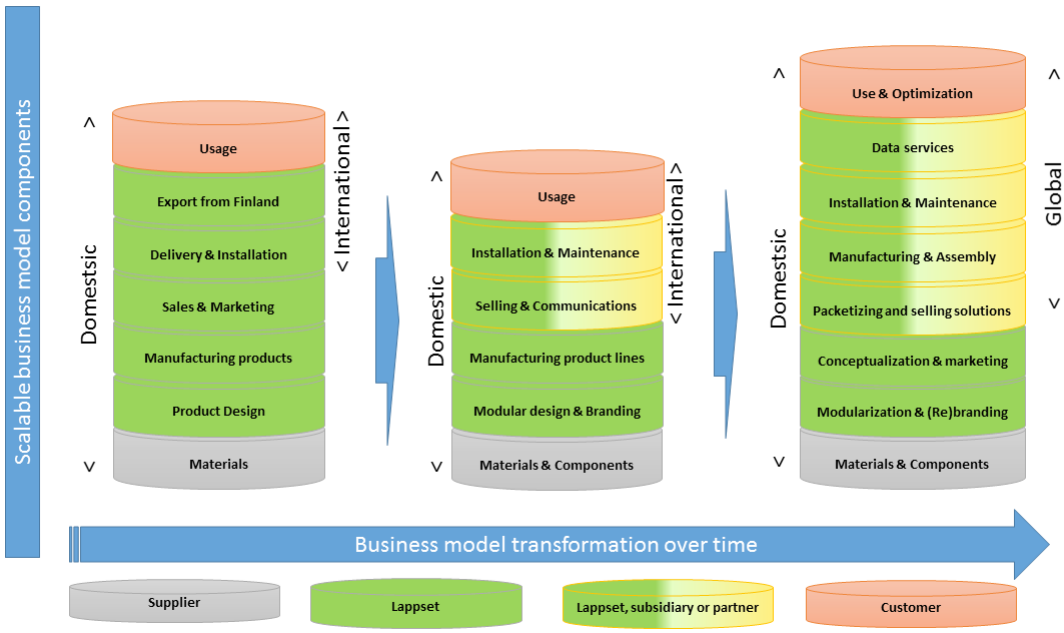

Figure 1: Business model elements and transformation

The transformation of the business model components and their relationships over time characterized two challenges inherent in the business model and change: how to manage operations and their interdependencies in different markets, and at the same time, how to enable growth and internationalization. The adoption of the modularization philosophy was one of the solutions the company found to manage the interdependencies. Similarly, the emergence of conceptualization at the later stages of the company development could be seen as a solution growing from component-based thinking applied to products. Next we take a different kind of look and delve into the role of innovation and internationalization in the development and transformation of the company.

Business model complexity map depiction

The creation of the complexity map of the development of Lappset opens up a systematic but fundamentally different picture of the development of the company. Similarly, the development of the business model complexity map can be traced over three phases: the 70s, the period between 80s and 2000, and from 2000 onwards. In the first phase, Lappset's innovation—Scandinavian wooden play equipment—was born by combining product-material innovation with a Nordic identity, opening up an opportunity to export differentiated products to customers. Scandinavian wooden play equipment and a Nordic identity are the initial conditions that directed the future evolution of the company business opportunity and business processes (Anderson, 1999). In the period between 80s and 2000, consistent with the principle of reinforcing cycles, growth enabled by the innovation contributed to the emergence of a product families that further boosted Lappset to the next stage of internationalization, with a local presence in an increasing number of countries (Anderson, 1999). Reflecting the ideas of self-organization, when the opportunities of digitalization were discovered by the company, it started to explore and invest in them, gradually transforming from product innovation thinking toward more abstract digital innovation thinking, and then to concept innovation thinking (Anderson, 1999). The parallel development of Lappset's branding activities are consistent with the connectivity principle, where choices with regard to the business opportunity influenced other company activities (Anderson, 1999). In the third phase, the digital product lines adopted conceptual thinking, and internal/external branding logic led to internationalization on a global scale and seizing the opportunity to develop theme parks for external brands. Reflecting the non-linearity principle, it is possible only to single out the anchoring elements

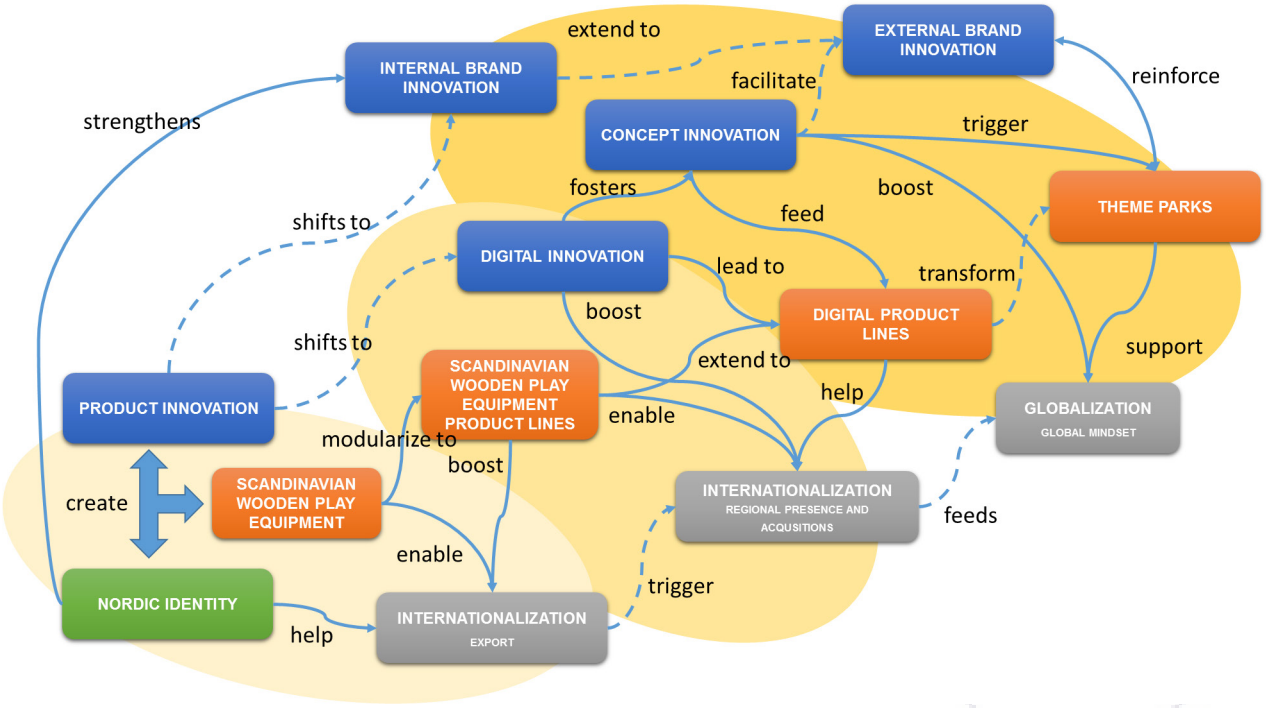

Figure 2: Complexity map: Dynamics of the business model evolution

of the innovation and internationalization processes, but it is impossible to predict how these elements will play out in the future (Anderson, 1999). The creation of a new "blue ocean" market opportunity required a fundamental transformation of the business model. In turn, it enabled Lappset to provide data services for its customers that made it possible to optimize the use of Lappset's offering. Although the data services offered are just first steps in this direction, there are indications that web 2.0 and gamification-based business models could well be the next steps.

Analysis of the primary and secondary data from the complexity theory perspective has revealed that the case company's business model has been developing thematically over several phases. During the first phase, the initial conditions for the business model included an opportunity to innovate children playgrounds, emphasizing the importance of learning in play and to differentiate from the market by accentuating its Nordic identity and utilizing sustainable materials. Following the idea of reinforcing cycles, a unique opportunity has allowed the company to take its first steps in the international market (Anderson, 1999).

"My father [the founder of the company] wanted to furnish the living environment, furnish better surroundings, and that was a great idea. And then in the 80s and 90s came growth though play. And it was a strong message. And nowadays we invite mankind outdoors." (Chairman of the board)

The connectivity principle postulates that each choice has implications for the whole structure; that is, different business model elements, activities, resources, and capabilities (Anderson, 1999; Zott and Amit, 2010). Similarly, production of the play equipment product lines instead of individual items created a novel business opportunity and marked a transition to the second wave in the business model evolution.

"Originally, our company was only a playground company, so we made infrastructure for playgrounds. I also mentioned the interactive products. Now we also have product lines that are for the total lifespan of a human being – from children to teenagers, to adults and seniors. (CEO of the company)

In turn, following the idea of reinforcing cycles and self-organization, a new opportunity boosted international development in the form of regional subsidiaries and acquisitions. The principle of initial conditions and connectivity reveal that at the same time, strengthened by the concept of the Nordic identity, the emphasis in

the innovation processes shifted toward internal brand development and utilization of new digital solutions, leading to the third wave of the business model evolution (Anderson, 1999). In the third stage, novel digital solutions have fostered conceptual thinking, implying that new products represented a certain concept for play, sport, or theme parks.

"And of course, Santa Claus is very important for us. We started with Santa and we are also building Santa Parks around the world. We are now in the process of building one in China." (Chairman of the board)

The principle of self-organization allows us to conclude that concept innovation had a tremendous effect on the business model evolution by facilitating external brand innovation, supporting the emergence of a global mindset and triggering the emergence a new business opportunity–theme parks development (Anderson, 1999). In turn, a new opportunity supported further globalization and reinforced the company brand.

The complexity theory perspective also allows us to differentiate between different themes in the business model evolution. The evolution dynamics is revealed in the business opportunity transformation–the development of the innovation and internationalization processes that reflect the main ideas of the complexity theory. The company started by utilizing a unique opportunity to rethink children's playgrounds, which led to the production of play equipment with a pronounced Nordic identity. This opportunity has transformed into the production of product lines and–at the start of the digital era–into digital product lines. Supported by digital and concept innovation, digital product lines evolved into theme parks. Innovation processes largely revolved around new business opportunities and the company brand. The internationalization process started off with small-scale export operations and progressed toward full-scale globalization.

Conclusions

The discussion above gives rise to two sets of conclusions related to the company business model and business model transformation from the complexity perspective. As was previously discussed, extant representations of the business model concept focus largely on the supply side of value creation, without considering the demand side (Massa *et al.,* 2017). Indeed, the customer is an essential part of a business model composition (Osterwalder and Pigneur, 2010). However, it does not play an active or proactive role, but rather is treated as a passive consumer. Yet, as the principle of reinforcing cycles allows us to conclude, the flexibility and responsiveness of the case company business model allowed the demand side of the value creation chain to be taken into account, as well as allowing the customer to have a say in the final product design (Anderson, 1999; Massa *et al.,* 2017). Additionally, flexibility enabled business model scalability (Chesbrough and Rosenbloom, 2002). The product evolution is closely associated with the changing external trends–from basic quality products to product lines and modular design, and on to digital products and theme parks. In other words, modularization, digitalization, and conceptualization supported novel value creation logic and fostered business model scalability (Teece, 2010; Chesbrough and Rosenbloom, 2002).

If the depiction of the business model elements and its transformation represents a company business model at a certain development stage, the complexity map allows the forces that enable this transformation–business opportunity transformation, development of the innovation and internationalization processes–to be captured (Anderson, 1999). Complexity theory suggests that systems can produce foreseeable as well as unforeseeable effects (Anderson, 1999). The case company initiated the internationalization process by exporting the products to a limited number of countries. Organizational learning in terms of foreign market knowledge supported the intensification of the internationalization process, and eventually the company became a benchmark in the industry on a global scale. If the company's internationalization path seems largely predictable, the development of a business opportunity takes a lot of unexpected turns over the years (Anderson, 1999).

The case company's business model evolution has revealed that the choices the company made with regard to business opportunities, innovation, and internationalization processes are closely connected, and have supported and fed each other. Co-evolving the processes of innovation and opportunity development

in close symbiosis contributed to the expansion of international operations. In turn, the company's internationalization process reflects the principle of the reinforcing cycles and self-organization, where the initial success in the foreign markets triggered further expansion and generated stable international growth (Anderson, 1999). Also, the opportunities, internationalization, and innovation also played a major role in the evolution, interdependencies, and contents of Lappset's business model components. In essence, we claim that the two figures we have presented (Figure 1 and 2) enable us to capture, depict, and explain the business model change processes in the case company.

Approaching business opportunity transformation in combination with innovation and internationalization processes does not allow us to fully predict what effect a change in one business model component would have at the individual, firm, or industry level (Teece, 2010; Anderson, 1999). However, this perspective emphasizes the multi-dimensional nature of a business model and allows us to understand the dynamics of business model evolution by looking at the different levels. Additionally, the complexity theory perspective emphasizes that the dynamics of business model evolution is predicated on different processes. It implies that, contrary to the current attempts of the extant research to develop business model kinds and types, complexity theory allows us to appreciate the unique nature of any business model without trying to classify or categorize it.

Importantly, complexity theory enables us to capture the dynamics of business model evolution (Doganova and Eyquem-Renault, 2009; McGrath, 2010; Demil and Lecocq, 2010). It does not provide a picture of a business model at a certain point in time, creating a static snapshot, but it does reveal how a new business model comes to be as a result of an intricate interplay between business model elements. In turn, it allows the connection between the elements to be traced. To sum up, complexity theory allows us to capture the process of business model development, avoiding a situation "when nothing continues to happen." This perspective assists us in capturing emerging as well as disappearing business model elements, enabling us to understand and explain how a business model evolves. Additionally, complexity theory helps us to comprehend the connections between different business model elements, to reveal its multi-faceted and unique nature.

References

Ahokangas, P., Atkova, I. & Hurmelinna-Laukkanen, P. (2017), Come to the Northern side – we have a business model, inVincze, S. (Ed.), *Motivating SMEs to Cooperate and Internationalize: A Dynamic Perspective,* Routledge Studies in Small Business, Routledge, London.

Ahokangas, P. & Myllykoski, J. (2014), The practice of creating and transforming a business model, *Journal of Business Models,* Vol. 2, No.1, pp. 6-18.

Amit, R. & Zott, C. (2001), Value Creation in E-Business, *Strategic Management Journal*, Vol. 22, No. 6, pp. 493-520.

Anderson, P. (1999), Complexity theory and organization science, *Organization Science*, Vol. 10, No. 3, pp. 216-232.

Anderson, P., Meyer, A., Eisenhardt, K., Carley, K. & Pettigrew, A. (1999), Introduction to the special issue: Applications of complexity theory to organization science, *Organization Science,* Vol. 10, No. 3, pp. 233-236.

Bowen, G. A. (2009), Document analysis as a qualitative research method, *Qualitative Research Journal*, Vol 9, No. 2, pp. 27-40.

Cavalcante, S., Kesting, P. & Ulhøi, J. (2011), Business model dynamics and innovation: (Re)establishing the missing linkages, *Management Decision,* Vol. 49, No. 8, pp. 1327-1342.

Casadesus-Masanell, R. & Ricart, J. (2010), From strategy to business models and onto tactics, *Long Range Planning,* Vol. 43, No. 2-3, pp. 195-215.

Chesbrough, H. (2010), Business model innovation, opportunities and barriers, *Long Range Planning,* Vol. 43, No. 2-3, pp. 354-363.

Chesbrough, H. & Rosenbloom, R.S. (2002), The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies, *Industrial and corporate chang*e, Vol. 11, No. 3, pp. 529-555.

Demil, B. & Lecocq, X. (2010), Business model evolution: In search of dynamic consistency, *Long Range Planning,* Vol. 43, No. 2-3, pp. 227-246.

Denzin, N. K. (1970), *The research act: A theoretical introduction to sociological methods*, Aldine, New York.

Doganova, L. & Eyquem-Renault, M. (2009), What do business models do? Innovation devices in technology entrepreneurship, *Research Policy,* Vol. 38, No. 10, pp. 1559-1570.

Drazin, R. & Sandelands, L. (1992), Autogenesis: A perspective on the process of organizing, *Organization Science,* Vol. 3, No. 2, pp. 230-249.

Dunn, K. (2005), Interviewing, in Hay, I. (Ed.), *Qualitative Research Methods in Human Geography* (2nd ed.), Oxford University Press, Melbourne, pp. 79-105.

Foss, N. & Saebi, T. (2017), Fifteen Years of Research on Business Model Innovation How Far Have We Come, and Where Should We Go? *Journal of Management,* Vol. 43, No. 1, pp. 200-227.

Galletta, A. & Cross, W. E. (2013), *Mastering the Semi-Structured Interview and Beyond: From Research Design to Analysis and Publication*. NYU Press, New York.

George, G. & Bock, A. (2011), The business model in practice and its implications for entrepreneurship research, *Entrepreneurship Theory and Practice,* Vol. 35, pp. 83-111.

Graud, R. & Van de Ven, A.H. (1992), An empirical evaluation of the internal corporate venturing process, *Strategic Management Journal,* Vol. 13, pp. 93-109.

Hamel, G. (2000), *Leading the Revolution,* Harvard Business School Press, Boston.

Hartley, J. (2004), Case study research, in Cassell, C. & Symon, G. (Eds.), *Essential Guide to Qualitative Methods in Organizational Research*, Sage Publications, London, pp. 323-333.

Havemo, E. (2018), A visual perspective on value creation: Exploring patterns in business model diagrams. *European Management Journal*, Vol. 36, no 4, pp. 441-452.

Ison, R. (2008), Systems thinking and practice for action research, in Reason, P. & Bradbury, H. (Eds.), *The SAGE Handbook of Action Research: Participative Inquiry and Practice* (2nd ed.), Sage Publications, London, pp. 138-158.

Longhurst, R. (2009), Semi-structured interviews and focus groups, in Clifford, N., Cope, M., Gillespie, T. & French, S. (Eds.), *Key Methods in Geography* (3rd ed.), Sage Publications, London, pp. 143-156.

Mason, K. & Spring, M. (2011), The sites and practices of business models, *Industrial Marketing Management,* Vol. 40, No. 6, pp. 1032-1041.

Massa, L., Tucci, C. & Afuah, A. (2017), A critical assessment of business model research, *Academy of Management Annals,* Vol. 11, No. 1, pp. 73-104.

Massa, L., Gianluigi, V. & Tucci, C. (2018), Business models and complexity. *Journal of Business Models*, Vol. 6, No. 1, pp. 59-71.

McGrath, R.G. (2010), Business models: a discovery driven approach, *Long Range Planning,* Vol. 43, No. 2-3, pp. 247-261.

McKelvey, B. (2004), Toward a complexity science of entrepreneurship, *Journal of Business Venturing,* Vol. 19, pp. 313-341.

Merriam, S. B. (1988), *Case study research in education: A qualitative approach,* Jossey-Bass, San Francisco.

Morris, M., Schindehutte, M. & Allen, J. (2005), The entrepreneur's business model: toward a unified perspective, *Journal of business research,* Vol. 58, No. 6, pp. 726-735.

Osterwalder, A. & Pigneur, Y. (2010), Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. ISBN: 978-0-470-87641-1.

Phillips, M. A. & Ritala, P. (2019), A complex adaptive systems agenda for ecosystem research methodology, *Technological Forecasting & Social Change,* Vol. 146, pp. 119-139.

Sosna, M., Trevinyo-Rodrigez, R.N. & Velamuri, S.R. (2010), Business model innovation through trial-and-error learning, *Long Range Planning,* Vol. 43, No. 2-3, pp. 383-407.

Steyaert, C. (2007), "Entrepreneuring" as a conceptual attractor? A review of process theories in 20 years of entrepreneurship studies, *Entrepreneurship and Regional Development,* Vol.19, pp. 453-477.

Teece, J. (2007), Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance, *Strategic management journal,* Vol. 28, No.13, pp. 1319-1350.

Teece, J. (2010), Business models, business strategy and innovation, *Long Range Planning,* Vol. 43, No. 2-3, pp. 172-194.

Tikkanen, H., Lamberg, J.A., Parvinen, P. & Kallunki, J.P. (2005), Managerial cognition, action and the business model of the firm, *Management decision,* Vol. 43, No. 6, pp. 789-809.

Täuscher, K., & Abdelkafi, N. (2017), Visual tools for business model innovation: Recommendations from a cognitive perspective, *Creativity and Innovation Management*, Vol. 26, no. 2, pp. 160-174.

Van de Ven, A.H. & Polley, A.S. (1992), Learning while innovating, *Organization Science,* Vol. 3, No. 1, pp. 92-116.

van Putten, B. & Schief, M. (2012), The relation between dynamic business models and business cases, *The Electronic Journal Information Systems Evaluation,* Vol. 15, No. 1, pp. 138-148.

Weick, K. (1979), *The Social Psychology of Organizin*g, Addison-Wesley, Reading, MA.

Winter, S.G. & Szulanski, G. (2001), Replication as strategy, *Organization Science,* Vol. 12, No. 6, pp. 730-743.

Wirtz, B.W., Pistoia, A., Ullrich, S. & Göttel, V. (2016), Business models: origin, development and future research perspectives, *Long Range Planning,* Vol. 49, pp. 36-54.

Yin, R. (1994), *Case Study Research: Design and Methods*, Sage Publishing, Beverly Hills, CA.

Zott, C. & Amit, R. (2010), Designing your future business model: an activity system perspective, *Long Range Planning,* Vol. 43, No. 2-3, pp. 216-226.

Zott, C., Amit, R. & Massa, L. (2011), The business model: Recent developments and future research, *Journal of Management,* Vol. 37, No. 4, pp. 1019-1042.

Appendix 1. Initial list of questions in the semi-structured interviews.

1. Could you please tell us the story of Lappset from your perspective?
2. How your business opportunity has changed over time?
3. How did your key targets change over time?
4. What were the key challenges?
5. What were the key barriers?
6. What were the critical events?
7. How did you choose your export countries?

About the Authors

Irina Atkova received her D.Sc. degree (2018) from Oulu Business School, University of Oulu. Her dissertation explains how entrepreneurs create business models to capture opportunities. More specifically, it focuses on the entrepreneurial actions between the moment of opportunity identification and the inception of the functioning business model. Her research interests revolve around entrepreneurship, business model creation and innovation in various contexts, including high-tech industry and start-up context. She has contributed to a number of peer-reviewed conference publications, peer-reviewed book chapters and peer-reviewed journal articles, among others Journal of Entrepreneurship Theory and Practice. She has been also involved in various international research projects, dealing with the development of the Arctic and Barents region, as well as with the Finnish software companies as the drivers of the digital economy.

Dr. Petri Ahokangas received his D.Sc. degree (1998) from University of Vaasa, Finland. Currently he is the head of Futuralis (future digital business) research group at Martti Ahtisaari institute, Oulu Business School. Prior to his academic career, he worked in the telecoms/software industry. His research is in the intersection of entrepreneurship, strategic management, international business, futures and action research, and various fields on technology. Specifically, he is interested in business models, strategies, ecosystems and internationalization within digital and wireless business domains, especially in the domain of next generation (5G/6G) wireless communications. He has over 180 scientific publications and extensive experience of working in national and international research projects.

JOBM
Journal of Business Models

Relationship Building in IoT Platform Models - the Case of the Danfoss Group

Dr. Svend Hollensen[1,*], Dr. Pernille Eskerod[2] and Dr. Anna Marie Dyhr Ulrich[3]

Abstract

Purpose: This paper investigates the implications for a manufacturer's relationship building towards B2B customers and suppliers as a consequence of Internet-of-Things (IoT) platform models.

Design/Methodology/Approach: Explorative single case study with embedded sub-cases. Qualitative research approach. Semi-structured interviews.

Findings: The paper identifies two ways of doing relationship building when it comes to IoT platform models. Relationship building can take place through a Classic Relationship IoT platform model (characterized by low complexity) or a New Relationship IoT platform model (characterized by high complexity). In both models, the manufacturer aims for high stickiness towards the customers. In the New Relationship model, however, low stickiness towards suppliers is aimed for in order to enable the manufacturer to orchestrate the stakeholder constellation dynamically. In addition, a driver for the low stickiness aim towards suppliers can be found in a motive to outsource risks to suppliers in IoT markets characterized by high degrees of turbulence and growth.

Research limitations/implications: The study points to the fact that a manufacturer should consider how the new technology IoT gives opportunities for different ways of relating to stakeholders, e.g. customers and suppliers, in the business model.

Originality/Value: Based on primary data collection the research shows how strategic relationship building can help a manufacturer create value with customers and suppliers within IoT platform models. The paper expands the business model literature by investigating consequences of a new technology, i.e. IoT.

Keywords: IoT, IoT platform model, platform stickiness, manufacturer, relationship building, business models.

Please cite this paper as: Hollensen, S. Eskerod, P. and Ulrich, A.M.D (2020), Relationship Building in IoT Platform Models - the Case of the Danfoss Group, Vol. 8, No. 2, pp. 73-91

1 Dept. of Entrepreneurship and Relationship Management, University of Southern Denmark, Faculty of Social Science, Alsion 2, DK-6400 Sønderborg, Denmark, email: svend@sam.sdu.dk
2 Dept. of Business and Management, Webster Vienna Private University, Palais Wenkheim, Praterstr. 23, A-1020 Vienna, Austria.
3 Dept. of Entrepreneurship and Relationship Management, University of Southern Denmark, Faculty of Social Science, Alsion 2, DK-6400 Sønderborg, Denmark.
* corresponding author

Acknowledgements: We acknowledge the support by Danfoss A/S, DK-6430 Nordborg.

Introduction

The current digital transformation, called Industry 4.0 and representing the fourth industrial revolution in manufacturing and industry, influences production of goods and services as well as value chains and business models. Automation, Big Data, AI (artificial intelligence) and IoT (Internet-of-Things) are technologies within Industry 4.0 that create so-called Smart Factories "allowing the manufacturer to control the entire production from one platform" (Danish Institute of Industry, n.d.). In the future, IoT will play a central role in everyday life (Gershenfeld & Vasseur, 2014), and it will open new business and market opportunities (Miorandi, Sicari, De Pellegrini & Chlamtac, 2012) as well as it will give market actors room for being active creators (Alvarez & Barney, 2007).

A British technology pioneer, Kevin Ashton, introduced the term IoT in 1999 (Ashton, 2009), and today it describes "a network of entities that are connected through any form of sensor, enabling these entities to be located, identified and even operated upon without any human interference" (Falkenreck & Wagner, 2017, p. 1). Opportunities for changing and sharing digital data give companies options for creating additional value for their customers (Kannan & Hongshuang, 2017) and for maintaining relationships in new ways. Lately, classical manufacturers have been transforming themselves from selling products and add-on services towards integrated service solutions packages, with combinations of products, services and software/data. Fast technological development, fierce competition and 'plug-and-play' opportunities through IoT create fast-changing and dynamic B2B market conditions. The IoT technology is radically changing the way manufacturers are creating value for their customers and offering new opportunities for IoT services to form a more substantial part of the company's business model and profits. Accordingly, there is a need to shift research focus from enabling technologies to a business platform model, where joint efforts are considered for value creation and capture among all stakeholders. In the context of IoT platform technology, business models are concerned with how technological potential can be translated into how organizations create and capture value (Iivari, Ahokangas, Komi, Tihinen & Valtanen, 2016). On an IoT platform, several stakeholders will participate, and the platform offers the opportunity for the single company to develop its own IoT service solutions in accordance with the overall IoT business model (Ionut Pirvan, Dedehayir & Le Fever, 2019). Therefore we refer to 'IoT business models' and 'IoT platforms' as interchangeably.

The transformation from a product to a service dominant business model (Woodside & Sood, 2017) is described by the term Service-Dominant Logic (Vargo & Lusch, 2008; Vargo & Lusch, 2017). The Service-Dominant Logic can be helped underway by IoT solutions by which B2B companies in a partner network can align their total offerings to support customers' value creation processes, rather than selling products through an arm's length market transaction. An IoT platform is seen as a configuration design for products, services and infrastructure, facilitating stakeholders' (e.g. suppliers, platform owners, customers) interaction (Löfberg & Åkesson, 2018). The value co-creation process is complex and the IoT platform needs to reflect this complexity, in form of advanced combination of physical products and software (service solutions).

Stakeholder theory can be applied when studying IoT platforms as it suggests that any business should be seen as an interconnected and interdependent system, where all stakeholders must contribute in order to flourish collectively (Freeman, Phillips & Sisodia, 2020). On an IoT platform, the constellation of stakeholders can change over time. The various stakeholders have potential for adding value or harming value creation, depending on the alignment of stakeholder capabilities and expectations (Savage, Bunn, Gray, Xiao, Wang, Wilson & Williams, 2010). To become successful within the context of IoT platforms it is necessary to figure out how to add value through explicit strategic decisions about relationships to stakeholders involved in the value creation process (Ulrich, Hollensen & Eskerod, 2019). The strength of a relationship can be expressed through the term stickiness. The term 'platform stickiness' refers to *"[the] central actor's [i.e. a focal company's] ability to continuously attract new and maintain existing stakeholders within a platform through the effective orchestration of value co-creation"* (Laczko, Hullova, Needham, Rossiter & Battisti, 2019, p. 216). We allow ourselves to replace the term 'ability' with 'aim' in our research as we think this gives the concept more relevance in a strategic context.

IoT provides the opportunity to create a number of different business models (Boehmer, Shukla, Kapletia & Tiwari, 2020; Iivari *et al.*, 2016). Platforms face the challenging task to balance openness and 'stickiness' in such a way that the right set of suppliers and complementary service providers are matched to the right set of customers using the right selection of product categories and channels.

A research gap exists on how a manufacturer relates to its core stakeholders, e.g. customers and suppliers, under these changed market conditions. Examples of suppliers are firms offering complementary products and services as well as installers. This leads us to the following research question:

> How do manufacturers build relationships, in the form of stickiness, with its customers and suppliers on IoT platforms in B2B markets?

The research question is addressed by literature studies as well as empirical studies. Our contribution is to determine a company's aimed level of IoT platform 'stickiness' towards suppliers and customers, depending on the market complexity.

The research involves explorative, qualitative, embedded case studies (Eisenhardt, 1989; Eisenhardt & Graebner, 2007: Yin, 2017). The case company is the Danfoss Group (www.danfoss.com), a Danish traditional manufacturer that has worked with IoT platforms for 10+ years, in order to transform themselves to a more service-oriented company.

The paper is organized as follows: In the next section, we present the theoretical framework, which is built on platform theory as well as stakeholder theory. Hereafter, we present the research methodology. The section includes a presentation of the case company. Afterwards, we present findings from the empirical study. The paper concludes with a discussion and conclusion section that answers the research question as well as it points to a future outlook.

Theoretical Framework

The theoretical framework of the research draws on an integration of platform theory and stakeholder theory.

A platform is defined as a configuration design for products, services and infrastructure, facilitating stakeholders' interaction (Löfberg & Åkesson, 2018). An organization's stakeholders can be defined as "those groups without whose support the organization would cease to exist"(Stanford Research Institute cited in Freeman, 1984, p. 31) and "those groups to whom the firm owes an obligation based on their participation in the cooperative scheme that constitute the organization and makes it a going concern" (Harrison & Wicks, 2013, p. 102). In this paper, we allow ourselves to change the word 'organization' with 'platform' implying that the platform stakeholders are the ones that are necessary for the platform's continuous existence and at the same time the ones for which, in our case, the manufacturer has an obligation.

A platform is used for sharing data and other resources that can be used by all stakeholders. Some platforms have led to significant disruption in the way of doing business, e.g. the retailing platform Amazon, the accommodation platform airbnb, the communication platform Facebook, and the transportation platform Uber.

Four different platform types exist (Smedlund, 2012): leading platforms (e.g. the ones mentioned above), open platforms (e.g. open source applications), closed platforms (e.g. for logistic transactions across companies) and internal platforms (e.g. company-wide). Each type of platform has its own characteristics, tasks and challenges. In an open platform, the end user of the offerings may not be known, whereas a closed platform requires a conscious decision from one or more decision makers on whom to invite to the platform.

Based on a literature review, Smedlund & Faghankhani (2015) propose that successful platforms are characterized by 1) co-creation of value, 2) interdependency and complementarity of components, 3) surplus value for the whole system (i.e. synergy) and 4) evolutionary growth.

Stakeholder theory builds on a systems perspective, implying that the value created by a system (or we can also say a network of stakeholders) is dependent on the contributions provided by each stakeholder (Rhenman, 1968). Each stakeholder involved must benefit from participating in the system in order to ensure its long-run viability (see e.g. Freeman, 1984; Freeman *et*

al., 2020). This is due to the fact that participation in the system is voluntary as stakeholders - whether it is customers, suppliers or platform partners producing products and services - have 'the freedom of choice' (Barnard, 1938) to continue the relationship or not.

The various stakeholders have potential for both promoting and harming the value creation, depending on the alignment of the stakeholder capabilities and expectations (Savage *et al.*, 2010). As the need for the individual stakeholder's contribution can vary, it is a strategic task of the focal organization which is leading the value creation system to decide how to relate to each stakeholder.

Tuominen (1995) proposes the concept 'ladder of stakeholder loyalty' to describe the relationship between the focal organization and the stakeholders within the value creation system. The author differentiates between neutral, cooperative and allied stakeholders, whereas allied stakeholders are on top of the stakeholder loyalty ladder (Tuominen, 1995). The underlying idea is that "... it may not be possible, desirable or efficient to position every positively oriented stakeholder on the top of the ladder, i.e. to have a true allied relationship with every stakeholder. ... [it] may not be an effective utilization of resources" (Polonsky, Schuppisser & Beldona, 2002, p. 122).

Multiple diverse stakeholders on both the supply and the demand sides are involved (Constantiou, Marton & Tuunainen, 2017), and the value created depends on the so-called value constellation (Normann & Ramirez, 1993; Ceccagnoli, Forman, Huang & Wu, 2012), i.e. the specific constellation of stakeholders involved in the creation of a specific offering for a customer. In the platform literature, two roles are defined: orchestrators and offering builders (Ulkuniemi, Pekkarinen, Bask, Lipponen, Rajahonka & Tinnilä, 2011; Eloranta & Turunen, 2016). Due to the dynamic nature of platforms, orchestration challenges exist for a central actor (Nambisan & Sawhney, 2011), i.e. the orchestrator that facilitates the co-creation of value by providing interaction possibilities for value-adding offerings and transactions among the core stakeholders (suppliers, platform partners, customers).

A multi-sided platform is mediating different groups of stakeholders. Digital platforms are often multi-sided, providing interfaces with and among two or more groups of economic actors on different 'sides' of the platform, including providers of complementary assets. In our case, the platform operates on two-sided markets. The popularity of platforms on two-sided markets has increased radically in recent years (Parker, Van Alstyne & Choudary, 2016; de Reuver, Sørensen & Basole, 2018).

On two-sided markets, groups on both the supplier and customer side interact with each other through a common platform. The two-sided market platform is a business ecosystem, which is being made up of coevolving interdependent and interconnected stakeholders: customers, suppliers, agents and channels, sellers of complementary products and services, and the platform owner (Salmela & Nurkka, 2018). In our two-sided platform case, the ecosystem consists primarily of the

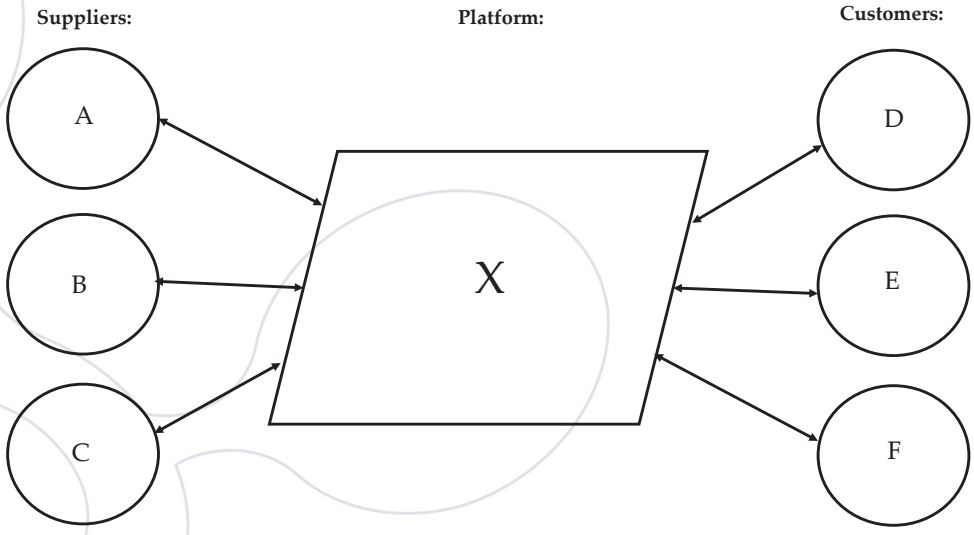

Figure 1: Multiple Diverse Stakeholders on both the Supply and the Demand Sides

suppliers, the platform partners and the customers, see Figure 1.

Fehrer, Woratschek & Brodie (2018) differentiate between the following business model platforms: Firm-centered networks (which builds on Porter's (1980; 1985) philosophy, in which a company chooses an attractive market, enters this market and holds a competitive position there); solution networks (which could be a typical B2B network, which includes a limited number of stakeholders that aims to exploit a business opportunity); and open networks (which include the large scale B2C multi-sided platforms, like airbnb and Uber). The platform business models emphasize value creation between stakeholders, rather than value being created within the boundaries of a single firm. This can only be done if the trust between stakeholders on the platform is built, and consequently the transaction costs between the multiple stakeholders on the platform are being reduced.

As mentioned in the Introduction, a central concept for this article is 'platform stickiness', meaning *"[the] central actor's ability [which we replace with aim in our research] to continuously attract new and maintain existing stakeholders within a platform through the effective orchestration of value co-creation"* (Laczko *et al.*, 2019, p. 216). In contrast to 'stickiness' the concept of 'platform openness' indicates how easy it is to access a platform. More specifically, we define 'platform openness' as the extent to which the platform owner places many or few restrictions on participation, development or use across the distinct roles related to the platform, whether for supplier or customer (Broekhuizen, Emrich, Gijsenberg, Broekhuis, Donkers & Sloot, 2020).

Research Methodology

Research Approach

The research involves literature reviews as well as an explorative, qualitative, single case study with embedded sub-cases (Eisenhardt, 1989; Eisenhardt & Graebner, 2007: Yin, 2017).

The aim is to contribute to the conceptual understanding of relationship building with core stakeholders in the context of IoT platforms in B2B markets by applying an abductive approach (Dubois & Gadde, 2002). In an abductive approach, empirical observations and concepts from existing literature are systematically combined in an evolving manner in order to develop descriptive theory propositions through observation, categorization, and association (Christensen, 2006). Abduction starts from individual observations and the aim is to reach the perceived 'best explanation' from those observations. A guiding principle based partly on intuition and partly facts is created at the beginning of the research (Dubois & Gadde, 2002). It is typical for the abductive logic that relevant theories are identified along the way due to the fact that unexpected findings are an essential part of this logic. The empirical data and the theories are in continuous dialogue during the research. The premises do not guarantee the conclusion, but inference to the perceived best explanation with the inputs at hand (Christensen, 2006).

Selection of Case

An important part of a case study approach is to select a case that can be powerful and rich for analysis of the conceptual problem at hand (Siggelkow, 2007).

As a powerful and rich case company for this research, a Danish manufacturer, the Danfoss Group (www.danfoss.com), was selected. The company, which is one of the largest industrial companies in Denmark, is in digital transformation and have used IoT platforms for 10+ years. Danfoss Group is a family-owned, globally leading component supplier. 80% of its sales is on the B2B market, where it operates as a classical OEM sub supplier (Danfoss, n.d.). See Figure 2.

In 2019, the Danfoss sales was EUR 6.3 billion. The operating profit (EBIT) amounted to EUR 771 million, leading to an EBITA margin of 12.3%. From 2018 to 2019 net profit improved 8% to EUR 502 million. In 2019 Danfoss had 27,871 employees (Danfoss, n.d.).

In 2015, decision makers within Danfoss asked themselves strategic questions about which positioning and future role(s) related to IoT platforms that would be attractive for the company's fields (interview, December 2018), while acknowledging that *"[in popular terms] the intelligence moves from what we call advanced components to the cloud; … a part of the revenue should come from innovative services; .. and we should have a clear opinion about where our role is in the control system*" (interview, May 2019).

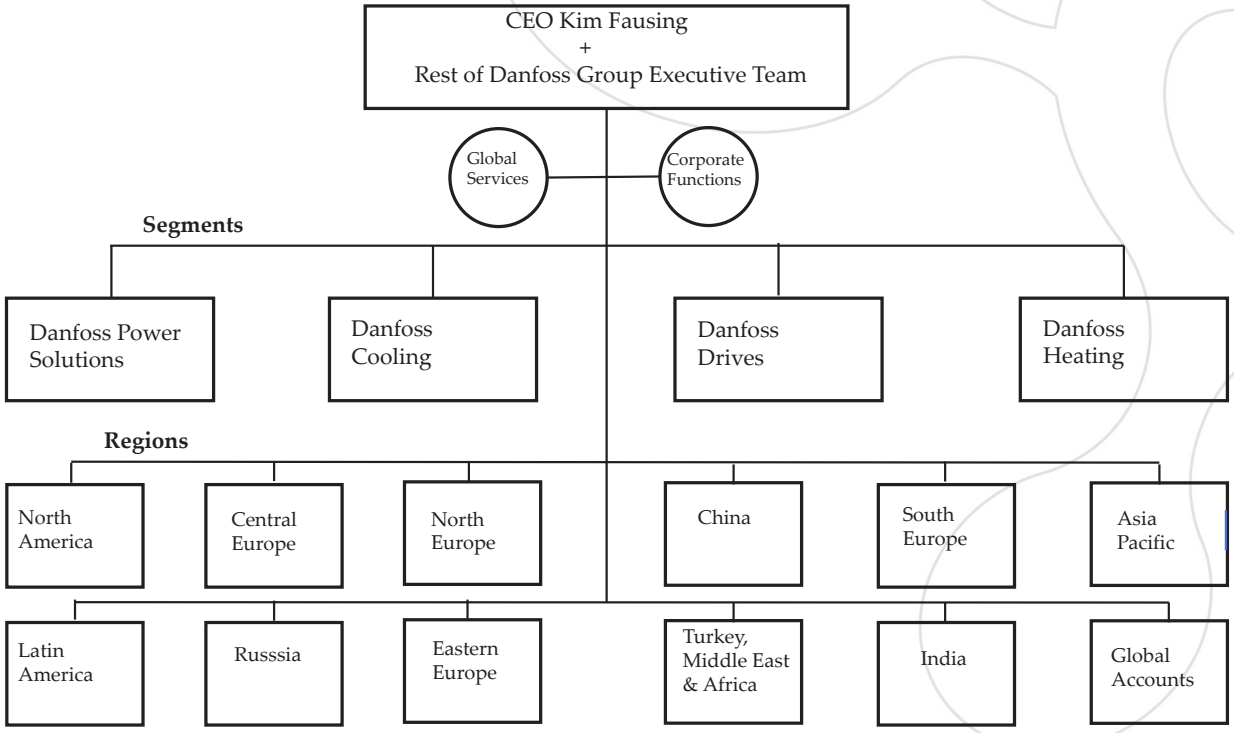

Figure 2: The Danfoss Group (March, 2020) – based on www.danfoss.com

The Danfoss Group has a number of IoT platform initiatives (involving customers and suppliers from around the world), which makes it possible to do comparative studies of sub-cases (Danfoss, n.d.). Danfoss is chosen as the case, because the company provides a variety of possible sub-cases in the B2B IoT area. After interviews with different divisions in Danfoss (e.g. Cooling), the authors have chosen to work with two sub-cases within the Heating division, because they represent different levels of complexity and market turbulence, so different levels of 'Stickiness' could be expected in these two cases.

Data Collection and Analysis

Two IoT platforms within the Danfoss Group were selected for embedded sub-case studies, i.e. the Danfoss-Leanheat IoT Platform and the The Danfoss-Schneider-Somfy IoT Alliance Platform. Both sub-cases are current strategic initiatives under the attention of top management. Both involve collaboration with more suppliers, as well as they address non-domestic customers on B2B markets. The cases were expected to have both similarities and differences - and thereby being suitable for sharpening the view and enabling conceptual sensitivity in the analyses.

Primary and secondary data were collected through interviews with seven IoT directors and employees in Danfoss Heating, Cooling and Drives, and through online sources and internal documents. Semi-structured interview guides were applied. An interview protocol facilitated that similar procedures were followed in all interviews (Yin, 2017). The semi-structured nature ensured that relevant topics were covered, yet still allowed for flexibility. In all interviews at least two researchers acted as interviewers, and each interview took 1.5-2 hours. Interview transcriptions and field notes were produced. To ensure validity of data, face-to-face interviews and secondary data were compared. This process reduced data misunderstanding, increased the validity of the findings and validated the information received from various sources. In Table 1 an overview of the interviews is visualized.

For data analysis, patterns, similarities and differences were identified. All three researchers undertook individual analysis before comparing findings and reflections.

Company Position	Danfoss Division	Month, Year	City, Country
President	Cooling	Dec, 2018	Nordborg (HQ), Denmark
Director Digital Business & IoT	Heating	Dec, 2018	Hamburg, Germany
Director Digital Business & IoT	Cooling	Dec, 2018	Hamburg, Germany
Director Business Development	Heating	Dec, 2018	Hamburg, Denmark
Vice President, Product & Segments	Heating	May, 2019	Silkeborg, Denmark
Head of IoT	Drives	Aug, 2019	Vaasa, Finland
Marketing Director	Heating	Sep, 2019	Sonderborg, Denmark

Table 1: Interviews 2018-19

Within-case and cross-case analyses (Eisenhardt, 1989; Eisenhardt & Graebner, 2007) were conducted.

Findings

In the following sub-sections, we offer findings from within-case and cross-case analyses of the two IoT platforms sub-cases.

Within-Case Analysis: The Danfoss-Leanheat IoT Platform

In 2016, Danfoss acquired a 23 percent stake in the Finnish company Leanheat Oy, which was started up in 2011. In 2018, Danfoss' shareholding increased to 46 percent. In May 2019, Danfoss took over the full ownership of Leanheat. Leanheat has continued operations as a separate business unit headed by its present CEO, Jukka Aho. From 2016 to 2019, Leanheat increased its number of employees from 12 to 50 (Leanheat, n.d.).

Leanheat uses AI (Artificial Intelligence) and machine learning to generate thermodynamic models of buildings on a closed platform. Leanheat software is installed to monitor and control energy consumption and improve the indoor climate for the residents. The company offers a digital user-interface, where the local real estate service providers can see the real-time temperature and relative humidity. In addition to indoor sensor data, Leanheat's system relates to weather data and district heat data. The interface gives the building administrators a very good overview of the apartments and is an easy way to control the heating. This has helped them to manage the temperature imbalances in each apartment and react much faster than before.

After installing the Leanheat system, the customers, i.e. Finnish building owners, reduced energy consumption by 20 percent during peak hours, and their overall energy costs dropped by 10 percent (interview, May 2019).
The Leanheat solution has been installed in more than 100,000 apartments, primarily in Finland, with pilots ongoing in Denmark, Sweden, Germany, Poland and Norway. But there is also potential outside Europe as is currently being demonstrated in a number of pilots with district heating companies in China. Leanheat software presently controls fifteen heating circuits at eight sites in the city Tianjin (Leanheat, n.d.).

When it comes to platform approach, Leanheat positions itself as a domain specialist (within heating) and a platform orchestrator that works independently from other domain specialists serving the customers, like e.g. manufacturers of light control products. A common IoT platform across the various domains, however, may come. It is impossible to say when though (interview, May 2019).

The Danfoss-Leanheat platform influences the company's interactions with its customers, and the company welcomes these new opportunities. Whereas Danfoss used to be a component supplier for which the interaction with the customers was finalized when the buying transaction was carried out, the digitalization and the platform allow for an ongoing dialogue with the customers. When customers buy a platform-related product they pay for the installation, and hereafter they pay a running service fee. The basis for the continuous dialogue and the service fee is that Leanheat, based on information from the system, now can debate how the

heating system works and how to optimize it. Instead of only dealing with the customer's procurement department, more stakeholder groups have become relevant, e.g. facility managers in buildings and district heating representatives. The information provided by the system as well as the ongoing dialogue with more stakeholder groups form the basis for an effective orchestration of value co-creation with existing and new customers, i.e. a high platform stickiness (interview, May 2019).

When it comes to suppliers, e.g. installers, Danfoss-Leanheat is still working with the same ones as before implementing the IoT platform. As stated by one of Danfoss' IoT-managers:

"Trust and respect are crucial and elementary values when selecting and working with suppliers."
(interview, Aug. 2019)

Danfoss has a developed network of specialists - and no plans for letting other stakeholders take over this task (interview, May 2019). We interpret this as an aim for high platform stickiness with the supplier-partners, see Figure 3.

In sum, Danfoss is aware that the way of doing business is changing, i.e. going from pure product-selling to a product-service focus, and communicates that suppliers that do not manage to develop themselves in this direction will be replaced. As stated by a Danfoss manager:

"Our suppliers need to understand: If they want to be an important partner in the future, then they must develop their business" (interview, Sep. 2019).

Within-Case Analysis: The Danfoss-Schneider-Somfy IoT Alliance Platform

In 2018, Danfoss entered into a partnership with the French companies Schneider Electric and Somfy, aimed at accelerating the adoption of connectivity in the residential, mid-size building and hotel markets on a closed, leading platform. The purpose of the alliance was to develop a 'connectivity ecosystem', primarily for smart hotel rooms and secondly for general smart homes and buildings.

Lars Tveen, president of Danfoss' heating segment, commented:

"Controlling lighting, heating, and shutters together in one system is a real expertise that we can now jointly offer by combining more than 300 years of industry leadership, all backed by our extensive professional installer networks." (Danfoss, n.d.).

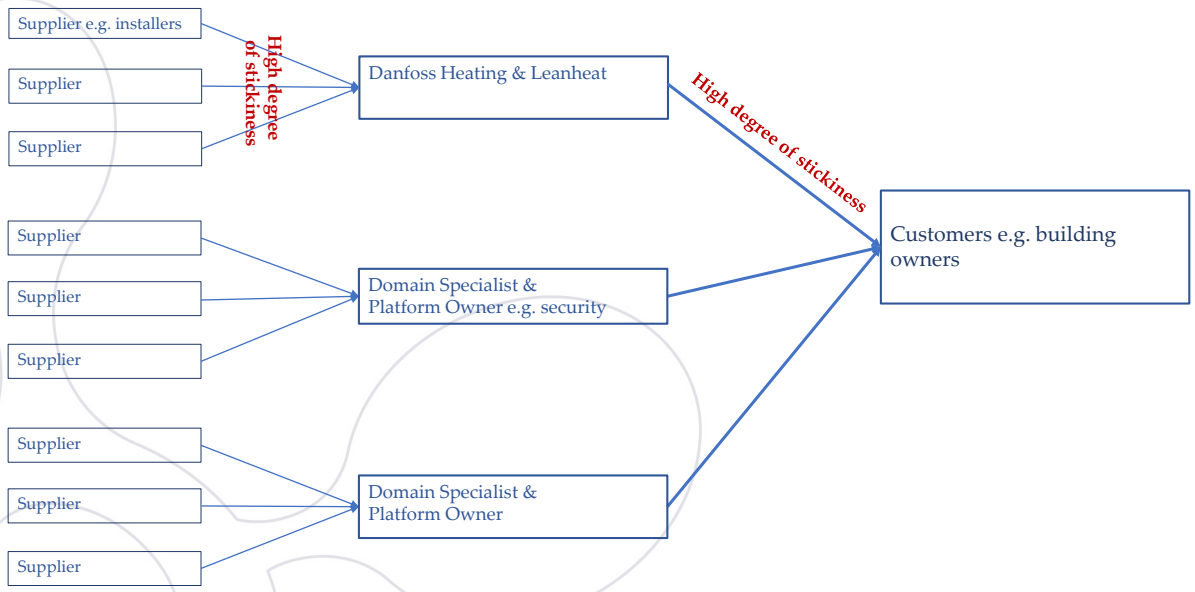

Figure 3: Danfoss-Leanheat's Relationships with Various Stakeholders

In developing a 'smart building' IoT platform solution, each of the three partners can supplement and integrate their core competences into one smart solution:

Danfoss: Danish company, leading position within Residential Heating and Indoor Climate, #1 position in District Energy Solutions, Strong installer network spanning across Europe, Russia and China.

Schneider: French company, Schneider Electric is among the global leaders in the Digital Transformation of Energy Management and Automation in Homes, Buildings, Data Centers, Infrastructure and Industries. Global presence in over 100 countries.

Somfy: French company, world leader in the automatic control of openings and closures (shutters) in homes and buildings. Present in 60 countries with 125 subsidiaries.

As one of the first customer priorities, the alliance wants to approach hotel chains around the world. The integration of systems provides a guest experience, while saving energy without impacting customer comfort and health. The solution also allows hotel facility managers to control everything through a single integrated system and at the same time save energy (Schneider, n.d.).

The three companies use Schneider's platform. The thought behind the alliance is that the three companies should stay independent and not interfere with the development of each other's products and services. The offerings will still be sold individually through Schneider's electricians, Danfoss' plumbers and Somfy's specialist installers - and they are not supposed to install each other's products even though they all can be connected to the common platform and operated by a single user-interface device. Instead the idea is - as a first step - that each company should introduce their customers to the other companies' products and services if the customers have needs in more domains, e.g. for optimization of heating and openings and closures of blinds. The attractiveness for the customers of the alliance should then be that they are ensured that the two partners of the one, they are in contact with, also are global market leaders, meaning that quality products and services (instead of competing on price) can be offered and seamlessly connected at the platform, also at a later point of time. This is supposed to give a high platform stickiness on the customer side. Danfoss is very aware of the role they have in the partnership, their main focus is to develop their competences within heating, and not to be a developer of the platform. As an IOT-expert at Danfoss phrased it:

"We are very good at meeting the customers' requirements and needs [within heating] … but to develop a platform I never think we will" (interview, Sep. 2019).

As many companies can offer platforms, e.g. Microsoft and Google, the idea is - as a second step – to undertake innovations together so that the three companies can get a competitive advantage by providing offerings that are even more value-adding than 'just' information of each other's products and services as well as seamless connection to the common platform. A Danfoss manager expressed it this way:

"Where the real value creation comes is where you start to think [the product] together to a higher extent… [and] also get the optimization advantage, because we actually have aligned the thought about energy savings" (interview, May 2019).

The aim for both the first and the second step, as described above, makes the platform stickiness between the three alliance partners high. As an IoT-manager said:

"If we manage to develop our services and be attractive enough, then we will continue to be interesting to the platform and as a partner. If not, you will be replaced. It is important to always to be in front in your domain" (interview, Sep 2019).

When it comes to other suppliers, firms offering products and services from complementary domains like door locks and installations, the three alliance partners are not ready now to invite them to take part of the alliance or have high stickiness. It builds too much complexity when it comes to coordination, as well as it gives lower flexibility for setting the optimal value constellation i.e. choice of stakeholders, see Figure 4.

But when the alliance has become more mature it will be natural to expand the collaboration with more platform partners (i.e. domain specialists). As stated in two of the interviews:

"With this new project approach we have stopped thinking about our own Danfoss products - we need to take a customer solution approach, which requires that we also include products and services from non-Danfoss suppliers" (interview, Dec 2019)

"In the future we will be more focused on teaming up with more partners" (interview, Sep 2019).

One of the key drivers for the formation of future alliances is 'time-to-market' - one of the interviewees emphasized this:

"Today's focus is on 'time-to-market'. For this you need to cooperate. We look to others and reach out instead of developing solutions ourselves" (interview, Dec 2019)

Cross-Case Analysis of the Two Sub-Cases

The empirical studies of the Danfoss Leanheat IoT platform and the Danfoss-Schneider-Somfy IoT Alliance Platform suggest that different strategies can be sought when it comes to building up relationships with core stakeholders on IoT platforms.

For both cases, high platform stickiness was sought in the relationship with the customers. This is illustrated by this quotation from an interview with a Danfoss representative:

"In [specific] segments we believe that we have a position where we can play a role [in an IoT-context] - and where we said we would deliver more than products. We [do] deliver products. Our strategy is that we stand on advanced products. This is where we come from. This is our legacy. This is where we are strong. However, new ways to optimize exist. .... Buildings will be 'smart'. Less than two percent of the current buildings are 'smart'... In 2015, we decided for a strategy to create more stickiness through a discussion with our current customers. Today, the problem .. is that when we leave [after having sold the product to a procurement department] we are kind of done. It is difficult to get an ongoing dialogue with them... we would like to have that". (interview, May 2019)

Danfoss has the latest years also experienced changes in some of the bigger customers' preferences, they are getting more and more interested in integrated service solutions. The possibilities within IoT provides new opportunities for the manufactures to offer the customers integrated service solutions in cooperation with new or existing alliance partners, and "*we are just in the beginning of that development process*". (interview, Sep. 2019)

In the two cases, it can be seen that the manufacturers aim for building up long term relationships with customers on IoT platforms in B2B markets. *"Setting up an IoT solution is anyway an effort, and as customers see the benefits, they want to benefit more. This means that we learn about things that are valuable to this customer, and it is easier for us to fulfil the requirements of this customer"*. (interview, Aug. 2019)

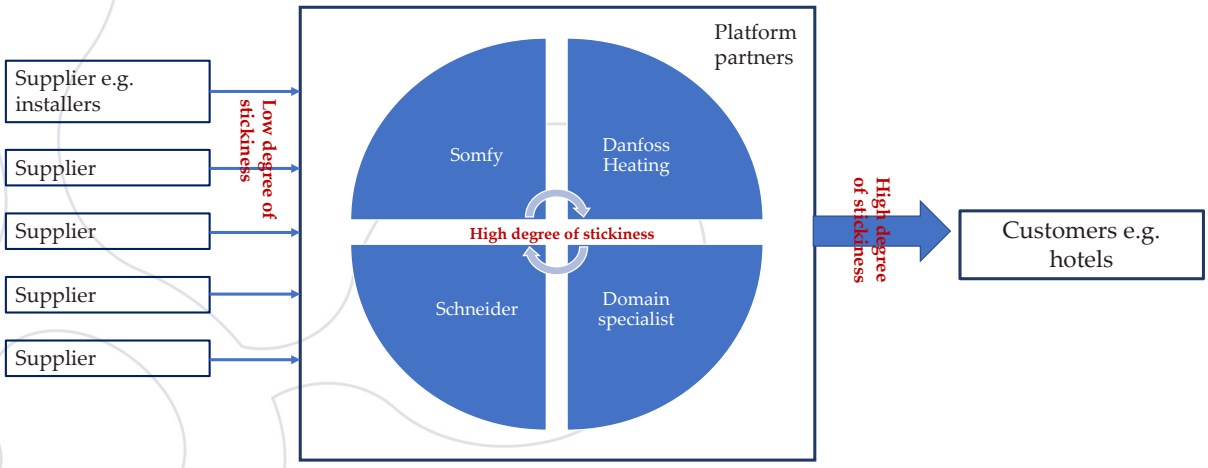

Figure 4: Danfoss-Schneider-Somfy IoT Alliance's Relationships with Various Stakeholders

When we compare the Danfoss-Leanheat case with the Danfoss-Schneider-Sompfy case it can be noticed that the manufacturer in the first case is aiming for building up long term relationships with a few core partners (i.e. high platform stickiness) in contrast to the latter case where the focus is to build up close relationship to the other domain partners on the platform and then applying, what we could call, a 'pick-and-choose' approach to the suppliers.

This low level of stickiness towards suppliers was underlined by one of the interviewees: *"Our official software partner is Microsoft, but we may also choose Google as partner - it all depends on the project requirements and the customer solution"* (interview, Dec. 2018).

The examples of both high and low platform stickiness towards the suppliers will be discussed further in the next section.

Discussion, Conclusion and Future Perspectives

Discussion and Propositions

The empirical study illustrated that an IoT platform gives opportunities for creating stickiness on the customer side and for co-creating added value due to e.g. the information of system performance. The frequency of interaction - on both the supplier and the customer side - is increasingly seen as a means to measure loyalty (Rong, Xiao, Zhang & Wang, 2019).

As a platform owner gains more knowledge about customers' preferences and behavior, it can personalize its offer to specific customers. This will create incentives to stick with the platform because abandoning the platform in favor of a rival platform would also mean leaving the value that the platform is able to deliver to the customer though learning effects over time.

One way for the platform owner to increase switching costs and create lock-in effects on both the supplier and customer side is to make the platform incompatible with rival platforms. The level of compatibility with rival platforms is a strategic choice, sometimes desirable and sometimes undesirable from the platform owner's perspective (Tiwana, 2014). More attractive customers make it more attractive for suppliers (e.g. software or app developers) to enter the platform and offer their digital services to the customers through the platform.

Prior research in the B2B industrial buying process identifies risk and complexity as two of the key determinants of how much time and effort that are involved in the upstream buying process. Higher risk and complexity motivates buying centers to let more managers and resources be involved in the buying process (Johnston & Lewin, 1996). However, Osmonbekov & Johnson (2018) find that use of IoT can decrease the Human-to-Human (H2H) communication and let the platform software make very fast side-be-side comparisons of performance information from different suppliers. In this way, the IoT platform software can more or less automatically choose the first and best supplier that would fulfill pre-determined criteria. At least this could be the case for products and services that are well-known to the platform owner. For 'New Task' situations, the buying process would require more H2H communication (Osmonbekov & Johnston, 2018).

Referring to the 'ladder of stakeholder loyalty' framework, it seemed clear that the IoT platform enabled a strategy for developing an allied relationship, i.e. the highest level on the ladder, with the customers. For a manufacturer like Danfoss which previous had challenges on keeping a dialogue with the customers after the sales transaction (as the customer didn't need it) this was welcomed - and makes us propose:

P1: To sustain and grow the business, manufacturers in B2B markets desire high IoT platform stickiness with customers.

When it concerns the suppliers the picture was more complex. In the Danfoss-Leanheat case, the company aimed at co-creating value with their existing suppliers, i.e. the plumbers, whereas they did not intend (in the short run) to co-create value with other domain experts. We call this 'the classical way' of relation building, as it seems to continue the patterns of doing business that existed before the application of IoT technology, intending for a high platform stickiness with their 'usual' partners but not with new ones in terms of someone from other domains as they did not want to expand their business in this direction.

In the Danfoss-Schneider-Somfy alliance, it was clear that the three companies intended to develop into allied partners in order to ensure long term innovation and optimization of the value co-creation. However, they preferred to have other suppliers on the IoT platform as cooperative or neutral partners in the terminology of the stakeholder loyalty ladder, as it gave more sense to select a supplier in light of the specific situation, we call this a "pick-and-choose" strategy, than to build up allied relationships. This is a result of the fact that an IoT platform potentially is dynamic, meaning that the constellation of stakeholders easily can be changed, which can be utilized to maximize the value constellation. We call this 'the new way' of relation building. This makes us propose:

P2: To ensure continuous innovation, manufacturers in B2B markets desire high IoT platform stickiness with a few partners.

P3: To ensure optimization in a high complexity context through a dynamic stakeholder constellation, manufacturers in B2B markets desire low IoT platform stickiness with the majority of suppliers.

When it comes to degree of aimed-for stickiness, two fundamentally different business models were identified, coined the Classic Relationship IoT platform model (characterized by low complexity) and the New Relationship IoT platform model (characterized by high complexity). In both business models, the manufacturer desires high stickiness with customers. In the New Relationship model, however, low stickiness with suppliers is preferred in order to enable the manufacturer to orchestrate the stakeholder constellation dynamically, see Scheme 1.

The low stickiness towards suppliers is in line with Broekhuizen *et al.* (2020) showing that in new turbulent markets, which is the case with use of IoT in hotels (Eskerod, Hollensen, Morales-Contreras & Arteaga-Ortiz, 2019) as in the Danfoss-Schneider-Somfy alliance, platforms often choose to open up ('low stickiness' towards suppliers) and stimulate supplier-led innovation, thereby shifting the risk to invest to suppliers. When shifting from the market growth to the maturity phase (as with the case of Danfoss Leanheat), knowledge becomes more readily available and platform differentiation becomes more difficult to achieve. In such a situation, platform owners may compensate for lack of platform differentiation by increasing the supplier stickiness and give them greater authority and more benefits, or by acquiring them, as we also saw in the case with Danfoss Leanheat.

Managerial Implications

Generally, IoT has far-reaching managerial implications beyond what has been presented here. In most companies, the current state of IoT is a collection of fragmented networks of things, using the Internet and other technologies to transfer data to and from each sector's cloud service. Consequently, the full potential of the

	Stickiness 'Upstream' (towards suppliers)	Stickiness 'Downstream' (towards customers)
Classic Relationship IoT platform model (Case: Danfoss Leanheat) *'Low Complexity'*	High	High
New Relationship IoT platform model (Case: Danfoss-Schneider-Somfy) *'High Complexity'*	Low	High

Scheme 1: Platform Stickiness in B2B IoT Platform Models

IoT-era has not yet materialized, so the future opportunities in internet-related industries are unlimited.

Specifically, when it comes to customers, the implications seem straightforward, where companies try to build up relationships, and stickiness, to their key customers through Key Account Management (KAM) and other relationship tools (Scheme 1). However, the implications in relationships and stickiness to supplier-partners seem more complex, as described in the following:

As shown in Scheme 1, 'complexity' is a key indicator for the degree of stickiness with supplier-partners. If several alliance partners are involved on the platform (as with the Danfoss-Schneider-Somfy platform), more coordination is needed and 'complexity' increases. Consequently, higher level of 'Orchestration capability' is needed for coordination of the different stakeholders' contribution to value creation. As an alternative, the company and its alliance partners can try to simplify operations and compensate for high complexity by setting up specific requirements for a supplier's product and service contribution to the IoT platform. The first supplier that will fulfill the specific requirements for the solution will be chosen - a kind of 'pick-and-choose' selection strategy with relatively low transaction costs, as the answer to the increasing complexity on IoT platforms. Following the notion of Ng & Wakenshaw (2017, p. 9): "Physical products can now be designed to be changeable, for example through an application interface that allows customizability upon use to respond to emergent contextual situation", it means that products and services from suppliers can learn adaptation to the IoT platform and customer solution very fast. Consequently, platform owners will increasingly require that suppliers are offering potential digital 'plug-and-play' solutions, which will then be coupled together with other suppliers' solutions to a total customer solution.

Research Contributions

The research contributes to the existing literature in three ways. First of all, the research provides an empirical example of two orchestration strategies by referring from the two embedded sub-cases within the Danish leading manufacturer, Danfoss. Secondly, the empirical study identified two ways of dealing with stakeholder relationships in an IoT context, coined by us as the Classic Relationship IoT platform model and the New Relationship IoT platform model. Fundamental for both models is the aim for high platform stickiness (long-lasting bonds) with the customers. Novel in this research is that in the New Relationship IoT platform model, low stickiness with suppliers is preferred in order to enable the manufacturer to orchestrate the stakeholder constellation dynamically to enhance value creation. Hereby (and our third contribution) our research shows that IoT platform orchestration can be seen as an important aspect of platform capabilities, where the orchestrator must take advantage of the external resources and not only focus on own resource ownership.

Limitations and Future Perspectives

This study involves one company (Danfoss) studied regarding handling of two-sided platforms in the heating of buildings. A more systematic comparison of several companies' IoT platform strategies could reveal more insight into how different industry and firm contexts would influence the level of intended platform stickiness and the capabilities needed. Several different company cases could represent different levels of complexity, which according to our research is one of the decisive factors for explaining 'intended stickiness' level. It is also likely that different industries would differ in terms of their competitive intensity and technological turbulence and this would probably also have an effect on the 'intended stickiness'.

Further research might take the next steps be exploring the necessary actions in order to fulfill the 'intended

stickiness' on IoT platforms. A future research framework could guide platform owners on when to apply certain stickiness activities rather than others. These activities could also be differentiated between upstream (towards suppliers) and downstream (towards customers) activities.

References

Alvarez, S.A. & Barney, J.B. (2007), Discovery and creation: Alternative theories of entrepreneurial action, *Strategic Entrepreneurship Journal*, Vol. 1, No. 1-2, pp. 11-26.

Ashton, K. (2009), That 'internet of things' thing, *RFID journal*, Vol. 22, No. 7, pp. 97-114.

Barnard, C.I. (1938), *The functions of the executive*, Harvard University Press, Cambridge.

Boehmer, J.H., Shukla, M., Kapletia, D. & Tiwari, M.K. (2020), The impact of the Internet of Things (IoT) on servitization: an exploration of changing supply relationships, *Production Planning & Control*, Vol. 31, No. 2-3, pp. 203-219.

Broekhuizen, T.L.J., Emrich, O., Gijsenberg, M.J., Broekhuis, M., Donkers, B. & Sloot, L.M. (2020), Digital platform openness: Drivers, dimensions and outcomes. *Journal of Business Research*, in press.

Ceccagnoli, M., Forman, C., Huang, P. & Wu, D.J. (2012), Cocreation of value in a platform ecosystem! The case of enterprise software, *MIS Quarterly*, Vol. 36, pp. 263-290.

Christensen, C.M. (2006), The ongoing process of building a theory of disruption, *Journal of Product Innovation Management,* Vol. 23, No. 1, pp. 39-55.

Constantiou, I., Marton, A. & Tuunainen, V.K. (2017), Four Models of Sharing Economy Platforms, *MIS Quarterly Executive*, Vol. 16, No. 4, pp. 231-251.

Danfoss (n.d.), available at: https://www.danfoss.com/en/ (accessed 20 May 2020).

Danish Institute of Industry 4.0 (n.d.), An Introduction to Industry 4.0, Copenhagen, 2016, available at: www.DII4.dk (accessed 31 March 2020).

de Reuver, M., Sørensen, C. & Basole, R.C. (2018), The digital platform: a research agenda, *Journal of Information Technology*, Vol. 33, No. 2, pp. 124-135.

Dubois, A. & Gadde, L.E. (2002), Systematic combining: an abductive approach to case research, *Journal of Business Research*, Vol. 55, No 7, pp. 553-560.

Eisenhardt, K.M. (1989), Building theories from case study research, *Academy of Management Review*, Vol. 14, No. 4, pp. 532-550.

Eisenhardt, K.M. & Graebner, M.E. (2007), Theory building from cases: Opportunities and challenges, *Academy of Management Journal*, Vol. 50, No. 1, pp. 25-32.

Eloranta, V. & Turunen, T. (2016), Platforms in service-driven manufacturing: Leveraging complexity by connecting, sharing, and integrating, *Industrial Marketing Management*, Vol. 55, pp. 178-186.

Eskerod, P., Hollensen, S., Morales-Contreras, M.F. & Arteaga-Ortiz, J. (2019), Drivers for Pursuing Sustainability through IoT Technology within High-End Hotels - An Exploratory Study, *Sustainability*, Vol. 11, No. 19, p. 5372.

Falkenreck, C. & Wagner, R. (2017), The Internet of Things–Chance and challenge in industrial business relationships, *Industrial Marketing Management*, Vol. 66, pp. 181-195.

Fehrer, J.A., Woratschek, H. & Brodie, R.J. (2018), A systemic logic for platform business models, *Journal of Service Management*, Vol. 29, pp. 546-568.

Freeman, R.E. (1984), *Strategic Management: A Stakeholder Approach*, Pitman Series in Business and Public Policy, Pitman, Boston.

Freeman, R.E., Phillips, R. & Sisodia, R. (2020), Tensions in stakeholder theory, *Business & Society*, Vol. 59, No, 2, pp. 213-231.

Gershenfeld, N. & Vasseur, J.P. (2014), As objects go online: the promise (and pitfalls) of the Internet of Things, *Foreign Affairs*, Vol. 93, No. 2, pp. 13-14.

Harrison, J.S. & Wicks, A.C. (2013), Stakeholder theory, value, and firm performance, *Business Ethics Quarterly*, Vol. 23, No. 1, pp. 97-124.

Iivari, M.M., Ahokangas, P., Komi, M., Tihinen, M. & Valtanen, K. (2016), Toward ecosystemic business models in the context of industrial internet, *Journal of Business Models*, Vol. 4, No. 2, pp. 42-59.

Ionut Pirvan, C., Dedehayir, O. & Le Fever, H. (2019), Industry platforms as facilitators of disruptive IoT innovations, *Journal of Technology Management & Innovation*, Vol. 14, No. 3, pp. 18-28.

Johnston, W.J. & Lewin, J.E. (1996), Organizational buying behavior: Toward an integrative framework, *Journal of Business Research*, Vol. 35, No. 1, pp. 1-15.

Kannan, P.K. (2017), Digital marketing: A framework, review and research agenda, *International Journal of Research in Marketing*, Vol. 34, No. 1, pp. 22-45.

Laczko, P., Hullova, D., Needham, A., Rossiter, A.M. & Battisti, M. (2019), The role of a central actor in increasing platform stickiness and stakeholder profitability: Bridging the gap between value creation and value capture in the sharing economy, *Industrial Marketing Management*, Vol. 76, pp. 214-230.

Leanheat (n.d.), available at: https://leanheat.com/ (accessed 20 May 2020).

Löfberg, N. & Åkesson, M. (2018), Creating a service platform - how to co-create value in a remote service context, *Journal of Business & Industrial Marketing*, Vol. 33, pp. 768-780.

Miorandi, D., Sicari, S., De Pellegrini, F. & Chlamtac, I. (2012), Internet of things: Vision, applications and research challenges, *Ad hoc networks*, Vol. 10, No. 7, pp. 1497-1516.

Nambisan, S. & Sawhney, M. (2011), Orchestration processes in network-centric innovation: Evidence from the field, *Academy of Management Perspectives*, Vol. 25, No. 3, pp. 40-57.

Ng, I.C. & Wakenshaw, S.Y. (2017), The Internet-of-Things: Review and research directions, *International Journal of Research in Marketing*, Vol. 34, No. 1, pp. 3-21.

Normann, R. & Ramirez, R. (1993), From value chain to value constellation: Designing interactive strategy, *Harvard Business Review*, Vol. 71, No. 4, pp. 65-77.

Osmonbekov, T. & Johnston, W.J. (2018), Adoption of the Internet of Things technologies in business procurement: impact on organizational buying behavior, *Journal of Business & Industrial Marketing*, Vol. 33, pp. 781-791.

Parker, G.G., Van Alstyne, M.W. & Choudary, S.P. (2016), *Platform Revolution: How Networked Markets Are Transforming the Economy? and How to Make Them Work for You*, WW Norton & Company, New York.

Polonsky, M.J., Schuppisser, D.S.W. & Beldona, S. (2002), A stakeholder perspective for analyzing marketing relationships, *Journal of Market-Focused Management*, Vol. 5, No. 2, pp. 109-126.

Porter, M.E. (1980), *Competitive Strategy - Techniques for Analyzing Industries and Competitors.* Free Press, New York.

Porter, M.E. (1985), *Competitive Advantage - Creating and Sustaining Superior*. Free Press, New York.

Rhenman, E. (1968), *Industrial democracy and industrial management*, Tavistock Publications, London.

Rong, K., Xiao, F., Zhang, X. & Wang, J. (2019), Platform strategies and user stickiness in the online video industry, *Technological Forecasting and Social Change*, Vol. 143, pp. 249-259.

Salmela, E. & Nurkka, N. (2018), Digital Market Capture in Platform Business–How to Pass the Valley of Death?, *Nordic Journal of Business*, Vol. 67, No. 2, pp. 90-113.

Savage, G.T., Bunn, M.D., Gray, B., Xiao, Q., Wang, S., Wilson, E.J. & Williams, E.S. (2010), Stakeholder collaboration: Implications for stakeholder theory and practice, *Journal of Business Ethics*, Vol. 96, No. 1, pp. 21-26.

Schneider (n.d.), available at: https://www.schneider-electric.com/ (accessed 20 May 2020).

Siggelkow, N. (2007), Persuasion with case studies, *Academy of Management Journal*, Vol. 50, No. 1, pp. 20-24.

Smedlund, A. (2012), Value cocreation in service platform business models, *Service Science*, Vol. 4, No. 1, pp. 79-88.

Smedlund, A. & Faghankhani, H. (2015), "Platform orchestration for efficiency, development, and innovation", in *proceedings of the 2015 48th Hawaii International Conference on System Sciences IEEE, pp. 1380-1388.*

Tiwana, A. (2014), *Platform Ecosystems - Aligning Architecture, Governance and Strategy*, Elsevier, Morgan Kaufmann, Waltham.

Tuominen, P. (1995), Relationship Marketing - A New Potential for Managing Corporate Investor Relations, in Nasi, J. (Ed.), *Understanding Stakeholder Thinking*, LSR-Publications, Helsinki, pp. 165-183.

Ulkuniemi, P., Pekkarinen, S., Bask, A., Lipponen, M., Rajahonka, M. & Tinnilä, M. (2011), Framework for modularity and customization: service perspective, *Journal of Business & Industrial Marketing*, Vol. 26, pp. 306-319.

Ulrich, A.M.D., Hollensen, S. & Eskerod, P. (2019), "IoT and Platform Stickiness in B2B Markets - The Case of Danfoss Group", in *proceedings of the Nordic Academy of Management (NFF) 2019, 22-24 August, Vaasa, Finland.*

Vargo, S.L. & Lusch, R.F. (2008), Service-dominant logic: continuing the evolution, *Journal of the Academy of Marketing Science*, Vol. 36, No. 1, pp. 1-10.

Vargo, S.L. & Lusch, R.F. (2017), Service-dominant logic 2025, *International Journal of Research in Marketing*, Vol. 34, No. 1, pp. 46-67.

Woodside, A.G. & Sood, S. (2017), Vignettes in the two-step arrival of the internet of things and its reshaping of marketing management's service-dominant logic, *Journal of Marketing Management*, Vol. 33, No. 1-2, pp. 98-110.

Yin, R.K. (2017), *Case Study Research and Applications: Design and methods*, SAGE Publications, Thousand Oaks.

About the Authors

Dr. Svend Hollensen (svend@sam.sdu.dk) is Ph.D. and Associate Professor of International Marketing at the University of Southern Denmark (Sønderborg). His research interests are within Global/International Marketing, Globalization, Internationalization of companies, Relationship Marketing and Social Media Marketing. He has published articles in well-recognized international journals like California Management Review. Furthermore, he is the author of globally published textbooks, e.g. 'Global Marketing' (8th edition, Pearson Education), 'Marketing Management' (4th edition, Pearson Education), and Social Media Marketing (4th edition, together with Philip Kotler and Marc Opresnik). Through his company, Hollensen ApS, Svend has also worked as a business consultant for several multinational companies, as well as global organizations like World Bank.

Dr. Pernille Eskerod is Ph.D. and Professor of Management and Organizational Behavior at Webster Vienna Private University. Her research interests are within Stakeholder Engagement, Project Management, Change Management, Sustainability and Strategic Management. She has published several articles within the leading journals of her main field, i.e. International Journal of Project Management and Project Management Journal. Pernille has acted as journal guest editor, published more books, journal articles and book chapters on Project Stakeholder Management. Furthermore, she has attracted funding from competitive applications for international research projects. In 2020, she conducts research on Engagement of Community Stakeholders in Infrastructure Projects, Stakeholder Engagement in Rural Tourism in Austria and Serbia, Internet-of-Things (IoT) and Sustainability within the Hotel Industry, and Managerial Implications of IoT.

About the Authors

Dr. Anna Marie Dyhr Ulrich is Ph.D. and Associate Professor of B2B Marketing at the Department of Entrepreneurship and Relationship Management at the University of Southern Denmark (Sønderborg). Her research interests are within B2B Marketing, International Marketing, Globalization, IOT and Relationship Marketing. Anna Marie has published articles within these topics in well-recognized international journals and books. She has a long national and international teaching and research experience. She has practical experience from jobs as project manager, owner of her own consultancy business and as senior consultant in the international department of the Confederation of the Danish Industry, Copenhagen.

Journal of Business Models (2020), Vol. 8, No. 2, pp. 92-100

JOBM
Journal of Business Models

Opportunity Complementarity in Data-Driven Business Models

Yueqiang Xu
Laura Kemppainen
Petri Ahokangas
Minna Pikkarainen

1.Martti Ahtisaari Institute, Oulu Business School, University of Oulu, Finland
2.Empirical Software Engineering in Software, Systems and Services, Faculty of Information Technology and Electrical Engineering, University of Oulu, Finland
3.Research Unit of Medical Imaging, Physics and Technology, University of Oulu, Finland
4.VTT, Technical Research Centre of Finland
** Corresponding author: Yueqiang Xu, yueqiang.xu@oulu.fi*

Abstract

Business model research typically focuses on value co-creation and co-capture logic to study business models in the ecosystem. To understand the "ex-ante" source of ecosystem-based value creation/capture, this paper proposes opportunity complementarity as a key antecedent for the ecosystem-based value creation and capture in data-driven business ecosystems.

Introduction

Digitalization has been driving the transformation of traditional industries (e.g. healthcare, energy). A key characteristic of this transformation is digital convergence, namely the convergence of Information and communication technologies (ICTs), data and new (digital) business models. The digital convergence requires to open the business research inquiry from the development of individual products and business models to business models created within business ecosystems (Teece, 2018). Since the inception of the business ecosystem concept introduced by Moore (1993), the ecosystem has gained popularity in different domains, such as Vargo, Akaka and Vaughan's (2017) service ecosystem as a complex system of actors that are interconnected by shared institutional arrangements and mutual value creation targets (Pikkarainen, Huhtala, Kemppainen, & Häikiö, 2019). The theoretical connection between business models and business ecosystems has also been established (Gomes, Kemppainen,

Keywords: business model, opportunity, data-driven service

Please cite this paper as: Xu et al. (2020), Opportunity Complementarity in Data-Driven Business Models, Vol. 8, No. 2, pp. 92-100

Pikkarainen, & Koivumäki, 2019). Business ecosystems are deemed as a network of business models (Jansson, Ahokangas, Iivari, Perälä-Heape, & Salo, 2014), where the firms seek various business models (e.g. bundled or hybrid) to aggregate services from different parts of the digital ecosystem (Iivari, Ahokangas, Komi, Tihinen, & Valtanen, 2016). Furthermore, the ecosystem discussion has been connected to platforms, for instance, Xu, Ahokangas, Turunen, Mäntymäki and Heikkilä (2019) examined the ecosystemic business models for AI (artificial intelligence) platforms. Jacobides, Cennamo and Gawer (2018) distinguish ecosystem and platform, suggesting that a "business ecosystem" centres on a company and its environment, while a "platform ecosystem" considers how actors organize around a (technical) platform. Thus, while all platforms can be considered as ecosystems, not all ecosystems are platforms. So far, business model research in ecosystems mainly focuses on the value aspect and advantage aspect of business models. For instance, the value perspective considers value co-creation and co-capture as a key characteristic for digital businesses in ecosystems (Nenonen & Storbacka, 2010). The advantage perspective suggests that joint open innovations are essential for the sustained competitive advantages of the actors involved (Chesbrough, Lettl, & Ritter, 2018).

However, so far the literature has looked at the fundamental driver of such co-creation and co-capture within ecosystems only rarely. Teece (2018) suggests complementarity as a new way to form the phenomenon that tech companies jointly create and capture value in an ecosystem, arguing that complementarity should not be solely seen as value capture mechanisms, rather it is a key requirement or prerequisite for the technology and business model to fun in the digital age. Building on Teece's (2018) complementarity thinking, this study proposes opportunity complementarity as a new construct and driver for the co-creation and co-capture actions in the digital ecosystems from the opportunity perspective.

The concept of opportunity has been widely recognized in the business literature. The existing study suggests that companies need to explore and exploit business opportunities to survive in the long term (Benitez, Llorens, & Braojos, 2018). Opportunity has been characterised as a cognition that emerges in the creative process (Alvarez & Barney, 2010), an objective phenomenon that exists and is independent of the company (Shane, 2003) and as a realization of something that brings value to the customer (Sridhar & Corbey, 2015). However, the opportunity is implicitly considered as a singular/atomistic construct, and little investigation has been conducted on complementary opportunities in business model and ecosystem literature. For example, previous study (Gomes, Iivari, Pikkarainen, & Ahokangas, 2018) suggests that business ecosystems need to be organized around only a specific broad business opportunity. However, this study argues that there can be multiple opportunities in an ecosystem. The opportunities are characterized as a social construction bringing value to the customer that are jointly explored and exploited by public and private actors in two data-driven ecosystems in the study.

The study investigates the opportunity complementarity in the context of data-driven business ecosystems. As data has become a valuable resource for companies and their business models, the data-driven aspect is an inherent characteristic of digital businesses (Hartmann, Zaki, Feldmann, & Neely, 2016). In data-driven business models, the value is created and captured within an ecosystem (Shafer, Smith, & Linder, 2005) by using data as the key resource in the business activities (Hartmann et al., 2016). Data-driven business models such as Amazon or Netflix are designed around collecting, organizing, and summarizing data, with the goal of better identifying the unmet customer needs and other opportunities in the market (Sorescu, 2017). Overall, this study contributes to the concept of complementarity from the opportunity perspective to the business model literature to enhance theoretical and empirical understanding of ecosystemic opportunity exploration and exploitation in the context of data-driven businesses.

Approach

The review of business model literature shows that the business model can be conceptualized through three important aspects that connect the business models to the business context, the value perspective that concerns with the value proposition, value creation and capture (Xu, Ahokangas, & Reuter, 2018), the opportunity perspective focusing on opportunity exploration

and exploitation (Teece, 2018) and the perspective of competitive advantage (Priem, Wenzel, & Koch, 2018).

The concept of complementarity was proposed in Teece's (1986) seminal PFI (Profit from Innovation) framework. PFI framework stresses the importance of complementarity from resource and capability perspectives, suggesting that complementary technologies and assets are key to the success of the business model. Recently, six streams of complementarity have been identified (Teece, 2018): 1) *Production complementarity*, which means that complementarity happens when a decrease in the price of one factor leads to an increase in the quantity used of its complements in production (Hicks, 1970); 2) *Consumer complementarity*, which means that two products are complements in consumption if the utility of consuming them together is greater than consuming each product separately (Edgeworth, 1925); 3) *Input complementarity* that means that two products can have complementarity with each other if they are used together but sold by separate companies (Teece, 2018); 4) *Asset price complementarity*, which suggests that an actor can speculate on complementary assets likely to increase in value in the futures market (Hirshleifer, 1971); 5) *Technology complementarity*: in technology systems, there are complementary components within the systems and the technical complementarity relation between different components (Holgersson, Granstrand, & Bogers, 2018); 6) *Innovation complementarity* that occurs when improvements in a general-purpose technology increase the productivity in downstream sectors (Teece, 2018).

The new type of complementarity: opportunity complementarity

Overall, economic literature looks at most of the complementarities as market-related phenomena. Only technology and innovation complementarities are related to the advantage perspective of business models. This study identifies a new type of complementarity, namely the opportunity complementarity, as a key antecedent of the business model, especially in ecosystem settings.

Opportunity research has its root in entrepreneurship studies, being mostly defined as as "situations in which new goods, services, raw materials, markets and organizing methods can be introduced through the formation of new means, ends, or means-ends relationships" (Eckhardt & Shane, 2003:336). Research on the opportunity can be divided into two major streams. First, the discovery stream considers opportunity as an objective phenomenon that exists in the external world, independent of the actors (Eckhardt & Shane, 2003). Instead, the creation perspective considers an opportunity as linked to entrepreneurial cognition and emerging due to a creation process (Alvarez & Barney, 2010). Regarding opportunity and business models, an opportunity would provide a basis for value creation (Atkova, 2018).

The concept of complementary opportunity can be seen in mathematical social sciences (Herrero, Iturbe-Ormaetxe, & Nieto, 1998) through the notions of (i) opportunity profiles, e.g. individual or atomistic opportunity that is the opportunity specifically for individual actor and is not complementary to other actors' opportunities, and (ii) the common opportunity (or complementary opportunity) available in the society. In our definition, opportunity complementarity means that business actors (especially in an ecosystem) can have opportunities that are complementary to each other, which can lead to the creation and the capture of value in a collective manner, namely to an ecosystemic value co-creation and co-capture. Evidently, opportunity complementary is different from the complementarities in economic studies such as production complementarity or consumer complementarity. It is particularly important to address the difference between technology complementarity and opportunity complementarity: 1) The former focus on the modular technical systems that require two or more modules to be combined so the overall system will function properly, such as software (e.g. Windows operating system) for hardware (personal computers). Without the correct and well-defined specification, the technology complementarity can barely work; 2) the latter suggests that business actors can create and capture value from complementary opportunities for individual or collective benefits. There is no rigid lock-in for the opportunities.

The categorisation of data-driven business models on scale and scope

Data-driven business models can be categorized based on whether they are scale- or scope-oriented. In scale-oriented business models, the companies in the

ecosystem partner with one another to integrate data and create data-driven products or services by focusing on the economics of scale. In a scope-oriented business model, the companies in the ecosystem aim for a platform model that allows a higher level of technology integration to enable the companies to create innovations in variety to address the needs and opportunities in the market (Pikkarainen, Ervasti, Hurmelinna-Laukkanen, & Nätti, 2017), thus, the economies of scope.

Research methodology

This study employs a multi-method and interpretive case study (Walsham, 2006). We include and cross-examine two data-driven business ecosystems from essentially un-related industries, in particular, one from the European Union (EU)'s energy innovation project (P2P-SmartTest) and the other from the Finnish national healthcare innovation project (Icory). In doing so, we aim at enhancing the findings' reliability and demonstrating the wide presence of data-driven business models. The EU's P2P-SmartTest project investigates a smarter electricity distribution system integrated with advanced ICT, regional markets and innovative business models. The project has 10 partners (5 companies and 5 public players) to develop four data-driven business model archetypes (Figure 1): conventional utility model, ESCO (energy service company) model, shared network access model and the P2P platform model. The Icory project aims for creating an intelligent and customer-driven solution for orthopaedic and paediatric surgery journey in collaboration with companies, hospitals and researchers in Finland and Singapore. The project has 18 partners (9 companies and 6 public players) who jointly identified four business model archetypes: the conventional healthcare model, the health service platform model, the health data integration model and health innovation ecosystem model.

During the workshops, the data business model archetypes were developed and a systematic way of generating the opportunity scenarios was applied similarly in both projects. For instance, both projects adopt an ecosystem approach to involve and engage the key actors and stakeholders in the ecosystem, including both public and private partners. The ecosystem approach seeks complex problem solving from the partner's diverse background and heterogeneous contributions. Thus, the benefits of such systems are the creation of alternative or complementary solutions to the opportunity (exploration and exploitation) and (value creation and capture) aspects of the business model.

Key insights

The business model cases collected from the two projects are mapped on the opportunity complementarity map based on the type of opportunity source and from the perspective of data-driven business (Figure 1).

From the two case studies, some common findings emerge. First, atomistic opportunities exist to be mainly beneficial to certain actors with the closed data model (single-source data to create a targeted application) or the single-sided data platform model that only benefits the platform operator. In the Icory project, the closed data model was the only option due to the healthcare-related data protection issues. Second, both cases confirm the presence of opportunity complementarity before the creation of business models. The opportunity complementarity brings the public and private partners together to explore and exploit the opportunities with digital technologies and more innovative business models like the data integration model, in which partners integrate technology and share data to create scale-oriented applications or the multi-sided platform incorporating different technologies and data sources for diverse applications. It is key to note that as both cases involve digital technology, therefore the technology complementarity and opportunity

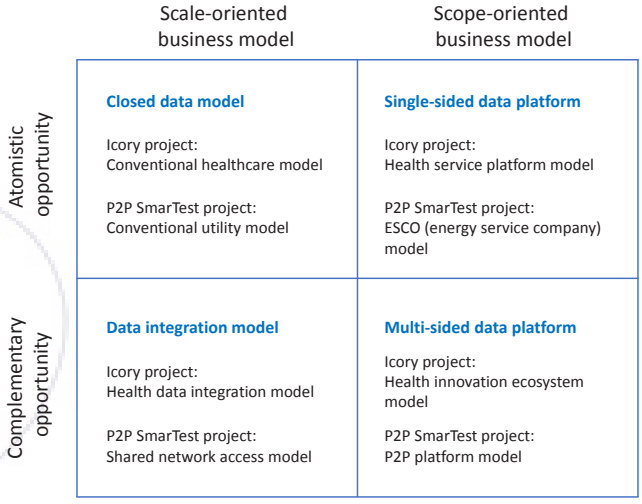

Figure 1: Opportunity complementarity mapping

complementarity can be observed as intertwined in each case. As such, the integration of data and technical interoperability (technology complementarity) facilitates the new ways of collaborative value creation and capture for new markets and business models (opportunity complementarity).

Specifically, the Icory project enables small and medium-sized companies and hospitals with the help of researchers to find opportunities for more customer-centred and innovative business models. Instead of one business model, in this case, the ecosystem consists of different companies with various offerings and different opportunity complementarities have been identified. Instead of pursuing atomistic opportunities, the companies aim for creating value together for the hospitals and patients and seizing complementarity opportunity with both a health data integration model and a multi-sided platform model. In the health data integration model, companies - such as patient engagement platform provider, data analysis provider and video communication provider - aim to integrate their resources for addressing the needs of the healthcare providers and patients. In the multi-sided platform model (health innovation ecosystem model), we found even more collaboration happening in the ecosystem, where all the ecosystem participants form a portfolio of services that are connected and integrated to create more value for the healthcare providers. In the Icory case, several complementarities are observed: 1) the companies created consumer complementarity by combining the digital solutions with typical medical treatment to enhance the patient experience; 2) the product complementarity is created as individual solution are targeting different stages in the care pathway, but complementing each other in the patient journey; 3) input complementarity can be seen when two companies jointly provide codes and data for a new bundled patient solutions that are sold separately by the two companies; 4) technology complementarity is achieved through integration of APIs (Application programming interface) from different companies; 5) the innovation complementarity is visible as the use of AI and data analytics improve the front-end user applications; 6) the opportunity complementarity not only enables the collaborative value creation and capture but also motives the public sector to overcome the institutional barrier and status quo to co-create new digital solutions and innovations with the startups and small healthcare companies, which is an unconventional practice of the public hospitals.

In P2P SmarTest, a key driver for the co-creation of the smart energy business models is the complementary opportunities from actors positioned in different domains of the ecosystem (e.g. electricity distribution, energy service, energy forecasting and energy trading). The opportunities are complementary to each other, so these actors can integrate their technical capabilities, utilizing assets and redirecting resources to co-develop new business models with the focus of scalability, replicability and business sustainability. The study identifies that a traditionally centralized utility with a closed business model (closed data model) starts to shift its focus towards the open business model (multi-sided data platform model) in the data-driven smart energy ecosystem. This would not have happened without the recognition of shared opportunities that are complementary to and from other energy ecosystem actors.

Another key finding of the research is the non-static nature of opportunity complementarity. The opportunity complementarity can affect the choice of business models while the choice or design of the business model can also affect the opportunity complementarity. For instance, in P2P SmarTest, the complementary opportunities in the emerging smart grids domain drive the energy ecosystem actors to embrace more open business models (e.g. sharing network access model and the P2P platform model) over the atomistic models (e.g. closed data model). In contrast, when energy utilities choose a business model (or design of business model), the opportunity complementarity changes significantly. More specifically, the shared network access model provides complementary opportunities for energy network operators who traditionally have closed and non-cooperative model with each other to generate new revenue streams by sharing their own data. The P2P platform model enables better opportunity complementarity between peer energy producers and energy service companies while it does not create complementarity for energy network operators anymore.

In the Icory case, addressing the unique nature of these particular cases as public-private partnerships

would also be useful. In Icory, three companies used the health innovation ecosystem model to address the opportunity in the public sector. In the first company, the national players in the international market helped them to modify their solution to be complement with the regulatory rules. They also worked together helping the company to co-create a solution content so that it is more complementing the needs at the public hospitals and among the patients. In the other case company, the discussions with the public international partners helped them to sell their solutions in a way that it is better to fit the targeted market. In the third company, the discussions with the public international players started as a multi-sided manner but it stopped suddenly because the solution does not fill the patient needs in the target country. This means that the collaborators did not anymore see the complementarity of their opportunities. The Icory case shows that despite the structural constraints of the hospitals as a type of key public actor in the healthcare ecosystem, the opportunity complementarity helps reduce the conflict and barriers (due to high safety and security requirements for healthcare products and services) that the small healthcare solution companies typically face when commercializing their solutions. However, it is also visible that institutional arrangements, such as data privacy and protection in healthcare institute do hinder the opportunities to be truly complementary.

Discussion and conclusions

The business model literature, and particularly research based on the perspective of value creation and capture, has evolved from single-actor models to multi-actor models, such as platform business models and ecosystem-oriented business models in the context of industry convergence and digitalisation. This paper presents two case studies of large-scale digitalization projects at EU and Finnish national levels with data-driven business models that are created within the two ecosystems.

This paper provides several contributions. *First*, it enriches the business model literature by proposing the opportunity complementarity as a new construct and antecedent prior to the creation of business models in the ecosystem setting. In particular, this paper adds to the literature by distinguishing the atomistic and complementary opportunities that are conceived and perceived by different ecosystem actors. This contributes to a deeper understanding of the ecosystem actors' rationale of engaging in value co-creation and co-capture processes in (digital) ecosystems, which is opportunity complementarity as an important factor. Furthermore, without a proper logic for value capture, even a ground-breaking opportunity is of no practical value due to its detachment from the business reality. To bring opportunities into business reality, actions are required to build business models through value co-creation and co-capture processes.

Second, this study investigates the data-driven business models in two large and established industries that are undergoing a digital transformation, proposing four data-driven business model archetypes. When an ecosystem adopts a scope-oriented business model, the players embrace a more integrated approach (e.g. connecting individual digital systems through platforms) to pursue the common opportunities, sharing data, knowledge, and technical resources. When dealing with scale-oriented data business models, companies are less likely to opt-in for a common platform and prefer to reserve their own data in silos.

Third, the study adds to the emerging platform research filling in a relevant research gap by explaining the opportunity complementary as an "ex-ante" driver for the creation of a platform business model. In doing so, we bring the concept of complementarity from economic literature to offer a novel understanding to address the research gap in understanding the drivers of business ecosystems in business model literature from the opportunity perspective by proposing the concept of opportunity complementarity that unites ecosystem and entrepreneurship studies.

Fourth, this research contributes to the ecosystem and platform research by showing that business platforms typically have ecosystem revolving around them or "platform ecosystem" per se (Jacobides et al., 2018). However, not all platforms are open. In fact, the non-existence of opportunity complementarity can lead to closed or "semi-closed" platforms, such as the single-sided data platform model in the research (Figure 1).

Fifth, from the empirical cases, six types of complementarities (including opportunity complementarity)

are observed. The only missing one is the production complementarity. The potential explanation is that the solutions within the two cases are mainly digital applications rather than physical products. The increased supply and use of data as an input did not lead to a decrease in the solution price but enhanced solution quality. Such finding may support the further investigation on the economics and complementarity of data in the digital age.

The research limitation is the missing of longitudinal perspective. The Icory case of the research shows that the opportunity complementarity may change over time as the opportunity itself has a fluid nature and is context-dependent: the old opportunity may lose its effect while new opportunities may emerge. Hence, the dynamic nature and longitudinal aspect of the opportunity complementarity and its impact on the business model require further research endeavour. Furthermore, this study acknowledges that opportunity complementarity is not static and further investigation is needed to understand the formation and dynamics of opportunity complementarity.

References

Alvarez, S. a., & Barney, J. B. (2010). Entrepreneurship and Epistemology: The Philosophical Underpinnings of the Study of Entrepreneurial Opportunities. *The Academy of Management Annals*, *4*(1), 557–583. https://doi.org/10.1080/19416520.2010.495521

Atkova, I. (2018). *From opportunity to business model: An entrepreneurial action perspective*. University of Oulu, Acta Universitatis Ouluensis. G, Oeconomica. Retrieved from http://urn.fi/urn:isbn:9789526218915

Benitez, J., Llorens, J., & Braojos, J. (2018). How information technology influences opportunity exploration and exploitation firm's capabilities. *Information and Management*, *55*(4), 508–523. https://doi.org/10.1016/j.im.2018.03.001

Chesbrough, H., Lettl, C., & Ritter, T. (2018). Value creation and value capture in open innovation. *Journal of Product Innovation Management*, *35*(6), 930–938. https://doi.org/10.1111/jpim.12471

Eckhardt, J., & Shane, S. (2003). The individual-opportunity nexus. In Z. Acs & & D. Audretsch (Eds.), *Handbook of Entrepreneurship Research: An Interdisciplinary Survey and Introduction* (pp. 161–191). Dordrecht, The Netherlands: Kluwer L aw International. https://doi.org/10.1007/0-387-24519-7_8

Edgeworth, F. Y. (1925). *Papers Relating to Political Economy.* London: Macmillan. https://doi.org/10.2307/2547849

Gomes, J. F., Iivari, M., Pikkarainen, M., & Ahokangas, P. (2018). Business Models as Enablers of Ecosystemic Interaction: A Dynamic Capability Perspective. *International Journal of Social Ecology and Sustainable Development (IJSESD)*, *9*(3), 1–13.

Gomes, J. F., Kemppainen, L., Pikkarainen, M., & Koivumäki, T. (2019). Ecosystemic Business Model Scenarios for Connected Health, *7*(4), 27–33.

Hartmann, P. M., Zaki, M., Feldmann, N., & Neely, A. (2016). Capturing value from big data – a taxonomy of data-driven business models used by start-up firms. *International Journal of Operations & Production Management*, *36*(10), 1382–1406. https://doi.org/10.1108/MBE-09-2016-0047

Herrero, C., Iturbe-Ormaetxe, I., & Nieto, J. (1998). Ranking opportunity profiles on the basis of the common opportunities. *Mathematical Social Sciences*, *35*(3), 273–289. https://doi.org/10.1016/S0165-4896(98)00003-1

Hicks, J. (1970). Elasticity of Substitution Again: Substitutes and Complements. *Oxford Economic Papers*, *22*(3), 289–296.

Hirshleifer, J. (1971). The Private and Social Value of Information and the Reward to Inventive Activity. *The American Economic Review*, *61*(4), 561–574.

Holgersson, M., Granstrand, O., & Bogers, M. (2018). The evolution of intellectual property strategy in innovation ecosystems: Uncovering complementary and substitute appropriability regimes. *Long Range Planning*, *51*(2), 303–319. https://doi.org/10.1016/j.lrp.2017.08.007

Iivari, M. M., Ahokangas, P., Komi, M., Tihinen, M., & Valtanen, K. (2016). Toward Ecosystemic Business Models in the Context of Industrial Internet. *Journal of Business Models*, *4*(2), 42–59.

Jacobides, M. G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. *Strategic Management Journal*, *39*(8), 2255–2276. https://doi.org/10.1002/smj.2904

Jansson, N., Ahokangas, P., Iivari, M., Perälä-Heape, M., & Salo, S. (2014). The competitive advantage of an eco-systemic business model: The case of OuluHealth. *Interdisciplinary Studies Journal*, *3*(4), 282–295. Retrieved from http://search.proquest.com/docview/1527435925?accountid=45153

Moore, J. F. (1993). Predators and prey: A new ecology of competition. *Harvard Business Review*, *71*(3), 75–86. Retrieved from http://www.mendeley.com/research/predators-and-prey-a-new-ecology-of-competition/

Nenonen, S., & Storbacka, K. (2010). Business model design: conceptualizing networked value co-creation. *International Journal of Quality and Service Sciences*, *2*(1), 43–59. Retrieved from http://dx.doi.org/10.1108/17566691011026595

Pikkarainen, M., Ervasti, M., Hurmelinna-Laukkanen, P., & Nätti, S. (2017). Orchestration Roles to Facilitate Networked Innovation in a Healthcare Ecosystem. *Technology Innovation Management Review*, *7*(9), 30–43. https://doi.org/10.22215/timreview/1104

Pikkarainen, M., Huhtala, T., Kemppainen, L., & Häikiö, J. (2019). Success factors for data-driven service delivery networks. *Journal of Innovation Management*, *7*(4), 14–46. https://doi.org/10.24840/2183-0606_007.004_0003

Priem, R. L., Wenzel, M., & Koch, J. (2018). Demand-side strategy and business models: Putting value creation for consumers center stage. *Long Range Planning*, *51*(1), 22–31. https://doi.org/10.1016/j.lrp.2017.07.007

Shafer, S. M., Smith, H. J., & Linder, J. C. (2005). The power of business models. *Business Horizons*, *48*(3), 199–207. https://doi.org/10.1016/j.bushor.2004.10.014

Shane, S. (2003). *A General Theory of Entrepreneurship The Individual-Opportunity Nexus*. Northampton, MA: Edward Elgar.

Sorescu, A. (2017). Data-Driven Business Model Innovation. *Journal of Product Innovation Management*, *34*(5), 691–696. https://doi.org/10.1111/jpim.12398

Sridhar, A., & Corbey, M. (2015). Customer profitability analysis and customer lifetime value: Comparing and contrasting two key metrics in Customer Accounting. *Management Accounting*, *89*(7–8), 265–273.

Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, *15*(6), 285–305. https://doi.org/https://doi.org/10.1016/0048-7333(86)90027-2

Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, *47*(8), 1367–1387. https://doi.org/10.1016/j.respol.2017.01.015

Vargo, S. L., Akaka, M. A., & Vaughan, C. M. (2017). Conceptualizing value: a service-ecosystem view. *Journal of Creating Value*, *3*(2), 117–124. https://doi.org/10.1177/2394964317732861

Walsham, G. (2006). Doing interpretive research. *European Journal of Information Systems*, *15*(3), 320–330. https://doi.org/10.1057/palgrave.ejis.3000589

Xu, Y., Ahokangas, P., & Reuter, E. (2018). EaaS: Electricity as a service? *Journal of Business Models*, *6*(3), 1–23.

Xu, Y., Ahokangas, P., Turunen, M., Mäntymäki, M., & Heikkilä, J. (2019). Platform-based business models: Insights from an emerging AI-enabled smart building ecosystem. *Electronics*, 1–20. https://doi.org/10.3390/electronics8101150

JOBM
Journal of Business Models

Developing New Sustainable Strategy: The Struggle of Small and Medium Swedish Contractors Companies to Experiment with Business Models.

Martine Buser[1] and Veronica Carlsson[2]

Abstract

Purpose: This paper analyses the efforts and challenges met by Small and Medium contractors to develop new business models when struggling to implement retrofit solutions for single house owners' renovation.

Design/methodology/approach: The paper builds on a four years action research project with 21 Swedish contractors from the Gothenburg region testing the business model canvas to develop energy efficient solutions. The project method includes 67 interviews with craftsmen and their customers, 18 workshops gathering the companies in two groups to develop new sustainable business models and 16 shadowing of visits to their customers.

Findings : Our study underlines how SMEs contractors concentrated on their technical core business tend to underestimate their customer relationship. Both customer segments and relationships escape from formalisation as these companies do not dare to exclude any client and are inclined to reduce customer relationship to personal interaction. Besides, these project base companies are challenged by the blocks presented by the canvas and struggle to match the model with their own organisation.

Original value: Differently to most research on business models and sustainability this paper addresses the concrete difficulties construction SMEs face when implementing business models.

Keywords: Business models, constructions SMEs, sustainability

Please cite this paper as: Buser M. and Carlsson, V. (2020), Developing New Sustainable Strategy: The Struggle of Small and Medium Swedish Contractors Companies to Experiment with Business Models., Vol. 8, No. 2, pp. 101-114

1 Construction Management, Architecture and Civil Engineering, Chalmers University of Technology, Gothenburg Sweden, buser@chalmers.se
2 Örebro University

Acknowledgment : the paper draws on a 4 years PhD project funded by the Swedish government research council for sustainable development Formas.

Introduction

The social and legislative focus on sustainability has pressed the construction sector to optimise and innovate in term of both material and business processes. As buildings represent 30% of the total energy consumption, Sweden, following EU regulation has formulated national targets regarding energy and sustainability, but is facing challenges regarding their implementation (Boverket 2020). While new built is adapting to new regulations, renovation of existing building stock is lagging behind. In particular properties built between 1950 and 1975, representing 43% of the Swedish dwelling are in need of renovation (Boverket 2015, SCB 2014). Houses of this period are outdated compared to today material efficiency, and technical components such as ventilation systems, bathrooms, laundry, drainage, windows or roofing are reaching the end of their lifetime expectancies. Whereas large real estate and contractor companies are taking care of large housing development, the responsibility of renovation scope for single-family houses is let to their owners who usually mandate small and medium sized enterprises (SMEs) to perform the work. However, the majority of these renovations aims at increasing comfort and aesthetic design to the detriment of energy efficiency solutions (Bravo et al. 2019). The situation seems to be similar to other European countries where energy renovation has still not emerged as common practice (Bartiaux et al. 2014) and SMEs contractors are failing to substantially increase sustainability awareness among their customers (Naef et al. 2019).

To account for this situation, the lack of competences regarding new technology and innovation has often been put forward. However, retrofit can be successfully achieved by using existing technology, suggesting that the lack of retrofit is not only a technical challenge related to innovation but also a problem related to the market. To explore retrofit from a market perspective, we chose to look at how craftsmen engaged in single family house renovation could increase retrofit testing the use of business models. This approach enables to map the actual practices of a company and enable changes that requires crosscutting activities, inter and extra-organisational integration and focus on the customers' needs.

Based on an action research method, financed by FORMAS; the project aimed at supporting small contractors' companies from the Gothenburg region experimenting with Osterwalder and Pigneur's (2010) business model canvas, to develop their activities towards new energy efficient solutions for their customers.

Drawing on the results of this four years project (2013-2017) gathering 21 small companies active in different trades, the purpose of the present paper is to investigate how concretely these companies could benefit from using the canvas, identify the challenges they met in doing so and assess the potential of BMC to improve these companies' offers in term of energy efficiency solutions.

The paper is organised as follows: the next section explains what characterises a BM, BMC and sustainable BM and its constituting elements as well as the specific issues related to their applications for SMEs and energy efficient solutions. Next come the method and the empirical findings. A discussion and a derived conclusion end the paper

Theoretical frame

Single house energy efficient renovation and the construction sector

So far, the absence of success encountered by retrofits for this single houses has often been explained by the focus on technical aspects. The contractor SMEs who should promote and carry these new forms of renovations are said to be inadequately prepared to develop and adapt the latest technical solutions to their current practices (Killip 2013). Not only do they lack the full set of skills and resources to deal with the technologies, but they also have problems to identify and select among the possibilities offered by these new developments and adapt them to their own businesses (Mokhlesian and Holmen 2012). Moreover, their suppliers seem to be not sufficiently supportive to promote these solutions (Kilip et al. 2020). Under pressure to deliver within tight time frames, the contractors tend to offer and repeat a set of standardized solutions to their customers (Archtnicht and Madelner 2014). So, even if a company is willing to take risks and engage in an innovative solution for a specific client, it does not imply that this solution will lead to a long-term change of practices. As the contractor moves from one project to the next, the routine is to revert to established and

conservative practices (Killip 2013). This practice is reinforced by the apparent singularity of each of the projects (Buser and Carlsson 2017).

In order to reshape the existing built environment towards EUs sustainability targets (EU action plan 2020) there is a need for innovative solutions (Geissdoerfer et al. 2018). To provide sustainable solutions construction companies need to change their practices especially towards integrating new technologies and products to their actual offers (Mokhlesian and Holmen 2012). However, the construction SMEs have not the reputation of being especially dynamic in term of innovation. Rather they demonstrate a business as usual attitude likely to miss the escalating environmental performance requirements (Hardie and Newell, 2011). These SMEs seem to be insufficiently equipped to develop and adapt to new markets and may miss the benefit from the upcoming increase of opportunities (Hardie and Newell, 2011). Researchers have highlighted the importance of clients and building standards to incite and support SMEs in their innovation process (Hardie and Newell, 2011, Håkansson and Ingemansson 2012).). Håkansson and Ingemansson (2012) identified that the collaboration with clients represents the most important driving forces for renewal in the construction industry, however the authors seems to take for granted that interested customers are available. Recent studies show that successful renovations are clearly associated so far with the rather rare proactive house owners (Risholt and Berker 2013, Galvin and Sunikka-Blank, 2014) and the result of engaged and active milieu friendly actors with a high level of knowledge (Fawcett and Killip 2014). While mainstream house owners are associated with lack of information and technical knowledge to carry out retrofit (Mortensen et al. 2014). In addition, they rather address their investments to other forms of renovation triggered by comfort, lifestyle and esthetical aspirations (Risholt and Berker 2013, Bravo et al. 2019).

The role of policies to promote CO_2 emission reduction, should not be forgotten. Hardie et al. (2013) suggest that the regulatory environment is far more important to environmental innovators than to others and that the influence of clients and end users becomes therefore less significant. So, the diffusion of EU´s energy efficient targets putting pressure on private house owners to renovate in order to comply with these energy targets should help the expansion of energy efficient renovations (Directive 2010/31/EU). However, in Sweden, these directives are regulatory and do not include financial incentives even though the latter may be more useful to influence owners of existing houses to adopt building envelope measures (Mokhlesian and Holmen 2012).

Authors (Uguru 2000, Janda 2014) have suggested that technological innovations related to retrofit have been overemphasized since many of the needed technology to achieve satisfying results are already available. They underlined instead that the retrofit issues should be considered as a market breakthrough problem instead of a technological one (Janda et al. 2014)

Business model

One strategy to develop new business is to implement business models methods. These tools serve to map the actual core aspects of an organisation and to define possibilities for future developments. Business models can be of many types, mobilising different components and configurations (see Saebi and Foss 2015, for a review), most of the authors seem nevertheless to agree on a basic understanding: business models are focusing on how a company defines a value proposition to address specific customer segments and organise itself and its networks to reach the benefits associated to this newly defined proposition. As pointed out by Teece (2010) a business model is a strategic tool "defining the manner by which the enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit" (p:172). A business model can be viewed as the conceptual glue of a business. It should be sufficiently differentiated to meet particular customer needs, no too difficult to replicate, and should lead to competitive advantage (Teece 2010). It contributes though more to change the "way you do things" rather than "what you do" and therefore should bring organisational changes for the company (Amit and Zott, 2012). However, these changes are not limited to the company but can involve larger group of actors including company customers, shareholders and key stakeholders like suppliers and are context dependant. (Zott et al. 2011). The dynamic process of BM and in particular its relation to practice is also underlined by Ahokangas and Myllykoski (2014).

Schneider and Spieth (2013) demonstrate that a contribution to studies of business model innovation

encompasses many different understandings of the prerequisites, the processes and the effects of business model innovation. They point to, for example that business models might develop as a continuous response to changes in the environment, and/or as a discovery driven trial and error process (Schneider and Spieth 2013). In this perspective, BM may serve to foster future development and include new technology. Though it is characteristic that these approaches, with their comprehensive business area coverage, do not include an appreciation of how new types of technologies would need to be integrated (see also Baden-Fueller and Haeflinger 2013).

Furthermore, the role of management of the company might need to change to support new ways of doing business and therefore also should be one of the "objects "of the business model innovation. Lindgren (2012) is thus discussing leadership when developing business models for small and medium sized enterprises (SME) and add competences to the conceptual landscape. His study shows that SMEs primarily focus on meeting needs and demands from a "predefined" customer and act rather reactively than actively.

In the construction sector, the use of business models has so far attracted little attention to the exception of the study of Pekuri et al. (2015). Their results show that for Finnish contractors the selection of project is not guided by any specific business model. The selection of tasks to be carried seems to be influenced by short term prospect such as need of work and profitability, as these are decided project by project .

Among the many business models, Osterwalder and Pigneur (2010) have developed a rather simple conceptual tool, the canvas, which should help companies to successfully generate new business models. This canvas is composed of nine blocks showing the logic of how a company intends to make money and represents the blueprint for a strategy to be implemented trough organizational structures, processes and systems (p15).

As noticed by Lund and Nielsen (2014) the model does not prescribe any particular starting point for the analysis, or any particular order of discussion. Though the 2010 canvas is designed with the company strengths and abilities on the left and moves to the customer on the right of the canvas. But Osterwalder and Pigneur's handbook starts by focusing on the customer and how to solve his/her problems and how to deliver a new solution (section 1-4). Once the revenue streams are assessed (section 5), the key resources, activities and partners are discussed (section 6-8) and end ups with the cost structure (section 9). The handbook offers consequently two contradictory lectures on how to proceed with the model. For our workshops, we exploited a third path starting with the value proposition then the customer segments followed by the building blocks "backwards" to the left in the canvas.

Business models and sustainability

The concern for sustainability has fostered interest in developing business models seeking to bridge the short-term financial interest of companies to maintain or increase economic prosperity with the longer-term focus of social, environmental and economic sustainability (Schaltegger et al. 2015). Their common purpose is to give a strategic tool to companies aspiring to integrate sustainability concerns and goals in their business (Pieroni et al.2019). Among other Geissdoerfer et al. (2018) have shown based on a literature review how BM and sustainable innovations are interrelated and have proposed normative requirements for businesses to operate towards sustainability. Furthermore, Bocken et al. (2014) have identified eight sustainable business models archetypes which together should provide guidance to integrate sustainability concerns in business purpose and support innovative practices. They aim a categorizing and explaining BM for sustainability, providing mechanisms to assist the development of sustainable BM and examples for business to de-risk the SBM innovation process, and finally to contribute

<table>
<tr><td rowspan="2">8.Key partners</td><td>7.Key activities</td><td rowspan="2">2.Value proposition</td><td>4. Customers relationship</td><td rowspan="2">1.Customers segments</td></tr>
<tr><td>6.Key resources</td><td>3.Channels</td></tr>
<tr><td colspan="3">9.Cost structure</td><td colspan="2">5.Revenue streams</td></tr>
</table>

Table 1: The business model canvas (Osterwalder & Pigneur, 2010)

to define a clearer research agenda for BM for sustainability (2014).

Regarding the development of practical tool, Joyce et al. (2015) have proposed to add two more canvas to the Osterwalder and Pigneur's initial BMC renaming the latter Economic BMC: an Environmental Life Cycle Business Models Canvas focusing on the environmental impacts of both new products and services and a Social Stakeholder Business Model Canvas assessing the social impacts and benefits of new products and services. These three models acknowledging the complexity of sustainability seems however to be rather heavy to operate in a business context.

However, the scope of the present paper is only indirectly referring to the SBM stream as the reflection towards implementing sustainable solutions to the customers has been carried in the workshops using the 2010 BMC (Osterwalder and Pigneur 2010). Our project started in 2013 where SBM were only slowly emerging. Though, by revealing the barriers that the AEC SMEs are facing when implementing BMC, we also contribute to discuss the challenges of this SBM stream.

Method

The present paper reports the findings of an action research project with small Swedish contractor companies from the Gothenburg region experimenting with business model to develop energy efficient solutions. The method is multidisciplinary and employs an interpretive approach to discuss the empirical material (Burrell and Morgan 1979, Bryman and Bell 2011). The frame of understanding is based on a selective literature review drawing on business models and sustainable business models theory, studies of sustainable renovation as well as of the particularities of the construction sector SMEs.

The empirical material has mostly be collected for a PhD (2013-2017) conducted by one of the authors whose focus is to document and analyse the integration of new energy saving solutions for the renovation of single family houses with a particular focus on the relation between the house owners and the craftsmen engaged to carry the work. Initially, 90 contractor SMEs of the Gothenburg region were contacted first by e-mail and then by phone. The enterprises were partly sought out from a map search engine using specific trade words and concepts, partly through snowballing when interacting with the enterprises. Out of the 90, we visited 24 for a first interview; 21 finally accepted to be part of the project. The trades are distributed as following 16 carpenters, 2 electricians, 5 energy solution providers, and 1 brick layer. We do not claim a representativeness in our sampling and see our study as exploratory.

This longitudinal study includes 18 workshops distributed during 24 months with a total of 21 craftsmen's companies to discuss and develop the potential of new energy saving solutions for their customers, and including twice the presence of technical experts; 13 interviews with craftsmen and enterprise representatives; nine interviews with customers and six observations of initial encounters between craftsmen and customers to design and decide the scope of the renovation. The purpose of the action project is not to develop solutions for the companies but to train the companies into using BM has tool to keep improve their business solutions and adapt to the continuous environment changes- The workshops represent the main sources for the present discussion. For the workshops the companies have been divided in three groups depending on their location. They did not have any previous business relation before meeting in the project. During the initial workshops, the different elements of the canvas (Osterwalder & Pigneur 2010) were discussed separately (customers, business proposition, key activities, value proposition etc). The complete canvas was presented in two workshops. The latest workshops have focused on potential new solutions and how to find and "get" new customers.

Out of the three groups, one, the South group, was more successful than the two others and therefore being richer in term of information will serve as a main example for the presentation of the results.

The following table gives a short description of the 9 companies participating in the South Group and underlines the diversity of the companies involved in the project but also the diversity of the services each provide to the customers. All these companies have a rather local market and tend to define their area of intervention within an hour drive from their central office.

Company	Trade	organisation	since	business
1	Energy	One main owner Nine employees	2001	Services: HVAC, Heating and plumbing
2	Insulation	Two owners 21 employees Sale department	1978	Services: Providing insulation in walls, floors, roofs and attics.
3	Electrician	Five owners 13 employees	2002	Services: Lighting, smart housing
4	Electrician	One main owner 25 employees	1992	Services: Electrical safety, lighting, renovation. Specialist expertise within e.g. control system, knx, heating and automatic heating controls
5	Carpenter	Two owners Nine employees	1984	Services: Construction, property services, snow plowing, renovations and decorations, custom installations
6	Carpenter	Two owners 14 employees	1995	Services: all types of construction work for private persons and businesses: new built, refurbishment, extensions, renovations, bricklaying and plastering etc
7	Carpenter	Two owners Seven employees	2011	Roof, new built, refurbishment, renovation
8	Carpenter	One owner Nine employees	1998	Services: New built, refurbishment of single-family houses, vacation homes etc. Renovations, kitchen renovations, carpentry. Through business partners: excavation, plumbing, electricians, tile work, expert work in wet areas, tinsmith
9	Carpenter	One owner One employee	1987	All types of construction services, new built, renovation, refurbishment, extensions. The owner owns two more businesses in transportation and warehousing.

Table 2: The 9 SMEs of the South group

Notes were taken during the workshops and the interviews were taped and transcribed. To carry our analysis, we have followed the 5 steps model of qualitative analysis suggested by Taylor-Powell & Renner (2003): knowing the data by getting over it several times; identify key questions or topics to organise the analysis; categorize information by themes and features; identify patterns and connections wihthin and between categories and finally interpretation by attaching meaning and significance to the analysis. Since the process is not rigid moving back and forth between the steps can occur. The results and interpretations of the different methods of gathering data have been triangulated by been discussed during the workshops with the participants and also between the researchers participating to the project.

Results

Challenges for the SMEs

Building on the Osterwalder Pigneur's handbook (2010), this section underlines the challenges met by the companies when dealing with most of the topics addressed by the 9 blocks of the canvas.

Customers segments

Identifying customers segment represents the first challenge for these companies. They fail to define and prioritise segments from fear of excluding any potential project. They claim their focus is on single family's house, but they also perform work for church, schools or factories. It appears that these companies are willing to take almost any jobs providing the project are assessed as low risk and can generate profit. From what should be a straightforward customers segment, these companies seem to face a rather diversified market with a very broad potential of customers. Besides, they also emphasised a need for flexibility to adjust to the building characteristics related to the periods and types of constructions they renovate.

Paradoxically, when discussing in group during the workshops, these companies tend to have rather stereotypic understanding of what their customers want and need. In particular, they argue that the costs of retrofit are too high to seduce their mainstream customers and prevent any kind of investment. This understanding of the customer appears to be more nuanced during interviews. Here the craftsmen tend to display a more open attitude towards their customers and acknowledge a large variety of situations, contexts and demands. In particular, they notice that their customers tend to be more knowledgeable about the renovation possibilities and may even challenge their expertise regarding the proposed solutions. If most of the craftsmen accept to consider these new possibilities and assess their relevance for the concrete customer's, they do not add them in their projects' portfolio. They may nevertheless reuse this new knowledge or competence if a similar case shows up. It appears clearly that the customers segments are decomposed into singular project and customer and that our companies are not willing to disregard any of them.

However, the South group did identify two new customer segments that the companies could target together. One was the new owners of houses built between 1950 and 1980 as these buildings are subject to a generation shift and in need of substantial renovation. The other segment was "the longstanding" houses owners, that might want to renovate to increase the house value before selling it.

Besides, company Four decided to create an offer for customers interested in solar panels and company Seven identified the customers lacking financial resources as a segment they could target in association with a bank. In our sample, new customers segments are added to existing ones; the companies are reluctant to select, prioritise or downsize the number of segments present in their portfolio as they may miss a project.

Value propositions

To create an explicit value proposition seems to be another challenge for our companies, not because they do not know what problems their customers are facing or which products or services to offer but because these are implicit knowledge the craftsmen mobilise project by project. They define their value propositions as depending on the specific context. There is no transparency regarding the cost or the length of the contract, as these features are modified following the type of customers or projects. As in this example, witnessed by one of the authors of a craftsman (company Five) coming to a customer house for the first time and commenting on the poor aspects of the location. The lack of maintenance of the surroundings were interpreted by the craftsman as a sign of low income and therefore the prospect of a meagre income. So, in order to avoid working for this customer he overpriced heavily his tender. To his surprise the price was accepted without discussion and he made a substantial benefit. The value for customers seems to be renegotiated for each transaction.

However unwilling to come up with defined and stable value proposition, the South group decided to create a joint service: a package gathering the different trades to simplify the task of the house owner when planning renovation. The package consists of a complete assessment of the houses' needs in term of renovation as well as several offers to carry the work in different steps. In doing so, the companies have identified the limit of their own competences and trade and decided to build on the complementarity of the services they already offer separately.

Company Four developed services regarding the choice, installation and maintenance of solar panels, to learn but also to demonstrate their expertise to their

customers, they have installed solar panels on their own houses and facilities.

Company Seven proposal with a bank shorten and simplify the house owners' process when planning the financing of their renovation.

Channels

When searching for companies to participate in the project, we were struck by the lack of information provided by the companies' websites and the difficulty to find proper description of the core business and competences these craftsmen were proposing. Their market seems to be very local and it would be a mistake to believe that all of them are willing to increase significantly their turnover. In fact, three of our companies stated explicitly that they did not want to grow unless undertaking a very substantial project.

The craftsmen described their relations to their customers as based on local and personal networks relying on personal recommendation to get new jobs. Therefore, investing in marketing is not seen as a priority. However, many of them have tried diverse marketing solutions in the past: leaflet in mailboxes, advertising in local or specialised magazines, participating in national TV broadcasts on craftsmen work or craftsmen competition, or investing in shiny websites. But none of these, they claim, have brought back much return on investment. For our companies, word to mouth is the main channel of information to attract new customers. Besides, these direct contacts allow the craftsmen to shape without delay their offers according to the specific needs of the customers.

The two new value propositions defined by the two single companies have appeared on the respective companies 'websites. The South group joint proposal has been printed as a leaflet and distributed door to door in the local area corresponding to the target groups. Using real estate's agents as medium to deliver this new value proposition has been discussed and finally discarded. The participants did not trust the agents to be fair and faithful to the proposals.

Customer relationships

As seen above, the relation to customers is personal and depends on local networks. These companies valorise face to face communication. They describe the first encounter with customers as determinant for the relation to come. This moment enables them to identify the type of client they are dealing with and define the scope of the project. They also have the possibility to refuse the collaboration. The first encounter is often carried by the owner of the company, where the tasks are later often performed by the employees. This shift of interlocutors can create misalignments and triangulation between the parts may occurs. The owner has then the responsibility to straighten the relation if needed.

The retention of customers is not as issue as such as renovation activities are seen to be a one-off event, so the companies do not aim at creating long term relationship with their customers. At the same time this relation is important for them as it should not damage the possibility of new potential customers and the quality of the services should contribute to the recommendation to new projects.

Revenues streams

Even if the companies insist on the uniqueness of the projects they perform, one way of assuring the revenue stream is to propose standardised and cheap solutions to the customers using a reduced number of materials. This repetition ensures financial profits and quality of execution. However, sustainable renovation asks for upgrade of competences, techniques and material. These companies are not opposed to such improvement providing the customers can afford it. The common understanding regarding the customers' will to invest in sustainable solution is that even if they wanted to, they would not be able to. The single houses market in the region of Gothenburg is under heavy press with more buyers than available properties and a system of open auction enabling people to bed on top of each other increasing the selling price by up to 10 to 15% (figures for 2013-2018). "*New house owners are actually "broke" when they enter their new property and go for cosmetic improvement instead for structure and sustainable renovation"(manager Company Eight).*

Another shared opinion is that *"if the customers do have money left, they would rather put them towards a new kitchen or bathroom than to put money towards energy efficiency solutions" (Manager company three).*

With the exception of the energy company providing price for heating equipment and installation, there are no cost transparency of the offered services or material. Here as well the cost of the work to be performed is estimated by the craftsmen project by project, though this is not a topic they are keen on openly discussing. Besides, none of the three new business propositions is announcing costs or prices for the work to be done.

Key Resources

They key resources for our companies are mainly human labour as they depend on the competences and skills of their employees. They do not hesitate to mobilize members of their professional network if a task requires more workforce or competences outsides of their own trade. They are also willing to broader their scope by adding new technical competences as for the solar panels or business competences as in the financial resource proposal.

The university participation to the project was also seen as a key resource for these companies– to be able to use the university logo has been a motivation to participate in the project for many of the companies. They saw this as a legitimization possibility for their company in term of knowledge and competence.

Key activities

The companies summarised their key activities as problem solving. They describe their work as defining and executing distinct solutions fitting with the customer's ambition, budget and houses' specificities. At the same time many of their current interventions do have elements of standardisation and repetitions which could justify a listing of their key activities. The appropriation of sustainable solutions requires time and funding. Our companies are not ready to prioritise these investments as long as the customers demand is not more outspoken. For the smallest companies this is especially acute as the owner is often the one delivering all the key activities of the company. They professional identity of our respondents is clearly connected to their trade: "*I am an electrician, this is what I know, this is what I am good a*t !" (manager company Three). Our participants saw activities such as customers, suppliers and partners relationships, marketing, or accounting as necessary burdens but not adding essential value to their companies.

Only one of the three business propositions, the solar panel is asking for a radical change in key activities requiring the mastering of new products, process and competences.

Key partners

Banks are mentioned as key partners by all the participants. The proposal of the company Seven for a financial solution associated to renovation project is a result of this close collaboration.

Asides of the bank, the companies possess a network of informal partners active both in their own domain and in other trades which they can mobilize when needed. They can rely on each other for specific tasks and recommend each other to their customers.

The joint proposal is building on this type of informal network where the competences are brought together to offer a common product. The modalities for the distribution of tasks and revenues are formalised.

The solar panels initiative of company Four requires a closer relation with the providers not only in term of equipment but also in term of learning and appropriation of the new technology. Apart from company Four, none of the companies participating to our research has identified new key partner it could associate with to develop new value proposition.

Cost structure

The expenses linked to the learning and time investment of new sustainable solutions is seen as one of the main barriers to their implementation. So, it is no surprise that two of three propositions are virtually cost free. By investing in solar panel for it owns house, company 4 minimises the risk and can actually carry a life size trial without investing too much from his own company.

The companies have all been very discrete about the cost structure of their running business. Investing in new solutions is certainly appealing but taking the risk of investing without being certain of the pay back is seen as too risky by these companies. Paradoxically, it is not so much the cost they worry about but the long term consequences of their intervention on the buildings.

To conclude, the experimenting of business model by a group of nine construction companies has results in the creation of three new value proposition for the companies involved. Two for single company and one engaging a network of several of these companies. Unfortunately, 6 months later they had not created new business and no customers had benefitted of any of these proposals. This situation did reinforce the participants' conviction that there were not much benefit investing in new business propositions and be proactive, ant that the market was definitely not open to .

Discussion and Conclusion

The lack of success so far of the three proposals tends to confirm the role of regulatory environment as the most influential factor to environmental innovators (Hardie et al. 2013). So far Sweden has not proposed any incentives to regulate the adoption of sustainable renovation.

Similar to previous studies (Pekuri et all. 2015, Mlecnik et al.2019) the preliminary assessment of the use of the canvas with the construction SMEs shows some difficulties for these companies to work with the blocks division as they tend to see their business as a succession of projects. The logic behind the business models' canvas does not fit with the understanding of their own organisation. The small size of these companies forces their members, often the owners, to take responsibilities for several if not all of the building blocks. The hierarchisation and prioritisation becomes difficult as they are totally immerged in all the activities. Distance to the issues and self-criticism are difficult to achieve.

Besides in order to secure their business they tend to broaden their customers segments instead of narrowing it down. But our results show that the problem for these SMEs is not unambiguously the lack of skills and knowledge to develop sustainable renovation solutions as suggested by Mokhlesian and Holmen (2012). These companies are able to deliver punctually innovative solutions when requested by the customers. What seems to miss though it the motivation to take the necessary time to translate these solutions embedded in the craftsmen head into regular business models to be accessible for other customers as long as the latter are not clearly stating their interest. So, it is not so much the conceptualisation of the solutions, but rather their formalisation and visibility which is an issue. As identified by Fawcett et al. (2014) when the contractor moves from one project to the next, the routine is to revert to established and conservative practices.

The business model followed by the companies participating to the project are going against two of the strong the propositions of the canvas as to define clear segments and specific value propositions. The proposed solutions are adding new customers segments and business proposals to the already much diversified portfolio of activities. However so far, no clear decision has been taken to substantially transform their business and invest in sustainable solutions, they strategic decisions have yet to be taken.

References

Achtenhagen L., Melin L., Naldi L. (2013) "Dynamics of Business Models – Strategizing, Critical Capabilities and Activities for Sustained Value Creation" *Long Range Planning*, Vol. 46, pp. 427-442.

Andreasen M. M. and Hein L. (1987) "Integrated Product Development". *IFS* (Publications), Bedford.

Baden-Fuller C. and Haefliger S. (2013) "Business Models and Technological Innovation". *Long Range Planning,* Vol. 46, pp. 417–418.

Bartiaux, F., Gram-Hanssen, K., Fonseca, P., Ozoliņa, L., & Christensen, T. H. (2014). A practice–theory approach to homeowners' energy retrofits in four European areas. *Building Research & Information*, Vol 42, 4, pp. 525-538.

Bocken, N.M.P., Short, S.W., Rana, P. and Evans, S. (2013), "A literature and practice review to develop sustainable business model archetypes", *Journal of Cleaner Production*, Vol 65, pp. 42-46.

Boons, F. and Lüdeke-Freund, F. (2013), "Business models for sustainable innovation: state-of-the-art and steps towards a research agenda", *Journal of Cleaner Production*, Vol. 45, pp. 9–19.

Boverket (2015) Förslag till utvecklad nationell strategi för energieffektiviserande renovering. Boverket. Stockholm

Boverket (2020) Utveckling av regler om klimatdeklaration av byggnader. Boverket. Stockholm.

Bravo, G., Pardalis, G., Mahapatra, K., & Mainali, B. (2019). Physical vs. aesthetic renovations: Learning from Swedish house owners. *Buildings*, Vol 9,1 pp 12.

Buser, M., & Carlsson, V. (2017). What you see is not what you get: single-family house renovation and energy retrofit seen through the lens of sociomateriality. *Construction management and economics*, Vol 35, 5, pp. 276-287.

Dainty, A. R. J., Green, S., & Bagilhole, B. (2007). People and culture in construction: contexts and challenges. In A. R. J. Dainty, S. Green & B. Bagilhole (Eds.), *People and Culture in Construction: a reader* (pp. 3–25). Abingdon / New York: Taylor Francis.

EU (2005) *The new SME definition. User guide and model declaration*. European Commission. Enterprise and Industry Publications Bruxelles.

Fawcett, T. and Killip, G. (2014)Anatomy of low carbon retrofits : evidence for owner-occupied Superhomes. *Building Research and Information*, Vol. 42, 4, pp. 434-445.

Geissdoerfer, M., Vladimirova, D., & Evans, S. (2018). Sustainable business model innovation: A review. *Journal of cleaner production*, Vol 18, pp. 401-416.

Graner M., Missler-Behr M (2014) "Method Application in New Product Development and the Impact on Cross-functional Collaboration". *International Journal of Innovation Management* Vol. 18, 01, 25 p.

Hardie, M., & Newell, G. (2011). Factors influencing technical innovation in construction SMEs: an Australian perspective. *Engineering, Construction and Architectural Management*, Vol. 18, 6, pp. 618-636.

Hardie M, Allen J, Newell G (2013) Environmentally driven technical innovation by Australian construction SMEs. *Smart and Sustainable Built Environment* 2013 Vol. 2, 2 , pp. 179-191

Joyce, A., Paquin, R., & Pigneur, Y. 2015. The triple layered business model canvas: a tool to design more sustainable business models. *ARTEM Organizational Creativity International Conference*. Nancy, France.

Killip, G. (2013) Products, practices and processes: exploring the innovation potential for low-carbon housing refurbishment among small and medium-sized enterprises (SMEs) in the UK construction industry. *Energy Policy*, Vol 62, pp. 522-530.

Killip, G., Owen, A., & Topouzi, M. (2020). Exploring the practices and roles of UK construction manufacturers and merchants in relation to housing energy retrofit. *Journal of Cleaner Production*, Vol 25, 1, pp 119-205.

Kirkels Y., Duysters G. (2010) Brokerage in SME networks. *Research Policy*, Vol. 39, 3, pp. 375–385.

Lindgren P. (2012): Business Model Innovation Leadership: How Do SME's Strategically Lead Business Model Innovation? *International Journal of Business and Management*, Vol. 7, 14, pp.53-66.

Lindgren P. & Abdullah M.A. (2014): Conceptualizing strategic business model innovation leadership for business survival and business model innovation excellence. *Journal of Multi Business Model Innovation and Technology,* Vol. 1, pp.115–134.

Lund, M. & Nielsen, C. 2014, 'The Evolution of Network-based Business Models Illustrated Through the Case Study of an Entrepreneurship Project', *The Journal of Business Models*, Vol. 2, 1, pp. 105-121.

Mlecnik, E., Straub, A., & Haavik, T. (2019). Collaborative business model development for home energy renovations. *Energy Efficiency*, *12*(1), 123-138.

Mortensen, A., Heiselberg, P., & Knudstrup, M. (2014). Economy controls energy retrofits of Danish single-family houses. Comfort, indoor environment and architecture increase the budget. *Energy and Buildings*, Vol. 72, pp. 465-475.

Naef, P., Sahakian, M., & Goggins, G. (2019). Conclusion: comparing household energy use across europe—uncovering opportunities for sustainable transformation. *Energy Demand Challenges in Europe*, 137.

Pekuri A, Pekuri L., Haapasalo H (2105) Business models and project selection in construction companies. *Construction Innovation* 2015 Vol.15, 2, pp.180-197.

Pekuri A, Pekuri L., Haapasalo H (2013) 'The role of business models in Finnish construction companies', *Australasian Journal of Construction Economics and Building,* Vol. 13, 3 pp.13-23.

Pieroni, M. P., McAloone, T. C., & Pigosso, D. C. (2019). Business model innovation for circular economy and sustainability: A review of approaches. *Journal of Cleaner Production*, *215*, 198-216.

Osterwalder A. & Pigneur Y. (2010) *Business Model Generation* (2010). *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons.

Osterwalder A , Pigneur Y., Bernarda G., Smith A. (2014) *Value Proposition Design: How to Create Products and Services Customers Want*. Wiley. Hoboken.

Risholt, B., Time, B., & Hestnes, A. G. (2013). Sustainability assessment of nearly zero energy renovation of dwellings based on energy, economy and home quality indicators. *Energy and Buildings*, Vol. 60, pp. 217-224.

Risholt, B., & Berker, T. (2013). Success for energy efficient renovation of dwellings–Learning from private homeowners. *Energy Policy*, Vol. 61, pp. 1022-1030.

Saebi T. and Foss N. (2017). Fifteen years of research on business model innovation: How far have we come, and where should we go? *Journal of Management*, Vol 43, 1, pp 200-227.

SCB (2014) Yearbook of Housing and Building Statistics 2014. Official Statistics of Sweden. Statistics Sweden. Stockholm.

Schaltegger, S., Hansen, E. G., & Lüdeke-Freund, F. (2015). Business Models for Sustainability Origins, Present Research, and Future Avenues. *Organization & Environment*, pp. 1-8.

Schneider S. and Spieth P.: "Business Model Innovation: Towards an integrated Future Research Agenda". *Int. J. Innovation Management.* Vol 17 1, (34 pages). 2013.

Sverige Byggindustrier (2016) Byggtermometern, http://www.byggtermometern.se

Taylor-Powell E., and Renner, M. (2003). Analyzing qualitative data. In P. H. Rossi (Ed.), *Handbook of survey research*. New York: Academic Press.

Teece D.J. (2010) *Business Models, Business Strategy and Innovation*. Long Range Planning. Vol. 43, pp. 172-194

Ulrich, K., Eppinger, S. (2012) *Product design and development*. 5 ed. Boston. McGraw-Hill.

Yunus, M., Moingeon, B. and Lehmann-Ortega, L. (2010), "Building Social Business Models: Lessons from the Grameen Experience", *Long Range Planning*, Business Models, Vol. 43, 2–3, pp. 308–325.

Zott C., Amit R, Massa L (2011) The business model: recent developments and future research, *Journal of Management*, Vol. 37. 4, pp. 1019 – 1042

About the Authors

Martine Buser is associate professor in construction management at Chalmers University of Technology in Sweden. Her work focuses on sociological aspects of environmental and social sustainability and explores social practice and organisational features related to project in the construction sector. Her interest includes innovation, change management and business development processes in context such as milieu certification, renovation, waste management and operation of buildings.

Veronica Carlsson holds a PhD in construction management from Chalmers. After her studies she chose to apply the principles she had researched and worked as project leader developping a strategy to create a fossil free transportation fleet for Örebro region. She is now back at university as administrative unit manager for education at Örebro University.

BUSINESS SCHOOL
AALBORG UNIVERSITY

BUSINESS
DESIGN
LAB