Agile New Solution Development in Manufacturing Companies

Tuomas Huikkola, Marko Kohtamäki

> *"When GDP is growing by 4% a year, no business is hard. When GDP is growing by 1% a year, no business is easy, so you've got to be percolating new and different ideas."*
>
> Jeff Immelt
> GE's former CEO

This conceptual paper proposes a new agile solution development model for technology and manufacturing companies. The flexible model consists of five key phases: 1) new idea screening, 2) idea nurturing, 3) conversion of ideas into "good enough" solutions, 4) solution productization, and 5) solution revamping. These phases are iterative by nature and follow partial stage model logic, hence combining elements of both the waterfall and agile methods. For technology and manufacturing companies, the new model presents a new way to consider ideas related to new product, service, process, and business model development. It is framed in contrast with older models that are typically product oriented, which potentially restrict companies in the ability to strategically renew themselves fast enough in turbulent product-service markets.

Introduction

Technology and manufacturing companies nowadays are moving towards services and solutions (Luoto et al., 2017; Rabetino et al., 2018) to escape the commoditization trap (Neu & Brown, 2005; Huikkola et al., 2016). This phenomenon has generally been called business "servitization" (Vandermerwe & Rada, 1988; Baines et al., 2017) and has been studied from many theoretical perspectives (Rabetino et al. 2018; Raddats et al. 2019). The existing servitization literature has identified many reasons for this business transition (Fang et al. 2008; Josephson et al., 2016). For instance, Gebauer and Fleisch (2007) identified three basic reasons why manufacturing companies attempt to servitize: 1) financial reasons (increased profits and more stable revenues), 2) strategic reasons (differentiation benefits), and 3) marketing reasons (image and reputation advantages). The extant servitization literature has quite thoroughly studied organizational-level antecedents and factors that facilitate servitization (Rabetino et al., 2018; Raddats et al., 2019), but lacks studies and conceptual frameworks on how those sellable, productized solutions (combinations of products, services, expertise, and software; see Vandermerwe & Rada, 1988; Nordin & Kowalkowski, 2010; Kohtamäki, et al., 2019) are initially developed in manufacturing and technology companies (Kowalkowski & Ulaga, 2017; Sjödin et al., 2020). Studies have called for research acknowledging the paradoxes and tensions that hamper solution development and servitization (Kohtamäki et al., 2020).

The aim of this conceptual paper is to gain deeper understanding of the process of agile solution development, that is, how new solutions emerge in practice. As most of the attempts (80%) to generate wealth from solution businesses fail (Reinartz & Ulaga, 2008; Ulaga & Reinartz, 2011), there is a constant need to improve the solution development process in order to reap significant economic and strategic benefits from services and solutions (Fang et al. 2008; Kohtamäki et al., 2013). This paper provides insight into different phases regarding solution development, and addresses the following question: *What are the preconditions needed to develop a novel integrated solution?* In this study, we present five key phases of agile solution development, namely, 1) new idea screening, 2) new idea nurturing, 3) conversion of ideas into "good enough" solutions, 4) solution productization, and 5) solution revamping. These phases, and related innovation practices, are discussed in more detail throughout the paper. For managers of servitized manufacturing companies, this conceptual study provides a new perspective on how to

Agile New Solution Development in Manufacturing Companies

Tuomas Huikkola, Marko Kohtamäki

manage the solution development process in an agile manner.

Theoretical Background

Business servitization

Servitization is not a completely new phenomenon in the business world. For instance, Michelin developed its Fleet Solution concept (Michelin sells driven miles instead of products) more than 100 years ago. Motor vehicles have to be maintained regularly to keep them running, and likewise elevators and escalators have to be serviced based on regulations. A well-known Finnish elevator and escalator manufacturer, KONE Oyj, has been making money from servicing elevators, escalators, and automatic doors since the 1920s (Simon, 2010; Michelsen, 2013). However, servitization has garnered more attention among business scholars and practitioners since the millennium began. The number of servitization-based studies skyrocketed, especially in the 2010s, when differentiation through pure products and technology became harder, and when rivalry, especially from East Asian economies, stiffened and made competition in product markets truly global (Baines et al. 2008; Luoto et al., 2017; Rabetino et al., 2018; Raddats et al., 2019).

Servitization (also known by other terms, such as service infusion, service business development, servicizing, tertiarization, service transition, and value migration in the literature; while in this study, we use the general term "servitization" henceforth to describe the business phenomenon where the relative amount of services increases in manufacturing sales) refers to a company's attempt to strategically renew itself by starting to sell an increased number of services and customer solutions to its clients (Tuli et al., 2007). Some researchers have described manufacturers as having gone downstream and becoming closer to the end customer (see Wise & Baumgartner, 1999), while others have claimed that this is reminiscent of synchronized development (Töytäri et al., 2018) that requires development activities in parallel between suppliers and customers (Huikkola et al., 2013). The existing literature has acknowledged how to structure services and solutions within a firm (Oliva & Kallenberg, 2003; Gebauer et al., 2010), how to sell more of them (Reinartz & Ulaga, 2008), what types of capabilities are needed to provide those solutions (Ulaga & Reinartz, 2011; Kindsröm et al., 2013; Huikkola et al., 2016; Visnjic et al., 2018) and what kind of organizational processes are needed to effectively bundle products and services into solutions (Storbacka et al., 2013; Huikkola & Kohtamäki, 2018). However, the extant literature is relatively silent on how these sellable services and solutions are initially developed within manufacturing companies, as stated in the previous literature (Kowalkowski & Ulaga, 2017).

New service development (NSD)

New service development (NSD) has gained attention especially among service marketing scholars. Researchers have identified key differences between new product and service development processes (Kowalkowski & Kindström, 2012; Kowalkowski & Ulaga, 2017). New product development (NPD) is typically back-heavy, meaning that it requires back-end capabilities in technology development and prototyping, whereas NSD is considered front-heavy, calling for customer-related capabilities during the market introduction and piloting phases (Kowalkowski & Ulaga, 2017). Some studies have described general frameworks for NSDs. For instance, Zeithaml and Bitner (2003) developed a model consisting of two major phases, namely, front-end planning, and implementation. In front-end planning, companies address questions regarding their overall mission and strategy when generating new ideas.

In concept development and feasibility analysis, companies should know the potential market demand and address the following question: is the new service feasible from a business perspective? During the implementation stage, companies have to consider all the factors affecting service delivery through prototypes and market testing. When introducing new services/solutions to markets, firms should understand the potential or problems that may occur in service delivery and customer adaptation. Design thinking literature (for example, Plattner et al., 2010) has expanded our understanding why NSDs typically fail, namely a lack of desirability, feasibility, and viability. In a traditional development model, feasibility is overemphasized, whereas two other dimensions (desirability and viability) are taken better into account in agile development models.

While solutions are described as bundles of products, services, and software (Vandermerwe & Rada, 1988; Nordin & Kowalkowski, 2010; Ulaga & Reinartz, 2011; Kohtamäki et al. 2019), their development requires logic and principles that support their intertwined development (Bäck & Kohtamäki, 2015). Particularly important is to notice the meaningful role of software, when operating at the age of digitalization (for example,

Agile New Solution Development in Manufacturing Companies

Tuomas Huikkola, Marko Kohtamäki

IoT, A.I. and connectivity). Existing NSD models typically consist of sensing, exploring, and ideation phases, a conceptualization phase, a test-building and development phase, and a deployment phase. New services are developed in collaboration with customers, thus following a feedback loop and joint sense-making of the novel, co-developed solutions (Huikkola et al., 2013). Hence, developing novel solutions requires balancing between traditional process-oriented models and modern agile methods (Sjödin et al., 2020a; Sjödin et al., 2020b).

Agile New Solution Development

Even though researchers are not unanimous about the term "agile" (Abrahamsson et al., 2002) and there exist different terms to describe the same phenomenon (for example, light methods), Abrahamsson et al. (2002) conclude based on previous literature that agile development is "when software development is incremental (small software releases, with rapid cycles), cooperative (customer and developers working constantly together with close communication), straightforward (the method itself is easy to learn and to modify, well documented), and adaptive (able to make last moment changes)." This is aligned with a later definition by Conboy (2009): "the continual readiness of an information systems development (ISD) method to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality, and simplicity), through its collective components and relationships with its environment". Agile methods featured in agile development, refer to specific methods used, such as extreme programming (XP), Scrum, Kanban, or lean software development, just to name a few (Takeuchi & Nonaka, 1986; Abrahamsson et al., 2002; Lei et al., 2017).

In this paper, we present five general phases regarding agile solution development: 1) new idea screening, 2) new idea nurturing, 3) conversion of ideas into good enough solutions, 4) solution productization, and 5) solution revamping. During each of these phases, there are questions that manufacturers need to address before rolling into the next stage. The framework is also iterative by nature. In the ideation phase, ideas are iterated within the company through cross-functional collaboration (sometimes involving interfirm collaboration as well). In the conceptual phase, the concept is iterated between pilot customers and the focal company. In the solution phase, the solution is iterated first internally, and then, when the solution has been delivered to clients, externally. In the following chapters, we explain the key features of each phase.

New idea screening

New ideas are fuel for any organization that attempts to thrive through innovations. For instance, Amazon has described itself as "the world's biggest laboratory", indicating that there must be enough ideas in the pipeline that eventually lead to sellable offerings. The rule of thumb is that 1-2% of the overall ideas will eventually be converted into sellable solutions. Hence, to obtain 10 solutions that will be sold in the future, there must initially be approximately one thousand ideas in the pipeline. Thus, most ideas will be rejected, and there must be rules, reasons, and guidelines about when to continue with an idea or abandon it.

To obtain enough ideas, manufacturers must encourage personnel to share their initial ideas. Moreover, manufacturers have increasingly moved towards open innovation practices (see Chesbrough, 2003, 2011), hence involving external parties such as customers, suppliers, and research institutions for contributions to the ideation phase. In new idea screening, it becomes important not only to generate those novel ideas inside and outside the organization, but also to provide information about the progress of the idea (and possibly to give a brief explanation of why the idea was rejected) to the initiator (when contact information is available).

There are several ways to enable people to share their ideas. Establishing traditional suggestion boxes is one way to generate various new development ideas. In global organizations, this method can be seen as relatively rigid and old-fashioned (but still often very useful and effective). Until recently, manufacturers have established several social media tools, both to generate new ideas and to review ideas online. Through web-based tools, it is now easier to obtain instant feedback on an idea and facilitate a faster process for reviewing the idea's validity and novelty, as people can vote and comment on ideas without extensive rounds of review.

Our proposal for the question of whether to proceed or reject an idea in the new idea screening phase is as follows:

> Q1. *Has the idea enough potential value that it is worth investigating further?*

Agile New Solution Development in Manufacturing Companies

Tuomas Huikkola, Marko Kohtamäki

At this point, ideas can overlap, that is, they may be duplicates, vague or even inferior. The key feature is that initiators can follow how their ideas proceed, learn about why they proceed, or why they have been abandoned. People's willingness to contribute to ideation is hindered more by lack of awareness than by information that the idea was abandoned for a reason than can somehow be justified. The justification for abandoning and idea becomes vital, as the majority (almost 98-99%) of ideas are typically rejected during the innovation process.

Idea nurturing

Idea nurturing refers to the optional phase that gives additional resources and capabilities for idea development within the focal company. In this phase, the key target is to validate the idea from two main perspectives: 1) is this idea good from the customer's perspective (is there real demand for the idea?), and 2) is it good from the focal company's perspective (is it economically viable and profitable?). One way to test the idea is to engage in sprints, that is, rapid experiments with the concept to reduce development cycles based on good enough information regarding the potential adaptation. In larger organizations, cross-functional development teams from different parts of the organization (for example, finance, HR, marketing, technology, sales) are typically established to obtain additional know-how for development, and to reduce the solution's potential bottlenecks. The idea is similar to the lean start-up method (see Ries, 2011) that enables organizations to try new ideas faster, making overall development cycles shorter through rapid experiments. Similarly, the initial target of the lean start-up method is to shed wasteful practices and improve chances of success, by collecting instant feedback and focusing on elements as lightly as possible that customers value most(Sarvas et al., 2017). To make progress during this stage, manufacturing companies need to answer the following question:

> Q2. *Has the idea been validated both internally and externally to build a minimum viable product (MVP)?*

The overall aim of this phase is to increase a company's agility through a faster learning curve that is enabled by allocating additional resources and capabilities for development. At this stage, greater involvement is needed from many parties, both within and outside the company. As with the other phases too, many organizations struggle to develop a "license to fail" culture, given that many engineering companies have not accepted this type of attitude in their approach. Nevertheless, "scaling fast or failing fast" is quite different than simply not making something properly in the first place. The key question is whether the development has been done properly enough.

Conversion of an idea into a "good enough" solution

This phase revolves around the initial conceptualization of an idea. In practice, companies develop a minimum viable product (MVP) at this point to test and pilot it with real customers. In digital solutions, building an MVP is much easier and less costly than building large-scale physical products. Some practitioners have referred to this phase as building a "good enough" solution, as a way of developing a minimum sellable product (MSP) (see Winton, 2017), or even minimum lovable product (Sarvas et al., 2017; Pulkkinen et al., 2019). The initial idea is to obtain specific feedback about the concept from real customers and users of the solution. In practice, companies can use simulations and prototypes to build a showcase.

One problem during this phase is that for testing, manufacturers often use old, established customers, and potentially leading customers in their fields. In general, this approach is very natural and fruitful (demanding customers tend to force suppliers to give their best effort). But if a firm is trying to bring a good enough solution or disruptive concept to markets, this approach is simply wrong, as stated by Clayton Christensen in his famous "Innovator's Dilemma" book. With these types of solutions, according to the theory of disruptive innovations, test customers should be noncustomers or low-end customers (Christensen et al., 2015) in the field. At this stage, manufacturing companies should address the following question related to their business viability:

> Q3. *Has the MVP been validated internally and externally to continue larger-scale development?*

The aim of developing a good enough solution is to obtain instant feedback from potential customers, by piloting and testing the solution in real-life situations. These pilots, through the testing of prototypes, provide insight for manufacturing companies regarding whether or not they should take the concept into the productization phase. However, special attention should be devoted to the selection of customers at this stage, as they should be the same as the customers to whom the solution is directed.

Agile New Solution Development in Manufacturing Companies

Tuomas Huikkola, Marko Kohtamäki

Solution productization

As previously mentioned, only a minority of all ideas will lead to sellable, productized solutions. When solutions are productized, they need to be priced and trained within an organization. In this phase, the company plans how it will start to bundle, sell, and deliver the solution in practice. There must already be a clear customer segment chosen for this solution. Often, a separate team responsible for productization issues is in charge of this initiative. The following question is presented after deciding that the solution will be produced:

> Q4. *Has the solution been priced and trained to be sold and delivered effectively to clients?*

When a company has addressed this question, a new solution is ready to be distributed to markets. Even though only a small portion of ideas will reach this phase, not all sellable solutions become success stories, despite promising indicators for success. However, this is just beginning of the journey. Solutions need continuous development and revamping as customer preferences change. The competitive landscape may also change, and solutions may contain some issues that need further development (teething problems). After the solution has been productized and sold, focal companies then start to consider processes to redevelop the solution based on accumulated expertise.

Solution revamping

Once the solution has been productized and sold to clients, there will most likely be issues requiring further development based on customer feedback and usage experiences. Solutions are thus continuously revamped based on customer feedback and problems arising in use. This learning loop benefits both the manufacturer and its clients. In manufacturers' strategic accounts, there may be several practices that companies use to increase their mutual learning. For instance, Huikkola et al. (2013) found that manufacturers make relationship-

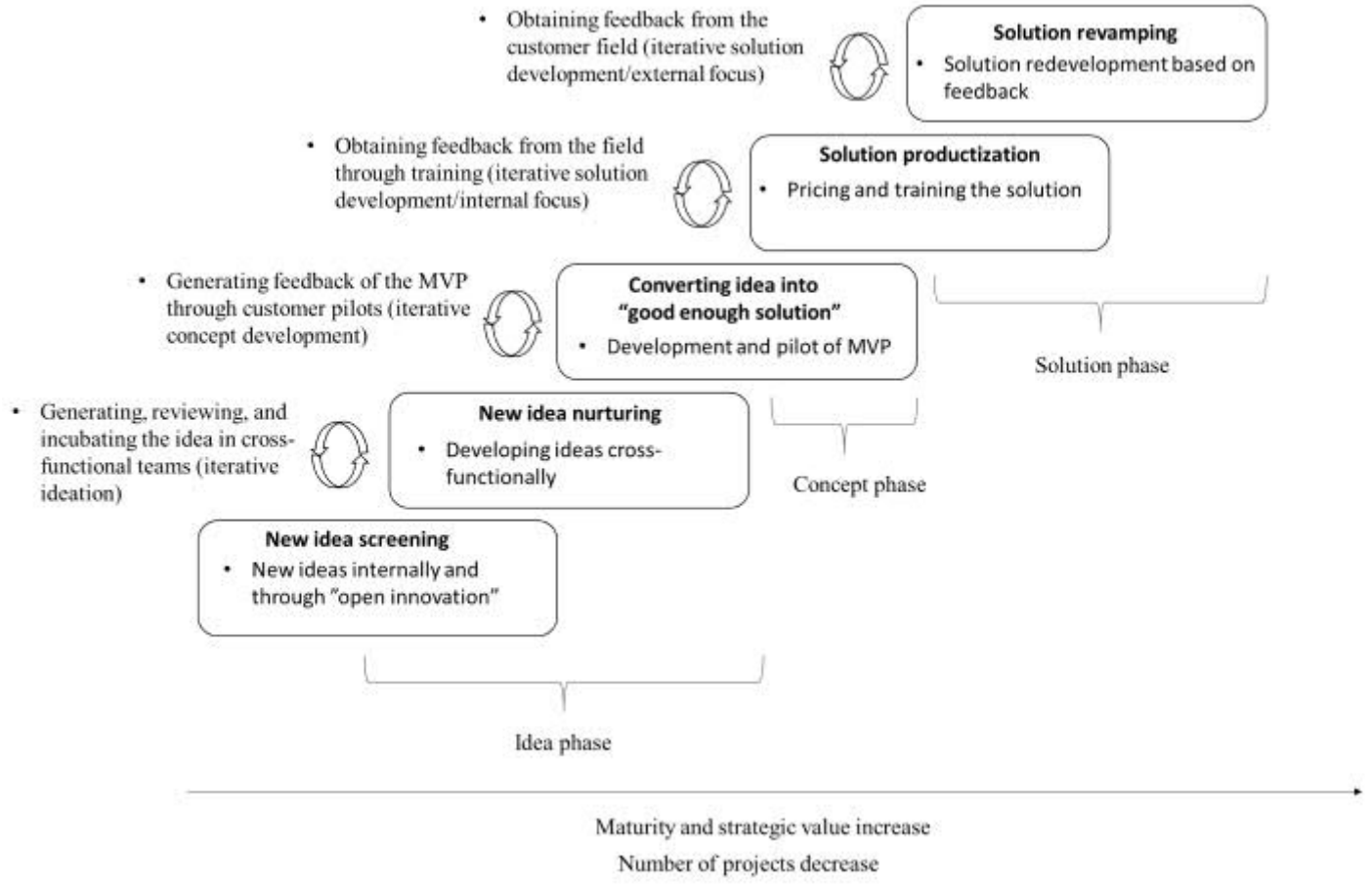

Figure 1. Key phases of agile new solution development for manufacturing companies.

Agile New Solution Development in Manufacturing Companies

Tuomas Huikkola, Marko Kohtamäki

specific investments in sites, tools, and people to enable mutual learning between parties. Moreover, they establish relational structures such as joint ICT systems, steering groups, and development teams to facilitate joint learning among separate companies. The following question is presented when the solution has already been sold to markets:

> Q5. *How does the solution need to be revamped after it has been sold and delivered?*

Solutions are under continuous development, and there may be a need to revamp the solution's technical features, quality, business model, or other issues. As today's business is considered a never-ending game (see Ritakallio & Vuori, 2018), companies need to be able to adjust their operations to changing environments, which may be caused by changes in customer preferences, competitive situations, or the general business environment. Through the increased digital elements of today's solutions, it is now possible to generate faster feedback loops and follow how customers actually use solutions in real life. Given that such information has historically been lacking, the recent notion that "data is the new oil" (see Marr, 2018), indicates the importance of collecting data for deeper understanding of customers.

Figure 1 above summarizes the key phases of agile new solution development for manufacturing companies. As manufacturers move ahead with this partial stage model, the number of projects naturally decreases while both the project's strategic value and its maturity increase. Notably, using this agile model, ideas lead to concepts, concepts eventually lead to solutions, and there are different rounds between the phases.

Practical Implications

Managers across industries can benchmark this conceptual model when developing new customer solutions. This practical framework facilitates solution development through a "one-size-fits-all" approach. Hence, instead of using established NPD models to develop services and solutions, we suggest that one general framework could be beneficial to boost several types of innovations (for example, product, service, digital service, business model, and process innovation). Of course, NPD can still utilize established models. Nevertheless, people developing new services and business models need not be forced to utilize development models that target traditional product development work, as is the case in many manufacturing companies today (Kowalkowski & Ulaga, 2017).

To thrive in a culture of innovation, managers in manufacturing companies should ensure that people make notable contributions by offering ideas, instead of discouraging them from doing so. Digital tools and social media types of digital solutions can be helpful when collecting and reviewing ideas easily and cost-effectively. In smaller companies, physical suggestion boxes may still have their place for generating and sharing ideas. This model helps managers to divide solution development into phases, and present key questions and rules regarding whether to proceed with an idea or reject it.

When developing MVPs, managers need to ponder the lightest MVP version. Is it reminiscent of only an idea that can be somehow presented to the customer (photo or image of an idea)? Should it be a minimum sellable product (rough draft that helps to sell the idea), or a minimum lovable product (bare bones that make customers to fall in love with a solution; see Sarvas et al., 2017)? All in all, the idea is to develop the lightest possible version of the solution that could be introduced to clients or customers. For manufacturers and engineers, this phase may cause embarrassment through experiencing failures, yet at the same time is mandatory for reducing waste and helping them to focus on the most relevant issues during the innovation process.

Conclusion

The development of novel solutions has, perhaps surprisingly, received relatively little attention in the existing servitization literature. The agile solution development model presented in this paper is an attempt to pursue a better conceptual understanding of the challenges related to new solution development. Even though conceptual models have their challenges, this framework presents general phases and guidelines on how manufacturing companies can potentially progress from idea screening to solution revamping.

Future studies should study this phenomenon empirically and identify practices that manufacturing companies have found helpful when developing novel solutions. Moreover, research can investigate potential challenges and rigidities related to solution development. Further studies may also examine the

Agile New Solution Development in Manufacturing Companies

Tuomas Huikkola, Marko Kohtamäki

different types of solution development processes and their characteristics. Future research could, for example, investigate how solutions that contain many digital elements differ from solutions that are based more on physical/hardware elements.

References

Baines, T.S., Lightfoot, H.W., Benedettini, O. & Kay, J.M. 2008. The servitization of manufacturing: A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management*, 20(5): 547-567.

Baines, T.S., Bigdeli, A.Z., Bustinza, O.F., Shi, V.G., Baldwin, J. & Ridgway, K. 2017. Servitization: revisiting the state-of-the-art and research priorities. *International Journal of Operations & Production Management*, 37(2): 256-278.

Bäck, I., & Kohtamäki, M. 2015. Boundaries of R&D collaboration. *Technovation*, 45–46 (November-December): 15–28.

Chesbrough, H. 2003. The Era of Open Innovation. *MIT Sloan Management Review*, 44(3): 35-41.

Chesbrough, H. 2011. Bringing Open Innovation to Services. *MIT Sloan Management Review*, 52(2): 85-90.

Christenssen, C. 1997. *Innovator's Dilemma - When New Technologies Cause Great Firms to Fail.* Harvard Business Review Press.

Christensen, C., Raynor, M.E. & McDonald, R. 2015. What Is Disruptive Innovation? *Harvard Business Review*, 93(12): 44-53.

Conboy, K. 2009. Agility from first principles: Reconstructing the concept of agility in information systems development. *Information Systems Research*, 20(3): 329–354.

Fang, E., Palmatier, R.W., & Steenkamp, J-E. 2008. Effect of Service Transition Strategies on Firm Value. *Journal of Marketing*, 72(5): 1–14.

Gebauer, H., & Fleisch, E. 2007. An investigation of the relationship between behavioral processes, motivation, investments in the service business and service revenue. *Industrial Marketing Management*, 36(3), 337-348.

Gebauer, H., Edvardsson, B., Gustafsson, A. & Witell, L. 2010. Match or Mismatch: Strategy-Structure Configurations in the Service Business of Manufacturing Companies. *Journal of Service Research*, 13(2): 198-215.

Huikkola, T., Ylimäki, J. & Kohtamäki, M. 2013. Joint learning in R&D collaborations and the facilitating relational practices. *Industrial Marketing Management*, 42(7): 1167-1180.

Huikkola, T., Kohtamäki, M. & Rabetino, R., 2016. Resource Realignment in Servitization. *Research-Technology Management*, 59(4): 30-39.

Huikkola, T., & Kohtamäki, M. 2018. Solution providers' strategic capabilities. *Journal of Business and Industrial Marketing*, 32(5), 752-770.

Josephson, B.W., Johnson, J.L., Mariadoss, B.J. & Cullen, J. 2016. Service Transition Strategies in Manufacturing: Implications for Firm Risk. *Journal of Service Research*, 19(2): 142-1

Kindström, D., Kowalkowski, C., & Sandberg, E. 2013. Enabling service innovation: A dynamic capabilities approach. *Journal of Business Research*, 66(8): 1063–1073.

Kohtamäki, M., Partanen, J., & Möller, K. 2013. Making a profit with R&D services – The critical role of relational capital. *Industrial Marketing Management*, 42(1): 71-81.

Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H., & Baines, T. S. 2019. Digital servitization business models in ecosystems: A theory of the firm. *Journal of Business Research*, 104(November): 380–392.

Kohtamäki, M., Einola, S., & Rabetino, R. 2020. Exploring servitization through the paradox lens: Coping practices in servitization. *International Journal of Production Economics*, In Press.

Kowalkowski, C., & Kindström, D. 2012. *Tjänster och helhetslösningar: nya affärsmodeller för konkurrenskarft*. Malmö, Sweden.

Kowalkowski, C., & Ulaga, W. 2017. *Service Strategy in Action: A Practical Guide for Growing Your B2B Service and Solution Business*. Publisher: Service Strategy Press.

Lei, H., Ganjeizadeh, F., Jayachandran, P. K., & Ozcan, P. 2017. A statistical analysis of the effects of Scrum and Kanban on software development projects. *Robotics and Computer-Integrated Manufacturing*, 43: 59–67.

Luoto, S., Brax, S., Kohtamäki, M. 2017. Critical meta-analysis of servitization research: Constructing a model-narrative to reveal paradigmatic assumptions. *Industrial Marketing Management*, 60: 89–100.

Marr, B. 2018. Here's Why Data Is Not The New Oil. *Forbes*: https://www.forbes.com/sites/bernardmarr/2018/03/05/heres-why-data-is-not-the-new-oil/

Michelsen, K-E. 2013. *Kone - Perhe, yrittäjyys ja yritys teollisuuden vuosisadalla*. Helsinki: Otava.

Neu, W., & Brown, S. 2005. Forming Successful Business-to-Business Services in Goods-Dominant Firms. *Journal of Service Research*, 8(3): 3-17.

Nordin, F., & Kowalkowski, C. 2010. Solutions offerings: a critical review and reconceptualization. *Journal of Service Management*, 21(4): 441-459.

Oliva, R., & Kallenberg, R. 2003. Managing the transition from products to services. *International Journal of Service Industry Management*, 14(2): 160–172.

Agile New Solution Development in Manufacturing Companies

Tuomas Huikkola, Marko Kohtamäki

Pulkkinen, J., Jussila, J., Partanen, A., & Trotskii, I. 2019. *Data strategy framework in servitization: Case study of service development for a vehicle fleet.* Springer Proceedings in Complexity.

Rabetino, R., Harmsen, W., Kohtamäki, M., & Sihvonen, J. 2018. Structuring servitization related research. *International Journal of Operations and Production Management*, 38(2): 350–371.

Raddats, C., Kowalkowski, C., Benedettini, O., Burton, J. & Gebauer, H. 2019. Servitization: A Contemporary Thematic Review of Four Major Research Streams. *Industrial Marketing Management*, https://doi.org/10.1016/j.indmarman.2019.03.015

Reinartz, W., & Ulaga, W. 2008. How to Sell Services More Profitably. *Harvard Business Review*, 86(5): 90–98.

Ries, E. 2011. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. *Currency.*

Ritakallio, T., & Vuori, T. 2018. *Elävä Strategia*. Alma Talent.

Sarvas, R., Nevanlinna, H., & Pesonen, J. 2017. Lean service creation. *The Handbook V1.8.* Futurice.

Simon, J. 2010. The Prince of Kone. *The Life of Pekka Herlin.* Helsinki: Otava.

Sjödin, D., Parida, V., Jovanovic, M., & Visnjic, I. 2020a. Value creation and value capture alignment in business model innovation: A process view on outcome-based business models. *Journal of Product Innovation Management*, In Press.

Sjödin, D., Parida, V., Kohtamäki, M., & Wincent, J. 2020b. An agile co-creation process for digital servitization: A micro-service innovation approach. *Journal of Business Research*, In Press.

Storbacka, K., Windahl, C., Nenonen, S. & Salonen, A. 2013. Solution business models: Transformation along four continua. *Industrial Marketing Management*, 42(5): 705-716.

Takeuchi, H., & Nonaka, I. 1986. The New Product Development Game. *Harvard Business Review*, 64(1): 137–146.

Tuli, K., Kohli, A., & Bharadwaj, S.G. 2007. Rethinking Customer Solutions: From Product Bundles to Relational Processes. *Journal of Marketing*, 71(3): 1–17.

Töytäri, P., T. Turunen, M. Klein, V. Eloranta, S. Biehl and R. Rajala. 2018. Aligning the Mindset and Capabilities within a Business Network for Successful Adoption of Smart Services. *Journal of Product Innovation Management*, 35(5): 763-779.

Ulaga, W. & Reinartz, W.J. 2011. Hybrid offerings%: How manufacturing firms combine goods and services successfully. *Journal of Marketing*, 75 (November): 5–23.

Vandermerwe, S., & Rada, J. 1988. Servitization of business: adding value by adding services. *European Management Journal*, 6(4): 314–324.

Visnjic, I., Neely, A. & Jovanovic, M. 2018. The path to outcome delivery: Interplay of service market strategy and open business models. *Technovation*, 72-73, (April-May): 46-59.

Winton, A. 2017. *When & Why it Makes Sense to Deliver a Minimum Sellable Product, Not a Minimum Viable Product.* Available: https://openviewpartners.com/blog/minimum-sellable-product-versus-minimum-viable-product/#.XihbDXtS_b0

Wise, R., & Baumgartner, P. 1999. Go Downstream: The New Profit Imperative in Manufacturing. *Harvard Business Review*, 77(5): 133-141.

Zeithaml, V.A., & Bitner, M.J. 2003. *Services Marketing: Integrating Customer Focus across the Firm.* 3rd Edition, Irwin McGraw-Hill, New York.

About the Author

Dr. Tuomas Huikkola is an Assistant Professor in the School of Management at the University of Vaasa. Huikkola's research interests are related to (digital) servitization, strategic change, and firm's strategic renewal in manufacturing companies. Huikkola has published in international journals such as Industrial Marketing Management, Journal of Business and Industrial Marketing, and Research-Technology Management.

Dr. Marko Kohtamäki is a Professor of Strategy at the University of Vaasa, and a Visiting Professor at the USN Business School, and Luleå University of Technology. Kohtamäki takes special interest in strategic practices, digital servitization, R&D and innovation, business models, and strategic alliances in technology companies. Kohtamäki has published in distinguished international journals such as Strategic Management Journal, International Journal of Operations and Production Management, Industrial Marketing Management, Long Range Planning, Strategic Entrepreneurship Journal, International Journal of Production Economics, Technovation, Journal of Business Research, amongst others.

Citation: Huikkola, T., Kohtamäki, M. 2020. Agile New Solution Development in Manufacturing Companies. Technology Innovation Management Review, 10(3): 16-23. http://doi.org/10.22215/timreview/1333

Keywords: Agile development, innovation practices, solution development, new service development (NSD), solution business, servitization and digital servitization, open innovation