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Title: Interplay of strategic orientations in the development of smart solutions

Year: 2019

Version: Publisher's PDF

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Please cite the original version:

Huikkola, T., & Kohtamäki, M., (2019). Interplay of strategic orientations in the development of smart solutions. *Procedia CIRP* 83, 89–94. <https://doi.org/10.1016/j.procir.2019.02.145>

11th CIRP Conference on Industrial Product-Service Systems

Interplay of strategic orientations in the development of smart solutions

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Abstract

This study investigates the different strategic orientations available for technology companies that provide smart solutions to their clients. We conceptualize eight archetypes of approaches employed by technology companies to develop smart solutions based on three strategic orientations: 1) entrepreneurial, 2) technology, and 3) market (customer). In our analysis, we examine the interplay of these orientations in leading technology companies that are developing smart solutions. Our findings reveal that smart solutions can potentially facilitate technology firms to synchronize their strategic orientations through improved organizational learning capability. Furthermore, suggestions for managers and the study's limitations are discussed.

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Peer-review under responsibility of the scientific committee of the 11th CIRP Conference on Industrial Product-Service Systems

Keywords: Smart solutions; digital servitization; strategic orientation; digitization; Internet of Things

1. Introduction

Smart products and solutions have recently gained attention among business researchers and practitioners as manufacturing companies have altered their business models to align with the new digital requirements [1]. It has been acknowledged that technology companies attempt to gain various financial, strategic, and marketing benefits through smart solutions [2]. Technology companies change their business models from transactional to relational, attempting to capture customer value through the utilization of digital systems such as sensors, antennas, and intelligence embedded in their products [3, 4]. Products and solutions have thus become “smart”, meaning that they are connected to the cloud and send and receive product-related data for the benefit of manufacturers, customers, and other stakeholders.

This organizational change has many effects on firms [5, 6]. In addition to changes in corporate strategies and earning logics, firms' organizational capabilities, structures, business relationships, and processes must be revised [5, 7]. Moreover, the development of smart solutions may have broader influences on a firm's behavior, namely, its strategic

orientations. These strategic orientations are manifestations of how market, customer, and technology oriented a firm is and how entrepreneurial it is. Strategic orientations also have effects on a technology company's approach to developing smart solutions.

The paper is structured as follows: first the theoretical lenses regarding strategic orientations and the literature on smart solutions are presented; second, the methodology section briefly describes the sample and research design; third, the findings of the study are presented; and finally, the theoretical and practical conclusions, the study's limitations and potential avenues for future research are discussed.

2. Theoretical background

In this section, different strategic orientations such as the entrepreneurial orientation (EO), market orientation (MO), and technology orientation (TO) are presented. Furthermore, a definition of smart products and smart solutions is presented.

2.1 Strategic orientations

Strategic orientations refer to managerial perceptions and beliefs regarding how a firm strategically competes within the product-service market in various dimensions such as risk-taking, proactive and forward-looking behaviors, analysis, aggressiveness, and defensiveness [8, 9]. More specifically, research from different disciplines has divided strategic orientations into MO (how customer and marketing oriented a firm is), EO (the firm's degree of risk-taking actions and how proactive and innovative the firm is perceived to be in the market), learning orientation (how organizations learn and change), and TO (the firm's approach to technology development) [8]. Strategic orientations are thus reflections of how a firm differs in the market in terms of tendency to serve its clients, act entrepreneurially, develop technology, and learn/change. Strategic orientations align with the organization's principles to direct the firm towards certain activities and behavior.

Previous studies have found that organizations focusing on a single orientation show weaker performance [10] than those that are able to exploit multiple orientations simultaneously [11, 12]. The extant strategic orientation literature has suggested that firms' orientations may evolve over time, leading to the utilization of multiple orientations within firms [13]. Thus, this evolution closely accords with the concept of dynamic capabilities, which means that an organization is able to renew itself by adapting to changes in the environment or creating change proactively [14, 15, 16, 17]. Previous literature has found mixed results regarding the integration of orientations. Having a high EO may not be beneficial in all market conditions [18], and some studies have found that the relationship between EO and sales and profit growth, return on assets, and acquisitive learning follows an inverted U-shape [19, 20], indicating that a moderate level of EO results in better performance with high levels of MO [21]. Even though the literature on strategic orientations is extensive, only a few studies have focused on the interplay of these orientations. This study focuses on the interplay of different strategic orientations in the context of the development of smart solutions.

2.2. Entrepreneurial orientation

A firm's EO accords with its willingness to take risks and be adaptive, innovative and proactive in the market [18, 22]. The key idea behind EO is that the firm is better able to adjust its operations to dynamic environments [18]. Entrepreneurial organizations have a tendency to explore novel and creative ideas and products and seize emerging opportunities to lead change in the market (e.g., Rolls-Royce's power-by-the-hour concept) and thus proactively shape the competitive environment in its favor. As a process, EO refers to how an organization adapts to a dynamic environment, presents new products/service products/solutions, creates new markets, and allows personnel to take risks. The opposite of an entrepreneurial organization would be an organization that is risk averse and non-innovative and that responds reactively; these characteristics relate to established, non-agile corporations that attempt to maintain the status quo.

2.3. Technology orientation

TO refers to a firm's inherent capability to create, launch or utilize new technologies, products or innovations [23]. A vendor's ability to launch new solutions without merely asking customers' opinions is a radical manifestation of the TO, reflecting a culture that enables firms to achieve performance by generating cost or differentiation benefits through the exploitation of technology. For instance, Apple has become famous for not asking customers what they want. Google has adopted similar thinking and has referred to Henry Ford's famous quote about people typically wanting faster horses instead of novel products/solutions such as automobiles [24]. According to this view, customers are not always able to imagine the best solution for them, and some customers just tend to buy similar solutions with extra features or a lower price. On the other hand, TO refers to a firm's activeness, ambitiousness, and intention to develop technologies to respond to continually changing customer needs.

2.4. Market orientation

MO is defined as the culture relating to how a firm serves its customers, how the firm exploits its activities to adapt to customer requirements or how it views its competitive environment, and how this MO affects the firm's performance [24]. Moreover, MO includes a component of the marketing concept referring to how the marketing culture or philosophy is manifested within the company [24]. In practice, this can be measured by how customer satisfaction or retention rate drive the firm's objectives and metrics, how disciplined the firm is in fulfilling customer needs, how customer information is shared within the organization, how committed customers are, how the firm is positioned in the markets relative to its rivals in serving customer needs, and how customer data are collected and utilized within the organization [26, 27]. MO and TO may be perceived as opposite viewpoints. However, it has been stated that some firms are able to achieve high levels in both orientations [12].

2.5. Smart solutions

Former AT&T executive Glenn Lurie said that any device that is connected is smart [28]. Smart products refer to cyber-physical systems (CPS) that are capable of communicating and interacting with other CPS by using the Internet [29]. However, not all smart products or technologies are treated equally, as they involve different levels of smartness. Boston Dynamics' Atlas robot can be defined as smart *per se*, and, for instance, elevators connected to the cloud are smart, as they can send valuable information to service companies that predicts when they will malfunction, their condition can be monitored in real-time, and customers can know in real-time how (often) the equipment has been used. When data received from elevators can lead to cost savings or more income for clients, this starts to generate customer value. In practice, the client (e.g., mall operator) takes for granted that the elevator works and is serviced regularly; therefore, differentiating among single

products or services becomes more difficult. Exceptional value can be created when the elevator company can optimize movement of the masses by providing route information to the client (the client can use that information in, e.g., pricing decisions), as the company can save the client lifecycle costs (e.g., savings on the building’s energy consumption) and bring synergy benefits or decreased transaction costs (the client starts to buy services from the company that integrate different real-estate operations such as elevators, air conditioners, and maintenance work under one roof).

Smart solutions are particularly useful in performance-based business models in which a vendor is responsible for the produced outcome. In transactional business models, there may even be disincentives for the development of smart solutions, as they may decrease sales of certain services or increase product costs and lead to lower profit margins. In relational and ongoing business -models, the potential benefits of smart solutions are greater, as they enable better control for the vendor responsible for process development. Figure 1 illustrates the phenomenon studied in this paper, i.e., how different strategic orientations and their interplay affect a manufacturer’s development of smart solutions.

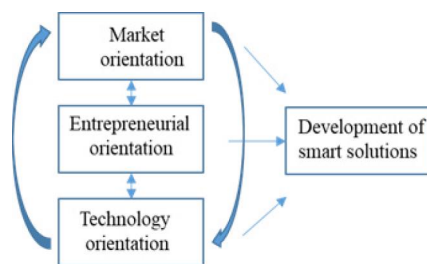


Fig. 1. Phenomenon examined in the study.

3. Methodology

We employed a qualitative comparative case method to study the interplay of strategic orientations in leading technology companies in the context of the development of smart solutions. We interviewed 25 executives from five leading technology firms considered forerunners in developing and selling smart solutions in their respective industries. The interviews focused on the focal firm’s development of its solution business in general and smart solutions. A typical interview lasted approximately 60 minutes. The interviewees’ positions ranged from CEO to Vice President of Services. All of the interviews were recorded and transcribed. See the summary of the sample below (Table 1).

The technology companies operated in different industrial sectors, ranging from heavy industry to machine industry. All of these multinational companies provided industrial goods and services to their clients, and their revenues ranged from 600 million euros to almost 9 billion euros (median value €3 billion, mean value €3.72 billion). Services accounted for 18-45% of their total turnover. This share is consistent with the share that has been reported to increase a firm’s market value [30]. The studied companies were purposefully selected [31]. All of the

companies are considered forerunners in smart solutions. They are public-listed companies, which enabled the researchers to obtain extensive secondary data (e.g., annual reports, histories, press releases) on the companies. Furthermore, the companies were involved in research projects related to smart solutions development.

We first executed a within-case analysis of each company based on the EO, MO, and TO of the companies. Next, we conducted a cross-case analysis of the themes found in the data, as suggested in previous comparative case studies [32, 33, 34]. We used a separate software program (QSR NVivo 12) to analyze the content of the data and compare it to the theoretical concepts related to the strategic orientations.

Table 1. Sample description.

| | Firm A | Firm B | Firm C |
|-----------------------------------|-------------------|-------------------|-------------------|
| Turnover | € 1 billion | €600 million | €9 billion |
| Industry | Mining | Forestry | Construction |
| Services share of firms’ revenues | >40% | <20% | <50% |
| Interviews | 5 senior managers | 5 senior managers | 4 senior managers |
| Pages of transcripts | 75 pages | 114 pages | 71 pages |
| | Firm D | Firm E | |
| Turnover | €5 billion | €3 billion | |
| Industry | Energy | Heavy industry | |
| Services share of firms’ revenues | <50% | <40% | |
| Interviews | 5 senior managers | 6 senior managers | |
| Pages of transcripts | 68 pages | 131 pages | |

4. Results

In this section, the key findings of the study are presented. First, the study conceptualizes different approaches to developing smart solutions. Second, the study discusses the interplay between the strategic orientations in the context of smart solutions.

4.1. Conceptualizing approaches to developing smart solutions

The study findings indicate that technology companies differ in their strategic orientations regarding the development of smart solutions. While some firms are very customer oriented, some are very technology oriented or entrepreneurial. Although no ideal forms exist in real life, Figure 2 presents pure ideal forms, consisting of eight typologies of strategic orientations for smart solutions. These archetypes are categorized as 1) technology explorer, 2) conventional

technologist, 3) market explorer, 4) bureaucrat, 5) servant, 6) entrepreneurial servant, 7) technology servant, and 8) Product-Service System (PSS) champion based on their TO, MO, and EO (high/low). These archetypes are illustrated in a three-dimensional exhibit (see Figure 2) and explained briefly.

The studied companies are positioned in Figure 2 based on the managers’ responses and the interpretation of those responses. The firms have taken different approaches to developing smart solutions. We can conclude from the picture that most of the studied firms are highly technology and customer oriented. However, most of the firms cannot be described as entrepreneurially oriented, as they are not perceived as taking many risks or as being proactive and innovative in terms of smart solution development.

developing smart solutions. It relies on collaborating with other firms in the market to avoid risks and adopt new technology. An *entrepreneurial servant* has high EO and customer orientation but low TO. It serves its customers well, listens to them, and behaves entrepreneurially when developing smart solutions. A *technology servant* is both technology and customer oriented but lacks EO. It has solved the dilemma of choosing whether to hold deep technology or customer understanding and is able to do both simultaneously. This does not happen often in the market. On the other hand, this type of firm is risk averse and unable to shape the market proactively. A *PSS champion* has a high EO, TO, and customer orientation when developing smart solutions. This combination is rare but has many advantages for technology companies pursuing high orientations in each behavioral category.

A typology of strategic orientations in smart solutions development

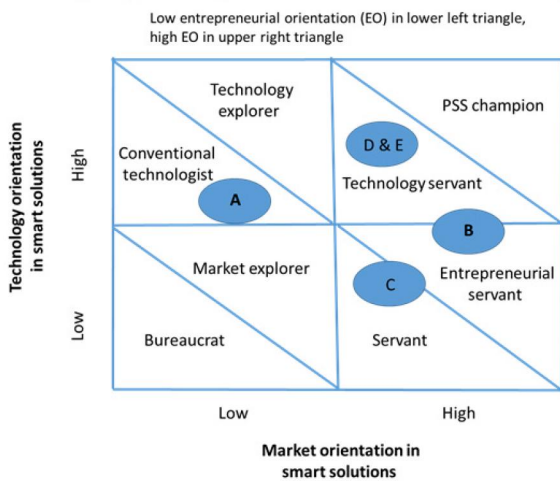


Fig. 2. Strategic orientations in smart solutions development.

A *technology explorer* has high TO and EO but low customer orientation, and its focus on development of smart solutions is inside-out rather than outside-in. It takes risks and is proactive and highly innovative but lacks deep customer understanding and focus. The *conventional technologist* category refers to technology companies that have a high TO towards the development of smart solutions but low EO and customer orientation when developing these solutions. Firms in this category develop smart solutions inside-out but are risk averse and place limited emphasis on customer work. The firm in this category is an engineer-based company and holds the mindset of a traditional technologist. *Market explorer* firms have a low customer orientation and low TO but high EO when developing smart solutions. This type of firm attempts to create new markets through risky market initiatives without merely asking customers. It has a strong perception of how the market is evolving but lacks the technological perspective to shape the market. Instead, it focuses on collaboration with suppliers that have a strong TO. Firms in the *bureaucrat* category have low EO, customer orientation, and TO towards smart solutions. Firms in this category are risk averse and react to changes in the markets without offering a strong contribution to technological or customer development. A *servant* firm is highly customer oriented but has low TO and EO when

4.2. Interplay between the strategic orientations in smart solutions

Strategic orientations affect how technology companies initially develop smart solutions. On the other hand, smart solutions may impact these fundamental strategic orientations and how they are manifested within the organizations. For instance, data collected through smart equipment may help a technology-oriented manufacturer better understand how its customers use products, thus enabling it to alter its operations to become more customer-centric. A market-oriented technology company may become even more customer-centric through the utilization of collected data.

The business opportunities generated by smart solutions should be evaluated not only by utilizing single strategic orientations but instead by considering the dynamics among the orientations. Table 2 presents some illustrative quotes regarding the interplay between the orientations and how they are manifested within the studied case companies.

Table 2. Illustrative quotes of the dynamics of the strategic orientations.

| Illustrative quotes regarding the interplay between the orientations |
|--|
| “It’s a continuous battle between technology push and market pull” (Manager, Firm D) |
| “You need to look at what the customer really needs, and you need to have an organization that is flexible and entrepreneurial enough to be able to put that package and the solution together.” (Director, Firm D) |
| “We aimed to get the message through the organization and get everybody to become customer-focused, creative, innovative rather than only technically focused.” (VP service unit, Firm D) |
| “Top managers’ job is to think about how to make a product desirable, how it solves customers’ problems and how it will be presented to the customer in a way that is interesting and easy to understand.” (CEO, Firm E) |
| “We are technology experts [in traditional equipment]. But we need to integrate that into our service business and understand customer value and be humble in the customer work.” (Manager, Firm C) |

“We used to say that we sold the project, and that's it. We delivered the project and forgot the customer.” (Vice President of Sales, Firm A)

“...technology itself cannot be your competitive advantage. Competitive advantage emerges from your ability to transform technology into services.” (Manager, Firm E)

“Our product innovations and maintenance procedures emerge from our thorough understanding of the customer... We solve customers’ problems.” (Executive group member, Firm B)

The decision to develop smart solutions may stem from strategic, financial, or marketing reasons [2]. We suggest that executives should consider how the development of smart solutions affects the firm’s overall strategic logic. Moreover, executives should place emphasis on 1) how smart solutions affect their general strategic orientations and 2) how general strategic orientations affect the development of smart solutions.

A high EO facilitates the firm to take more risks in its technology development initiatives, whereas a high TO is in alignment with some forms of EO, such as innovativeness and proactiveness (particularly in technology development). When both EO and TO are high, the strategy for the development of smart solutions is a proactive technology push, indicating the firm’s ability and willingness to shape the market through black-box technology development.

A high EO can facilitate proactive customer-based market creation and development. A high MO can encourage a technology company to make more risky decisions or even mitigate some of the risks through better customer understanding. When both EO and MOs are high, a proactive market push strategy is employed for the development of smart solutions. Thus, the technology company attempts to shape the market through better customer understanding and entrepreneurial behavior.

A high TO can be somewhat discordant with a high MO. These two orientations are sometimes perceived as opposite views that require trade-offs. Based on the results, we found that smart solutions can moderate this tension, as technological development and collected data can improve a technology-oriented technology firm’s customer understanding. The combination of high TO and MO requires a synchronized strategy for technology push and market pull. The utilization of customer pilots and rapid experiments can be manifestations of this initiative.

These insights into strategic orientations explain the effects of the development of smart solutions on technology companies. Smart solutions have impacts on a technology company’s overall strategic orientations and how these orientations interact with one another. Tables 2 and 3 illustrate the dynamic interplay between EO, TO, and MO.

Table 3. Interplay between the entrepreneurial, technology, and market orientations in the development of smart solutions.

| | Entrepreneurial orientation (EO) | Technology orientation (TO) |
|----------------------------------|--|---|
| Entrepreneurial orientation (EO) | - | - |
| Technology orientation (TO) | A high EO enables a technology firm to take more risks related to the technological development required for smart solutions. High TO is aligned with some entrepreneurial initiatives such as innovativeness. When both EO and TO are high, a proactive technology push strategy for the development of smart solutions should be observed. | - |
| Market orientation (MO) | High EO can facilitate proactive customer-based market creation and development. High MO can encourage a technology company to make risky decisions or mitigate those risks. When both EO and MO are high, a proactive market push strategy is employed for the development of smart solutions. | High TO can be somewhat discordant with high MO. When both TO and MO are high, a synchronized market push and pull strategy for the development of smart solutions is used. |

5. Conclusions and implications

To address the question of how the development of smart solutions affects a firm’s strategic orientations, this study collected data from five manufacturing companies considered frontrunners in their respective industries. The contributions of this study are twofold: The study 1) conceptualizes different archetypes of technology companies based on their strategic orientations and 2) underlines the interplay of different strategic orientations regarding firms’ approach to developing smart solutions. Even though we acknowledge that pure forms rarely exist in the real world, we believe that conceptualizing different archetypes increases our understanding of how firms differ in their approaches to developing smart solutions and how technology companies strategically compete in the market with respect to their behavior. This information is beneficial for both practitioners and researchers focused on understanding the anatomy of smart solutions. We identified eight types of manufacturing companies with regard to their strategic orientations towards smart solutions.

Second, we highlight the importance of the interplay among the orientations. Even though it has been said that firms typically need to make a trade-off between MO and TO, we find that technology companies can be successful in executing both orientations, although this is difficult according to the interviewees’ responses. First, smart solutions may enable this ambidexterity through increased utilization of high-quality data. Second, large corporations in particular may possess superior skills in different parts of the organization. In practice, a technology company may excel at back-office technology development and front-line customer understanding. In this case, the interaction between the functions becomes important yet challenging. Cross-functional development teams, physical proximity, informal collaboration, active knowledge-sharing, and management job rotation may be examples of practices that can increase internal collaboration, knowledge-sharing, sense-making, and mutual learning between units [35]. This study helps managers recognize their approaches and behaviors regarding the development of smart solutions. Practitioners can identify the firm’s position in the market, compare it to key

rivals, make a roadmap to change that position, and focus on orientations that need special attention.

6. Limitations and future research

As with any research, this study has limitations that need to be addressed. The present study is based on a comparison of leading cases, and although far-reaching generalizations cannot be made because of the qualitative nature of the study, the paper provides valuable insights into the development of smart solutions in manufacturing companies. The interplay between different strategic orientations can provide interesting opportunities for future research, as different strategic orientations have not been utilized to study the development of smart solutions.

Moreover, because the present study utilized three strategic orientations to discuss their complementary effects thus precluding an in-depth analysis on the use of any single orientation, further research utilizing a single orientation is needed. In particular, further empirical research is needed to explore the performance effects of the interplay of different orientations in the development of smart solutions. Finally, performance differences among the firm archetypes should be studied quantitatively to obtain more generalizable results related to this relatively new phenomenon.

Acknowledgements

This paper emerged from the Digital Growth (Digikasvu) research project. The authors gratefully acknowledge the financial support provided by the *European Social Fund* and the organizations involved in the research project.

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