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Selling Digital Twins in Business-to-Business Markets

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Abstract

Selling value generated by digital solutions for customers is different than selling traditional physical equipment. The purpose of this chapter is to study how digital twin sales can be promoted. The chapter combines the literature of business-to-business (B2B) sales with new information coming from a study on digital twinning in a manufacturing context. The study includes the results of ten semi-structured theme interviews that were conducted in January and February of 2020 with six digital twin provider companies from the areas of intelligent machine control systems, software solutions, real-time simulation, and machine engineering. The result is a model illustrating the levels of customer and data-based-solution understanding needed to successfully sell digital twins in the B2B market. The model was applied to the six case companies, each with a different digital-twin solution, and practical examples are presented that were revealed during the qualitative interviews. The empirical study identified different challenges related to the sale of differing levels of the digital-twin solution. The results indicate that companies that targeted more complex digital-twin developments required a higher level of technological proficiency from their salespeople and a stronger understanding of the value elements for the customers, their businesses, and their business ecosystems

Keywords: digital twin, big data, sales, B2B, innovation

5.1 Introduction

Recently, simulation-based product development has received significant attention in scientific publications (Alaei, 2018). That same trend is recognizable with the deployment and popularity

of the digital twin, which is designed, e.g., to accommodate the need for cheaper and repeatable product development (Alaei, 2018). The levels of maturity in digital-twin use, the solutions used, and the definition what is understood to belong to the digital twin concept still vary a lot across industries and among different companies (Lee *et al.*, 2013; Tao *et al.*, 2019). In addition to rapid development of technological solutions enabled by digital transformation, the growing emphasis in many industrial fields on the service-based business (*e.g.*, Kohtamäki *et al.*, 2018) demands that companies develop an ability to work with their customers to co-create value (Marcos-Cuevas *et al.*, 2016). Therefore, to develop new data-based innovations such as digital-twin services, companies must acquire a new understanding of their customers and their customers' businesses. The digital twin, based on digital technologies, is at the core of digitalization. The "digital twin", "data utilization", and "value-based sales" are currently the subject of much discussion among academics and practitioners (*e.g.*, Manyika *et al.*, 2014; Gandomi and Heider, 2015; Vargo & Lusch, 2016; and Donoghue, 2019). However, thus far, there is little formal research into these important topics.

Previous studies do not emphasize selling digital twins in business-to-business (B2B) markets, where it is crucial to precisely address customer need. This chapter aims to fill the gap by combining the literature of business-to-business (B2B) sales with new information coming from a study on digital twinning in a manufacturing context. In addition, this chapter of the book highlights the importance of research related to sales and the establishment of business value through better customer understanding.

The value that customers gain from digital solutions is different than the value gained from their purchase of physical products. This difference affects sales processes. Moreover, value creation for customer business is a key focus of this book. By applying a sales viewpoint to digital twinning, new insights can be provided into the value elements of the differing levels of digital-twin solution implementation and about how best to promote the sale of these digital-twin solutions. In fact, how to promote the sale of digital twins is the primary focus of this chapter. In addition, the chapter reviews the level of understanding needed to successfully implement digital-twin solutions, how much must be known about the customers and their businesses to sell digital twins, and what kind of challenges can emerge when selling digital twins today and what challenges will emerge as digital twins advance to satisfy the future wants and needs of the case companies surveyed in this study.

This chapter presents a model that illustrates the level of customer understanding and the level of understanding of data-based solutions required from the viewpoint of selling digital twins in business-to-business markets. In the empirical study, the model was applied to six participating case companies, each working with a different digital-twin solution. Practical examples that were revealed during the qualitative interviews are presented.

The remainder of the chapter is structured as follows. The next section reviews related research on digital twins, especially in the manufacturing context, and digital twin sales in B2B markets. Further, the research methodology and the results of the empirical study are presented. In the final section, research findings are discussed and recommendations and conclusions are offered.

5.2 Theoretical background

5.2.1 Digital twins in manufacturing industry

The digital twin terminology was first introduced by Grieves in 2003. Since then, there have been several digital-twin definitions. For example, Chen (2017) defines the digital twin as a computerized model of a physical device or system representing all functional features and links with the working elements. According to Madni *et al.* (2019), a digital twin is a virtual illustration of a physical system that is constantly updated with performance, maintenance, and health status data throughout the lifecycle of a physical system.

The digital twin provides several opportunities for new product and service innovations (Tao *et al.*, 2019; Zheng *et al.*, 2018). In manufacturing industries, several digital-twin-enabled services have been developed related, *e.g.*, to fault diagnosis, real-time state monitoring, predictive maintenance, performance analysis, user management, user behavior analysis, and product- or plant-level virtual maintenance and operation (Kritzinger *et al.*, 2018; Tao *et al.*, 2019; Zheng *et al.*, 2018). The use of the digital twin enables virtual product and process planning, and companies are increasingly turning their attention on how and in what ways the communication, synergy, and coevolution between a physical product and its digital twin can lead to more innovative product design processes (Kritzinger *et al.*, 2018; Tao *et al.*, 2019). Based on recent literature, digital twins are most commonly used in production planning and

control and condition-based maintenance. Digital twin integration throughout the entire product lifecycle or production system is still rare (Kritzinger *et al.*, 2018; Zheng *et al.*, 2018).

The opportunities for the collection and utilization of IoT data have remarkably changed manufacturing company product-service systems (PSS) and boosted their transformation towards becoming service-based businesses (Rymaszewska *et al.*, 2017). The increasing amount of available data, gathered from machines and manufacturing processes, offers new service innovations and business opportunities for several companies within the entire manufacturing industry (Olaf & Hanser, 2019), *e.g.*, in planning, project management, simulation modeling, visualization, control systems, and automation services. However, these service business opportunities enabled by digital twins at the ecosystem level still seem to be scarcely researched (*e.g.*, Zheng *et al.*, 2018). An even less researched topic is the selling of digital twins, the focus of this chapter.

5.2.2 Selling data-based solutions in business-to-business markets

Utilizing data in business is still relatively new for many companies. It is generally not the result of strategic planning or management. In addition, digital business models in several companies are unstructured (Ulander *et al.*, 2019). Therefore, sales forces are challenged by data-based innovations, which can be described as opportunities that arise from business model reinvention (new data-based services, for example). Furthermore, there may be a radical shift in selling practices, the object for sales, and earning logics. Sales forces may face several challenges when moving from products to value-added services, rethinking value propositions, reordering value-chains, reconfiguring value delivery models, or even when moving to different markets (Westerman *et al.*, 2014).

Unlike traditional transactions, selling data-based solutions is in many cases equivalent to selling value. Value-based sales is more about the offering's potential implications for the customer's business than about the customers' actual expressed needs (Terho *et al.* 2012). Meanwhile, the developments of emerging technologies may force an increasing demand for even more effective salespeople to carry out the value-based selling process (Marshall *et al.*, 2012). Furthermore, a face-to-face meeting, for example, may be difficult to arrange if the salesperson's capability to influence the customer's buying process is challenged (Adamson *et al.*, 2012). When selling complex data-based solutions, such as digital twins, it is important

to deeply understand the customer's business, as well as the solution being sold. With respect to digital twins, however, the B2B salesperson's perspective has not been properly considered in previous published research.

Rantala *et al.* (2020) presented a model for understanding data-based value sales and the knowledge needed in relation to the customer, data-based solutions, and technologies. To be effective, the salesperson must better understand customer processes, the customer's business, and what customer value a data-based solution can offer. The salesperson must understand the data-based solution on three levels: light, moderate, and deep (Rantala *et al.*, 2020). The model introduced by Rantala *et al.* (2020) was selected as a basis for this work, because it brings new ideas on how to sell data-based solutions. The model brings together in a fresh way two important aspects: (1) the level of understanding needed about the customer's business and (2) the level of understanding needed regarding the data-based solution.

5.3 Research methodology

In this chapter, the focus is on selling data-based solutions and innovations based on digital twins with the main research question of the study: How can the sales of digital twin be promoted? Two sub-questions of the study are as follows.

- What kind of customer & digital twin understanding is needed when selling digital twins in business-to-business markets?
- What kind of challenges emerge when selling digital twins currently or in the next level of transformation?

The research methodology employed in this chapter is a qualitative case study. The case study was chosen as a method because of its suitability for situations that include complex and multiple variables and processes (Yin, 2014). According to Yin, case studies can be used as empirical investigations, which examine a present phenomenon, *e.g.*, the concept of digital twin, within its real-life contexts (in companies), especially when the boundaries between phenomenon and real-life contexts are not clearly apparent. In this study, six cases were selected where the concept of digital twins from the sales point of view was examined. The qualitative data were collected in January and February of 2020 from 16 semi-structured theme interviews held with representatives from 6 different companies from the areas of intelligent

machine control systems, software solutions, real-time simulation, and machine engineering (Table 5.1).

Table 5.1. Interviewed companies, their main products and services, number of interviewees and interview dates

Company	Main products and services	Number of interviewees	Interview date
A	Product data sharing software and solutions for product lifecycle management collaboration	1	February 2020
B	Solutions for digitalizing earthmoving jobsites and robotizing earthmoving machinery	4	January 2020
C	Data visualization and rationalizing the operative hands-on work with different kinds of Digital-twin solutions	4	January 2020
D	Tools and tooling systems for industrial metal cutting, stainless steels	4	January 2020
E	Technologies and lifecycle solutions for the marine and energy markets	1	February 2020
F	Software for digital twins and real-time simulations	2	February 2020

The case companies all operate in B2B markets. They were selected, because they are actively developing solutions related to digital twins. The interviews were recorded and transcribed. The duration of a typical interview was 1 - 1.5 hours, and each involved 1 - 4 interviewers. The semi-structured theme interviews were chosen as the main source of empirical material, because the study is partly explorative in nature, and the meanings of concepts needed to be negotiated with the interviewees. The interviews went beyond customer aspects of the digital twins to cover a broad range of themes, such as current utilization, advantages, and challenges of the digital twins. Content analysis was the approach to analyzing the data. Emerging main themes were grouped and analyzed over several researcher meetings. Then, interview data were studied from the perspectives of the model of Rantala *et al.* (2020).

5.4 Results

5.4.1 Model illustrating the level of customer and digital twin understanding needed from the sales perspective

The paper presents a model (Figure 5.1) that illustrates, from the viewpoint of digital twining, the level of understanding needed of the customer and the data-based solution. From the salesperson viewpoint, it means the need to increase simultaneously one's own understanding of a customer's sub-processes, processes, and business as well as understanding which value-adding data-based solution will provide the best result. The level of needed data-based-solution understanding can be light, moderate, or deep (Rantala *et al.*, 2020). The model of Rantala *et al.* (2020) is related to data-based solutions in general. It is not specific to digital twinning. Rather, it is an example of data-based services for optimizing an industrial company's operations. In this chapter, practical examples are presented to illustrate what understanding of the digital twin and the customer business is required to effectively sell data-based solutions.

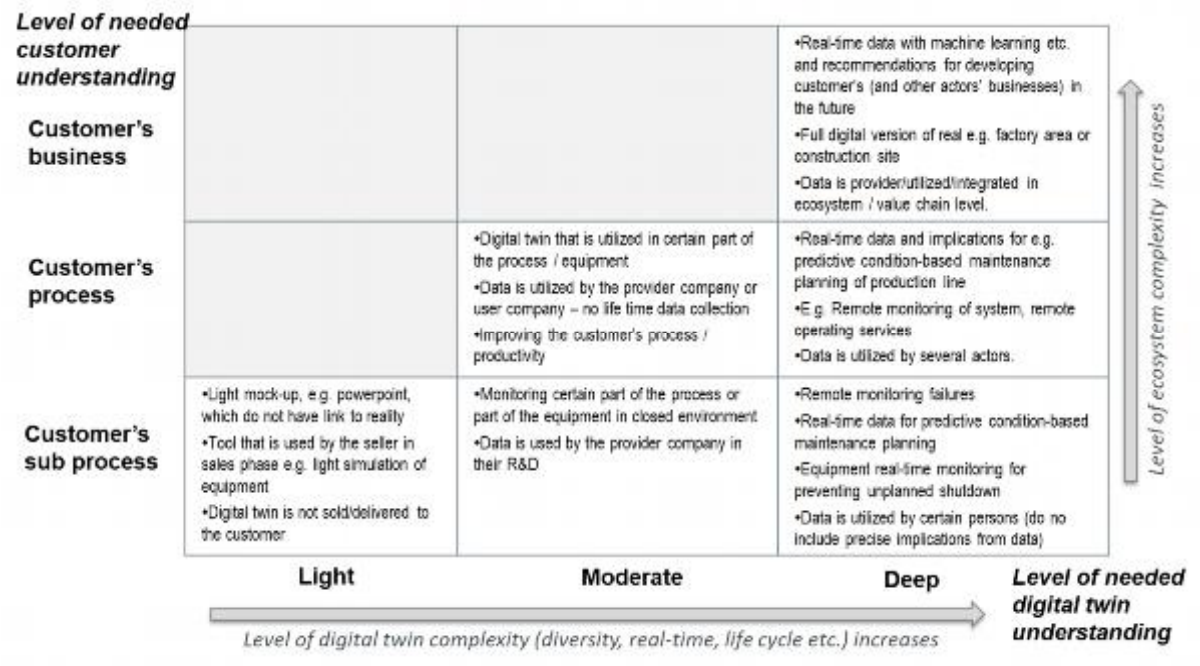

Figure 5.1. Selling digital twins in B2B markets showing the levels of customer and digital twin understanding required as well as ecosystem complexity

Selling "light" digital-twin solutions to customers is the first level in the model. At this level, the digital-twin solutions are characterized as "light". They are usually light simulations of the product that are used as supporting tools for the sales process and are not delivered to the customer or updated afterwards. At this level, the salesperson's existing understanding about the customer equipment and the development of the product with digital features is usually enough.

When moving to the next level, **selling "moderate" digital-twin solutions to customers** (middle column of the model), the complexity of the digital-twin solution increases. Digital twins at this level can be used in the customer's process or sub-process, and they are usually utilized for providing monitoring data on the process or equipment, *e.g.*, for improving efficiency and predicting maintenance needs. At this level, salespersons need a deeper understanding of the data utilization and working principles of the digital-twin solution as well as a better understanding of customer systems. At the customer sub-process level, the sales team's existing knowledge of equipment and process is usually enough. However, when moving up to the customer process level, salespeople need a broader knowledge of customer production lines and processes.

Selling "deep" digital-twin solutions to customers (right column of the model) requires real-time data from multiple sources for more extensive use in customer production lines, factory areas, or construction sites. The wider the utilization area of the digital twin, the more actors are involved. At the highest level (top right in the figure), data is utilized in value chains or ecosystems, and the customer business can be supported by advanced and integrated digital-twin solutions that probably involve machine learning. At this level, salespersons need knowledge of real-time data management and advanced technological tools, such as artificial intelligence. Moreover, they must understand the value of data to the customers' business, the complexity of the related ecosystem, and the role of data. This jump in complexity may demand new value propositions, value co-creation with the customers, and even new business models and earning logics. Selling digital twin innovations at this level demands a deep understanding of the customer, other ecosystem actors, and their businesses.

The interviewed companies are in different phases of the model presented in Figure 5.1. The interviewed companies have been positioned according to their current digital-twin solution, as well as future development directions (Figure 5.2). The companies may have several digital

twins, but in this study, the focus was on a particular digital-twin solution envisioned for the future. In Figure 5.2, the interviewed companies (A through F) are positioned according to their current level of digital-twin-solution integration. Targeted development directions are marked with arrows. One company (C) has two development direction arrows. The dashed-line arrow represents a more ambitious future scenario.

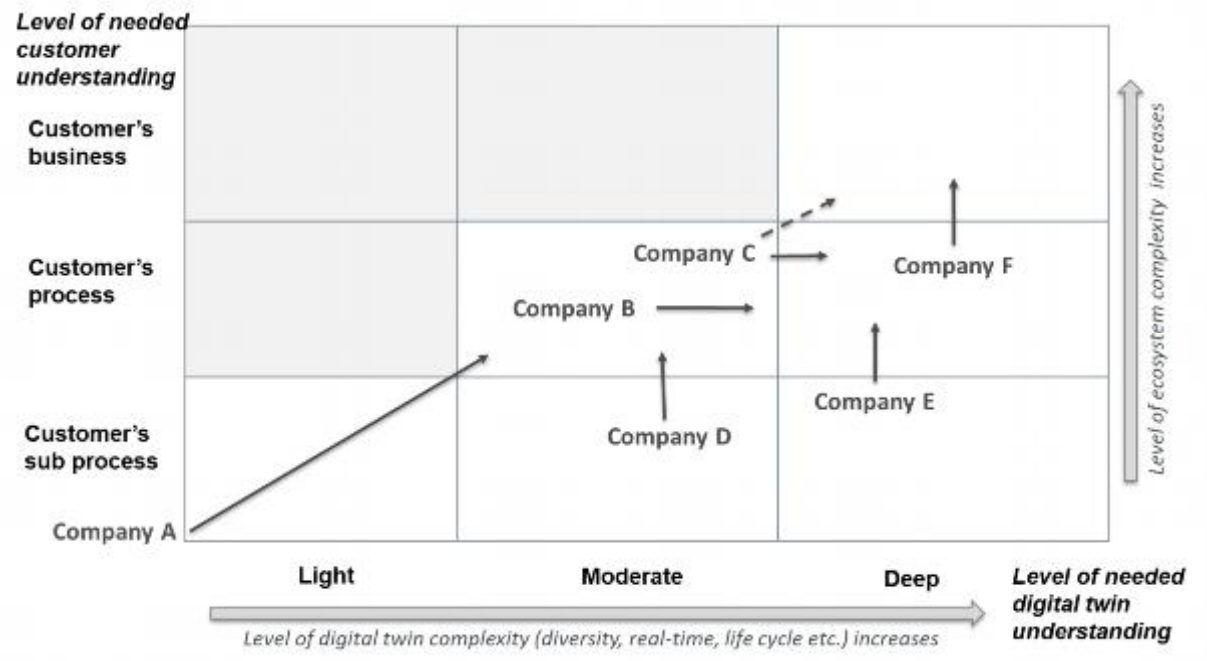

Figure 5.2. Selling digital twins in B2B markets showing the levels of customer and digital twin understanding required as well as ecosystem complexity from the perspectives of the case companies both now and in the future

5.4.2 Challenges in selling digital twins

According to the interview results, the major challenge is to identify customer value, *i.e.*, what is real value for the customer, and then transform the innovations related to digital twins to provide that value from the customer perspective. For example, when selling data-based solutions, the sales team must listen carefully to the customer and respond to the precise need. In general, selling services to a traditional product company may be a challenge. Selling services involving digital twinning may be even more difficult. To respond precisely to the customer need, sales must understand both the digital-twin solution and the need, in detail, to transform the voice of the customer into the outputs of the digital twin. The sales team is facing

more knowledgeable and demanding customers than ever before, and responding by offering the value the customer is seeking can be challenging.

With respect to **selling "light" digital-twin solutions to customers**, the interviewees identified several challenges that salespeople may face. At this stage, the challenges are associated with understanding digitalization, how it applies to customer need, and the benefits of digital twinning. For instance, traditional industry players may simply be resistant to change or an enterprise may have silos that inhibit progressive transformation. Or, customers may have doubts about the reliability of the proposed configuration of the digital-twin solution. Moreover, there may be confusion within the sales team about what customers really need. Finally, challenges related to achieving and sustaining information may emerge. One interviewee (the CEO of company A) clarified the importance of having constant reliable information flow as follows.

"If the digital twin is disintegrated, it's worth is zero."

There might be challenges regarding responsibility ownership. For example, who is responsible for updating the digital twin configuration and the digital-twin information, *etc.* In addition, smaller companies may find it difficult to compete with larger companies such as Siemens. Companies with more advanced deep implementations of digital twinning may also make use of light versions. Light versions can be used in training or in sales to present the digital twin concept before it is further developed with the customer.

With respect to **selling "moderate" digital-twin solutions to customers,** interviewees identified several challenges related to the compatibility of platform, systems, and data. The customer platform may be old, compatibility may become a big issue, or the company infrastructure may struggle to keep up with technological changes. There might be significant sales challenges from customers working in traditional industries that are resistant to change. "No digi needed" or "big brother is controlling us" are examples of comments received from interviewees (companies B and C). Another challenge may be that a business may be strictly standardized, which could restrict utilization opportunities for digital-twin solutions (company B).

Lack of openness in sharing data, the incompatibility of systems, and data integration challenges from different sources are recognized as major challenges (companies B and C) when contemplating the implementation of the next level of digital twinning. Digital twins for a certain part of both equipment and process are less complex with respect to the level of diversity, real-time capability, and lifecycle data. As one interviewee (Research Scientist in company B) stated:

"Open data transformation formats and common rules are needed."

Another challenge might be that the process lines or equipment offered may be so customer-specific that the digital twin must be modified for each sales case (company D). With increases in digital-twin complexity, sales personnel must learn new products and product features (company C). In addition, there may be lack of knowledge about technological aspects or customer needs (company D). For the next level of digital twins, for example, the sales team might present an agile factory of the future (company D).

With respect to **selling "deep" digital-twin solutions to customers,** interviewees recognized challenges related to complexity. When reaching out to the right top corner (Figure 5.2), the digital-twin provider may face challenges related to understanding the meaning of real-time data and find it difficult to make the meaning clear to the customers. The availability of real-time data may be beneficial to the provider, but not yet of perceived benefit to the customer (company E). Moreover, the sales team may think that access by the customer to too much detailed information about its processes may be disruptive and result in an overly concerned customer (company E). Technical development is continuous, and customers are making more intelligent and more complex products and machines. The challenge is to stay on the crest of the wave and be able to provide customers the components they need and that they are able to model to their complex machinery (company F). As one interviewee (Technology Director in company F) stated:

"One of the challenges is that when customer models become more complex and heavier, how can they be solved in real-time."

At the next level, the provider may need to develop new business models, such as licensing models (monthly or project based usage of DT software), around the digital twin to make it

easier to implement in a complex ecosystem (company F). Another challenge may be model complexity. As the digital-twin model becomes more complex, achieving real-time solutions will become more difficult (company F). The development of virtual models takes a lot of time and resources. The seller may use different versions of the models for different phases. For example, a simpler version may be sufficient for a concept phase (concept testing), but for testing final control systems a more advanced model may be needed to get relevant information from the model (company F).

5.5 Conclusions

Based on the empirical results, the main challenges in selling “light” digital-twin solutions are often related to the adoption of digital technological solutions in general. Many manufacturing companies are still conservative, and the advantages of digital twins or how to assign responsibilities for their operation may be unclear. At this level, sales team efforts should promote the added value offered by digital twins. Using a digital twin, the physical product can be visualized in advance, which helps in understanding how it might be received and how it will operate in practice

At the “moderate” level, challenges are often related to the technological fit of the systems and interfaces or the customer’s outdated machine infrastructure that doesn’t necessarily support all the digital twin integrations. Existing digital-twin solutions are often related to separate installations, but the target of companies at this level is often to extend the digital-twin solutions to an increasing number of systems and users. For the sales force, it is essential to know the customer systems and understand the realistic possibilities for integration. For example, what installations and parts of the processes will benefit from digital twinning? Or, what is the effectiveness or cost savings in relation to existing solutions?

There is no point in selling “too heavy” digital-twin solutions that are not technologically or economically feasible. The value for customer comes mainly from the incremental improvement of its processes. Moreover, the value and business opportunities arising from the increasing amount of data may arouse interest in companies that are transitioning towards service-based business.

At the “deep” level, the challenges relate to the management of complex solutions and especially to managing the increasing amount of data. The practicalities and rules for data ownership and sharing are still underdeveloped, and companies may be cautious about open collaboration. At this level, customer companies are increasingly adopting service-based business logics, and this development in product-service offerings can cause changes to their value elements and, as a result, changes to their business models. Customer companies are increasingly interested in providing data-based lifecycle services. This, of course, provides opportunities for digital twinning and raises question about how real-time simulation and digital twins could be utilized across product/process/factory lifecycles and who could utilize the data.

The empirical results of this study support views from the existing literature (*e.g.*, Kirtzinger *et al*., 2018; Zheng *et al*., 2018) and also from Chapter 2 of this book (“Identifying industrial needs for real-time simulation and digital twins”) that digital-twin integrations across the entire product lifecycle are still scarce. One reason for this may be that the digital twinning is a relatively new concept for many companies, and its integration has thus far concentrated mainly on the first steps of product lifecycles. From a technological perspective, incompatibility of systems and insufficient capacities are still slowing down development in many companies. As the models become more complex, they become heavy and more difficult to solve in real time. However, the expectation is that more complex digital twins that also provide real-time data across the entire lifecycle will be coming in the near future.

Moreover, data is supposed to be utilized by an increasing number of different actors in manufacturing ecosystems. This development is not easy to navigate, as it demands that companies adopt a new kind of openness about sharing their data and their expertise in analyzing and using this data. From the sales perspective, being able to provide sustainable value for customers and selling complex digital-twin solutions not only demand knowledge of the customer’s business, but also an understanding of their partners, ecosystems, and future business development targets.

Empirical findings found in the literature regarding digital twins focus mainly on technical rather than business aspects. There are relatively few studies covering sales, B2B companies, and digital twins. This chapter gives practical viewpoints for selling data-based solutions related to digital twins in B2B markets. The chapter also tests and broadens the model presented

by Rantala *et al.* (2020) related to the level of needed customer understanding and data-based-solution understanding associated with the sale of digital-twin solutions. Based on these research results, the model of Rantala *et al*. (2020) conforms to the general theme of selling digital twins. However, the suitability of the model requires more testing with a larger set of case companies and industries to generalize the suitability.

This chapter is intended to help practitioners to benchmark practices in other companies and to give feedback to managers for developing their B2B sales function successfully in practice. The study also helps researchers visualize how data can be applied for new innovations in a broader context including the digital twin, B2B sales, and management. In addition, this study increases customer understanding related to digital twins.

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