Industry 4.0 – an Enabler for Digital Sales Processes

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Abstract: *Why should and how can the instruments of Industry 4.0 be applied to the sales process in order to automatically take customer needs and market knowledge into account? After briefly analysing the key technologies of Industry 4.0, this article focuses on two instruments: Integrating sales data into an ecosystem of new kinds of Digital Twins enhances the simulation of the manufacturing process as well as enables the description of the entire customer journey and eventually "co-creation" with customers. Secondly, Platform Architectures establish dynamic symbiotic networks between Industry 4.0 producers, suppliers and customers which create more value for individuals, companies and society.*
Keywords*: INDUSTRY 4.0; DIGITAL SALES PROCESSES; DIGITAL TWIN; PLATFORM ARCHITECTURES; CO-CREATION; PROSUMER; SALES; MARKETING*

1. Introduction

The Fourth Industrial Revolution is driven by rapid advances in digital technologies. Up to date, the majority of innovations focus on production and logistics. How can the instruments of Industry 4.0 be applied to sales processes in order to integrate customer needs and demands, maximize customer value, create market knowledge, develop innovative forms of use, new business models and more?

The article answers this question by first presenting the *key technologies of Industry 4.0*, followed by the *specific challenges for sales* in the age of digitization. After briefly examining the potentials of Industry 4.0´s key enabling technologies for sales, the third chapter focuses on two instruments that could play a particularly important role for the *integration* of Industry 4.0 into sales: *Digital Twins* and *Platform Architectures*. Chapter four discusses the potential contribution of those two instruments for the integration of sales and the challenges that have to be overcome in order to unlock their full potential.

2. The Key Technologies of Industry 4.0 and the Challenges for Sales

The history of economy is a history of revolutions. At the moment, the world is in the middle of the Fourth Industrial Revolution, which is about to disrupt the entire value chain of almost every industry and to turn our way of thinking upside down. Rapid advances in the digitization of the economy are transforming *markets*, *manufacturing* and *work* at an enormous pace.

As a result, competition and complexity of the *global environment* increase at an accelerating rate. The *companies* themselves face swelling external and internal complexity. In many industries, the dominant technologies and designs will be replaced. New business models with novel competitors will turn everything upside down. Finally, digitization is changing our *individual* daily lives more than any other megatrend: People are constantly online – and companies have to follow them into those virtual spaces, forcing them towards a digital transformation [1].

2.1 The Key Technologies of Industry 4.0

The answers to all those challenges are bundled under the concept of "Industry 4.0". Its basic idea consists of two elements: the global cross-system networking of people, products and plants as well as the independent and decentralized self-organization and control of these production units in real time. Technologically, Industry 4.0 is based on the merging of the physical world with the virtual world into a *cyber-physical system* (CPS) [2]. The availability of all relevant data in real time is a key feature of advanced CPS. With the help of this real-time data, the network permanently updates the virtual image of reality [3].

Industry 4.0 solutions combine innovative production methods with state-of-the-art information and communication technology (ICT) [4]. The result is manufacturing processes which run automatically, sometimes even autonomously, with a maximum of both flexibility and efficiency, at high speed and low cost. Figure 1 gives an overview of the key enabling technologies of Industry 4.0:

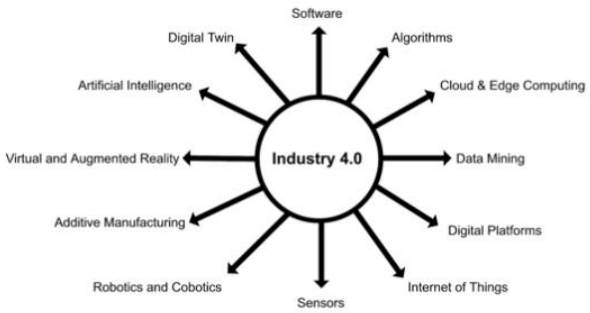

Fig. 1: *Key Technologies for Industry 4.0 (Source: Own Illustration)*

2.2 The Challenges for Sales

Digitization is the biggest challenge for sales as well. It refers to the process of capturing, processing and organizing consumer knowledge to make it accessible and reliable for varied goals, including customer analytics [5]. Experts agree that digitization poses a *disruptive force* that is likely to be more significant and run deeper than any previous sales technology innovation. Merging the physical with the virtual world as the next step will be turning established sales theories and practices upside-down. The emerging challenges can be roughly categorized into two segments: *the emancipation of the consumer* [6] and *the disruption of sales organizations and processes* [7].

2.2.1 The Emancipation of the Consumer

How does digitization change the interaction between companies and their customers? Today's buyers have access to a wealth of information. Being more informed, they become more empowered and self-confident which makes them demand complex combinations of products and services. The company *Salesforce* has proclaimed the "Age of the Customer", meaning that information technology introduced a new type of consumer expectation [8], because consumers now interact directly with the brands and

products they love online [9]. If they choose to, consumers play an active role during customer acquisition, retention, information exchange, even in sourcing new ideas for product innovation [10]. *Consumers* become *active* und *influential participants* in marketing and sales efforts [11] while expecting 24/7 availability of sales. If interaction in terms of understanding, consulting, expertise, availability and value creation by sales is not sufficient, digital punishment follows immediately, visible online for everyone else. In a nutshell, buying behavior and processes of consumers are changing tremendously.

2.2.2 The Disruption of Sales Organizations and Processes

Digital technologies support the *automation* of many aspects of the sales process from customer acquisition to customer retention [12]. Research conducted by the McKinsey Global Institute found that automation can be applied to 40% of the sales functions. High-tech developments such as *Artificial Intelligence* (AI) boost this number potentially to 50% [13]. As a result, the need for traditional salespeople will considerably decrease, and traditional sales organizational structures and processes will be disrupted.

Selling is no longer being viewed merely as a process between a buyer and a seller but involves a broader range of actors. With digital transformation and multiple actors becoming involved in the sales process, selling today often requires exchange, close collaboration and even value co-creation among a dynamic set of actors [14]. Hence, the era of digitization poses enormous organizational challenges of structuring and managing the sales force. One example is the exponentially increasing number of intra- and interorganizational interfaces which have to be managed.

3. Key Technologies of Industry 4.0 and their Role for Innovation in Sales

As mentioned above, the majority of the existing Industry 4.0 technologies address challenges in production and logistics. Yet the potential of Industry 4.0 can only be fully exploited if the effective range covers the *entire value chain*: from development, production and logistics to sales and service [1]. Therefore, it is a logical and necessary next step to *adapt* the *instruments of Industry 4.0* to the *digital sales processes* in order to meet the challenges discussed in the preceding chapter. The following chapter analyses which of the key technologies of Industry 4.0 offer the highest potential for sales.

Pure production technologies for the floor shop like *Additive Manufacturing* or *Robotics/Cobotics* have nearly no relevance for sales. Generally, key technologies with a strong focus on production and logistics offer rather little potential, although they can hold interesting aspects for sales. The famous “iBin” by Würth is an example of a simple but effective *sensor* technology which is relevant for sales: The “iBin” camera module monitors the fill level of a container. If that level falls below a certain threshold, the system automatically triggers an order process and thus autonomously ensures the permanent supply of spare parts, regardless of whether the container is on the shelf or on the production line [15].

More interesting are technologies which cover the entire value chain. Among them are the *Internet of Things* (IoT), *Cloud and Edge Computing*, *Software* and *Algorithms*. In sales, all those technologies serve to improve the processes and to enhance customer satisfaction. Since their field of application is so broad and therefore unspecific, a detailed consideration is not relevant in the context of this article.

Augmented and Virtual Reality (AR/VR) can be very useful for sales. There are many B2B and B2C use cases for AR/VR to give customers a realistic vision of what a solution will look like before it is actually produced. For example, the "Audi VR experience" in car showrooms allows potential customers to experience their individually configured car very realistically, down to the last detail, through VR goggles [16]. AR/VR technology features certain parallels to Digital Twins, although those go well beyond a “mere” visual presentation of a products´ design, layout or ergonomics. Further benefits of the Digital Twin will be discussed in chapter 3.1.

The analysis of *Big Data* helps to optimize an organization´s sales processes and products. It can also provide strategic insights into customer behaviors and desires [12] and even generate new business models. Popular innovative application examples include "pay-per-use" models or “predictive maintenance”, which would be inconceivable without Big Data.

Huge amounts of data are also essential for *Artificial Intelligence* (AI). AI engines generating value for customers are widespread in B2C industries. Popular examples are Amazon and Netflix, which provide personalized product recommendations to fulfill customers' needs [17]. For similar reasons, B2B companies are also increasingly using AI technologies. Another use case is to analyze the needs of *potential* customers. For instance, solutions such as “JOYai” determine an individual´s personality from her/his social media footprint so that salespeople can adapt their initial offer to those individual preferences [18]. AI-based chatbots are able to answer customer questions immediately and accurately [19]. AI can transform sales processes and customer interactions in a wide variety of ways, virtually changing the way business is conducted. AI also has the potential to revolutionize training within the sales profession. To sum it up: AI is taking on more and more recurring as well as sophisticated tasks which changes the sales profession considerably.

Two technologies have potentially an even stronger impact on sales than AI: The *Digital Twin* and *Platform Architectures*.

3.1 The Digital Twin

With a Digital Twin, the real world can be mapped in the digital world [20]. Originally, it was thus a mere digital illustration of a physical product. Grieves and Vickers expanded the concept by incorporating three elements: the *physical products* of the real world, their *virtual twin* and *interfaces* that connect the data and information flows from both worlds [21]. That makes it possible to save on physical prototypes and to simulate functionality and behavior via a model before going into physical production.

3.1.1 Specific Digital Twins for PLM

In Industry 4.0, Digital Twins are playing an important role in the entire *Product Lifecycle Management* (PLM). Figure 2 shows the relationships of PLM, the *Customer Journey* and the respective kinds of *Digital Twins*.

For PLM, three areas are particularly noteworthy: The *product* (and/or the product design), the *production* itself and the corresponding *service* [22]. The *open interface standard* OPC-UA (“Open Platform Communications Unified Architecture”) enables linking the data of those three areas [23]. Correspondingly, as Figure 2 shows, there are three different forms of Digital Twins in PLM depending on the specific area of application [24]: A *Digital Product Twin* describes the product in terms of its properties using different software (e.g. geometrical characteristics in M-CAD or electrical requirements in E-CAD). The *Digital Twin in Production* maps the process structure of the factory, in particular the production and testing processes. The *Digital Service Twin* describes the services (e.g. spare parts, wear parts, maintenance, service plans). The corresponding operating data is collected in order to automatically trigger the necessary service tasks.

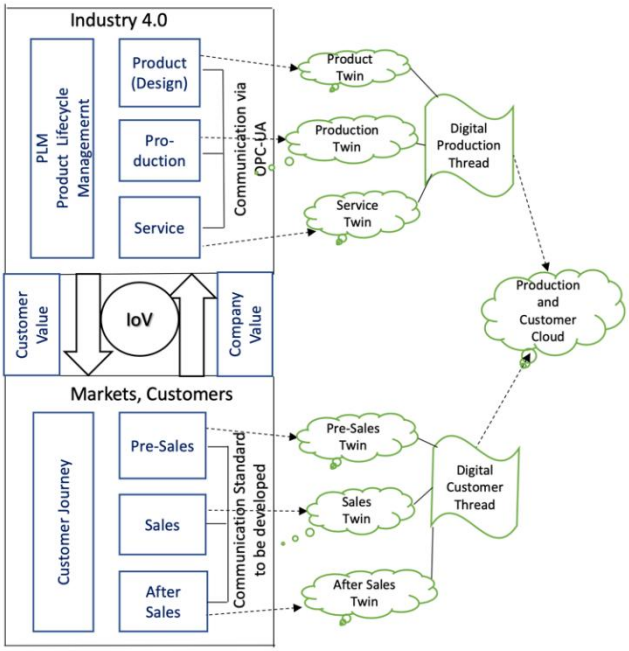

Fig. 2: *Collaboration and Interaction of the Digital Production and the Digital Customer Thread (Source: Own Illustration)*

Linking those three different Digital Twins with one another in such a way that communication and interaction are possible via OPC-UA results in a *Digital Production Thread*. This allows *optimization* along the entire value chain of a product life cycle (PLM) and results in significant competitive advantages for existing products. In addition, innovations can be implemented faster and more reliably with *digital prototypes* because they can replace expensive and time-consuming physical prototypes. That means that a Digital Twin can even exist before the corresponding physical object. In this case, certain situations are simulated beforehand so that the real manifestations will be already optimized from the start. Also, the configuration of certain machines and systems can be simulated in a Production Twin to determine the perfect production process in advance.

3.1.2 Specific Digital Twins for Sales Processes

The concept of the Digital Twin is universal and can therefore be applied to all kinds of processes. Because products and services have to take customer needs and demands into account, sales are a segment of the value chain with a particularly high potential. The sales perspective is not primarily focused on products or services produced but on the customer and her/his needs and requirements: The product must create, even maximize, *value for the customer*.

The Digital Twin has the potential to integrate the selling process into the producing part of a company – including customers´ needs, experience and even to create market knowledge. As shown in Fig. 2, the selling process can be divided into three phases: *Pre-Sales*, *Sales* and *After Sales*, each with its specific twin [25]. All three together simulate the Customer Journey as represented by the *Digital Consumer Thread*.

By finally combining the *Digital Production Thread* and the *Digital Customer Thread*, customer-based solutions at low cost and in high quality can be provided which increase both Customer and Company Value (see Fig. 2). Thus, an *Internet of Value* (IoV) can be created which is an important prerequisite for developing innovative forms of use and new business models.

Figure 3 shows a way to combine the *twins of the Production Life Cycle* with the *twins of the Customer Journey*. There are two important "bridges" between the two realms: First, the Product Twin´s data informs the Pre-Sales Twin so that sales can use all the product knowledge to convince potential customers. Second, the After-Sales Twin influences the Service Twin in order to provide the necessary data for a constant and error-free use of the product.

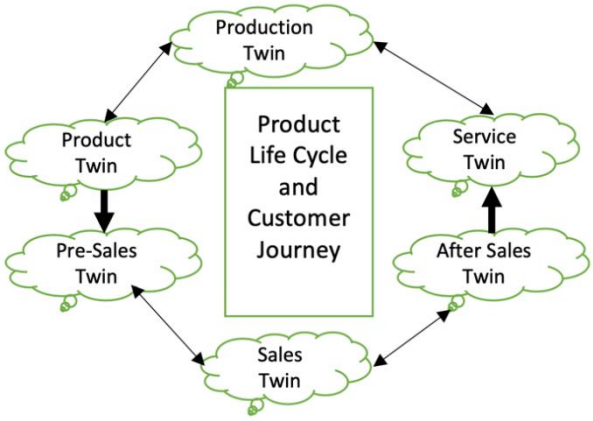

Fig. 3: *Digital Twins linking the Product Life Cycle and Customer Journey (Source: Own Illustration)*

Those bridges allow to supply more information about the product and the production processes to the sales people and the customers – and vice versa: When customer needs are changing, it is possible to simulate different production processes in order to calculate the corresponding new cost situations. In this way, an individual and transparent pricing information is possible. Also, the user´s experiences can be integrated to optimize products and their production processes, which increases the company value. On the other hand, the company´s information can help the customer to use the product in an optimal way (e.g. going through a training via AR or VR) – making the customer value grow. To sum it up: This concept holds benefits for both sides. Increasing the Customer as well as the Company Value is very important to create a win-win-situation and a competitive advantage.

3.1.3 Specific Digital Twins for B2B and B2C Customers

B2B and B2C customers have to be distinguished. For *B2B customers*, the requirements documented in the *specifications* must be met at a *market-driven price*. These customers usually understand a lot about the manufacturing processes in production. Their experience can contribute to the improvement of the properties of the products, to the optimization of the production system and to informative usage and maintenance instructions as well as training documents. This partnership can make an important contribution to increasing competitiveness and establish a USP that is recognizable in the market for both sides. An example: Long production cycles are common in factory engineering. During this time, customer requirements or technical capabilities can change. These changes can be taken into consideration for production via the bridge between the *Digital Pre-Sales Twins* and the *Production Twin*, and the mutual effects can be simulated. This means that changes to the product can even be made during the manufacturing process without great effort.

B2C customers also often use *digital* and *social media* to find out about the properties and advantages of the products they want to buy. In B2C, it is particularly important to address the target groups via accurate communication channels. In particular, a distinction must be made between *premium customers*, who buy expensive and high-quality products, and *economy customers*, who purchase their products price-consciously in useful quality [26]. B2C customers can also use a simulation program that connects them with production (connection of the *Pre-Sales Twin* with the *Production Twin*) to directly experience the effects of their wishes on price, delivery time and quality. In this way, the customer receives transparent and quick information about his customized product

and, as a consumer, directly influences production. Thus, he becomes a *prosumer*.

3.2 Platform Architectures

Platform Architectures are an important prerequisite for this in a B2C as well as in a B2B environment: Interaction between companies in a business-to-business environment also evolves as digital business platforms progressively replace traditional interactions [27].

3.2.1 From Linear Value Chains to Multi-Sided Platforms

Major transformations how future business can be successfully and sustainably architected are ongoing. Porter's concept of linear value chains [28] has been relevant for many years: purchasing pre-products, followed by value creation through manufacturing or assembling and finally using sales and marketing channels to reach consumers. This concept becomes more and more discarded and less relevant for economic growth. The Fourth Industrial Revolution with its technologies has enabled the proliferation of so-called "*Platform Architectures*", which are now changing the landscape of today's economy [29]. According to McKinsey, 30% of global GDP will be generated by platforms (in this context also referred to as eco-systems) as early as 2025 [30]. As a result, traditional pipeline businesses, named as *two-sided markets*, are giving way to these platforms [31].

A Platform Architecture is a stable network (sometimes also referred to as a "*digital marketplace*") of interconnected entities, such as individuals, suppliers, distributors, customers, competitors, government agencies etc. [32]. The opportunity for joint and interactional value creation within one thematic (eco-)system by different parties on the platform is a key proposition compared to other business models [5]. Another highly important distinctive feature is the positive correlation between the number of participants and the value of the platform [33]. Digital platforms do not necessarily hold physical assets nor generate value through sales [34]. They usually provide an open and participative infrastructure for potential interactions and set the governance conditions to orchestrate these interactions [35]. To fully understand Platform Architectures, it is furthermore important to distinguish the discussed platforms from product platforms, such as those found in the automotive sector [36].

There are a variety examples for successful platforms, such as *business-to-retail platforms* (Alibaba Group, Amazon Business) that enable users to consummate commercial transactions or *consumer-sharing platforms*, such as Uber, enabling users both delivery and use of transportation services [27].

3.2.2 A Sales Perspective on Platforms

From a sales perspective, a *multi-sided platform* is a digital market that automatically serves the function of matching the needs and resources of two or more entities and creates the possibility for everybody to innovate and interact in ways not otherwise possible, with potential for nonlinear increases in utility and value [37]. Hence, Platform Architectures connect both buyer and seller as well as generate a combination of both, named as prosumer (when a buyer adds value to a product or solution, see chapter 3.1.3).

Through the connection of several entities participating on the platform (related to a specific topic), this architecture provides not only huge benefits for consumers but also access to data and information which is of utmost importance for sales management. This allows customer needs and demands to be taken into account as well as to create market knowledge. And as the number of consumers and interactions on the platform grow, this architecture produces more and more comprehensible data which can be transformed to relevant information for sales. Not only *more customers* can be reached more quickly and more specifically via the platform, but also *forecasting of sales* can be undertaken as well as customers can be attracted at a very early point of their Customer Journey [38]. This entails the potential development of innovative forms of use and new business models.

3.2.3 Customer Behavior and the Importance of Platforms

Gathering information about customers as well as providing experiences via platforms is very important, because digitization is continuously changing customers´ ways of searching and buying products and services [39]. As already introduced in chapter 2.2, dealing with the challenges of sales, today´s customers like to share experiences and interact with each other [8]. Companies that implement elements of this new paradigm to their processes, are part of platforms or can even be the platform initiator, gain an overwhelming unique selling proposition for their company. The huge change of customer behavior in their buying process is displayed by van der Kooij as he compares the traditional sales funnel with a Customer Journey-adapted "*customer centric sales perspective*" [9]. The size of the circles in Fig. 4 indicate where customers spend most of their time: the bigger the circle, the more time they spend on the corresponding activity.

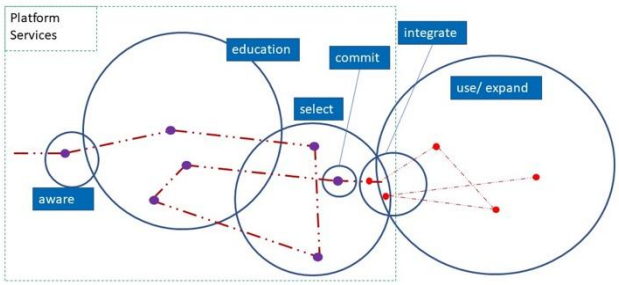

Fig. 4: *Buying Behavior in the Digital Age (Source: van der Kooij 2018)*

The research of Kooji shows that digitally infused buying processes of today´s customers completely differ from traditional ones, as customers have become extremely self-confident. The whole process is experienced via real time data on a *non-linear path* and customer´s experience is *asynchronous* (customers obtain insights online and no longer from sales) [9]. If this whole process takes place on a platform or can be provided by Platform Architectures, opportunities for sales are nearly endless.

4. Results and Discussion

Digitization and its enabling technologies deeply influence economy, especially *supplier-seller-buyer-transactions* as well as *buying behaviors* and *buying expectations*. This causes an urgency for companies to react. Chapter 3 points out that the potential of two key technologies of Industry 4.0, the Digital Twin and Platform Architectures, is especially promising. For those opportunities to be realized, certain challenges must be mastered:

It is essential to understand *Platform Architectures*, their principles and how they create value. Furthermore, as platforms are the new *digital marketplaces*, it becomes vital for companies to play an active role "in the game" to fully enjoy the benefits. This could be either as the platform initiator or as a partner. Nevertheless, there are many challenges to be overcome to benefit from the huge potential of the platform business with its opportunities for nonlinear growth. Those challenges are:

a. *The enormous technological base and demanding preconditions to establish platforms*: As platforms usually work highly automated, in real time and with high speed, data, data exchange and interfaces need to be standardized

and available. For instance, products should be uniquely identifiable by serialization of products. Related product information such as pictures and technical documentation has to be automatically connected to this serialization code.

b. *The comparably high investment for setting up or participating in a platform, including participation strategies*: Setting up a platform as a single company is usually reserved to start-ups with lots of venture capital, family owned businesses with a clear vision, courage and available cash or – most of the time – conglomerates of companies with activities in similar business segments. In the third case, it is however difficult to set up and define which of the participants receives which slice of the "value generating and scalable cake".

c. *The transformation of a company´s strategy, business model and whole organizational setup, which has usually been operating well for decades*: Strategy means choice and requires courage. Therefore, entering into the platform business is not only a technological but mostly a transformational issue. To leave well-trodden (and still revenue generating) paths is not an easy decision given that many companies still struggle to make money with their digital technologies.

d. *The development and maintenance of completely new skills in a company´s original skill portfolio*: "Equals among equals" is not only a phrase, which makes it very challenging for non-IT companies to develop and hold qualified human resources and skills for IT activities.

Besides these challenges and many more, however, *Platform Architectures* offer a great variety of opportunities which should obviously be worthwhile to take some risks for. For sales, platforms are an already widely established technology, in contrast to the *Digital Twin*. In order for the Digital Twin concept to be successful in the sales arena, the challenges are primarily not on the company level, but still on the superordinate research level.

First, the respective models for the Pre-Sales, Sales and After Sales Twin must be developed. Equally important will be to engineer a *communication interface* for the Digital Customer Thread that is as effective as the OPC-UA standard is for the Digital Production Thread since this is a prerequisite for effectively interlinking the three Digital Sales Twins. To this end, the Object Management Group (OMG) founded a *Digital Twin Consortium* in May 2020. Members are Ansys, Dell Technologies, Lendlease and Microsoft. In this group, uniform standards and architectures are to be developed for the communication of Digital Twins in different positions of the value chain [40], which will be also applicable for sales. The Industrial Digital Twin Association (IDTA) has been pursuing the same goal in Germany since September 2020 under the direction of VDMA, ZVEI and Bitcom. Well-known companies (e.g. Bosch, SAP, SIEMENS) are founding members [41]. This shows that considerable efforts are being undertaken nationally and internationally to leverage the added value potential of the Digital Twin for all areas of the value chain, including sales.

By themselves, both technologies presented in chapter 3 already offer an enormous potential. It potentiates when Platform Architectures and the Digital Twin are combined with the rather general Industry 4.0 technologies like the *Internet of Things* (IoT), *Cloud and Edge Computing*, *Software* and *Algorithms.* As self-learning and self-analyzing tools, *Artificial Intelligence* and *Big Data* will become even more important for the Digital Twin and Platform Architectures in the future. To put it the other way around, these two technologies will greatly benefit from the support of all the other Industry 4.0 technologies. Generally, all the available and future technologies will still have to be combined with each other. And for all those technologies, the following all the more applies: They only unlock their full potential if they are not limited to production, logistics or sales, but encompass the entire value chain.

5. Conclusion

This article has answered the question of how the key technologies of Industry 4.0 can be effectively applied to sales processes. It has made evident that the consideration of technologies introduced by Industry 4.0 creates completely new opportunities for sales [39].

As stated in chapter 2, the influence of sales digitalization technologies is likely to be more significant and far reaching than any other previous sales technology: According to Forrester, sales must not only hit quotas, but also fulfill the digitally oriented expectations of todays' customers – 94% of whom state that a consistent experience across digital and offline channels is important to them [42]. Platform Architectures as well as the Digital Twin have the potential to rule future digital sales processes as they satisfy modern customer needs of interaction, sharing and co-creating. Although there are considerable challenges such as technological obstacles, high investments or transformational issues, it is of utmost importance to unlock the full potential of Industry 4.0´s technologies in order to survive in our digitized world. This accounts for sales as much as for every other segment of the value chain. The reason is that digitization results in scaling of business models and revenues, and this principle potentially applies to every market and every company [43].

6. References

[1] H. Wildemann: *Produktivität durch Industrie 4.0.*, München: TCW Transfer-Centrum 2018.

[2] S. Hering, R. Fayzullin: *The Organizational Concept of the Virtual Corporation and its Integration into Industry 4.0,* in: *Int. Scientific Journal Industry 4.0*, **3**, p. 132-137 (2020)

[3] M. Bauernhansl, M. ten Hompel, B. Vogel-Heuser: *Industrie 4.0 in Produktion, Automatisierung und Logistik*, Wiesbaden (2014)

[4] Plattform Industrie 4.0: *Digital Transformation "Made in Germany"*, Federal Ministry for Economic Affairs and Energy, Berlin, (2019)

[5] V. Ramaswamy, K. Ozcan: *Offerings as Digitalized Interactive Platforms: A Conceptual Framework and Implications*, in: Journal of Marketing 82, **4**, p. 19-31 (2018)

[6] A. Borgmeier, A. Grohmann, S. Gross: *Smart Services und Internet der Dinge. Geschäftsmodelle, Umsetzung und Best Practices: Industrie 4.0, Internet of Things (IoT), Machine-to-Machine, Big Data, Augmented Reality Technologie*, München (2017)

[7] H. Grove, K. Sellers, R. Ettenson, J. Knowles: *Selling Solutions Isn't Enough*, in: MIT Sloan Management Review 60, **1**, p. 55 (2018)

[8] D. Daly: *Digital Sales Transformation in a Customer First World*, Cork (2017)

[9] J. van der Kooij: *BLUEPRINTS FOR A SAAS SALES ORGANIZATON. How to design, build and scale a customer*, Vol. 2, 2nd edition, San Francisco (2018)

[10] E. Malthouse, M. Haenlein, B. Skiera, E. Wege, M. Zhang: *Managing Customer Relationships in the Social Media Era: Introducing the Social CRM* House, in: Journal of Interactive Marketing 27, **4**, p. 270-280 (2013)

[11] C. Harmeling, J. Moffett, M. Arnold, B. Carlson: *Toward a Theory of Customer Engagement Marketing*, in: Journal of the Academy of Marketing Science 45, **3**, p. 312-335 (2017)

[12] N. Syam, A. Sharma: *Waiting for a Sales Renaissance in the Fourth Industrial Revolution: Machine Learning and Artificial*

Intelligence in Sales Research and Practice, in: Industrial Marketing Management 69, p. 135-146 (2018)

[13] M. Valdivieso de Uster: *The 7 Biggest Trends Upending Sales Today*", in: https://www.salesforce.com/quotable/articles/biggest-sales-trends/, accessed Nov. 2, 2020

[14] N. Hartmann, H. Wieland, S. Vargo: *Converging on a New Theoretical Foundation for Selling*, in: Journal of Marketing 82, **2**, p. 1-18 (2018)

[15] WÜRTH Industrie Service GmbH: https://www.wuerth-industrie.com/web/de/wuerthindustrie/cteile_management/kanban/kanban_steuerung/ibin_intelligenterbehaelter/ibin.php, accessed: Nov. 3, 2020

[16] Audi AG: https://www.audi-mediacenter.com/de/pressemitteilungen/audi-startet-virtual-reality-im-autohaus-9270, accessed: Nov. 3, 2020

[17] M. Wedel, P. Kannan: *Marketing Analytics for Data-Rich Environments*, in: Journal of Marketing 80, **6**, p. 97-121 (2016)

[18] JOYai Inc.: *Personalized Selling at Scale*, https://www.joyai.com/, accessed Nov. 4, 2020

[19] I. Melas: *Harnessing the Power of Digital Selling*, in: Ernst & Young, New Business Trends in Information Technology, https://www.salesforce.com/research/it-innovation-new-biz-trend/, accessed Oct. 2, 2018

[20] M. W. Grieves: *Virtually Intelligent Product Systems: Digital and Physical Twins*, in*: Complex Systems Engineering: Theory and Practice.* American Institute of Aeronautics and Astronautics, ISBN 978-1-62410-564-7, p. 175 -200, 2019

[21] M. W. Grieves: *Digital Twin - Manufacturing Excellence through Virtual Factory Replication*, Whitepaper, LLC, 2004

[22] R.: Klostermeier, S. Haag, A. Benlian: *Geschäftsmodelle digitaler Zwillinge*, essentials Springer Vieweg, 2020

[23] VDMA Forum Industrie 4.0: *Kommunikation mit OPC UA*, ISBN: 978-3-8163-0709-9, 2017

[24] R. Montau: *Digitaler Zwilling – Herz der Digitalisierung*, in: at 09/2020 https://aktuelletechnik.blverlag.ch/digitaler-zwilling-herz-der-digitalisierung/, accessed: Oct. 12, 2020

[25] C. Homburg, D. Jozic, C. Kuehnl: *Customer Experience Manegement: Umsetzung eines sich weiterentwickelnden Marketingkonzepts*, Zeitschrift der Academy of Marketing Science, Vol. 45, p. 377 – 401, Springer (2017)

[26] S. G. Jansky: *Kundensegmente der Zukunft*, Trendanalyse 2bAHEAD, Jun. 16, 2020

[27] A. Rangaswamy, N. Moch, C. Felten, G. van Bruggen, J. Wieringa, J. Wirtz: *The Role of Marketing in Digital Business Platforms*, in: Journal of Interactive Marketing 51, p. 72-90 (2020)

[28] M. Porter: *Competitive advantage of nations: creating and sustaining superior performance*, New York (2011)

[29] A. Smedlund, A. Lindblom, L. Mitronen (Hg.): *Collaborative Value Co-Creation in the Platform Economy*, Singapore (2018)

[30] https://www.mckinsey.com/industries/financial-services/our-insights/the-rise-of-ecosystems-and-platforms-what-role-can-insurers-play-and-how-can-they-get-started?cid=soc-web, accessed: Nov. 4, 2020

[31] M. van Alstyne, G. Parker, S. Choudary: *Pipelines, Platforms, and the New Rules of Strategy*, in: Harvard Business Review 94, **4**, p. 54-62 (2016)

[32] G. Clark, M. Feldman, M. Gertler, D. Wójcik, P. Auerswald, L. Dani, Oxford: *Economic Ecosystems*, in: Oxford Handbooks Online (2018)

[33] A. Hagiu, J. Wright: *Multi-sided platforms*, in: Int. Journal of Industrial Organization 43, p. 162-174 (2015)

[34] P. Constantinides, O. Henfridsson, G. Geoffrey: *Introduction—Platforms and infrastructures in the digital age*, in: Information Systems Research 29, **2** (2018)

[35] G. Parker, M. van Alstyne, S. Choudary: *Platform Revolution: How Networked Markets are Transforming the Economy and How to Make them Work For You*, New York (2016)

[36] M. Fisher, K. Ramdas, K. Ulrich: *Component Sharing in the Management of Product Variety: A Study of Automotive Braking Systems*, in: Management Science 45, **3**, p. 297-315 (1999)

[37] M. Cusumano, A. Gawer, D. Yoffie: *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation and Power*, New York (2019)

[38] M. Stickdorn, M. Hormess, A. Lawrence, J. Schneider (Hg.): This is Service Design Doing: Applying Service Design and Design Thinking in the Real World. A Practitioners' Handbook, Sebastopol (2018)

[39] A. Venerm, J. Rantala, T. Holopainen (Hg.): *From Sales Funnel to Customer Journey, Proceedings of the AHFE 2020 Virtual Conferences on Human Factors, Business Management and Society and Human Factors in Management and Leadership*, New York (2020)

[40] M. Large: Ansys, Microsoft und Dell gründen Digital Twin Consortium, IEE, https://www.businesswire.com/news/home/20200518005748/en/Object-Management-Group-Forms-Digital Twin_Consortium, accessed Oct. 19, 2020

[41] M. Billmann, C: Mosch: *Nutzerorganisation "Industrial Digital Twin" gegründet*, in: VDMA, Sept. 24, 2020

[42] M. Shea, M. Cain, C. Robertson, S. Casey, J. Cicman, J. Basseches, M. Bakalar: The State of Digitized Selling. Stop testing the waters and get immersed.Forrester Report. (2019)

[43] H. Meffert, J. Meffert: Eins oder Null, Wie Sie Ihr Unternehmen mit digital@scale in die digitale Zukunft führen. Econ Verlag, 2017.