

Customer Experience as the Driving Force for Supply Chains Digital Transformation

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Abstract

Supply chain managers constantly look for the resources that are able to enhance and improve supply chain competitiveness. This competitiveness is analysed mainly in the light of cost, time and quality of the customers' service delivered by the supply chain management. Today one of the most important resource impacting on driving business in the competitive way are the digital technologies. This is mainly due to the fact that digital technologies are strongly changing the innovation level of the company and its performance. Therefore it is worth to analyse the influence of digital technologies on supply chain competitiveness in terms of cost, time and quality. The aim of this paper is to present the most important areas that are impacted by the digital technologies in improving of supply chain competitiveness. The results of the empirical research, conducted among 120 supply chain managers in 2018, show that the aspect of quality is the weakest point in terms of digital innovation impacting on supply chain competitiveness. Thus in the second part of the paper the analyses of the role of the customers experience have been done to understand the new approach to the role of digital technologies. The digital innovation is impacting the whole customers' journey during their relation not only with the company, but with the supply chain – that is actually the organization of several independent companies. In this way digital technologies starting to be a central point of supply chain configuration for improving its competitiveness.

Keywords: Supply Chain Digital Transformation, Customer Experience, Customer Journey, Digital Innovation, Supply Chain Competitiveness

Introduction

Everyone wants progress, but nobody wants change.

Supply chain (or better – “demand network”) is a complex organization involving different parties' engaged in the coordination of the flows of information, goods and money. Supply chain competitiveness concentrates mainly on cost, time and quality improvement. According to McKinsey, once a company sets out a vision for its supply chain, it should articulate that vision in terms of business and technical capabilities. These might include the following (Gezgin, *et. al.*, 2017):

Better decision making. Machine-learning systems can provide supply-chain managers with recommendations for how to deal with particular situations, such as changing material planning and scheduling in response to new customer orders.

Automation. Automated operations can streamline the work of supply-chain professionals and allow them to focus on more valuable tasks. For example, digital solutions can be configured to process real-time information automatically, thus eliminating the manual effort of gathering, scrubbing, and entering data.

End-to-end customer engagement. Digital technology can make customer experiences better by giving supply-chain managers more control and providing customers with unprecedented transparency: for example, track-and-trace systems that send detailed updates about orders throughout the lead time.

Innovation. A digital supply chain can help a company strengthen its business model and collaborate more effectively with both customers and suppliers.

Talent. Digitally enabled supply chains have talent requirements that can be quite different from those of conventional supply chains. At least some supply-chain managers will need to be able to translate their business needs into relevant digital applications.

Today competitive demand networks are the ones that are intimately connected to data sources such as the internet of things (IoT) enabled with comprehensive and fast analytics, openly collaborative through cloud-based commerce networks, conscious of cyber threats, and cognitively interwoven (IDC, 2017). At the same time, customers started to be more involved into the customers journey with the company as the technology stimulates their and companies' behaviour. These include connectivity supported by i.e. cloud computing, IoT, artificial intelligence (AI), blockchain, big data analytics, etc. that enable e-commerce development from one side and access to the information by smart phones on the other.

To gain in value from digital technologies and innovations driven by them it is worth to identify both – digital supply chains and digital customers journey to improve supply chain competitiveness by better customers' experience. This experience might be at the same time the driving force for supply chains digital transformation improving that process by meeting the customers' expectations and thus the quality of service delivered by the whole supply chain process.

The aim of the paper is to present the idea of improving the supply chain competitiveness by merging the customers experience during their journey with the organization together with digital supply chain concept. The concept is presented in the light of digital transformation process; the main supply chain completeive advantage forces – namely: cost, time and service quality – supported by digital technologies; and the idea of customers experience and journey compiled with digital supply chain description. Based on the considerations made, a definition of the digital transformation of the supply chains which are customers centric and see potential of competitive advantage improvement by digital innovation implementation is proposed.

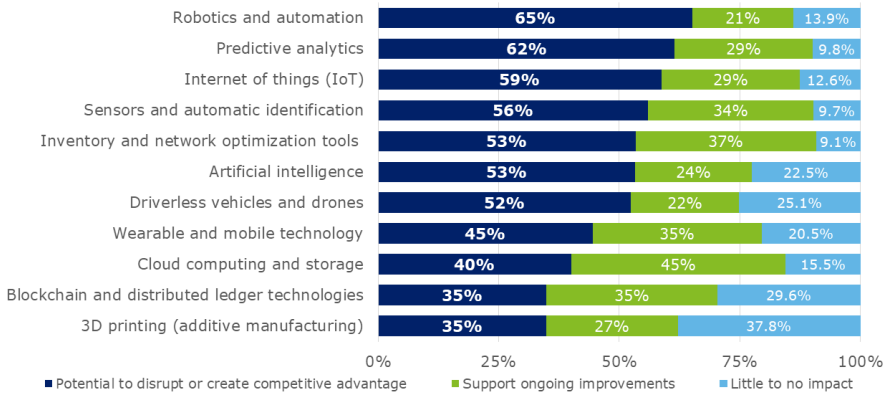
Digital Technologies, Digital Innovation and the Idea of Digital Transformation

Digital technologies developed and rapidly spread as a result of using the potential and the possibilities of technology – mainly information and communication technologies (ICT) in organization's management. Digital technologies are a compilation of information, processing, communication and technology, undergoing fundamental transformations in business models and business processes, goods and services, and customer and other stakeholder relationships (Olszak & Ziemia, 2012; Susarla, et. al., 2012; Rai, et. al., 2012). Digital text and image content thanks to technical means and their software can be quickly shared, flawlessly duplicated and enable team-based, interactive work on them, they are available for devices constituting a repository of data, information and codified knowledge. In addition, hypertextual digital information can have many connections in the form of links enabling the actual use of this information by many independent users. This is possible when the computer is connected to the Internet using adequate software to search for specific data and information (Kowalczyk, 2017).

Digital technologies enable interactivity between companies, facilities, countries and people, expanding the context of their understanding from the level of ICT supporting management to the level of solutions that create a key resource, which is the basis of competition and the basis for building new ways of conducting business activities of a strategic nature. What distinguishes modern digital technologies from those that have been used in business so far is the availability of multi-task computers using operating systems separating functionality from hardware, the ability to use software functionality to solve specialized and complex problems without freezing capital in infrastructure-related assets, communication through ubiquitous internet connectivity, a multitude of relationship interfaces at various levels - with and without human intervention (Dasi, 2017).

According to Deloitte study conducted in 2018 robotics and automation, predictive analytics and internet of things are the technologies that have the highest potential to disrupt or create competitive advantages by the companies (Fig. 1).

Figure 1. Technologies with potential to disrupt or create competitive advantage



Source: "The 2018 MHI Annual Industry Report: Overcoming Barriers to NextGen Supply Chain Innovation", Deloitte Development LLC, 2018.

Nowadays, it is recognized that digital technologies are the main competitive factor by creating so-called digital innovations, which are a combination of knowledge and digital technology. Digital innovation is the creation of market offers, business processes or models (and the effecting changes) that result from the use of digital technologies. A feature of digital innovation is therefore that digital technologies and related digital transformation processes are an immanent part of a new idea, its development, diffusion or assimilation (Nowicka, 2019).

Due to continuous digital technologies implementation into the activities and business processes the digital transformation take place in the organizations. Digital transformation is a special type of organizational change (Sobczak, 2013). According to Day-Yang, Shou-Weii and Tzu-Chuan Chou digital transformation is such a transformation of an organization that results in the integration of digital technologies and business processes. This is to lead to the creation of a new model of functioning of a given unit, whose core will be digital technologies (Day-Yang, Shou-Wei & Tzu-Chuan Chou, 2011). Stolterman and Fors indicate that digital transformation can be understood as a change that causes digital technology to permeate all aspects of human life (Stolterman & Fors, 2004). Finally, in a report prepared by the MIT Center for Digital Business and Capgemini, digital transformation was defined as the use of digital technologies to radically improve the performance and effectiveness of an organization. According to the report's authors, the digital transformation affects three areas of the organization: the experience of the organization's customers (understanding customer needs, introducing multiple contact channels and elements of self-service), operational processes (internal processes of the organization and the working environment, as well as mechanisms for monitoring performance) and the organization's operating model (which products/services the organization provides and to which markets) (Westerman, *et al.*, 2011).

Supply Chain Competitiveness

According to M. Christopher, the supply chain is a network of organizations involved, through links with suppliers and recipients, in the implementation of various processes and activities that create value in the form of goods and services provided to consumers (Christopher, 2016). This approach is closer to business practice, where there are actually networks of relationships between partners in supply chains. These networks are demand-driven, so using the term supply chain in practice reference *de facto* to demand networks. The literature on the subject also includes the concept of the supply chain business model, according to which it was assumed that it is the way a network creates and delivers value in specific environmental conditions through available resources that enable it to take advantage of emerging opportunities (Nowicka, 2017).

Supply chain management aims to get the right product in the right way, in the right quantity and the right quality, at the right place, at the right time, and at the right cost (Mangan & Lalwani, 2016). However, the increasing complexity of the supply chain (demand network), greater demand volatility, subversive technological changes, and shortening the time make supply chain processes management increasingly difficult (Christopher & Holweg, 2017). When analysing the factors of

supply chain competitiveness, it is worth first underlying the areas that can be a reference point for decisions regarding the structure of resources or the selection of instruments to compete. It is therefore important to determine the expected effect in the selected area of competition. This, however, is in direct relation to the adopted strategy of the enterprise and the subsequent supply chain strategy. To sum up, the strategy and its goals dictate certain expected results, the achievement of which allows adequate choice of resources and instruments of competition in the selected sector, i.e. in relation to certain specific conditions.

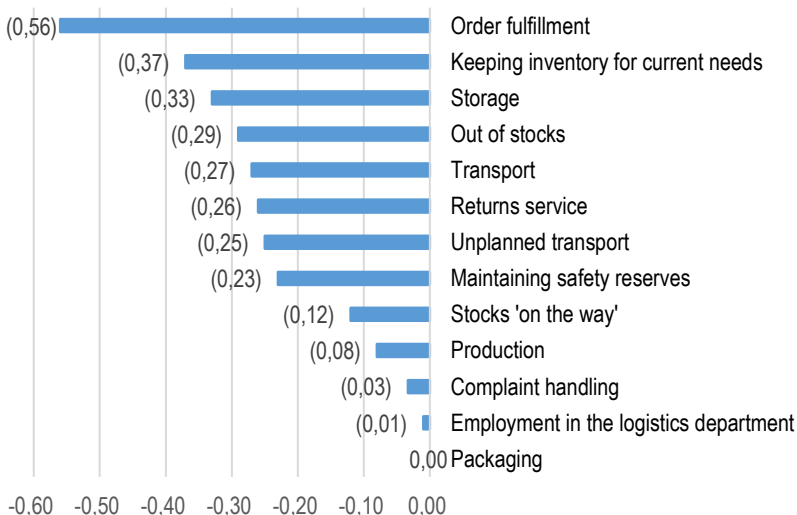
The most important determinant of achieving supply chain efficiency is the level of cost, quality and time (Szymczak, 2015) that impact the competitiveness of the supply chain. In this perspective, it is therefore worth examining digital technologies influence on particular determinant that enhances the competitiveness of the supply chains.

Digital Technologies Impact on Supply Chain Competitiveness

To diagnose the impact of digital technologies on supply chain competitiveness the quantitative empirical research was conducted in November and December 2018 using standardized questionnaire interviews (i.e. containing questions with a strictly defined order and unchanging wording, generally closed). Computer-Assisted Telephone Interviewing (CATI) methodology was used and the sample was random. The study was conducted with representatives of supply chain management. The sampling frame consisted of micro, small, medium and large enterprises (respectively: employment: up to 9 employees, 10–49, 50–249, 250+) from the manufacturing, service, production and service sectors located in the Bisnode Polska database. Contact was established with 1397 enterprises, 120 full interviews were carried out. The response rate of completed questionnaires was 8.59%. The randomization algorithm built into the telephone testing software provided an equal chance for each of the records in the database to be in the sample.

Respondents were asked how usage of digital technologies (i.e. cloud computing, blockchain, internet of things, robotics, drones, etc.) impacted on the level of costs, quality and time in supply chain activities. In general, the use of digital technologies has reduced costs in the supply chain, as evidenced by the negative values of the obtained indicators (Fig.2). The main decrease related to the costs of order processing. It was also observed that the costs of maintaining inventories for current needs, storage, handling complaints and exhaustion of inventories were statistically significantly lower compared to the costs of employment in logistics departments. Among the pre-defined types of costs, only packaging costs have not been reduced. In addition, respondents did not indicate any increase in costs resulting from the use of digital technologies in the area of supply chain management (Nowicka, 2019a).

Figure 2. Digital technologies impact on the supply chain costs (median)

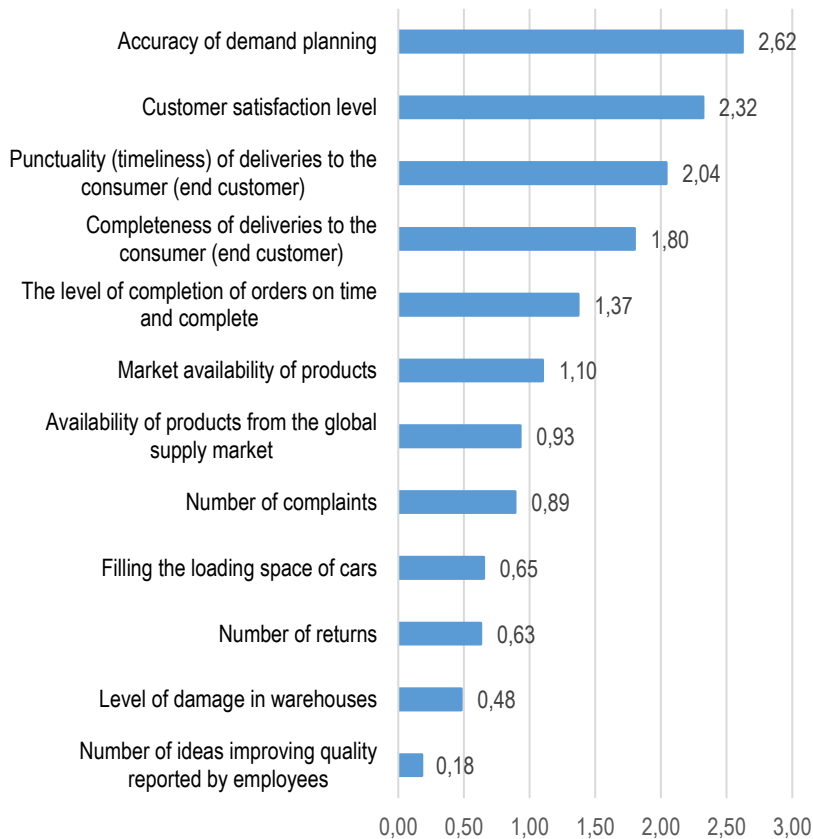


scale 5–0, where: 1 - costs increase; 0 - no impact; -1 - cost decrease

Source: own elaboration.

Next, comparative analyses of the impact of digital technology application indicators on quality in supply chain management were made. In general, according to research participants, digital technologies affect the accuracy of demand planning, customer satisfaction and punctuality of customer deliveries. However, this impact is minor. The role of digital technologies in the context of management quality in the area of completeness of deliveries to customers, punctuality of deliveries, level of customer satisfaction and accuracy of demand planning was statistically significantly higher in comparison to the level of damage, loading space filling, number of returns, global product availability, number of complaints, product availability and level of order completion on time. Areas mostly impacted by digital technologies implementation in terms of quality are presented on Fig. 3.

Figure 3. Digital technologies impact on quality (average)



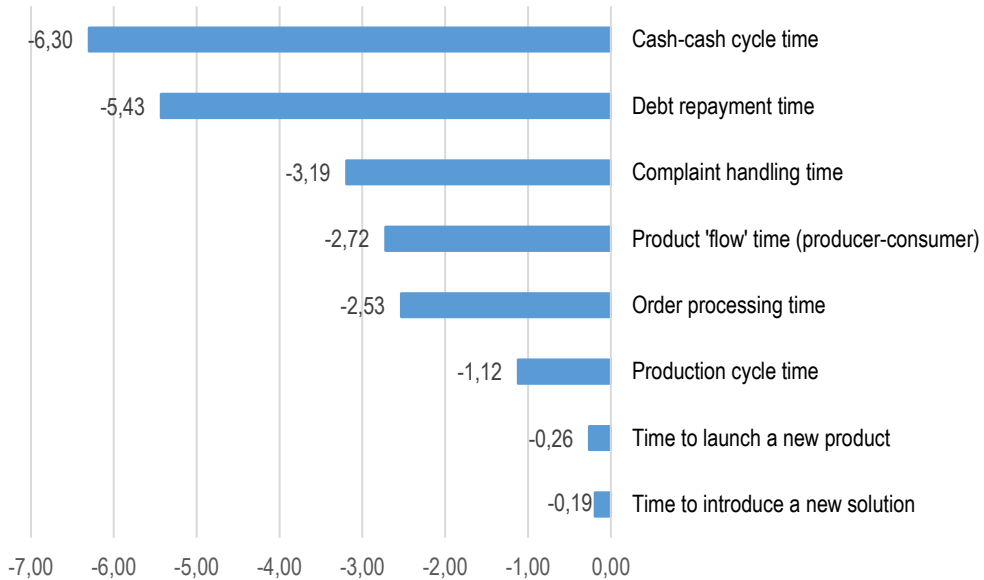
scale 5–0, where: 5 - very high growth, 4 - high growth, 3 - significant growth, 2 - slight growth, 1 - no change, 0 - decrease

Source: own elaboration.

The last researched area in this part concerned the impact of digital technologies on the duration of activities in supply chains. The indicators of the level of this impact obtained on the basis of the study carried out in all the analysed areas indicated a decrease in that time. The use of digital technologies has changed, above all, the time of the cash - cash cycle, in which the average number dropped by about 6.3 days. The second area in which the largest changes were noted was the time of repayment of liabilities, which according to respondents was reduced by an average of about 5.4 days. The third area of changes was the complaint handling time, which saw an average decrease of about 3.2 days. A slight increase in

time was recorded in the implementation of activities related to the introduction of a new solution and a new product on the market (Fig. 4).

Figure 4. Digital technologies impact on time (number of days; median)



Source: own elaboration.

Analysing the importance of digital technologies for improving the efficiency of the supply chain, it should be noted that they play the most important role in reducing costs and shortening time of the duration of activities. It is worth emphasizing that these are the main areas of competition in supply chains. However, it is also important to note that the use of digital technologies has not shown a significant role in improving quality in supply chain management. This concerns the currently key aspect of the quality of customer service indicated additionally as the most important strategic goal of supply chain management in the medium term (until 3 years). In addition, according to managers, customer needs are the main stimulus for technology implementation in supply chain management (Nowicka, 2019a).

Therefore there is a need to pay more attention on how digital technologies might improve quality of activities to enhance customers experience in terms of their satisfaction and loyalty improvement.

5. Supply Chain Digital Transformation Driven by Customer Experience

While costs and time are relatively simple to measure, the quality of supply chain management can be understood in many ways. It is worth noting that the quality in supply chain management is influenced both by activities undertaken in the area of customer service, i.e. completeness, punctuality of deliveries, and the level of customer satisfaction, as well as the quality of activities not in direct relationship and contact with the customer, i.e. related to internal efficiency organizations (Hugos, 2011) that indirectly influence these effects. These include, for example, accuracy in demand planning, product availability, level of damage in warehouses, etc. Both these groups can be compared to sets of actions with market effects and economic effects that interact with each other and, as a consequence, constitute the entire set of actions determining the quality of supply chain management.

However those activities might still be not enough in terms of accuracy in meeting customers' needs. Therefore the specific so called "track and tracing" of customers "journey" during their relation with the whole supply chain seems to be needed. To gain in value from having such an information some digital technologies might be expected to implement in particular

processes of the supply chain management. First of all it should be clarified that customer experience can be defined as customers' perceptions – both conscious and subconscious – of their relationship with brand resulting from all their interactions with brand during the customer life cycle (www.sas.com/en_us/insights/marketing/customer-experience-management.html). But customers' journey and the experience from that "journey" seems to be more important since it covers experience from many stages of the process of order fulfilment and enables supply chain personalization for particular customer (Nowicka, 2019b).

According to Deloitte analysis, marketers will not "be seating behind the wheel" anymore but the customer. And therefore, during the next 18 to 24 months, we should expect more companies to launch their own *beyond marketing* journeys. Organizations are exploring opportunities to integrate different parties' data, cognitive analytics, machine learning, and real-time/right-time touchpoint delivery into their data management stacks. The experience creation process is a dynamic feedback loop that turns interactions into insights. This interaction is based on digital technology and covers the following steps of customer experience creation (Briggs & Buchholz, 2019):

Marketers develop strategies and metrics for improving customer experience and work with IT to set up technical enablers.

The customer interacts with brand across various channels (Web, mobile apps, social media, store, call centre, etc.).

Customer interactions are transformed into data and tied to a unique customer ID through data ingestion, integration and hygiene processes.

Marketers and IT build self-learning model that predict outputs by analysing historical data.

The models determine which content, offers and interactions resonate most with consumers at specific times.

The system decides which action to take and delivers the experience.

The system analyses customer responses to improve the next experience, and marketers use augmented intelligence to optimize strategy.

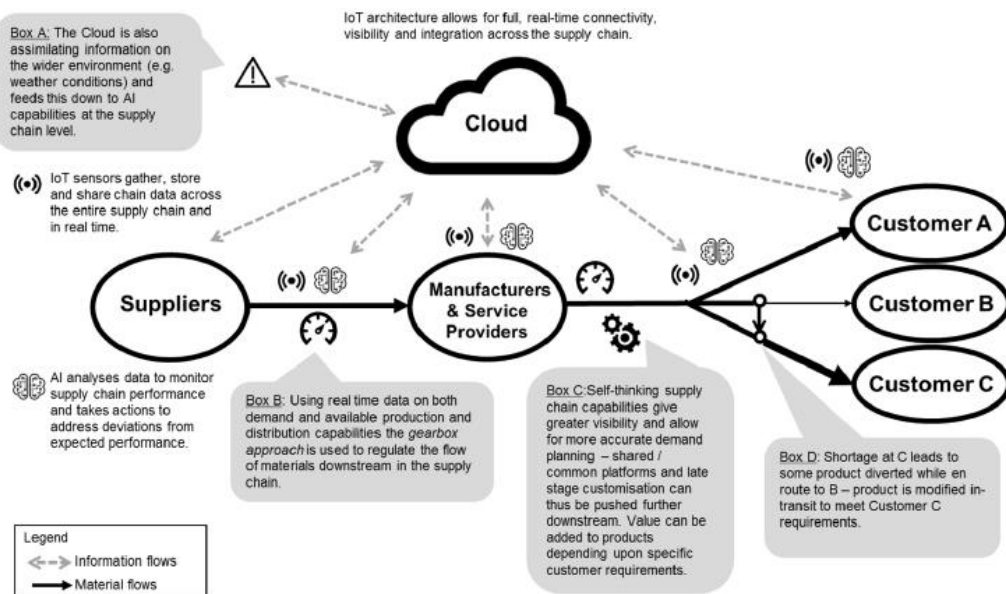
Based on the above steps the best in class customer experience can be recognized that is characterised by real-time dynamic, outcome orientation, data-driven processing, across channels development and customization based on customers' needs (Briggs & Buchholz, 2019).

However it must be underlined that today's technology features make customers being able i.e. to identify and track place of production, stock level for particular SKU (stock keeping unit) in different localizations, time and speed of delivery, compare the results between different competitors and share their opinions with other customers and non-customers online in real time. Thus digital technologies are a tool, which is changing the level of customers' expectations and at the same time it is the strongest accelerator for improving customers' service within whole supply chain activities. This is also the reason why marketing activities leading to build best in class customer experience seem to be not enough when seeking competitive advantages through the use of digital technologies or innovations driven by them.

In reply to new customers' demand and power, supply chains are developing in the direction of the digital supply chains. The digital supply chain is a new supply chain business model based on the properties of digital technologies that aims to deliver higher values than before (Nowicka, 2019a). Digital supply chain results from digital transformation that can be understood as a transformation of the supply chain business model that provides new value based on digital technologies in order to reach higher efficiency as part of achieving the strategic goals set for supply chains (Nowicka, 2019a).

The concept of digital supply chains changes the current way of organizing flows - by reconfiguring them - and adds value to them in a diverse way. New supply chain business models are emerging, and the quality of implemented processes is significantly improved, additionally costs and risks associated with supply chain management are reduced (Chui, *et. al.*, 2010), as well as the problem of trade-off choices ("The 2017 MHI Annual Industry Report. Next-Generation Supply Chains: Digital, On-Demand and Always-On", 2017). One of the example of digital supply chain can be the self-thinking supply chain developed by Calatayud, Mangan and Christopher (Fig. 5). This supply chain is based on IoT, AI and cloud computing. Increased connectivity amongst supply chain partners enabled by IoT, together with AI, allows i.e. for more accurate demand forecasting, predictive maintenance and continuous optimization (Calatayud, *et. al.*, 2018). Those factors impact directly on supply chain costs, but also on time and quality delivered.

Figure 5. The self-thinking supply chain



Source: Galatayud, A., Mangan, J., & Christopher, M., (2018), "The self-thinking supply chain", Supply Chain Management, An International Journal, p. 10.

It must be underlined, that the digital supply chain is described in terms of digital technologies usage from the perspective of the company (or the supply chain integrator). And today – as already mentioned – this is a customer who plays central role in the supply chain management. At the same time it is worth noting that "customer journey" term addresses the processual and experiential aspects of service processes as seen from the customer's viewpoint (Følstad & Kvale, 2018). Additionally, Kankainen et al. (2012) view the customer journey perspective as a means to "describe the process of experiencing service" (p. 221). This perspective underlines the role of customer as a decision maker of supply chain configuration and the need for its reconfiguration based on customers' perspective especially in light of customer journey, which is also described as the repeated interactions between a service provider and the customer (Meroni & Sangiorgi, 2011).

Therefore, having in mind the wide usage of digital technologies by customers and the concept of digital supply chain, it is worth to analyse interaction between the customer and the supply chain during the customer's journey with the support of digital technologies or even designing supply chain on-demand. In this approach this is a customer who decides on supply chain digital transformation being an initiator of the new business model development. Hence for the supply chains which are customers centric and see potential of competitive advantage improvement by digital innovation implementation **the supply chain digital transformation can be understood as transformation of the supply chain business model that is driven by customers journey experience and provides new value based on digital technologies in order to achieve higher efficiency and competitiveness.**

The concept of supply chain digital transformation driven by the customer concentrates on improving value on a different stages on customers' journey map. Therefore first step is to analyse customers' behaviour and expectations and build the map describing how customer might interact along the supply chain process. Those might concern activities starting from i.e. product's design, selection of raw materials used for the production, deciding on production localization, type of transport means used on different levels of the supply chain, etc. All of those decisions might be taken in relation to costs and time and impact on sustainable development.

Developing the concept of supply chain digital transformation driven by the customers extends the current view on the scope of customer service provided by the supply chains today. It enables involving customers on very early stage of supply chain flows and decide not only on the "last mile" of the supply chain but also on other activities (i.e. "first mile") impacting on whole process of order fulfilment and its design. However this concept could only be developed when digital technologies are implemented within supply chain – which means involvement of many companies is supply chain digital transformation – and the customer wants to engage (interact) in the development of the quality of his/her customer journey experienced during the relation with the particular supply chain process.

6. Conclusions

Today supply chains starting to be more and more digitalised and are undergoing the digital transformation. Digital technologies that are impacting on digital innovation might clearly improve supply chain competitiveness in terms of time, costs and service quality. This competitiveness is developed in light of improving customers' satisfaction and experience. However, it is worth to pay attention on supply chain digital transformation in the perspective of customers view. This means that this is a customer how might decide not only on where to pick up his order, but also on how and where it is produced. This solution, namely – supply chain digital transformation driven by the customer – enables companies to design whole supply chain in the way that meets all the customers' needs and to accomplish the customers' centric supply chain goals.

Engaging customers on very early stage of supply chain configuration might be difficult and costly for most of the companies and their supply chain organization. Therefore to gain in value and improve competitiveness the digital supply chain that is already implemented in the organization would be the most adequate environment since it is characterised by flexibility, adaptability and quick response to the market.

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