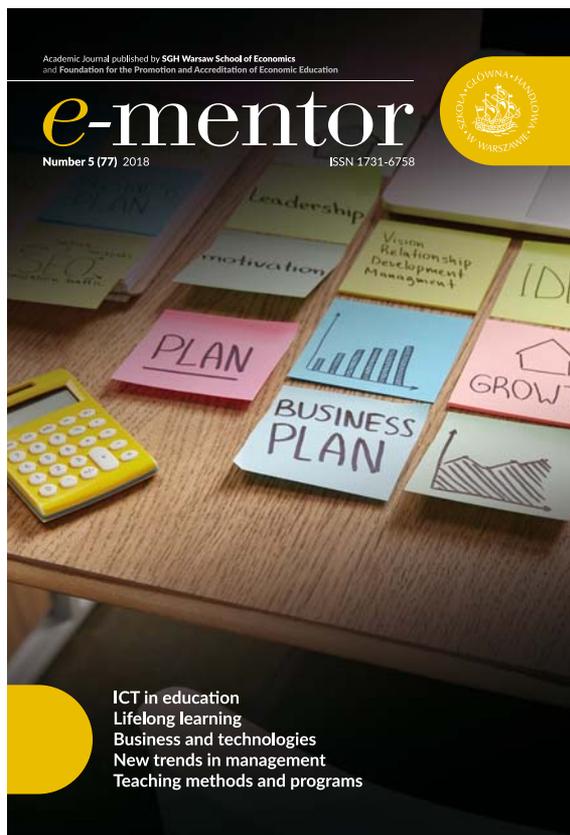


# e-mentor

DWUMIESIĘCZNIK SZKOŁY GŁÓWNEJ HANDLOWEJ W WARSZAWIE  
WSPÓŁWYDAWCA: FUNDACJA PROMOCJI I AKREDYTACJ KIERUNKÓW EKONOMICZNYCH

2018, nr 5 (77)



Marzenna Cichosz, *Digitalization and Competitiveness in the Logistics Service Industry*,  
“e-mentor” 2018, No 5(77), pp. 73–82, <http://dx.doi.org/10.15219/em77.1392>.



# Digitalization and Competitiveness in the Logistics Service Industry

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*The second decade of the 21st century is best characterized by the term 'the digital age.' Intensive (exponentially growing) technological progress has become part of business for producers, their suppliers, consumers, and also logistics service providers. Consultants specializing in the field of supply chain and logistics (e.g., A.T. Kearney & WHU, 2015; PwC, 2016; Langley et al., 2017) emphasize that modern transport and logistics cannot do without technology. Sensors, robots, automation, cloud computing, data analysis, 3D printing, autonomous vehicles, artificial intelligence, digital twins or blockchain technology on the one hand enable, on the other, trigger changes in supply chains and logistics, and thus also affect the logistics services industry.*

## Introduction

While analyzing technological changes in the environment and their impact on the innovativeness of enterprises in the logistics service industry, it is worth paying attention to two issues. Firstly, logistics service providers (LSPs) in response to emerging intelligent factories and Industry 4.0, using technological and process innovations, must shift logistics to a higher level of integration and efficiency of logistics processes – Logistics 4.0 (Paprocki, 2016). Secondly, the balance of power in the logistics service industry is changing. The new technological players with their innovative business models are joining in the competition for customers. These processes constitute a threat that can destroy the industry or can be treated as an opportunity to strengthen the innovativeness of the industry and its participants. In connection with the above, the following research questions arise:

- RQ1:** How does digital technology change the balance of power in the logistics service industry?
- RQ2:** How does digital technology influence the business models of logistics service providers?
- RQ3:** Are the changes that we are observing a *digital destruction* (like Schumpeter's creative destruction) or maybe a *digital transformation* that LSPs are faced with in order to avoid creative destruction?

This article responds to the request reported by Rutkowski (2011) regarding the consequences of the

growing role of advanced technologies and automation (one of the six global megatrends indicated by the author) in supply chain management and logistics. This article aims to show the changes that take place in the market of logistics services as a result of the development of digital technologies and the emergence of new players and analyze the consequences they bring for business models of LSPs. It is also important to present examples of actions taken by leaders in the fight against technology not becoming the cause of the digital disruption of enterprises and maybe even the entire logistics industry in the way that we know it. The theoretical framework of the analysis is Porter's 5 forces model, which was applied to research conducted in the area of innovation and technology in logistics. The work was based on the analysis of secondary materials, i.e., innovative logistics solutions, reports of research agencies and consulting companies, as well as literature studies. The deduction method was used.

The structure of the article is as follows. The first part discusses the issue of digitization and key technological trends in the supply chain and logistics. Next, the methodology of the study is presented, allowing for the analysis of competitive forces occurring in the logistics service industry in the face of technological changes. At the next stage, the author started a discussion on the impact of technological innovations on operations, business models and the strategy of LSPs, presenting examples of their hybrid business models. The conclusion presents potential directions of future research.

## Digitalization of the supply chain and logistics

Digitalization is a reflection of an object or analog activity in binary form (Gartner IT Glossary). The European Commission describes digital transformation as the process of combining advanced technologies with the integration of physical and digital systems. The process is dominated by innovative business models and new processes, as well as the creation of intelligent products and services (EC, 2016).

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Brynjolfsson and McAfee (2015, p. 19) appraise that (...) *digital technologies can now become just as important to society and the economy as the steam engine once*. We are dealing with the fourth industrial revolution in which two and a half billion final users are connected to the internet thanks to mobile technology (Statista, 2018). That means they can transmit in real time information about their needs and wants upward the supply chain where machines and devices connected by the Internet of Things (IoT) use them to organize procurement and production processes. Moreover, thanks to advanced analytics and artificial intelligence systems can improve themselves. Such factory, referred to as intelligent, is the basis for the concept of Industry 4.0 (Szozda, 2017). The primary goal of Industry 4.0 is the radical transformation of traditional production processes into intelligent processes managed by self-controlling mechanisms. As Paprocki (2016, p. 187) observes: *Logistics 4.0 is needed as a reaction to Industry 4.0 development*. It focuses on the integration of logistics process participants (i.e., primarily manufacturers, LSPs and infrastructure operators) to flexibly respond to customers' demand.

According to the World Economic Forum (2016, p. 4), digitization in logistics can grow up to 1.5 trillion USD in value by 2025. The innovation and adaptation of advanced technologies is key to the process of

digitalizing the supply chain<sup>1</sup> and logistics<sup>2</sup>. The list of technologies used in the management of physical flows in supply chains is the subject of many studies (e.g., A.T. Kearney & WHU, 2016; PwC, 2016; Langley et al., 2017; DP DHL, 2018; Gartner, 2018). Table 1 presents the results of an analysis carried out by the Innovation Center of one of the LSPs. The results are divided into two groups depending on the estimated time of their adoption. Technologies that will be used in logistics and supply chain management in the next five years belong to the first group and those that will be used in perspective longer than five years to the second.

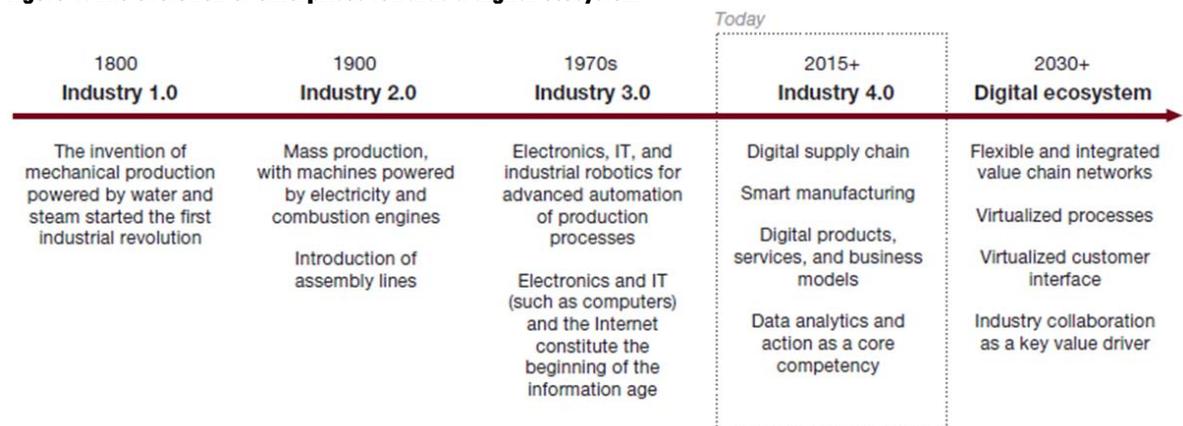
The technologies listed in Table 1 are applied in logistics and supply chain management in order to serve: material flows in the physical world (i.e., within supply 4.0, production, intelligent warehouses, spare parts' management, distribution to final consumers (B2C), autonomous logistics and transport) and to improve processes in the virtual world (i.e., integrated planning, analytics or ensuring the visibility of cargo throughout the supply chain) (PwC, 2016). This cyber-physical duality is the basis of Industry 4.0 (e.g., Paprocki, 2016; Pfohl et al., 2017; Szozda, 2017). It is increasingly emphasized that technological changes taking place in enterprises and their surroundings are a step towards the digital ecosystem (Figure 1),

**Table 1. Technological trends according to DP DHL Logistics Trend Radar (2018)**

	Relevant in < 5 years	Relevant in > 5 years
Technological trends presented according to its importance for logistics service industry from the most important (potentially disruptive) to incremental improvements	<ul style="list-style-type: none"> <li>• Robotics &amp; Automation</li> <li>• Internet of Things</li> <li>• Cloud Logistics</li> <li>• Big Data Analytics</li> <li>• Augmented Reality</li> <li>• Low-Cost Sensor Solutions</li> </ul>	<ul style="list-style-type: none"> <li>• Self-Driving Vehicles</li> <li>• Artificial Intelligence</li> <li>• 3D Printing</li> <li>• Unmanned Aerial Vehicles</li> <li>• Blockchain</li> <li>• Next-Generation Wireless</li> <li>• Bionic Enhancement</li> <li>• Virtual Reality &amp; Digital Twins</li> </ul>

Source: DP DHL *Logistics Trend Radar* (2018) and Paprocki (2018).

**Figure 1. The evolution of enterprises towards a digital ecosystem**



Source: PwC (2016). *Industry 4.0. How digitalization makes the supply chain more efficient, agile, and more customer-focused*.

<sup>1</sup> Here: the collaboration among business network partners to provide value to final consumers.

<sup>2</sup> Here: the management of goods and information flows.

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in which physical operations will have their mapping in the digital world and collaboration between participants of distributed networks will be a key value creator. Companies operating in the logistics services industry must find their footing in that reality.

## Research method

It is a conceptual paper based on the desk research method (Figure 2). The first step of the research was carried out within the 'Logistics Innovations' project launched by the author for students of Logistics class as part of the master studies at SGH Warsaw School of Economics in 2018. It aimed at screening the market and collecting technological innovations in logistics. Throughout the semester, students investigated the internet and published posts referring to press releases, infographics, presentations and videos regarding logistics innovations. They reported their findings in four areas: transport management, warehousing, inventory management and others. Students were asked to apply Design Thinking approach and present each solution from the perspective of the problem addressed by it. As a result, a database of 43 innovative logistics practices was created. These included both solutions that improve operational efficiency within existing business models and innovative business models themselves. The collected examples serve as an illustration in this paper.<sup>3</sup>

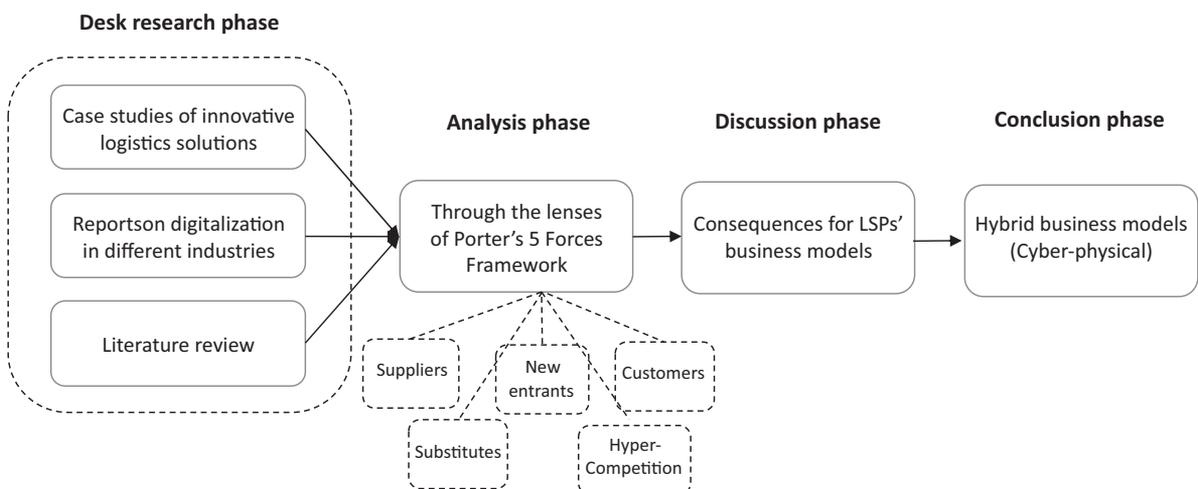
The second stage of the desk research was devoted to the analysis of the reports of research agencies and consulting companies regarding technology, digital transformation and innovations in logistics and supply chain management. That included A.T.

Kearney & WHU (2016), PwC (2016), Langley et al. (2017), DHL (2018), and Gartner (2018) reports. The research allowed for the identification of both technological trends in logistics and supply chain management and the level of their implementation in the logistics services industry.

The last stage of the desk research was literature review. The Scopus database was searched using the following keywords: 'digital transformation' AND 'business model' AND 'logistics.' Phrases were searched for in the title of the article, its abstract, and the keywords. Twelve publications from the database fulfilled those criterias. Then, the search was narrowed to 'Business, Management and Accounting' subject with seven publications identified. Based on their abstracts, the author selected papers for the analysis. The list of papers has been extended by selected items written in Polish referring to the logistics service industry as well as to innovations and technology in supply chain management and logistics available in BazEkon.

The author applied Porter's 5 forces model as the framework for the analysis of changes taking place in the logistics service industry and their impact on LSPs' business models. Next, the deduction method was used to discuss how technological changes affect business models in the logistics services industry. That resulted in indicating, on the one hand, the existing threats and on the other, the main characteristics of an innovative business model that has become a kind of 'must have' for the industry. The solutions based on hybrid models combining 'the old' with 'the new' are presented in the form of mini case studies.

Figure 2. Research method model



Source: author's own study.

<sup>1</sup> Here: the collaboration among business network partners to provide value to final consumers.

<sup>2</sup> Here: the management of goods and information flows.

## The analysis of competitive forces in the logistics services industry in the era of digitalization

### Industry and business models of logistics service providers

The logistics services industry can be defined as a group of enterprises that organizes processes of goods and information's flow on behalf of other market players (Kawa, 2017). These companies provide services related to transport and logistics referred later in the text as T&L. Both in Poland and around the world, the logistics service industry is internally very diverse and fragmented. There are several dozens of big players in Poland, which in total generate about 5% of turnover (Zysińska, 2013) what results in fact that innovations and technological changes are not common. Moreover, the industry is very diversified in terms of services provided. One can distinguish: transport and forwarding trade companies, logistics service providers (LSPs), couriers, express and parcel operators (CEP), postal operators, railway operators, air operators, maritime ship owners, inland navigation companies and terminal operators.

Delfmann and Albers (2002) divided logistics players into three groups depending on the range of services they offer. The first group includes suppliers of standard, logistics-critical services, for example transport and storage (2PL, second-party logistics). The second group consists of entities offering service packages, i.e. standard services combined with value-added services (for example, packaging, labeling, fulfillment), prepared on the customer's request (3PL, third-party logistics). The third group of entities is operators who offer comprehensive tailored logistics solutions. That includes 4PL (fourth-party logistics) operators who combine the resources, skills, and technology of their organization and other companies to design a complete solution for the entire supply chain on supply and distribution sides as well (Hanus et al., 2010).

The range of services offered by LSPs differs not only in terms of the subject but also in the geographical scope of activity. There may be services provided locally (mostly within the city), nationally, internationally and on a global basis (Cichosz and Pluta-Zaremba, 2013). As a consequence, LSPs have

different approaches to creating value for customers and capturing it from them, which translates into various business models<sup>4</sup> used in the industry (Płaczek, 2012). Prockl et al. (2012) claim that two generic models exist: a 'service factory' focused on improving the efficiency of processes through their standardization and 'lernstatt,' the learning organization model oriented on relationships and interaction with the customer.

### Porter's 5 forces model

The Porter's 5 forces model (Porter, 2008) was used to analyze competitive forces affecting the logistics service industry. The analysis was carried out through the prism of changes related to technological innovations and startups that appear in the industry, i.e., on the suppliers and customers' side (vertical competition) and as a result of the threat of new entrances and the appearance of substitutes (horizontal competition) (Figure 3). These forces increase the intensity of competition within the industry, which is referred to as hyper-competition (Cichosz, 2018).

### New entrants

As noted by Porter (2008, p. 8) *new players entering the industry bring new potential and a great will to fight for market share, which is reflected in the prices, costs and level of investment necessary to compete*. In order to survive, they must overcome entry barriers and be ready to face the opposition of already existing players and the consequences of their unwilling welcome. The exponential growth of technology and technological solutions observed in the logistics means that we are not talking about the threat of appearing new entrants, but about new entrants themselves and the risk, they pose to the industry. The list of new entrants to the logistics industry includes following:

- technology companies operating in the retail industry, for example Amazon and Alibaba; previously, they were customers of LSPs, nowadays they invest in logistics; at first, in warehouses and modern technology-supported warehouse management systems, next in leasing means of transport (including airplanes),<sup>5</sup> development of new methods of transport and delivery such as the use of drones (Amazon Prime).<sup>6</sup> In this way, technology companies obtain new competences that make them the competitors of LSPs;

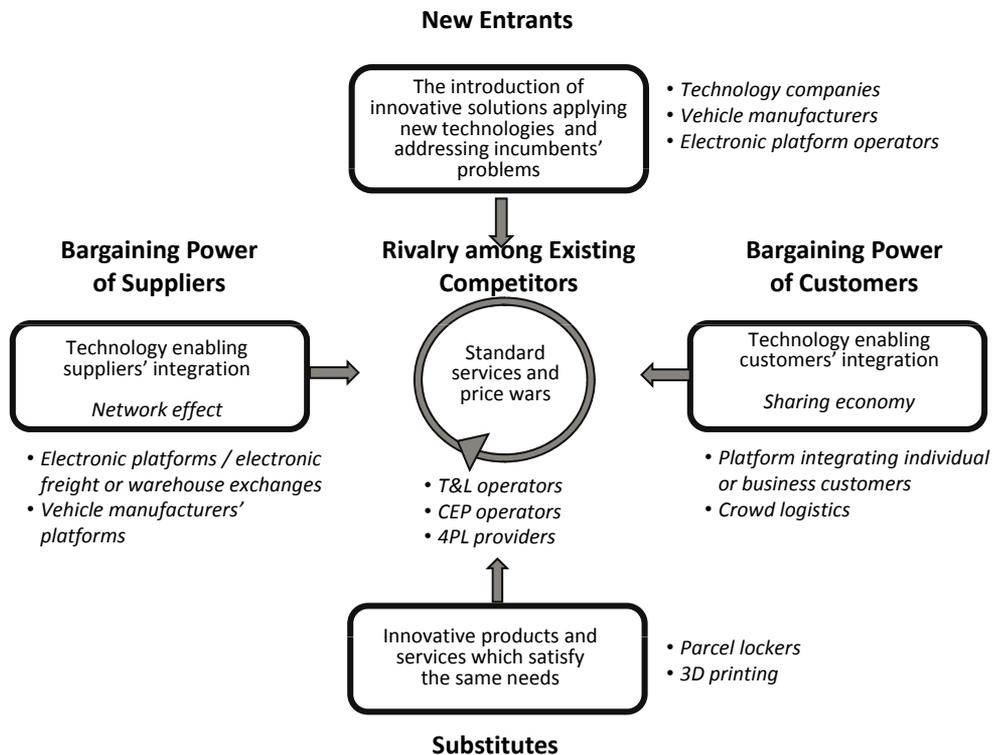
<sup>4</sup> The business model describes how the organization creates value for a customer, at the same time capturing profits from its operations (Osterwalder and Pigneur, 2012). Gołębiowski and others (2008) emphasize that the business model is a tool that presents the logic of the enterprise's operations. It includes a description of the value offered by the company to a group or groups of customers along with the definition of primary resources, processes (actions) and external relations of this company, which may be used to create, capture and deliver value and to ensure the company's competitiveness in a given field. In line with this goes the approach of Nogalski (2009, p. 45), where he points out that *the business model formulates the framework of business logic and its features such as innovation and competitiveness*.

<sup>5</sup> <http://time.com/4440542/amazon-one-airplane-fedex-ups/>

<sup>6</sup> <https://www.amazon.com/Amazon-Prime-Air/b?ie=UTF8&node=8037720011>

# Digitalization and Competitiveness in the Logistics Service...

**Figure 3. Competitive forces in the logistics services industry in the era of digitalization**



Source: author's own study.

- vehicle manufacturers who invest in a car fleet, and then make them available to enterprises or individuals in the *sharing economy* model, for example Daimler offering various types of CAR2SHARE services, including VAN2SHARE<sup>7</sup> (Paprocki, 2016); or vehicle manufacturers working on a car model, which may be the base station (mobile point of collection/delivery of the package) for drones – a service developed by Daimler as part of the Matternet project;<sup>8</sup> and work on an autonomous vehicles for parcel deliveries made by Ford Motor Co.;<sup>9</sup>
- electronic platform operators, offering logistics services in the *crowd logistics* model, i.e., combining the supply of free space in cars with the customers' demand for transport services on a given route; this is primarily about the space in private vehicles and transport in the C2C – consumer-to-consumer or C2B – consumer-to-business model. PiggyBee<sup>10</sup> (parcel transport service in the C2C model) and Stowga<sup>11</sup> (rental of free storage space both in private garages in

the C2C model and professional warehouses in the B2B model<sup>12</sup>) are the examples of such services; virtual platform operators are newcomers who strengthen the position of suppliers and sometimes also the individual customers.

### Growing bargaining power of suppliers

This advantage stems mainly from the fact that thanks to technology, both suppliers and customers can combine their forces and influence the logistics service industry. That happens, through the use of platforms (Witkowski, 2018), such as electronic freight and warehousing exchange markets (Kawa, 2014). The more suppliers or customers operate within the platform, the stronger is its impact (in economics this is called *'the network effect'*). The advantage of using the exchange platform is the direct contact of the customer and the carrier, which speeds up the process and reduces its costs. Very often, platforms offer services that add value to the transport process, such as cargo tracking services. Examples of electronic freight exchanges that change the logistics service industry

<sup>7</sup> <https://van2share.net/en/>

<sup>8</sup> In June 2018 Boeing has invested in Matternet: <https://mtrr.net/>

<sup>9</sup> <https://www.bloomberg.com/news/articles/2018-01-30/nuro-has-built-a-robot-van-to-deliver-your-stuff>

<sup>10</sup> <https://www.piggybee.com/en/>

<sup>11</sup> <https://www.stowga.com/>

<sup>12</sup> It should be noticed that sometimes there are doubts whether professional warehouses offering their free space to other business clients can still be considered as the 'crowd'.

can be: Teleroute<sup>13</sup> (the first European platform), TimoCom<sup>14</sup> (an exchange operating in 44 countries), Trans.eu<sup>15</sup> (the Polish exchange that is transforming into a platform) or Cargonexx.<sup>16</sup> The latter electronic freight decided to use artificial intelligence (AI) to determine the market price of cargo transport, which is offered to the customer before the carrier, ready to offer the given road transport, is chosen. Registered freight forwarders enter orders into the Cargonexx platform and automatically receive a price proposal within a maximum of two minutes. When they confirm it, Cargonexx which describes itself as a responsible forwarding partner takes over the request. Registered carriers are then automatically informed about available orders and can accept them with one click. That allows for a much faster conclusion and execution of transactions than in the traditional freight exchange model. That is the way how Cargonexx redefines the value for both the customer and the carrier.

The suppliers' platforms are also built on the platforms of vehicle manufacturers (for example, Daimler, Volkswagen). Thanks to the systems embedded in cars, manufacturers can collect and analyze vast amounts of data which they can use to develop comprehensive solutions for logistics and supply chain management.

### Growing bargaining power of customers

The platforms described above could also build bargaining power of customers. They allow one to share free transport or warehouse capacity. uShip is an example for transport services,<sup>17</sup> Stowga for storage services.<sup>18</sup> Platforms could integrate even final consumers. This is coined the crowd logistics. The 'last mile' service delivered within the crowd logistics is offered, for example, by Deliv<sup>19</sup> (analysis of the solution presented by Castillo et al. 2017) or Amazon Flex.<sup>20</sup> Reduced number of trips in the city and a faster response to the demand reported by e-consumers should be mentioned among the key benefits.

### Substitutes

A substitute is a product or service that meets the same need. Thanks to technology and human creativity, new solutions appear that successfully replace traditional logistics services. An example of a substitute for delivery or collection of service to or from a consumer as part of e-commerce logistics are deliveries to parcel lockers set in public places – most often at railway or bus stations, petrol stations, shopping centers or university campuses. This solu-

tion eliminates the problems of customer availability in the area of delivery (home or work) and relatively narrow delivery time slots resulting from courier working hours. At the same time, it enabled reducing delivery costs since the courier does not have to visit each customer individually. In the Polish market, the concept of parcel lockers was popularized by InPost<sup>21</sup> which at the end of September 2018 had over 3,000 parcel lockers in 428 cities in Poland.

Another example of a substitute for logistics services is 3D printing (in other words additive manufacturing or incremental production), i.e., a set of technologies allowing for combining materials (e.g., plastic or metal) to produce physical three-dimensional objects based on their computer model. The use of 3D printing changes the configuration of supply chains and allows for massive customization (Rutkowski and Ocicka, 2017). From the LSPs perspective, 3D printing changes the approach primarily to managing slowly-rotating stocks, such as spare parts. Companies do not have to maintain them in regional distribution centers and transport them to the customer when there is a demand for them, but spare parts can be produced on the spot at the time, and in the place, they are needed. It causes a drop in the demand for warehouse space and storage services, but also for transport. In the case of 3D printing, the carrier is mainly used to deliver the right raw materials to the right place of production. However, it should be emphasized that at the current stage of development in 3D printing, only selected niche spare parts or a small series of customized products can be produced this way. On the other hand, as additive manufacturing technology is constantly improving, and the model of its use is refining, this solution could pose a threat to the logistics services industry in the future.

### Increasing rivalry among existing competitors in the logistics services industry

It is getting very crowded in the logistics services industry. We observed the first wave of the competitive struggle at the beginning of the 21<sup>st</sup> century, when T&L and CEP operators began to expand their service packages. As a consequence, the areas of activity of individual operators began to penetrate each other, and in many cases also overlap (Cichosz and Pluta-Zarembo, 2013, p. 90). The second wave of competitive struggle took place in the second decade of the 21<sup>st</sup> century with the emergence of technological startups, which, thanks to an innovative approach to the provision of logistics services, are able to offer customers

<sup>13</sup> <https://teleroute.com/pl-pl/>

<sup>14</sup> <https://www.timocom.pl/>

<sup>15</sup> <https://www.trans.eu/en/>

<sup>16</sup> <https://www.cargonexx.de/pl>

<sup>17</sup> <https://www.uship.com/>

<sup>18</sup> <https://www.stowga.com/>

<sup>19</sup> <https://www.deliv.co/>

<sup>20</sup> <https://flex.amazon.com/>

<sup>21</sup> <https://www.inpost.pl>

an extra value i.e. higher quality at a lower price. The situation is very difficult for incumbents. Their margins are at the level of several percent which do not allow for large investments in technologies. The lack of investment in technology limits the improvement of operational efficiency and an innovative customer experience. Therefore, the critical issue for incumbents is to respond to the changes so that the technology that enters the industry does not have the character of digital disruption which is the equivalent of Schumpeter's *creative destruction*, the process responsible for the demise of organizations, industries or even entire economies that could not adapt to the changes taking place. The situation also raises the issue how to use technology as an activator of changes and development in logistics operators, their strategies and business models what will be the subject of analysis in a further part of the study.

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## Discussion on the digitalization of business models in the logistics services industry

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### Threats to current models of logistics service providers

The analysis of the areas where innovative new players in the logistics service industry are particularly active leads to the conclusion that most endangered are LSPs offering simple, standard services in the 'service factory' model. Their offer can easily be replaced by an innovative offer from technology players. The storage and transport services for e-commerce are a good example of such actions. It is one of the most dynamically developing segments of the logistics market (about a 20% increase each year) where the majority of innovations appears. Examples are robots for handling warehouse picking process, autonomous vehicles for city deliveries, drones for delivering packages in hard-to-reach places, parcel lockers, including mobile ones. In many cases, the solutions offered by innovators refer to the problems that exist in traditional models and are associated, for example, with the improvement of operational efficiency or deliveries completed as part of the 'last mile.' If innovators offer the customers greater value (i.e., higher quality at a lower price), they can grow at the expense of the traditional services market. Moreover, the ease of scalability of an innovative business model can lead, in the long term, to the domination of innovators in a given market segment.

Development of electronic platforms may also place at a risk services related to the coordination

of logistics activities (for example, services offered by 4PL providers). Their business model is based on the ability to connect partners' resources and offer a comprehensive service. This competence is more and more often taken over by platforms. Access to a more extensive network of LSPs or the use of big data analytics constitutes the competitive advantage of innovative solutions of online platforms, electronic exchanges, and shared service platforms. The downside here is the relatively low level of trust that customers have for service providers available through those platforms. Therefore, virtual platform operators are mainly used to handle spot transactions.<sup>22</sup> However, one should keep in mind that the efforts to effectively certify platform participants and increase the level of trust in them are underway and therefore such services may soon become a significant threat in the contract services segment as well (Witkowski, 2018).

Also, the LSPs applying the *lernstatt* model can constitute a threat. Thanks to the use of analytics of big data sets (as in the case of platform operators) and machine learning, it becomes possible to predict the future with an accuracy of up to 95%<sup>23</sup> which allows digital players to reach customers with a proactive offer and increase the level of satisfaction within the customer experience.

### Hybrid business models in the logistics service industry

The analysis of activities undertaken by big players from the logistics service industry leads to the conclusion that the leaders of the CEP and T&L markets quite quickly noticed that changes caused by new technology and startups need their action. The leaders decided to maintain their existing business while expanding into new digital business models, i.e., the old, proven business models were in most cases supplemented with innovative business models<sup>24</sup>, and so-called hybrid business models were built.

On the market, we observe a twofold approach to creating innovative models within hybrid business models. On the one hand, big players like DP DHL launch Innovation Centers and build their own technology startups, such as Saloodo!. On the other hand, there are players (not only small and medium, but also large LSPs) who decide to make use of knowledge available on the market and cooperate with partners, including technology partners within the open innovation concept when moving towards being more digital (Cichosz, 2018).

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<sup>22</sup> Spot is a transaction concluded for immediate delivery and payment (usually two business days).

<sup>23</sup> <http://www.transmetrics.eu>

<sup>24</sup> Business model innovations are changes in defining, creating, delivering and capturing values within the business model (Teece, 2010). Basically, there are two ways to bring innovation to the business model. The first one is an evolutionary approach, in which the enterprise experiments and introduces changes to selected elements of the model (i.e., in contacts with key suppliers or customers, in terms of applied activities, resources, channels or customer relations, which leads to changes in the cost structure or revenues) (Amit and Zott, 2010). The second approach is a revolution, where one business model is replaced by another (Bock et al., 2012).

**DP DHL and Saloodo!**

DP DHL is a global leader in the logistics service market (Armstrong & Associates, 2017; Brdulak, 2018). As part of its Technology and Innovation Center, DP DHL has developed a digital Saloodo! platform, which is part of ‘Strategy 2020: Focus. Connect. Grow.’ The platform was launched in Germany as a tool aimed at small and medium-sized shippers and carriers. It allows the carriers to optimize the use of the rolling stock of trucks (topping up vehicles, minimizing empty mileages). Thanks to the mobile application, drivers have real-time access to information about orders and routes. The main value for the customer is the ease of access to information about the possibility of transport (full-truck, but also part-truck), the speed of the transaction, and a number of additional services such as requests for quotes, invoicing in national currencies, various forms of payment by credit cards, PayPal accounts or SEPA transfers. At the end of 2018 on the Saloodo! platform over 6,000 carriers with over 250,000 trucks were registered. The platform covered the reach of 25 European countries (<https://www.saloodo.com>).

**DB Schenker, uShip and Drive4Schenker**

DB Schenker is a global logistics operator on the T&L market, providing innovative solutions for logistics and supply chain. In 2017, the company ranked fourth in the world in terms of revenues (Armstrong and Associates, 2017), and the third in Poland (Brdulak, 2018). In 2016, the company announced the implementation of the digital transformation strategy. As part of the changes alongside the traditional road, air and maritime transport, contract logistics and 4PL logistics, in 2016 DB Schenker invested in strategic technology partnership with the uShip US transport exchange and based on their software created a new business model within the group. The free Drive4Schenker digital platform is aimed at the drivers and allows them to find return cargo throughout Europe. The platform does not replace but complements the traditional contract logistics business model, and by addressing the challenge of minimizing empty mileages, it allows participants to increase the efficiency of rolling stock utilization (<https://d4s.dbschenker.com>).

**UPS, Ware2Go and partnership for 3D printing**

UPS is a global courier company operating on the CEP market, which decided to expand its portfolio of business models with digital models. One of the UPS research initiatives is the launch of the Ware2Go digital platform announced in August 2018 (<https://www.ware2go.co>). The platform connects e-sellers, whose short-term needs are for storage space and inventory fulfillment services with operators, who have potential in this area. The service is addressed mainly to small and medium-sized e-businesses that operate in the B2B segment who need fast deliveries and cannot afford to organize an effective distribution network. In this way, UPS, using a digital platform, extends the service package with warehouse services and offers new value to customers in the innovative digital platform model.

UPS also works in the 3D printing segment. In a technological partnership with Fast Radius (additive manufacturing specialists) and SAP (ERP system specialists), using its global distribution network, it offers customers (including production companies) the option of placing an order through a website and printing at the UPS handling point equipped with a 3D printer, a product which UPS couriers will next deliver to the customer (Conner et al., 2014).

**Common features of innovative business models**

Analysis of the above mini case studies allows creating a list of characteristic features of innovative business models in the logistics service industry. These are primarily: hyper-connectivity, cooperation, and integration of network participants and the related adaptiveness of the system to the changing environment. The list with a short discussion is presented in Table 2.

**Conclusion**

A modern, hyper-competitive market of logistics services, with new entrants including those from technology and automotive industries, as well as consumers implies that the incumbents should undergo transformation and develop innovative business models. As noted by Płaczek (2012, p. 206), *logistics service providers (...) are not limited to the implementation of one business model and use different models in parallel.*

**Table 2. Determinants of innovative business models in the digital era**

Feature	Description
Connectivity	All elements of the supply chain are connected. Hyper-connectivity allows for the visibility of the product throughout the entire supply chain (end-to-end visibility).
Cooperation	The digitization of the participants in the supply chain facilitates vertical, horizontal and lateral cooperation to better use resources and provide customers with higher logistics value.
Integration	Integration, firstly, in the process dimension, secondly, in the area of data and information exchange.
Adaptiveness	Digitization refers to open, dynamically adapting systems. The system of digital resources can adapt itself as well as be adapted to changes (more on adaptiveness of LSPs one may find in Świtłała et al., 2018).

Source: author’s own study.

Thus, the real world of logistics flows is complemented (not replaced) with a virtual world in which sensors, robots, automation, cloud computing, data analysis, 3D printing, autonomous vehicles, artificial intelligence, digital twins or technology blockchain provide customers with logistics services of greater value (i.e., higher quality at a lower price).

In the case of logistics industry leaders, digital business models are most often a supplement to traditional, already proven models, which results in hybrid solutions. Due to the pace and scope of changes, LSPs are becoming more open to the knowledge and skills of partners (including technology partners). Cooperation with them gains more significance nowadays. The aim of this cooperation should be both to improve existing solutions and to develop and implement breakthrough innovations (Cichosz, 2018).

The subject of the digital transformation of the logistics services industry is very broad and at the same time scarcely explored in the literature referred to logistics and supply chain management. This study does not attempt to be exhaustive. Further research is required. It would be particularly interesting to learn to what extent the customers accept innovative solutions and business models introduced to the logistics services industry by its leaders. It is also worth looking at this issue from the experts' perspective and getting to know their opinions and recommendations on the direction of evolution in the logistics service industry. In turn, regarding the management sciences, it would be particularly interesting to examine the mechanisms of managing the digital transformation, barriers and success factors.

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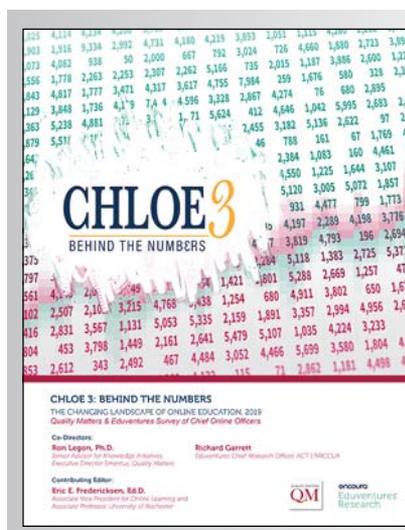
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## Abstract

This study aims to present changes that are taking place in the market of logistics services as a result of the development of digital technologies and show their influence on the business models of logistics service providers. In her research, the author applied Porter's 5 forces model as a theoretical framework for the analysis in the area of innovation and technology in logistics. The study uses the deduction method. This is a conceptual paper based on the analysis of secondary materials, i.e., examples of innovative logistics solutions, reports of research agencies and consulting companies, and literature studies. The results of the analysis show that we are dealing with the digital transformation of the logistics service industry (not digital destruction). Technologies like sensors, robots, automation, cloud computing, data analysis, 3D printing, autonomous vehicles, artificial intelligence, digital twins or blockchain technology supplement but not replace the real world of logistics by providing customers with higher logistics service value.

**Keywords:** digitalization; digital transformation; logistics service provider (LSP); competitive analysis; hybrid business model

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