SUPPLY CHAIN IT TRENDS THAT HAVE BEEN SHAPING OUR TOMORROW

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Abstract

As new digital technologies emerge, companies must evaluate IT trends to identify opportunities, reduce risks and create competitive advantage. In today's digital age, the competence to successfully exploit digital disruption could be the difference between thriving and barely surviving. To navigate new challenges and to determine the best opportunities, companies must understand the impact of supply chain technology trends on their business operations and outcomes. Therefore, we decided to review supply chain IT trends, based on Gartner's predictions for the past six years, to determine, to what extent they have transformed, evolved, changed, or remained constant. As a result, we were able to determine the implementation of supply chain IT trends that are a must for managing a successful business. We also examined supply chain digital trends, that await us in the future. And lastly, we have focused on some open issues related to the pressing topic, the possibility of further research, and presented our subjective opinion on IT trends that may affect the business future.

Key words: IT, digital trends, supply chain, evolution, opportunities

1. INTRODUCTION

The importance of an optimized supply chain is increasing day by day as it meets the requirements of the company's customers. If the supply chain is properly managed, it can, inter alia, result in much lower costs and a faster production cycle. Supply chain management is an integral part of the business since it has the power to reduce costs, improve the financial standing of a company and boost customer service. (Kleab, 2017) However, with inefficient management, a company can be at risk for loss or reduction of customers, which will consequently lead to a decrease in its competitive advantage within the industry (Grimshaw, 2020). Successful supply chain management is thus essential for the competitiveness of any company, and the first step to achieving this is to be aware of the potential challenges that may affect the company's supply chain.

We know that knowledge and skills are crucial factors of human and business evolution, therefore also a must for technological progress. Without knowledge and skills, machines, devices, and processes of operations would be a big unknown to all (Kabanda, 2019). Therefore, knowledge and skills are fundamental to rational, effective, and consistent improvements, innovations, use of machines, devices, and management of business processes.

The evolution of communication technologies and their constant improvements have transformed the way companies conduct their business. Information technology (hereinafter: IT) is at the epicentre of global socio-economic transformation, also represents a strategic resource and foundation for every activity (Kabanda, 2019). Thus, any company that ignores the importance of IT will be discredited as a competing business.

The dawn of the digital age has brought wholesale transformation to the world of commerce. Just a few tens of years ago, these processes were disorganized, intensive and time-consuming. Now, delivery times have reduced from weeks to a month down to hours, in some cases. Automated systems with high-speed communication have eased the operations of supply chain management and its increased demand. (Kleab, 2017) Technological advances are, among other things, responsible for the reduction of the workforce, while at the same time enables the possibility to increase outputs of production. IT systems have the potential to change the decision hierarchy and consequently reducing the need for middle management (Kabanda, 2019).

Business fields are evolving and the whole world is changing on a day-to-day basis. With the COVID-19 pandemic and its consequences, it is especially hard for companies to try to predict events of upcoming months. Because of the ever-changing business and everyday environment, we have decided to review supply chain IT trends in the span from 2015 to 2020. Basing on the results, we were able to determine, which trends evolved and are somewhat constant. This helped us to extract the »must supply chain IT trends to implement« in any supply chain to be able to manage a successful business. As final, we also reviewed supply chain IT trends, that are awaiting in near future.

2. THEORETICAL BACKGROUND

2.1. Supply chain

As early as 1998, Lambert et al. (1998) noted that the concept of »supply chain« is well established in the literature and generally refers to the coordination of companies that bring products or services to markets. Ayers (2001, p. 4) suggests that the supply chain includes: »life cycle processes involving physical, informational, financial, and knowledge flows designed to meet the needs of end-users with the products and services of multiple related suppliers«. He further states that, following this definition, the supply chain and its processes include a wide range of activities,

including the supply, production, transport and sale of physical products and services. Life cycle refers to both the market life cycle and the life cycle of use, which are not the same for durable goods and services, so after-sales service for customers becomes an important part of the supply chain (Ayers, 2001). Chopra and Meindl (2007, p. 3) believe that the supply chain consists of all stakeholders who are directly or indirectly involved in meeting customers' requirements. Mentzer et al. (2001) describe a supply chain as wa set of three or more entities (organizations or individuals) who are directly involved in [...] flows of products, services, finances and/or information from source to the customer«. Chen and Paulraj (2004) have argued that a typical supply chain is a network of materials, information, and services that define the link to characteristics of supply, transformation, and demand.

Supply chains can have different levels of complexity, depending on the number of participles and the diversity of the business process, but there is supposed to be central company that can manage the whole supply chain, but not necessarily doing it. Mentzer et al. (2001) indicate three levels of supply chain complexity: »direct supply chain«, »extended supply chain« and »ultimate supply chain«. The first consists of the central company, its suppliers, and customers. The second, in addition to the aforesaid, includes direct supplier suppliers and direct customer customers. The last includes all companies (involved in all the flows of goods, services, finance, and information from end suppliers to end customers) and functional intermediaries such as third-party logistics service providers.

Scott et al. (2011) also list various customers that may appear in supply chains: distributors, which supply manufacturers with large-scale stocks and offer customers a range of related production lines; wholesalers, which specialize in certain types of products and purchase large quantities directly from distributors; and retailers, which stock products in small quantities and sell them to the general public.

Given the definitions of the supply chain and its complex composition, which interconnects the most diverse stakeholders, we can see that its importance is pronounced. Therefore, companies are improving their supply chains as they want to reduce their costs and maintain competitiveness in the business environment (Kenton, 2020).

The operation of more or less complex supply chains is intensively supported by IT. Without digitalization in today's times, they cannot function, and they decay – their operation is not possible.

2.2. Logistics

There are many ways we can define logistics. As one, we highlight the definition of the basic concept of logistics (Christopher, 2005, p. 4): »Logistics is the process of strategically managing the procurement, movement and storage of materials, parts and final inventory (and related information flows) through a company and its marketing channels in such a way that current and future profitability are maximized through efficient order fulfilment.«

As we analyse IT support of logistics, we need to be aware that there are different resources of logistics in supply chains. Jereb et al. defined four primary logistics resources (Jereb et al., 2013; Jereb, 2017; Jereb, 2020), without which logistics

processes cannot take place. The implementation of logistics is based on the following logistics resources:

- 1. The flow of goods and services should be managed from the point of origin to the point of use to meet the requirements of customers.
- 2. The information which causes a change in the state of a dynamic system, if the system was able to decode data and to attribute them with relevant meaning, and also deliver a change of knowledge under certain rules where the system has access to them.
- 3. Logistics infrastructure and suprastructure as basic physical and organizational structures needed for the operation of logistics.
- 4. People are the personnel required to plan, organize, acquire, implement, deliver, support, monitor and evaluate the logistics systems and services. They may be internal, outsourced or contracted as required.

Any consequence of IT support, occurring in a supply chain, can influence one or more of these resources. If we wish to effectively manage IT, we need to be aware of logistics resources.

2.3. Information technology

Management should optimise the use of available IT resources, which are: applications, information, infrastructure, and people. To provide the information that the enterprise requires to achieve its objectives, the enterprise needs to invest in and manage and control IT resources using a structured set of processes to provide the services that deliver the required enterprise information. In other words: IT resources need to be managed by the IT processes to deliver IT's goals (IT Governance Institute, 2007).

Both areas, logistics and informatics, deal with information and are crucial areas for the implementation of business processes in companies. They both represent »infrastructure« and offer support to other business processes. And finally, have similar challenges related to the quality of services, investments, challenges, business ownership, and their management. The main difference is that IT is an area that must support the smooth operation of logistics (Jereb, 2019).

The digital transformation has since always encouraged companies to constantly improve their business models. Technology, especially nowadays, is spreading constant change at an increasing rate. To conduct successful management of a company and consequentially have a competitive advantage (Kukovič et al., 2014), it is necessary to have a good overview concerning information technology and supply chain strategic technology trends.

3. RESEARCH METHOD AND RESULTS

For our research, we decided to take into account Gartner's predictions on foremost leading IT trends in the supply chain. We can find various lists with IT trends that differ from each other in authors and content. Choosing the right one is subjectively oriented and depends on your perspective. The reason why we choose Gartner lies in the fact that they are known as a leading global research and advisory company. They have expanded beyond leading technology research to provide executives with the indispensable business insights, information, advice, and tools to achieve mission-critical priorities and build the companies of tomorrow.

Our research interval was set on years between (and including) 2015 and 2020 and focused on search words »Top supply chain IT trends« for selected years. Through our research, we have realized, that Gartner's »supply chain IT trends« come to the surface barely in the year 2018. Because of this, we decided to divide search words and combine the following:

- »Gartner's top strategic IT trends« between (and including) 2015 and 2017;
- »Gartner's top supply chain IT trends« between (and including) 2018 and 2020.

We have decided to take this path since strategic IT trends are also useful and managed within supply chains.

Based on accumulated data from the years 2015 to 2020, we were able to identify the IT trends that are repetitive, reoccurring, constant, or evolving. All IT trends were firstly written in a table, where we reviewed them, but similar ones in the same rows but in different columns (based on years). The table helped us to deploy IT trends based on their similarity. As some of the IT trends did not evolve or reoccur, we removed them from the equation. The "popular and evolved" IT trends were left for a detailed review.

Table 1 contains (#) the number of iterations (in rows) of IT trends by years (columns). We arranged IT trends in descending order – at the top of the table, we can find IT trends with most iterations, escalating to the least common ones. Number six in the first column and second row means, that the IT trend was (in some form) occurring every year from 2015 to 2020, number four in the first column and sixth row means, that the IT trend was (in some form) occurring in four of the examined years from 2015 to 2020, etc.

As a result, we received numbers of iterations of recurrent IT trends over six years, as follows:

- Six iterations from »Smart Machines« to »Continuous intelligence«;
- Six iterations from »Context-Rich Systems« to »Artificial intelligence«;
- Five iterations from »Ambient User Experience« to »Immersive experience«;
- Four iterations from »Intelligent Apps« to »Hyperautomation«;
- Four iterations for »Internet of Things«;
- Four iterations from »Advanced, Pervasive and Invisible Analytics« to »Edge computing and analytics«;
- Four iterations from »Risk-Based Security and Self-Protection« to »Supply chain governance and security«;
- Three iterations from »Software-Defined Applications and Infrastructure« to »Mesh App and Service Architecture«;
- Three iterations from »Blockchain and Distributed Ledgers« to »Blockchain«;

- Three iterations from »Digital Twin« to »Digital Supply Chain Twin«;
- Two iterations for »Conversational System«;
- Three iterations from »3D-Printing« to »3D-Printing Materials«. Excluded trends from the research, because of lack of iterations, were:
 - »Web-scale IT«, »Computing Everywhere« and »Cloud/Client Computing« (the year 2015);
 - »Advanced System Architecture«, »The Device Mesh« and »Information of Everything« (the year 2016);
 - »Digital Technology Platforms« (the year 2017);
 - »5G Networks« (the year 2020).

#	2015	2016	2017	2018	2019	2020
6	Smart machines	Autonomous Agents and Things	Intelligent Things	Intelligent Things	Autonomous things	Continuous intelligence
6	Context-Rich Systems	Advanced Machine Learning (ML)	AI and Advanced ML	Artificial intelligence	Artificial intelligence	Artificial intelligence
5	/	Ambient User Experience	Virtual and Augmented Reality	Immersive technologies	Immersive experience	Immersive experience
4	/	/	Intelligent Apps	Robotic process automation	Robotic process automation	Hyper- automation
4	Internet of Things (IoT)	IoT Architecture and Platforms	/	ΙоТ	ΙоТ	/
4	Advanced, Pervasive and Invisible Analytics	/	/	Advanced analytics	Advanced analytics	Edge computing and analytics
4	Risk-Based Security and Self- Protection	Adaptive Security Architecture	Adaptive Security Architecture	/	/	Supply chain governance and security
3	Software- Defined Applications and Infrastructure	Mesh App and Service Architecture	Mesh App and Service Architecture	/	/	/
3	/	/	Blockchain and Distributed Ledgers	Blockchain	Blockchain	/
3	/	/	Digital Twin	/	Digital Supply Chain Twin	Digital Supply Chain Twin
2	/	/	Conversa- tional System	Conversa- tional systems	/	/
2	3D-Printing	3D-Printing Materials	/	/	/	/

 Table 1. Iterations of IT trends between (and including) 2015 and 2020

Source: own research

4. ANALYSIS AND DISCUSSION

4.1. Evolution of strategic IT trends to supply chain IT trends

If we want to focus on the future, we must first consider events from the past. In the subsections, we will first describe three indents – namely 6 and 5 iterations of IT trends – listed in the previous section (Table 1). The trends are in descending order – first, we will start with the one that appears in all six years and is, therefore, of greater importance. Each subsection contains a description of individual trends and their evolution in the span of the past six years. The latter is qualified as the »must supply chain IT trends to implement«.

4.1.1. From »Smart Machines« to »Continuous intelligence

The rapid evolution of prototype autonomous vehicles, advanced robots, virtual personal assistants (hereinafter: VPAs), and smart advisors were already discussed in 2015. As part of context understanding, applied deep analytics was and still is a prerequisite for the world of »smart machines«. This represents a foundation, which is combined with advanced algorithms that allow the systems to understand their environment, support self-learning and autonomous work (Gartner, 2014).

Advanced machine learning (hereinafter: ML) gave the following year rise to a spectrum of various smart machine implementations that acted in an autonomous or at least semiautonomous manner. VPAs (such as Microsoft's Cortana) were already becoming smarter and were so-called precursors to autonomous agents. That is when »Smart Machines« transformed into »Autonomous Agents and Things«. The notion of assistance feeds arose when ambient user experience transformed – the user spoke directly to an app (read: intelligent agent) instead of interacting with menus, forms, or buttons on smartphones (Gartner, 2015b).

From 2015 to 2017, »Smart Machines« developed through »Autonomous Agents and Things« and evolved into »Intelligent Things« for the next two years. The latter refers to physical things that exploit applied artificial intelligence (hereinafter: AI) and ML to deliver advanced behaviours and interaction with surroundings and people in a more natural way. In addition to smart machines, intelligent things include drones and smart appliances. Due to the widespread of intelligent things, Gartner anticipated a transformation from a stand-alone intelligent thing to a collaborative model of intelligent things in 2017 (Gartner, 2016). In 2018, the use of intelligent things was focused on defined scenarios and controlled environments. Intelligent things were designed to operate through a variety of asset-centric, product-focused and serviceoriented industries (such as in warehouses). Consequentially, companies should have obtained the ability to assist, replace or redeploy human resources to more valueadded activities, which had the potential to create even more transformational business benefits (Gartner, 2018).

As predicted in 2017, the rapid connectivity explosion of intelligent things gave this overall trend an enormous boost in the direction of »Autonomous things«. Mentioned enables new business scenarios and optimization of existing ones. The scope of autonomous things in 2019 encompassed physical devices, operating in the real world. For instance: robots carrying out coordinated jobs in manufacturing to create a seamless and connected process; or implementation of inventory quality assurance with drones taking images, to reduce the time of inventory checks (Gartner, 2019).

Last researched year showed that the IT trend blossomed into »Continuous intelligence«, which represents one of the biggest opportunities to accelerate supply chain company's digital transformation. This evolution of IT trend complements a computer's ability to process data at a faster pace, while supply chain leaders or even systems, can review processed data, understand, and comprehend the situation, then take immediate action (Gartner, 2020a).

Smart, intelligent, and autonomous things or advisors have existed for some time now. We can see that the great evolution of this trend did not take much time, as it ushered in the new age of machine helpers. As Gartner stated in 2014, »The smart machine era will be the most disruptive in the history of IT« (Gartner, 2014). Because of this, IT leaders, with compliance of supply chain leaders, should have already explored the use of this specific IT trend to utilize people for work, which only humans can perform. Thus, supply chain leaders should implement intelligent and autonomous things as substitutes and complements to the human workforce. This will generate improvements in productivity and overall output, regardless of reductions in labour (Gartner, 2019). However, it should be emphasized and must be recognized that intelligent things are a long-term phenomenon that will continually evolve further and expand their scope of use for the next tens of years.

4.1.2. From »Context-Rich Systems« to »Artificial intelligence«

»Context-Rich Systems« cover ubiquitously embedded intelligence and, in combination with pervasive analytics, had led the development of systems that are, with their alertness, able to respond appropriately to their surroundings (Gartner, 2015a). Context-aware security was an early application of this new capability. With an understanding of the user's request context, applications can be adjusted by both security response and deliverance of information to users (Gartner, 2014). This process has greatly simplified an increasingly complex computing world.

A wealth of data sources and information complexity made a manual classification, alongside analysis, impractical and uneconomical. With ML, these tasks became automated and enabled the possibility to deal with key challenges, related to the »Information of everything« trend. ML algorithms are composed of various technologies, from deep learning, neural networks, natural-language processing and others; used in both unsupervised and supervised learning ranges to understand activities, information, and the world. In 2016, »Advanced ML« exceeded previous attempts at creating algorithmic-based solutions, for information harvesting of everything, to become more perceptive, self-directed, and autonomous. Advanced ML is what makes smart machines appear "intelligent". Smart machines are enabled to understand concepts of their environment, to learn from them and to change their future behaviour – which could not be possible without advanced ML. For example, "learning machines" can analyse vast databases of medical case histories and reveal previously possibly unknown insights in treatment effectiveness (Gartner, 2015b).

In 2017, »Artificial intelligence and advanced ML« made their debut with a combination of various technologies and techniques. The more advanced techniques transformed beyond traditional rule-based algorithms, into system creation that understands, learns, predicts, adapts, and potentially operates autonomously. AI and advanced ML elevated a spectrum of intelligent implementations, including physical devices (such as consumer electronics, robots, and autonomous vehicles), applications and services (such as VPAs and smart advisors). These implementations were delivered as a new, sophisticated class of indeed intelligent apps and things. Implementations also provided embedded intelligence for a broad spectrum of existing software, service solutions and mesh devices (Gartner, 2016).

As written, »Context-Rich Systems« developed into »Advanced ML«, then to the combination »AI and advanced ML«, which enabled the birth of IT trend »AI«, evolving through following three years. AI in the supply chain consists of a technology options toolbox, helping companies to understand complex content - how to engage in a natural dialogue with people, how to enhance human performance and how to reshape routine tasks (Gartner, 2020a). In other words, AI in the supply chain consists of technologies that seek to reproduce human knowledge and performance. For example, improving order delivery and service levels is possible by using AI capabilities to determine optimized route deliveries, or by application of AI algorithms for optimization of shipping replacement parts, or to notify the company's stakeholders of potential equipment failure before occurrence (Gartner, 2019). »AI« has enormous potential to revolutionize the processes of supply chains. The capability to apply AI in order to enhance and even automate decision-making, to reinvent business models or ecosystems, and to rework customers experience – could possibly exceed other emerging IT trends. Although AI solutions can find patterns and predict future scenarios, they were still absent of decision-making abilities. Thus, a combination of pattern capabilities and more advanced prescriptive capabilities could be critical to supply chain extended acquisitions (Gartner, 2018). Currently, AI supports supply chain leaders by addressing long-standing challenges of data silos and governance. Its capabilities enable greater transparency and integration of the company's once distant and diverse stakeholders (Gartner, 2020a).

We can assert that AI supports the company's vision for opulent supply chain automation. The level of the latter could be semi--automated, fully automated or a mix between, depending on the necessity. Hand in hand with automation comes augmented decision-making – since the human is no longer needed for this task (Gartner, 2019). Through self-learning and natural language, AI solutions can help automate any spectrum of supply chain processes (such as predictive maintenance, demand forecasting and production planning).

4.1.3. From »Ambient User Experience« to »Immersive experience«

The last IT trend of this detailed research made its appearance in 2016. The »Ambient user experience« enables a greatly enhanced and immersive user's experience with ameliorated augmented reality (hereinafter: AR) and virtual reality (hereinafter: VR). VR and AR transformed the way individuals interacted with each other and software systems. VR is a computer-generated scenario that simulates a

realistic experience, while AR can be a direct or indirect live view of a physical, realworld environment (Kabanda, 2019). Alongside well specialized head-mounted displays, mentioned trend uses a variety of connected devices in the mesh, surrounding the user – for example, a tablet displays real-time video of the user's surroundings with superimposed information about objects in the video. With device mesh, the foundation for a new continuous and ambient digital experience was created. A continuous experience preserves the continuity of the user's experience beyond the traditional perimeter of devices, space, and time. User's interaction with applications in a dynamic multistep sequence seamlessly flows across various devices and/or interaction channels for extended periods. User's experience and app design were (already then) altering the expanding set of endpoints in the device mesh. With then new user experience, new input/output mechanisms emerged using audio, video, haptic, taste, olfactory and other sensory channels. These sensory modes have competencies beyond all we know. Gartner (2015b) stated that apps will target an orchestrated collection of device mixture rather than an individually used device. The realization of the »Ambient user experience« required in-depth consideration of permissions and privacy (Gartner, 2015b).

For 2017, Gartner stated that the scope of immersive consumer, business content and applications will evolve dramatically through 2021. Furthermore, the capabilities of »virtual and augmented reality« will, merged with digital mesh, form a more seamless system of devices. These devices should be capable of arranging a flow of information at the user through hyper-personalized, relevant apps and services. Integration through multiple wearable, mobile, IoT and sensor-rich environments would have led to extended immersive applications beyond individual experiences (Gartner, 2016).

»Immersive technologies«, such as VR and AR, enabled supply chain companies to intensify customer and employee digital experiences. In 2018, Gartner estimated that VR would reach mainstream acquisition in the next two to five years, while AR would achieve the same in the next five to ten years. Although, these technologies were already in use in various industries at the time – for enhanced repair or maintenance in manufacturing, logistics and warehousing; better customer's purchasing decisions with utilizing product visualization; even store planning and layouts (Gartner, 2018).

As previously stated, user's experience will undergo a significant shift in how users perceive the digital world and interact with it. The integration of VR and AR with multiple digital environments and conversational platforms will extend immersive applications beyond single-person experiences – hence the IT trend »Immersive experience« in 2019 and 2020. Supply chain leaders can take precedence of these platforms in the desire to improve processes and safety, save time, and make prosaic tasks easy. For example, AR could be used for rendering of equipment to portray the footprint in a specific area to compare dissimilar configuration options; remote checks of product features or appointments by voice-controlled personal assistants (Gartner, 2019).

Immersive experience technologies - VR, AR, and mixed reality (hereinafter: MR) - have the potential to drastically influence the trajectory of supply chain management. For better understanding, MR exceeds both VR and AR approaches,

since it incorporates the physical world more robustly. Additionally, to the visual aspect, MR also focuses on other sensors, such as touch and sound (Jereb & Kajba, 2020). These new interaction models can augment human capabilities. Because of this, companies already saw the advantages in use cases – organizational socialization of new workers with immersive on-the-job training in a safe, virtual but realistic environment (Gartner, 2020a).

Other trends can also have a positive and strong impact on logistics and supply chains, but these three trends are the most common and therefore we can assume that they also have the greatest impact on the company's operations.

4.2. Future evolution of supply chain IT trends

Our past is the foundation of our future. Based on the researched supply chain IT trends of our past, we can try to predict their future. Regarding Gartner (2021), the adoption of supply chain IT will not only increase in the next three to five years but the future will also be marked by the integration of new, more IT-focused roles in supply chains.

Many different authors try to predict various IT trends that may, in some form, take place in the future. Thus, we could list all possible sources and combinations of different IT trends, which of course also differ depending on the field of business. However, these options are intended for future research.

Therefore, we will not deviate (too much) from already conducted research and will hold onto Gartner's predictions for the future, which says we can prepare for (Gartner, 2020b):

- Internet of Behaviours came to the surface with 2020 predictions. It consists of leveraging technology to monitor behavioural events. It enables the management of data, needed to upgrade, or downgrade the experience to influence the latter. In addition to big data, it also includes facial recognition and location tracking. This is already done by health insurance companies through monitoring fitness bands, food consumption, and more, allowing them to adjust premiums.
- Cybersecurity mesh enables access to any digital asset security, regardless of the location of the asset or the person. It allows determining the security perimeter around an individual instead of around a company.
- Total-experience is beyond the aforementioned immersive experience trend. It interconnects customer's, employee's, and user's experiences with the multi-experience environment. This trend is a must since interactions are more virtual and distributed as a consequence of the COVID-19 pandemic.
- Intelligent compassable business consists of leveraging from both an application perspective and packaged business capabilities. Intertwining allows better decision making, access to data that changes the way of doing things, which is necessary for flexible applications, and which we can provide when we have such a composite approach to application delivery.

- Hyperautomation has been evolving through the years in response to the tremendous demand for automating repetitive manual processes and tasks. Now, it has progressed from task-based automation, through process-based automation (automation of several tasks in a process), to functional automation across multiple processes. However, its development does not stop here automation at the business ecosystem level is on the horizon.
- Anywhere operations refers to an IT operating model that supports customers, enables employees, and manages the business services deployment across distributed infrastructure, anywhere and everywhere. A movement towards the independent location and providing services at the point where they are required, has always existed. With the beginning of the pandemic, an immediate need for support remote business arose. Most companies succeeded in that with the support of their employees, in addition to them, they also had to cope with remote customers and products, which had to be deliverable remotely.
- AI engineering is also one of the evolving trends, which includes providing engineering discipline to a company. The reason for this lies in a little over 50 percent development success rate of transition from prototype projects to actual production. Its goal is bound to providing a particular engineering discipline, that consistently emphasizes the deliverance of AI projects to ensure products can be expanded and advanced into production.
- Privacy-enhancing computation there is more and more talk about privacy. This is because it carries extraordinary significance, which is also evident from the maturity of global data protection legislation. The trend protects data in use, meanwhile maintaining their secrecy and/or privacy. The latter can present a challenge for companies in the future. Its importance is increasing, alongside the associated opportunities. Companies will be able to both outsource the implementation of analytics and share data across priorities without exposing personal information in the data.

It is speculated, that the future may bring higher demand for robotic »goods-toperson« systems, in a desire to aid enforcement of social distancing in warehouses. They can move goods from one employee to another in such an efficient way, that they increase productivity alongside the improvement of storage density. (Gartner, 2021a) The use of this system is directly related to overcoming the challenges of the pandemic, and in the long run, it can strongly increase the efficiency and productivity of the company.

Many companies will also invest in real-time transportation visibility platforms (intended, for example, for transport) and among other things, supply chain companies will invest in applications that support capabilities of AI and advanced analytics (Gartner, 2021a). Companies, which were already using the latter, are trying to understand, what is currently happening in their business and what will possibly happen with them in the future. Because of that, supply chain leaders should strive to

completely understand the company's environment, challenges, risks, and advantages that are associated with each new or previous IT trend.

5. CONCLUSION

The popularity of technology innovations is causing a lot of noise in many industries. Amongst them, supply chains could be the ones that are impacted the most due to, as described in theory, intertwined networks of different stakeholders within differently complex supply chains whose business and collaboration is closely interconnected via digitalization. On the other hand, supply chains also have the most to gain from implementing new IT trends due to manual processes and amounts of different information, stored in different ways, at various places, by different people. Regardless of the business field of a company, monitoring and keeping up with IT trends is imperative. This is confirmed by two areas where IT trend awareness has a significant impact, namely increasing the company's opportunities with new, innovative ideas and/or new ventures and enhancing the company's visibility to the customers (Cleverism, n. d.). Predicting supply chain IT trends represents a long and important subject for a company's information systems research. Their prediction makes it possible to acknowledge emerging eras of innovation and the allocation of budgets to prepare against rapidly changing technological trends (Choong Kwon & Cha Kyung, 2015). Technology has helped countless times in various arising environmental problems. Last year alone, several IT firms collaborated in using technological advancement to face the outburst of the COVID-19 pandemics (Singhal & Prakash, 2020). Thus, there is no wonder emerging supply chain IT trends are a major source of competitive advantage.

As can be seen from the sections above, trends change from year to year. They are also affected by the current situation around the world. Which makes it very difficult to say with certainty which trends can await us in the future, in all their magnitude. Because of this, one could almost argue that emerging supply chains and other IT could also be overhyped. At present, many trends refer to the situation currently associated with the pandemic, the consequences of which they want to overcome or mitigate.

Speaking of consequences and impacts - there is a lot of talk about trends that can facilitate or enable the improvement of the company's operations. What about trends that are not so "positive"? Which can, so to speak, harm a company's business? Or the possible negative consequences of so-called good trends. For example, will technology oligarchies (such as different cryptocurrencies) increase their market value, pricing power, enable the world's business relief or will they collapse due to their actions? What happened to Enterprise resource planning (ERP) applications and 3D printing and regulations? Knowing answers to these kinds of questions can allow a company to prepare for the downside and try to prevent it from happening. It is not only the advantages that trends allow that is important, but also the disadvantages and being able to respond appropriately. Also, an interesting question: how are these trends determined? Could these trends also be influencing people's behaviour through data collection? We know this has been happening for some time, but not as openly as it did during the pandemic.

From this point of view, some ideas for further research arise: 1) research into the possible negative consequences of trends or the identification of negative trends; 2) an overview of the correspondence between the trends envisaged by Gartner and other authors would; 3) research about trend formation or revelation phenomenon – research on how, in what way and who determines the trends. These are just some of the research ideas provided, that would be very instructive, useful, interesting, and ultimately intriguing to study.

Having regard to aforementioned facts (predicting IT trend represents extensive and important research subject, many trends are primarily focused on today's events and situations and lastly, who are we to determine what the actual trends are), our expectations, related to IT trends with a major impact on the future, depend mainly on the connectivity and interdependence of different individual trends, that primarily focus on the industrial enterprises needs. Under the latter we considered 1) IoT trend will become Internet of Networks as a result of Big data, 2) AR, VR and AI will continue to evolve en masse and rapidly throughout different business fields, 3) cyber security, robotics and nanotechnology will sooner or later be responsible for scientifically recognized achievements and discoveries, 4) vast majority of companies and countries are engaged in renewable energy and sharing economy, which could potentially allow a lot of much-needed investment in a better tomorrow, 5) e-learning has been known for some time, although many institutions have been reluctant to use it. In the past two years, however, the benefits of this trend have emerged, which we consider will continue to be widespread. Of course, these trends are a reflection of our subjective opinion in terms of observing the environment and the topic. It should be noted that trends differ according to locality (i. e. the geographical position of the studied subject, people's habits, the influence of the environment, political beliefs and many other factors).

Nonetheless, the COVID-19 pandemic only amplified the ever-existing need for IT tools that help companies to a better and more informed decision-making process and digitalization. Supply chain leaders need to adopt a broad and holistic perspective when it comes to assortment and choice between »must supply chain IT trends to implement«. These technologies are increasingly ubiquitous and there are many ways on how and in what way to apply them to enhance customer retention. It is well known that following and complying with trends in the past only provided benefits for companies in the long term.

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