Artificial Intelligence in Transport and Logistics

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Abstract:- "An idea without a plan is only a dream". The optimization of business processes is at the core of every novelty and innovation. We are in Logistics 4.0 – the fourth industrial revolution, where the use of smart technology is reflected effectively on all aspects of life. The systems lead to an improved way of life and optimal use of available physical and human resources. Digital technology is one of the most essential driving forces in an economy. In the future digitalization will be a crucial trait of innovations, business models and operative processes and it will shape the behavior of consumers and customers.

Keywords:- Artificial Intelligence (AI), Digitalization, Logistics 4.0, Digital Transformation, Internet Of Things (Iot) JEL: R40; R41; R49.

I. INTRODUCTION

Time is more dynamic than ever – everything is connected in a single system. We are in a transport revolution. We no longer talk solely about transport, but logistics as well; and artificial intelligence is changing the logistics industry as a whole. Large firms from the transport-logistics branch strive towards offering "sales solutions" ("SS"), i.e. selling products or services that will solve any problem or situation in the work process.

Every firm strives to make its customers feel like they are accompanied by it in their everyday work routine and that there are innovative decisions for improving work processes. Firms' pursuit of constant competition with the purpose of fully satisfying customers leads to the emergence of new innovative decisions and creates new types of products.

Artificial intelligence in transport and logistics is the natural continuation of the development of the transport-logistics branch.

1. What Is Artificial Intelligence?

Artificial intelligence is a field of computer science that deals with the development of computer systems which can independently perform functions that usually require human intelligence, such as logical thinking, solving problems, learning from experience or speech recognition[1].

There are three main factors that influence artificial intelligence, as shown on the chart below:
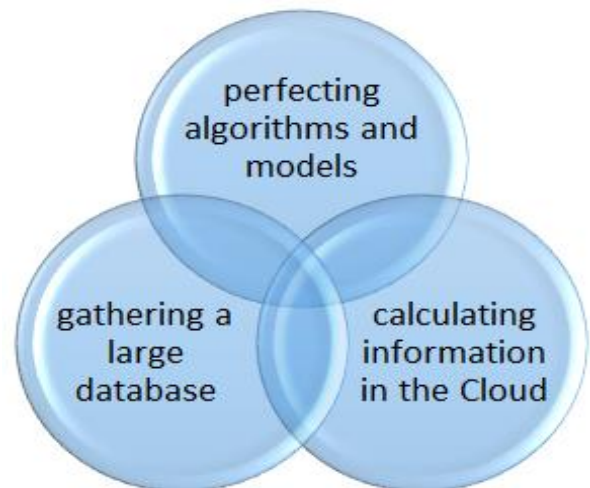

Chart 1:- Factors that influence artificial intelligence

Artificial intelligence is in no way a market trend – it is a key factor for improving the competitiveness and profitability of companies. Access to large quantities of data which are the basis of modeling and training new algorithms and training systems is an advantage for innovations.

Innovations, in turn, are an essential part of transport development[2].

The market for technology, software, consultations, computing power and services in the context of machine training will develop quite dynamically in the coming years – in 2017 alone investments amounted to 4,3 billion euros and, according to prognoses for 2020, investments are expected to amount to 21 billion euros[3].

2. Digitalization as a Dimension

Digitalization is developing rapidly in all sectors of economy and it is causing huge transformation processes – both for firms and for consumers. Digitalization is a revolution of markets where innovative digital products and business models are beginning to compete. The graphic representation of the four stages of the industrial revolution's development shows that the fourth stage – "connectedness" (which we are presently in) – is the natural continuation of technical progress. Artificial intelligence emerges precisely in the fourth stage, represented through smart products, items and machines, connecting everything

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[1] Lexikon der Neurowissenschaft

[2] Tzvetkova, S. (2014), „Effective Management of Innovation Activities in Transport", "Krisan-S" Publ. House;

[3] 34. Deutscher Logistik-Kongress • Kongressband • Bundesvereinigung Logistik (BVL)

in a network, merging of the real world and the digital world, and digitalization of data.
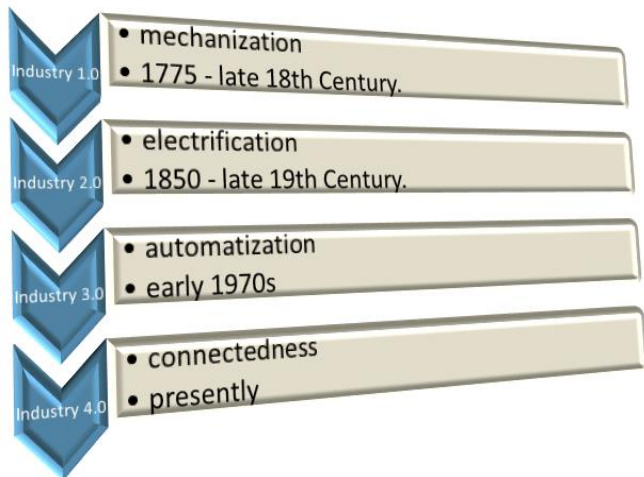

Fig 2:- The four stages of development of the industrial revolution[4]

It is important to mention that digitalization has two main flows of action: on one hand, it is the transfer of information from analogue to digital form of storage; on the other hand, it is the transfer of objectives that have been transferred to computers by people beforehand[5].

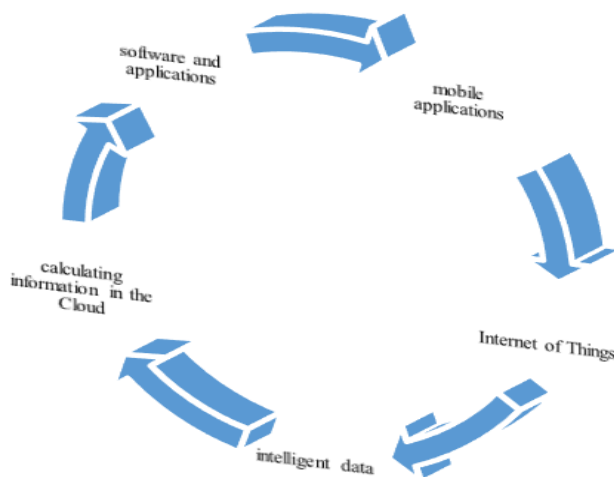Digitalization is realized through 5 primary components.

Chart 3:- Digitalization as a system

3. How Will We Work in the Future?

The future starts today. Innovations in transport and logistics create prerequisites for a completely different type of working environment. Being in the 4th industrial revolution, characterized by artificial intelligence as part of the digitalization, Internet of Things and databases collected in the Cloud, what business requires is different thinking.

Innovations in transport also help influence the collective development of economy[6]. Everyday work routines change, processes become more flexible, the network connection of individual departments in companies, the requirements and qualifications towards employees change, new technological capabilities provide opportunities for making faster and more appropriate decisions.

The emergence of new occupations is part of this new era of the development of the transport-logistics branch and industry, and the incorporation of artificial intelligence permeates this entire process. A combination of multiple skills will be necessary in the future for this emerging new digital era[7].

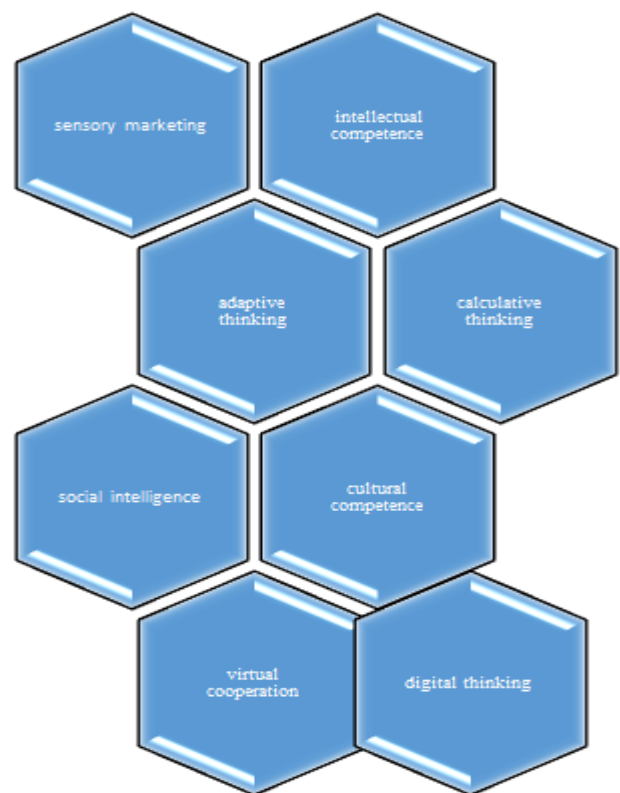The skills necessary for the occupations of the future

Chart 4:- Graphic representation of the skills for the occupations of the future.

The creation of a new type of working environment where expenses are reduced, processes are transparent, data is in real time, employees are offered the opportunity for flexible office-hours and suppliers and customers are linked in a single network is the time of the industrial revolution of Logistics 4.0, digitalization and artificial intelligence.

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[4] Bundesministerium für Wirtschaft und Energie, "Industrie 4.0 und Digitale Wirtschaft", April 2015
[5] Enzyklopädie der Wirtschaftsinformatik – Online Lexikon

[6] Tzvetkova, S. (2016), "Managing Innovations in Transport", ch. 9 "The Role of Innovative Thinking and Entrepreneurship for Economic Development", p. 152, UNWE Publ. House;
[7] Institute for the Future for Apollo Research Institute, Future Work Skills 2020
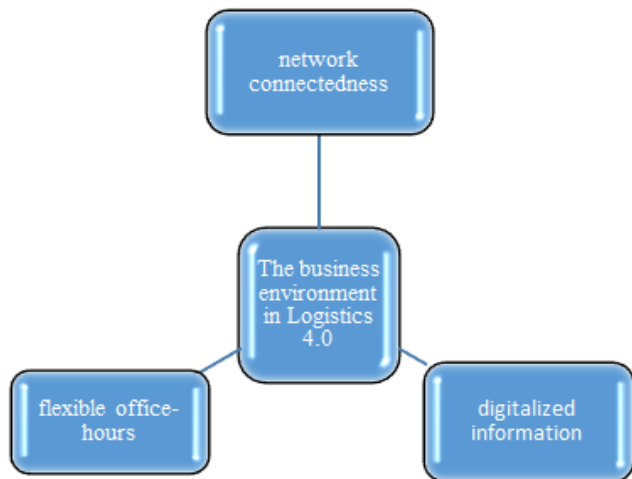
Fig 5:- Presenting the work process in the industrial revolution of Logistics 4.0

The perspective is changing – at the core of business lies not only profit, but also flexible and rapid processes aimed towards customers. The focus is not on collecting data but on analyzing this data for the purpose of making more precise and appropriate decisions, making more specific analyses and developing strategic projects.

Digitalization and artificial intelligence set the new standards in various areas of life. Active online sales, autonomous trucks and the use of transport drones are examples of fundamental paradigmatic changes in logistics[8]. The development of the fourth industrial revolution is in full swing. Autonomous driving, robotized machines in warehouses, smart factories – all of this is the new reality. Artificial intelligence (AI) will change the logistics industry drastically. Even today online platforms coordinate algorithms for self-training with orders and routes. The first field tests with autonomous trucks are being conducted as well.

There are three main directions in which the transport industry will change in the following years through the use of artificial intelligence.

A) Autonomous movement of trucks
The first aspect for the realization of artificial intelligence in transport and logistics is manifested in the possibility for the autonomous movement of trucks on highways in the following years.

Manufacturers such as Daimler, Tesla and Scania have already brought in the first autonomously moving trucks[9]. In the following years, completely automated trucks on European roads will be part of the real picture[10]. Of course, this is where the necessity for active partnership between technological firms and politics comes in. What the future will bring is that computers will be equal to human drivers and that will be strongly expressed in automobile traffic.

It can definitely be said that autonomous trucks are the most spectacular application of artificial intelligence in logistics, even though more and more applications such as importing information in Google Glass glasses with data or completely automated inventories with the help of drones are already available[11].

B) Intelligent platforms
The second aspect for the realization of artificial intelligence in transport and logistics is presented through intelligent platforms. In Germany alone an average of about 500 000 heavy trucks traverse the streets every day (semi-trailers, articulated trains with a weight of 12+ tons). Almost a third of them are empty trips and thus they contribute to the high volume of traffic and traffic jams[12]. The future promises less busy roads. Autonomous network automobiles will cause fewer traffic jams during heavy traffic due to their behavior when driving. This will lead to significantly more balanced traffic.

Online platforms coordinate orders and routes more effectively. As a result, fewer vehicles are necessary; on the other hand, empty volumes are significantly reduced. Logistical platforms also take into account information such as road conditions, including construction work along main roads or closed main roads; as a result, truck flows can be directed more effectively along the respective country's roads and along the European transport network. The use of this type of online electronic markets is extremely easy, fast and effective.

Various online electronic markets show through algorithms how the optimal use of trucks' cargo spaces as well as avoiding empty trips and offering the best and most competitive prices are possible – all with just a few clicks. The possibility for planning the periodic transportation of cargo will lead to the full utilization of each transport vehicle's capacity. This, in turn, will be reflected on traffic, which will be managed intelligently.

C) Storehouse management
Artificial intelligence also becomes actively applicable in storehouses. Product suppliers will be integrated in firms' structure and processes from the development of the product to its delivery. Digitalization in storehouses will have a strong influence on reducing process and staff expenses, minimizing work time, avoiding mistakes; it will also lead to

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[8] Bundesministerium für Wirtschaft und Energie, "DIGITALPOLITIK FÜR WIRTSCHAFT, ARBEIT UND VERBRAUCHER Trends – Chancen – Herausforderungen" , Juni 2017
[9] https://www.welt.de/wirtschaft/article173824299/Daimler-gegen-Tesla-Stuttgarter-stellen-Lkw-eActros-vor.html

[10] AUSWIRKUNGEN VON SELBSTFAHRENDEN AUTOS|2017
[11] Bitkom, Entscheidungsunterstützung mit Künstlicher Intelligenz, 2017
[12] GÜTERVERKEHR Wirtschaft und Nachhaltigkeit im Unterricht, Juli 2012

significantly improved control in storing the merchandise and possibilities for stable inventory.

Traders/Manufacturers and customers will be included in a single information chain through an online platform where the digital exchange of data in the Cloud, through structured and standardized data transmission, will be external and internal. The elimination of paper documents will become fact. The biggest challenge in storehouse management, as a result of the incorporation of artificial intelligence, will be the necessity for higher data security, which in turn will lead to the creation of technical requirements (interfaces).

As a result of this entire process, the reception and production of merchandise from storehouses will be an active and well-functioning system.

The next essential moment in effective storehouse management is the opportunity that "Internet of Things" (IoT) will provide – namely, communication between trucks and storehouses, where trucks will send messages to storehouses: what kind and quantity of merchandise they need and when. The availability of modular, autonomous transport systems for storing goods in storehouses will lead to a fast and fully flexible work process[13]. This entire process will be digitalized with a sequence of algorithms connected in Cloud information sections.

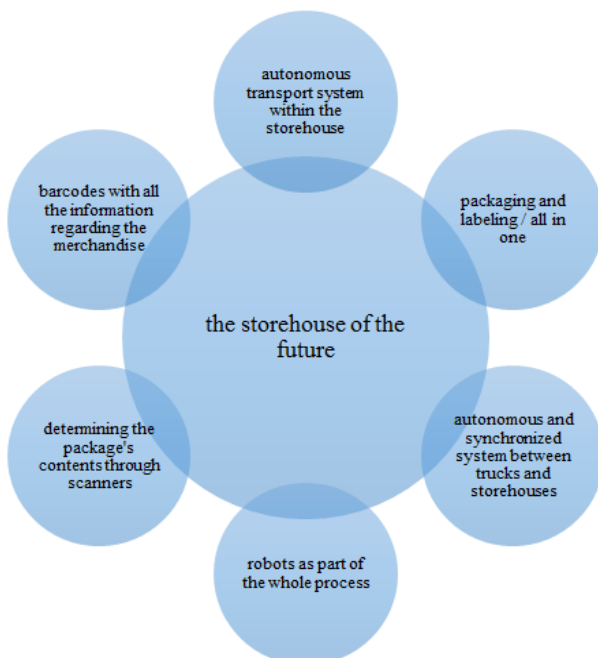A graphic presentation of the storehouse of the future

Fig 6:- The Storehouse of the Future

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[13] FRAUNHOFER-ALLIANZ BIG DATA
FRAUNHOFER-ALLIANZ BIG DATA, "Zukunftsmarkt Künstliche Intelligenz – Potenziale und Anwendungen", 2017

With the presence of artificial intelligence in storehouses, this new organizational work process will lead to a significant optimization of storehouse space, better control over the merchandise and changes in work organization. There will be a necessity for large investments, intense coordination with suppliers, clashes between man and machine and risks of the emergence of possible defects in the system.

II. CONCLUSION

The fact is that artificial intelligence is already changing logistics and transport and it will continue to influence and alter the entire transport-logistics chain. The pursuit of fully automatized decision-making does not exclude or isolate the presence of people. Quite the contrary – the human factor is a key one in the work process, where people are coordinators and analysts and keep track of the proper and full realization of every activity in the work process. As a process, digitalization will inevitably lead to changes such as the decline of many jobs, but also the emergence of many new ones which will accompany and support artificial intelligence. Alterations in company structures and the realization of deals will change and adjust. The logistics of today will not be the logistics of tomorrow. The important thing is that all these changes and innovations be recognized and accepted as a chance, not as a risk because digitalization will lead to stable changes in economy and society. On a European level, Germany holds the strongest positions in the field of new technology, more specifically – artificial intelligence. With multiple scientific institutes in the field of electronics, information technology, mechanical engineering, specifically robotics and artificial intelligence, Germany is the engine of Europe. On an international level, however, the USA, China, Korea or Japan reign. Competitors are found not only in established fields, but often in the form of newly emerging companies such as Tesla, Rethink Robotics and Boston Dynamics or giants like Google, Amazon and Apple. Software companies, Internet companies, the BigData companies (often fragments of technical universities) in particular are the driving forces of AI and robotics worldwide. Digitalization as a process and artificial intelligence in particular are a positive effect and a challenge for the transport-logistics branch.

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