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D5.5.1

Development of 10 Business Scenarios for the Business Simulation Platform

Document Control Sheet

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PU: PU = Public, fully open, e.g., web,

CO =Confidential, restricted under conditions

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Chapter 1

Introduction

1. Introduction

The purpose of this deliverable is to develop business scenarios of circular economy for various business areas that will be simulated in the CIRCUIT business platform to support entrepreneurship in Greece and Bulgaria. These business scenarios focus in strengthening entrepreneurship mindset on circular economy and promoting the development of innovative circular business models, envisaging to influence young entrepreneurs that are willing to be involved in circular economy practices, promote circular economy initiatives, support new collaborative business schemes and, hence, ameliorate the competitiveness of SMEs.

Chapter 2

Business Scenarios

2.1. Business scenario introducing the specialized instruments FIFO, LIFO and FEFO that could enforce the optimization of the product flow

This business scenario involves the implementation of specialized tools in the business of transport companies, sedition companies and warehouse companies in order to achieve more effective and efficient management of their processes. On that base, through these instruments companies are able to succeed in the optimization of their business according to the requirements of the circular economy model. Nowadays, the conventional production method, in which raw materials are extracted, processed into products and disposed of as waste at the end of their lifetime, is beginning to be discontinued.

The future belongs to the circular economy. In simplified terms, the aim is to keep materials and components of all kinds in a constant and sustainable cycle. If implemented consistently, this principle could decouple future economic growth from resource consumption. Manufacturing companies need to question their product design and rethink products to enable circularity. This applies to the product structure for a simple replacement of components as well as the breakdown into components and the use of new and sustainable raw materials. This way of thinking also applies to the processes of every company that must be optimized. The holistic manner in the management of a contemporary company must be considered.

Here comes the important role of the logistics sector. Logistics, as the centre of future business models, are able to play an essential role in this process. It will take on more and more important tasks — and at the same time become more fragmented and local. Both shippers and logistics service providers will undergo a transformation in the circular economy.

Key challenges towards the sector:

Logistics service providers must create the necessary infrastructure. Transforming toward a circular economy (CE) is a viable strategy for achieving sustainable logistics systems. However, for big part of the participants this sector and all other related parties it is still unclear how this transformation should be approached because there is limited knowledge in this context. Sustainable logistics, also known as green logistics, is defined as "supply chain management practices and strategies that reduce the ecological and energy footprints of the distribution of goods which focuses on material handling, waste management, packaging and transport" [1]

Companies in the sector must strive for the absorption and implementation of more and more innovative technologies, for greater security, reliability and convenience of customers and achieving efficiency in the distribution of loads by means of efficient organization of full and partial trucks and combined transport. The future belongs to these companies that adopt in the right way the key innovations that comes from the major technological trend - the next-generation wireless solutions. Standards such as 5G, WiFi and Bluetooth 5.0 are gaining more and more range and power, which significantly increases data transfer. These solutions help with lower connection latency, better real-time data processing, and easier cloud application management.

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[1] Seroka-Stolka & Ociepa-Kubicka, 2019, p. 472

The proposed idea in this business scenario is to develop an integrated approach for optimizing the flow of products in the warehouses. The process of optimization could be reached through the implementation of the specialized instruments FIFO, LIFO, FEFO as systems for optimizing the flow of products in the warehouse. They optimize the process for each shipment, helping to maximize speed, preserve product quality and shelf life.

Key benefits of implementing innovations in the sector:

Logistics plays an important role in the whole supply chain, and key practices could be implemented as a way of reducing the pollution problem globally but also to be reached a direct positive business impact. The positive environmental effect could be reached through the implementation of innovate instruments that helps to be optimized the management of the operations in the warehouses. Such tools are FIFO, FEFO, LIFO. [2] In the context of global trade, the performance of inventory management in the supply chain depends to a large extent on the respective issuing policy that is in place at the echelons between the supplier and the store, e.g. at the retailer's distribution centre. The purpose of these policies is to determine which products are picked and sent to a specific store when an order arrives. FIFO, FEFO and LIFO are the three main strategies for warehouse management.[3]

FIFO (FIRST IN, FIRST OUT)

The FIFO method follows the logic that in order to avoid product stagnation, the oldest inventory items will be removed first. The FIFO method is mainly used if more perishable goods that have a short shelf life are stored. Products with a relatively short demand cycle, such as clothing, may also need to choose FIFO to ensure that they are not left with outdated styles in inventory.[4]

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[2] Dada A, Thiesse F (2008) Sensor applications in the supply chain: the example of quality-based issuing of perishables, Sci 4952:140–154

[3] Sensor Applications in the Supply Chain: The Example of Quality-Based Issuing of Perishables Ali Dada, Frédéric Thiesse1, Institute of Technology Management (ITEM-HSG), University of St. Gallen, Dufourstrasse 40a, 9000 St. Gallen, Switzerland

[4] https://cappelen-logistics.com/en/warehousing-and-logistics

LIFO (LAST IN FIRST OUT)

The LIFO method is a simple, multi-functional method of merchandise management. In this system, products that are last in stock are first out. LIFO is mainly used for products that do not have an expiration date.[5]
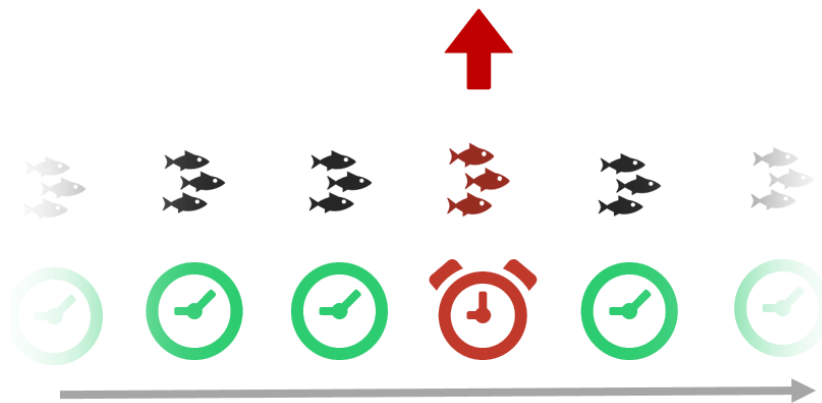

FEFO (FIRST EXPIRY FIRST OUT)

In the FEFO management system, products are shipped from the warehouse according to their expiration date. This ensures that no unusable products are left behind. It is mainly used for goods with less durability or with a certain expiration date. Most often, these are pharmaceutical and chemical goods, where expiration dates are calculated based on the expired date of the batch or expiration date, as well as any fresh food products, such as fruits, juices, cereals, etc.[6]

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[5] https://cappelen-logistics.com/en/warehousing-and-logistics
[6] https://cappelen-logistics.com/en/warehousing-and-logistics

FEFO (First Expired First Out)

Actors that could be involved: logistics operators, warehouse operators, transport companies, retail companies, global brands, big companies with warehouses and big amount of products and processes, pharmaceutical companies etc.

2.2. Business scenario for the implementation of the managerial concept "Lean Six Sigma" as an important factor for the transition from Linear Economy to Circular Economic

This business scenario will present an opportunity for the faster, better and more sustainable transition from the model of linear economy to the desirable model of circular economy on the base of one proven and highly efficient managerial concept. In face of challenges of global competition companies are concentrating more on the needs of customers and seeking ways to reduce costs, improve quality and meet the ever-increasing expectation of their customers. The modern world has entered a stage called "New Reality".

The main characteristics of the new reality are associated with non-uniformity of changes, uncertainty, high dynamics, increasing non-linearity of processes in the environment, increased complexity of administrative and management processes, changes in resource and commodity markets. Processes are also intense at the international political level. There are complicated trade and political relations between countries and regions. The macroeconomic development of the modern world is increasingly faced with unidentified threats, uncertainty, slowing growth rates, critical shortage of resources. Factors that make it difficult to create conditions for the development of the idea of a circular economy and the implementation of targeted efforts to turn it into a basic and sustainable model.
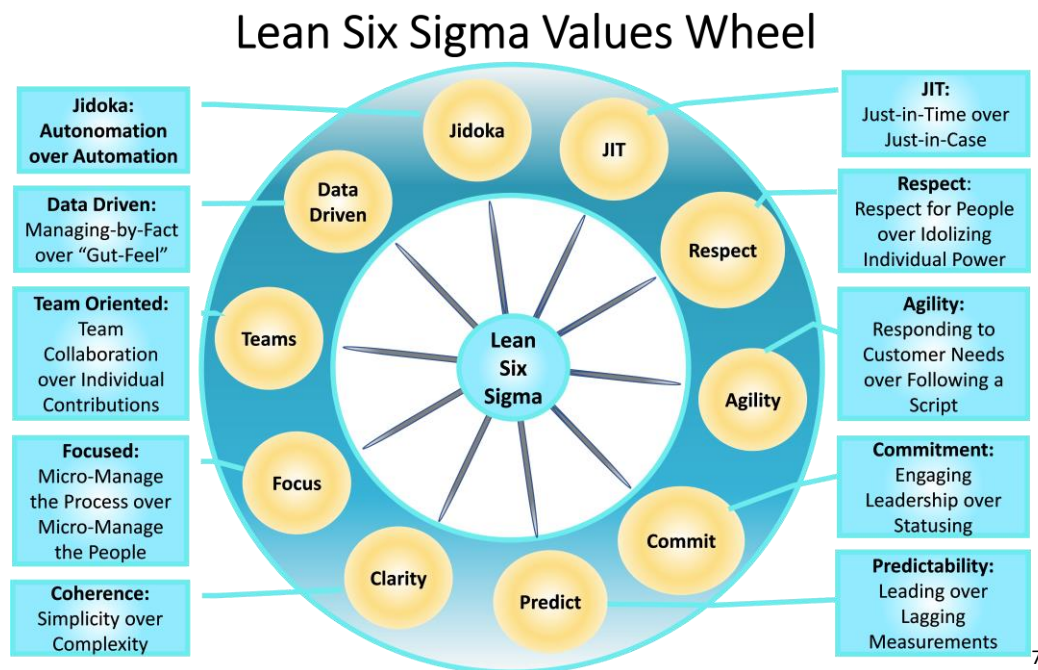
This business scenario will focus the attention over the efficient management of the companies because they are the key element in the circular economy model. Positive results at the macroeconomic level and progress towards a circular economy largely depend on their activity and the way they are managed. The behaviour of modern companies, especially large companies, is defined by their managers. The described dynamic changes in the business environment require modern managers to possess multifunctional qualities that enable them to make accurate and timely decisions in a highly dynamic and uncertain environment. High competition between companies in all sectors makes planning difficult and shortens the life cycle of products, which affects important factors for the circular economy such as - the creation of waste, inefficient use of resources, increased consumption of energy and raw materials, etc. The entry of artificial intelligence and technologies into more and more areas of life and business qualitatively change production processes and company's management, which requires a permanent search for ways and means of innovation, as a necessary basis for the transition from linear economy to circular economy.

On the one hand, the described factors can contribute to the emergence or strengthening of negative processes in the world economy, but on the other hand, there are proven management methodologies and specialized tools with the help of which the main goals of the circular economy can be achieved. One such type of tool is the proven "Lean Six Sigma" management concept.

Application of the "Lean Six Sigma" management concept as a factor for transforming the traditional linear economy model into a circular economy model

In this business scenario will be presented the positive impact of a proven managerial concept that could be applied worldwide. Applying the concept of "Lean Six Sigma" in the management of modern companies has the potential to contribute to a significant improvement in the results of companies which is a basis for a common positive macroeconomic change. The understanding of total quality

management is used, a change in the way of thinking and attitudes of employees is achieved, processes are changed, emphasis is placed on customer expectations, and the entire organization is committed to their satisfaction, i.e. people, processes and systems work hand in hand to meet customer expectations. The below picture represents the possible positive effects that the implementation of the concept could bring to the macroenvironment if it is adopted from more and more companies worldwide.

Lean Six Sigma Values Wheel

Jidoka: Autonomation over Automation

Data Driven: Managing-by-Fact over "Gut-Feel"

Team Oriented: Team Collaboration over Individual Contributions

Focused: Micro-Manage the Process over Micro-Manage the People

Coherence: Simplicity over Complexity

JIT: Just-in-Time over Just-in-Case

Respect: Respect for People over Idolizing Individual Power

Agility: Responding to Customer Needs over Following a Script

Commitment: Engaging Leadership over Statusing

Predictability: Leading over Lagging Measurements [7]

The methodology requires paying serious attention to the removal of defects and the continuous improvement of technological processes at the workplace as a basis for: reducing the volume of rejected products, reducing the consumption of materials without a real need for it, reducing the number of personnel required to carry out certain operation, building constant customer satisfaction with the product or service. In fact, the Lean Six Sigma concept is a philosophy based on the understanding of continuous improvement as a drive for superior work performance. All these effects are basis for the transformation from the linear economic model to a circular economic model.

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[7] https://www.glssregistry.com/glssr/manifesto
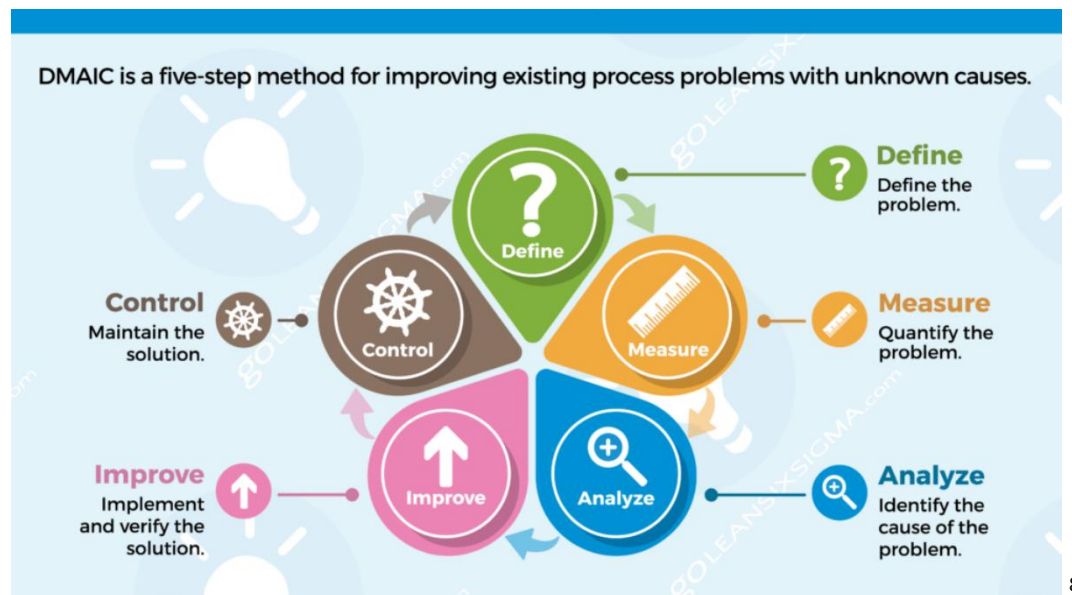
Main challenges

- Integrating the concept requires funds, time, effort and desire on the part of managers and employees;
- Positive results from the application of the concept require awareness, discipline and readiness for changes;
- The process of transforming a company from its current state to management based on the "Lean Six Sigma" concept requires time;
- After introducing this concept, it needs to be upgraded daily in order to contribute to the expected positive results.

Main contributions of Lean Six Sigma concept:

- Management decisions are made based on analysis of facts and data;
- The quality of the product or service is brought to the fore;
- Orientation at all individual levels of the company to the user, to business results and a very low level of defectiveness;
- Focuses on identifying and eliminating all activities that consume time and resources but do not add value to the final product or service, shortening the production cycle time;
- Investing efforts and funds to offer the company a better product at a better price and with higher customer satisfaction;
- The use of materials and the generation of waste is minimized as much as possible;
- The application of the Lean Six Sigma concept in more and more companies around the world has been proven to contribute to significant improvements, which, taken together, give grounds for it to be accepted as a powerful ally of the transition to a circular economy.

8

Possible stakeholders: managers, employees, companies from all over the world, from different sectors, with different subject of activity, of different size, public administration, governments, individual progress.

2.3. Business scenario for the implementation of "Just in Time" (JIT) system as a tool for optimization of order processing, warehousing and shipping

In face of the challenges of expanding global competition, emerging new technologies and improved communications, companies are concentrating more on the need of customers and seeking ways to reduce costs, improve quality and meet the ever-rising expectations on their customers. Faced with these challenges, companies worldwide identified logistics as an area to build cost and service advantages. In this business scenario will be presented a proven way for optimization of the processes in the logistics and warehousing sectors.

Logistics refers to all the move-store activities from the point of raw materials acquisition to the point of final consumption. Its core elements include customer service, order processing, inventory management and transportation. However, there are variety of challenges in front of this sector towards the transition from linear economy to circular economy and a brighter future for the world. The core idea of this business idea is to develop an integrated approach for efficient processing of goods, services and processes.

The value of logistics according to the Circular Economy Model:

Customer service: relates to quality with which the flow of goods and services is managed. It is about the creation of time and place utility in the seven rights (7Rs), that is the ability to deliver the right product to the right customer and the right place in the right condition and the right quantity at the right time at the lowest possible costs.

Order processing: it involves all the activities in the order cycle, including collecting, checking, entering and transmitting information. The collected information could provide useful data for production scheduling, financial planning, market analysis, logistics operations etc.

Inventory management: it is about appropriate inventory levels to serve the demand in a supply chain.

Transportation: it is concerned with the ways in which all necessary for the producing process items, as well as all the finished goods are allocated between different parties.

It is obvious that and effective and efficient logistics management is very important to the success of the companies. Exactly in this point the Just-in-Time (JIT) management approach could be useful.

The potential of Just-in-Time (JIT) management approach in the logistics sector:

Just-in-Time (JIT) management approach is long proven. But its famous and use is focused mostly in the manufacturing sector. However, the potential of Just-in-Time (JIT) has not been widely recognized in the logistics sector. In the scientific literature, many authors shared the idea that business logistics is an area where the implementation of Just-in-Time (JIT) can help attain its performance objectives, that is, cost reduction and service improvement. Both areas are highly important for the circular economy model.
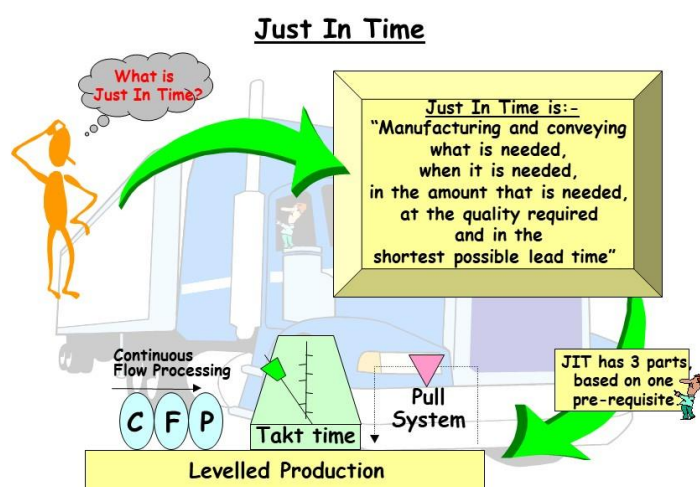
Main activities in the business logistics:

There are four main activities, namely: customer service, order processing, inventory management, transportation management, also there are number of supporting elements including packaging, handling, materials, purchasing, warehousing. The management philosophy underlying "Just-in-Time" (JIT) is to continuously search for ways to make processes more efficient with the ultimate goal of producing goods or service without incurring any waste. That is the reason why this concept could have a significant positive effect of the transition from linear economic model to a circular economic model.

Significance of Just-in-Time (JIT) for Logistics:

"Just-in-Time" (JIT) is an integrated, problem-solving management approach aimed at improving quality and facilitating timeless un supply, production and distribution. The concept is helpful for a service improvement based on a better process understanding, planning and performance. For instance, the implementation of the approach enhances logistics customer service by ensuring the availability of goods to meet demand requirements, thereby creating time, place and possession utilities for the customers. Another positive effect of the adoption of "Just-in-Time" (JIT) is achieving close working relationships with suppliers to ensure the quality and dependability of supply.


As an effective and efficient logistics management tool, the approach could prevent the following typical problems in companies worldwide:

- Logistics operations in the supply chain cause environmental pollution and extensive resource depletion;
- The negative impacts of logistics operations create interrelated economic, environmental, and social issues which demand more sustainability strategies for the logistics companies;
- Traditional industrial approaches such as the linear economic model (take–make–dispose) do not address environmental pollution such as waste generation, natural resource depletion, and impact on economic and social performance. The circular economy (CE) emerged as a sustainable strategy to tackle these issues, and this emergence calls for more circular business models in which businesses can create supply chains that recover or recycle the resources to produce products or services.

Actors that could be involved: specialists in the "Logistics"; "Business logistics"; "Logistics management"; "Customer service"; "Inventory management"; "Order processing", managers, entrepreneurs, employees, researchers.

2.4. Business scenario concerning the importance of the digitalization of the logistics sector as an alternative for achieving main aims of the circular economy

This business scenario is focused over the importance of the successful digitalization of the logistics sector worldwide as being key part in the nowadays globalized world and macroeconomy. It is concerned to be a basis for achieving the main goals for the circular economy model. The proposed business idea is to be presented an integrated approach for efficient, effective, sure, innovative and eco-friendly business model.
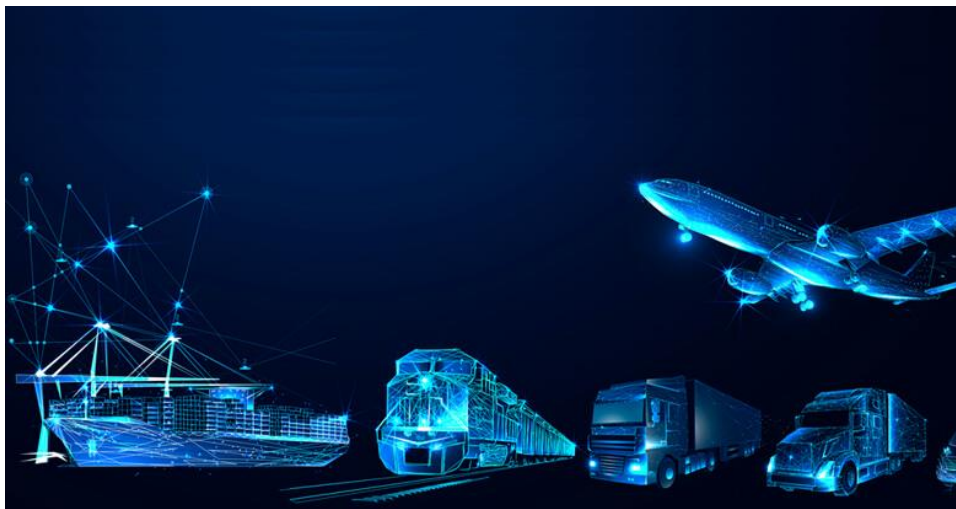
What is the history of logistics?

Logistics has evolved significantly throughout history, adapting to the changing societal needs and technological advancements. The origin of logistics can be traced back to Mesopotamia, Egypt, China and Rome. These ancient civilizations devised transport and storage systems to supply armies, cities and trade. Logistics has a long and interesting history that was always targeted to the changes in the environment.

What is the present of logistics?

The very essence of a business is to exchange goods or services for money or trade. Logistics is the path those goods and services take to complete the transactions. Sometimes goods are moved in bulk, such as raw goods to a manufacturer. And sometimes goods are moved as individual disbursements, one customer at a time. No matter the particulars, logistics is the physical fulfilment of a transaction and as such is the life of the business. Where there is no movement of goods or services, there are no transactions and no profits.

In general, nowadays the term "logistics" applies to the reliable movement of supplies and finished products. According to a Statista study, businesses spent trillions of dollars on logistics and this process is only increasing. Thus the importance of logistics increases too. However, there are few

severe problems that this important business sector cause to the environment. It is clearly defined that if this sector does not change, the environment problems will becomes bigger. The main fears are that if there is only increasing of the demand of logistics services without their improvement, the future in not bright!!! Thus, some action must be taken now!!!

What is the future of logistics?
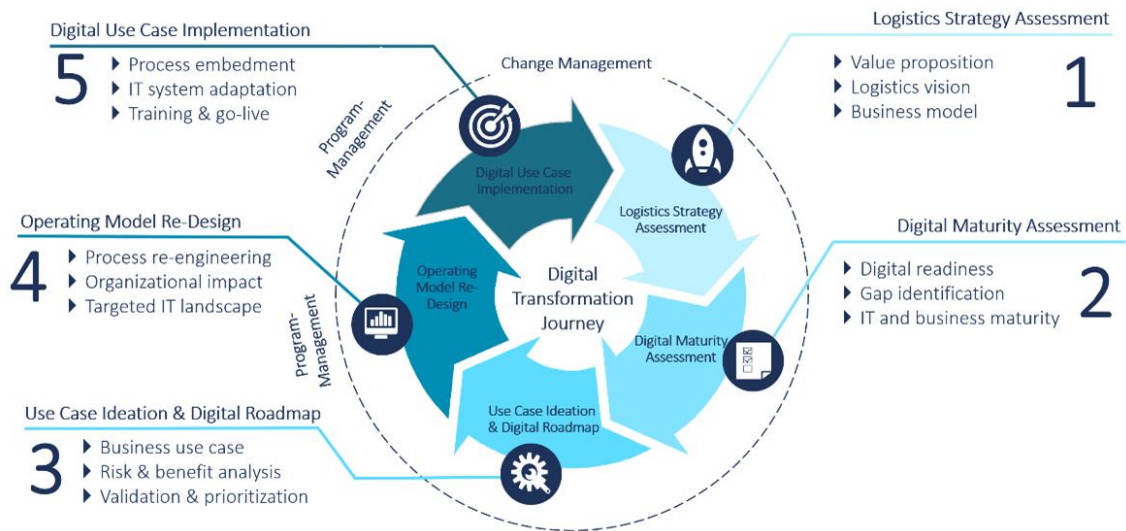
Without efficient logistics, a business cannot win the profitability war. The logistics sector takes very important role in the circular economy. Production and user processes must be linked in order to create a system without waste. The circular economy offers many opportunities for logistics companies to change their role, to innovate and to seize opportunities. A very important opportunity is the digitalization of the logistics sector.

The main challenges aims towards the sector are:

- In the light of global challenges and the need for climate neutrality and sustainability, the linear economy model is no longer tenable.
- The circular economy will replace linear economies, creating a connected flow of goods.
- Logistics will become the centre of future business models and will be called upon to live up to its responsibility.
- The demand for localized, condition and cycle specific transport solutions is increasing, and new value-added services will be in demand in logistics.
- Manufacturing companies need to question their product design and rethink products to enable circularity. This applies to the product structure for a simple replacement of components as well as the breakdown into components and the use of new and sustainable raw materials. The holistic product cycle must be considered.
- Logistics service providers must create the necessary infrastructure.

These challenges could be overtaken only if the new tendencies in the nowadays macro economic conditions globally begins their adaptation to the so called "New Reality".

One of the most important challenges is the digitalization of the logistics sector!

Digitization is a phenomenon that affects an increasing part of modern industry. The logistics sector, although one of the oldest in the world, is also beginning to emphasize more digital solutions, as an engine of innovation and optimization of its daily processes. This digital revolution in the sector is called Logistics 4.0. With each passing day, the pluses are getting bigger and bigger. In addition to better and faster customer service, digitalization itself will reduce costs and optimize all internal processes in the future. Adaptation of new technologies is inevitable, and without it, even the market leaders will decrease and even lose their share.

The Basis of the logistics sector digitalization:

- **Internet of Things:** new technologies are evolving and adapting faster than ever. Thanks to cheaper sensors and more processing power, innovation is accelerating in the logistics industry, making supply chains smarter, faster, more flexible and predictable. Key to this is the Internet of Things (IoT), which dictates ever greater connectivity of individual machines, with ever less need for human supervision. Thanks to falling integration costs, IoT will power more and more technologies. Smart warehousing, real-time transport visibility and predictable delivery are just a small part of all the pluses that will be seen with the deeper future implementation of the technology.

- **Artificial intelligence:** Artificial intelligence (AI) drives much of our daily lives – from a simple Google search to the robots we send to other planets, more and more of the world is being run by AI, and industry is no exception. Its adaptation also plays a huge role in the digital development of logistics. Key application areas include back-office automation, predictive supply chains and AI powering customers.

- **Blockchain:** Although the first association with Blockchain is cryptocurrencies, the technology itself is much broader and integral to the development of future enterprises and warehouses.The main idea behind the blockchain is faster and more secure communication throughout the supply chain, as well as easier and optimal tracking of goods, through the unique identifier by which each "block" in the network is identified.
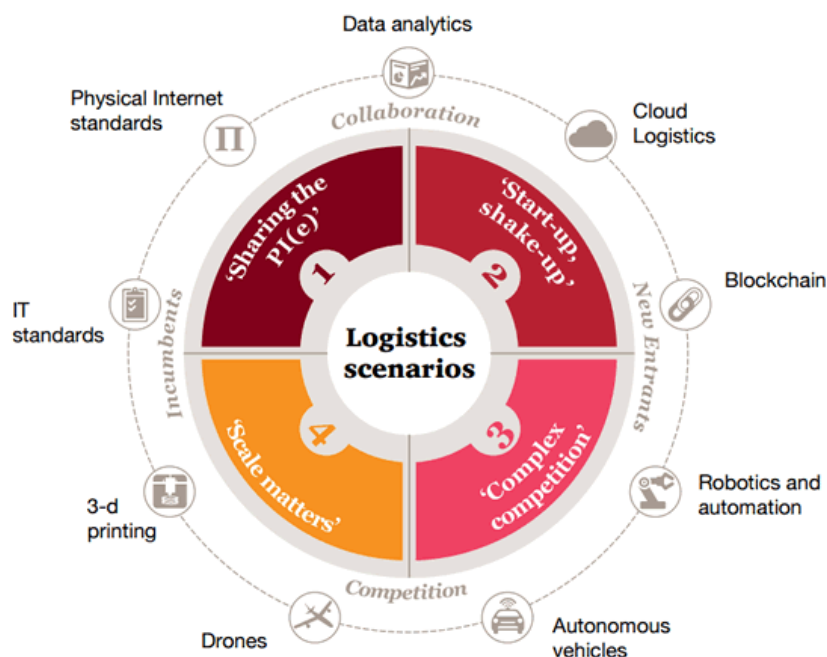
Potential benefits of the digitalization in the logistics sector:

- Companies worldwide are able to implement variety of innovative technologies that will affect positively the environment;

- The innovative technologies could be focused towards greater security, reliability and convenience of customers and achieving efficiency in the distribution of loads by means of efficient organization of full and partial trucks and combined transport.

- Major technological trend is next-generation wireless solutions. Standards such as 5G, WiFi and Bluetooth 5.0 are gaining more and more range and power, which significantly increases data transfer. These solutions help with lower connection latency, better real-time data processing, and easier cloud application management.

- All these are base for further improvement the environment for transformation to circular economy requirements.

Actors that could be involved: companies in the sector; companies that are connected and/or dependent from this sector; local authorities; national and international authorities.

2.5. Business scenario for the digitalization of the Agricultural Sector

This business scenario will present opportunities towards the agriculture sector in the "New Reality". The relevance of this topic is due to the fact that the contemporary macroeconomic environment is complex. From one side, there is high intensity of business processes, dramatic changes caused by the COVID-19 pandemic, globalization, political instability, trade wars, military conflicts worldwide and others. From other side, there is a constant move towards technology as well as sustainable penetration of artificial intelligence in various fields, fierce competition between market participants and scarcity problem heavier than ever. In this taught macroenvironment the agricultural sector becomes more complex and dynamic, so it requires a sophisticated management systems. Digitalization has impacted agricultural and food production systems, and makes application of technologies and advanced data processing techniques in agricultural field possible. Digital farming aims to use available information from agricultural assets to solve several existing challenges for addressing food security, climate protection, and resource management. However, there are important and difficult challenges towards the sector.
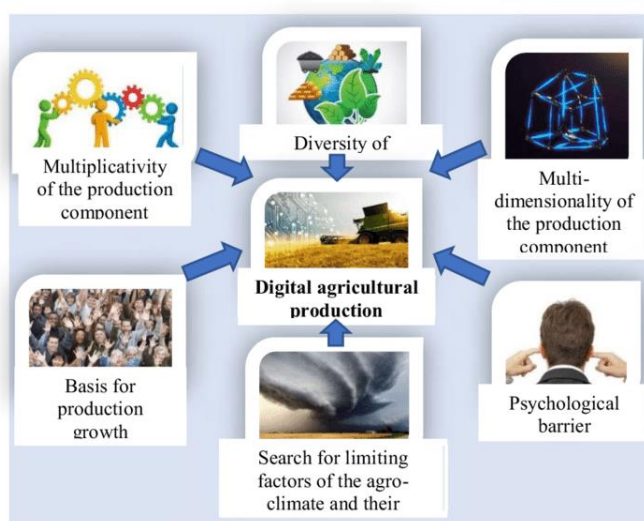
Main challenges towards the agricultural sector in the past and nowadays:

- One of the main global challenges is how to ensure food security for the world's growing population whilst ensuring long-term sustainable development.

- According to the Food and Agriculture Organization, agricultural and food productions will need to grow to feed the world population, which will reach around 10 billion by 2050 (1).

- Due to the increase in world population and market demand for higher product quantity and quality standards, the issue of food security, sustainability, productivity, and profitability becomes more important.

- Furthermore, the economic pressure on the agricultural sector, labour, environmental, and climate change issues are increasing.

- Therefore, the enhancement of efficiency through effective integrated smart technologies and techniques has been widely considered in recent years.

- The agricultural sector is complex, dynamic, so it requires advanced managerial methods.

- Agriculture has traditionally been a costly industry and has always had large losses throughout the entire production process, which led to a decrease in production efficiency.

The future of agriculture business:

Digitalization processes are currently being increasingly introduced into various sectors of the national economy, including the agricultural sector. In this context, digital agriculture (also known as smart farming or smart agriculture) tools can support the deeper understanding of interrelations within the agricultural production system and the consequent effects on the performance of farm production while balancing human health and well-being, social and environmental aspects, and sustainability associated with agricultural system. Due to advances in data generation, data processing and human-computer interactions, digital farming has progressed in recent years. One of the main features of digitalization in agriculture is the introduction of innovative Information and Communication Technology (ICT), Internet of Things (IoT), big data analytics and interpretation techniques, machine learning and Artificial Intelligence (AI).

How does the presented business scenario could solve the key problems of the agriculture sector in terms of a Circular Economy Model:
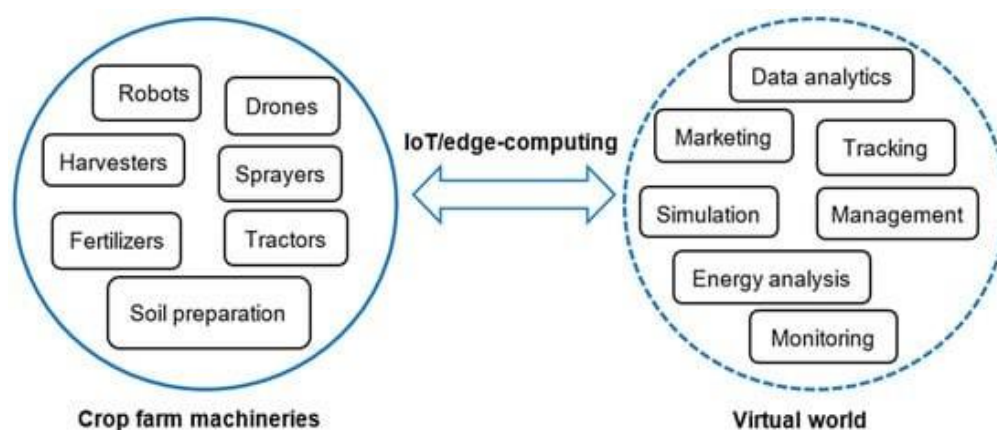

Digitalization in agriculture is designed to solve the vast majority of these problems and significantly increase the profitability of the industry. Digitalization helps to cover the whole range of actions, automate processes, cover the fullness of information, bring it into a single system, process it promptly, clearly monitor all processes, significantly reduce the loss of resources of all kinds as well as the waste.

Digitalization makes it possible to constantly monitor any process in crop production, animal husbandry, processing, logistics and prevent the development of some negative phenomena. Field monitoring involves monitoring the qualitative characteristics of soils and crops, crop rotation management, recommendations for crop rotation planning, helps to trace the entire cycle of work from planting to harvesting, including logistics.

Since there are large losses of agricultural products in the process of moving products, it seems appropriate to use digital technologies in logistics, which should significantly increase production efficiency. Control of finished products involves accounting for the harvest (from field to weight), monitoring the progress of the harvesting campaign, the amount of harvest for each field separately, the production of each employee, accounting for the work of carriers.

Key Advantages of Digitization in Agriculture Business that could benefit the transition to Circular Economy Model:
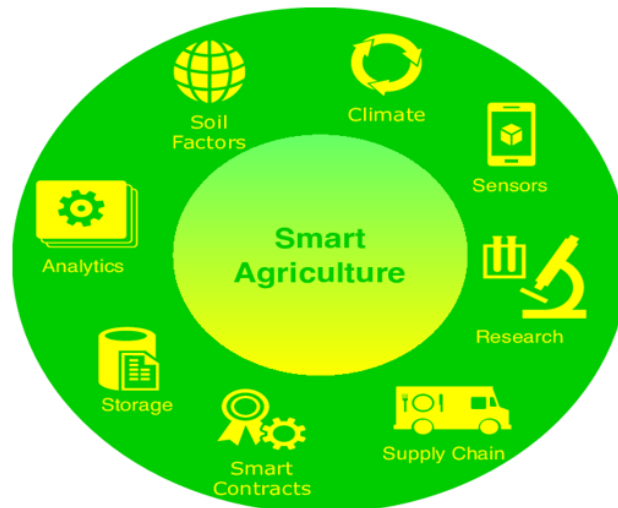
1. Smooth Operations
2. A reduced margin of error
3. Enhanced Speed in lesser Time
4. Improved Operational Safety for All
5. Enhanced Connectivity
6. Bringing in Intelligence in Business
7. Improved customer experience

Parties that could be involved: companies from the agricultural sector, companies that use their resources, food producers, livestock breeders, meat processors, dairy processors, food chains, food industry.

2.6. Business scenario about circular economy and big data analytics: The role of data-driven insight on circular economy performance

This business scenario involves the use of big data analytics for the positive influence of the business processes and a way to be done more efficient transition from the linear economic model to circular economy model. The role of the big data analytics is pivotal. In past years, the management of the companies worldwide has been increasingly influenced by the key concept of sustainability. To be able to achieve sustainable development, more and more specialists, scientists and managers pay attention to circular economy, which allows resource usage and waste production to be reduced. The concept of circular economy represents a substantial change in the way firms are run, since it requires the integration of economic activities and environmental well-being[9] and calls for the definition of new business models that lead to higher performance in environmental, social and economic terms[10]. In this perspective, circular economy is strongly related to supply chain management practices, as both are based on effective business process management.

The presented business idea here gives a good basis for the implementation of a more sustainable mode of production as it has become necessary for manufacturing companies to thrive in the international business context. Professionals and researchers are also paying increasing attention to Industry 4.0 (I4.0) and big data, as well as circular economy (CE) concepts, due to the many advantages they can provide for the manufacturing industry. The purpose of the circular economy is the effective utilization of resources, and the I4.0 concept has been established to help achieve this objective and requires further exploration in the field of sustainable production.

Moreover, adopting circular economy principles along the supply chain requires the acquisition, elaboration and use of adequate information and knowledge to implement the desired changes in business operations effectively[11]. Disruptive technologies, such as the Internet of things, big data analytics and artificial intelligence, are affecting the way supply chain managers make strategic and operational decisions[12]. In particular, big data made available by the spread of cloud computing, mobile digital business platforms, business analytics and social networks have not only significantly changed the *modus operandi* of many firms but have also been used to achieve better performance by optimizing circular economy supply chain solutions[13].
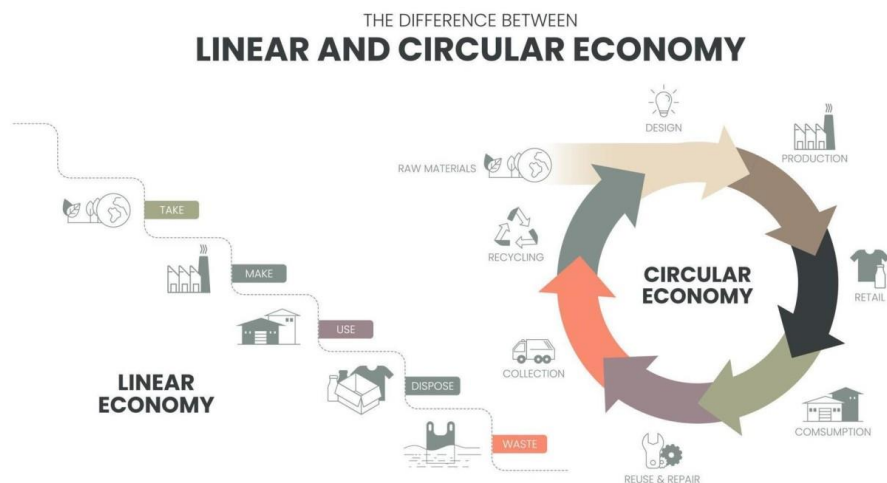
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[9] Jabbour et al., 2019
[10] Stahel, 2016; Teixeira et al., 2016
[11] Gupta et al., 2019; Sumbal et al., 2019
[12] Forbes Insights, 2018
[13] Müller et al., 2018; Tseng et al., 2018

The basis for a transition from linear economic model to circular economic model:

THE DIFFERENCE BETWEEN
LINEAR AND CIRCULAR ECONOMY

It is a widely known fact that information is the only resource that is constantly growing. Modern society generates so much data that storing it, processing it, analyzing it, protecting it, etc. become a real challenge. Both individuals and companies are constantly generating data. But this data is created for different purposes, on different media, using different technologies. The need to mix data flows, their huge volume and variety, as well as their incompatibility in certain cases, create a prerequisite for serious difficulties. It is here that modern science provides clear definitions regarding the sources of "big data". Knowing the different sources and types of "big data" makes it possible to choose the right tools to analyze it. Finding the right way to use big data would contribute to achieving some of the important goals of the circular economy model.[14]

On the basis of big data, a whole new world called "Metaverse" is being created. Big data, cloud systems and real-time data analysis are a prerequisite for building the blockchain technology, which is changing the understanding and concepts of business, finance and security on a large scale. The change is so significant that it requires a rethinking of the basic economic principles and dependencies, and this, in turn, becomes an important prerequisite for the transition from a linear economic model to a circular economy model.

Various points of view regarding the essence of "big data" are presented in the specialized literature. In a report on the subject, the McKinsey Global Institute offers its point of view - big data is a huge volume of data collected in real time, the scales of which are so large that they cannot be processed and analyzed with the tools known to date. They require new, advanced and powerful tools. Due to the fact that they are extremely important for the competitiveness and corporate security of any organization, company, national economy, regional economy and the world economy as a whole, every modern citizen, specialist or manager must be concerned with these new processes.[15]

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[14] Todorov, R. "Data Warehouse" concept - a tool for increasing the corporate security of the modern Bulgarian company

[15] Todorov, R. "Data Warehouse" concept - a tool for increasing the corporate security of the modern Bulgarian company

Big data enables a deeper understanding of processes and phenomena from different social areas, between which there are often invisible connections. The analysis of large volumes of data mediates the creation of complex algorithms that enable the preparation of forecasts and thus proactivity in company management. But "big data" has a number of challenges.

Big data challenges, overcoming which has the potential to positively impact the transition from a linear economic model to a successful circular economy model:
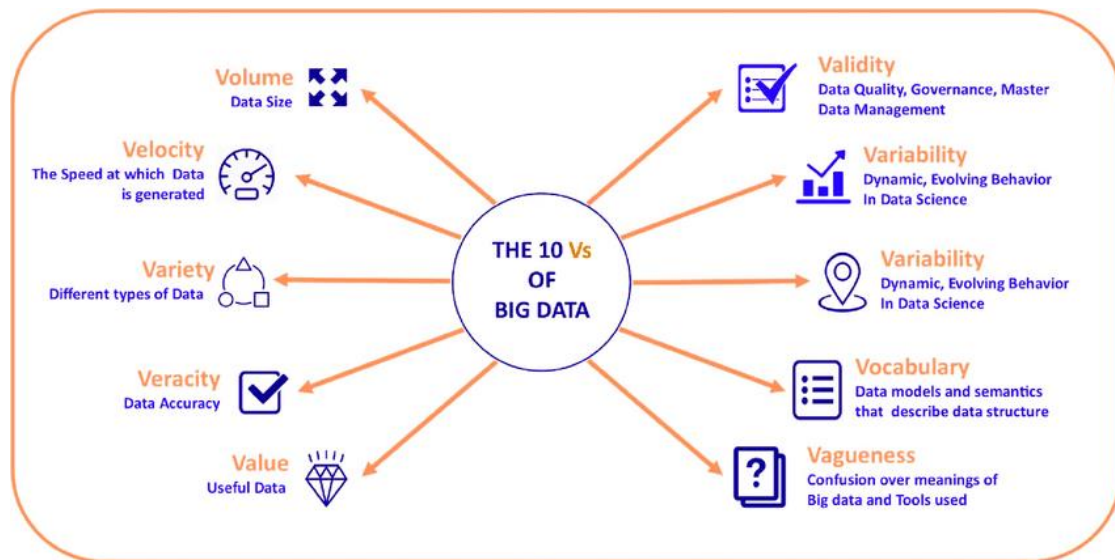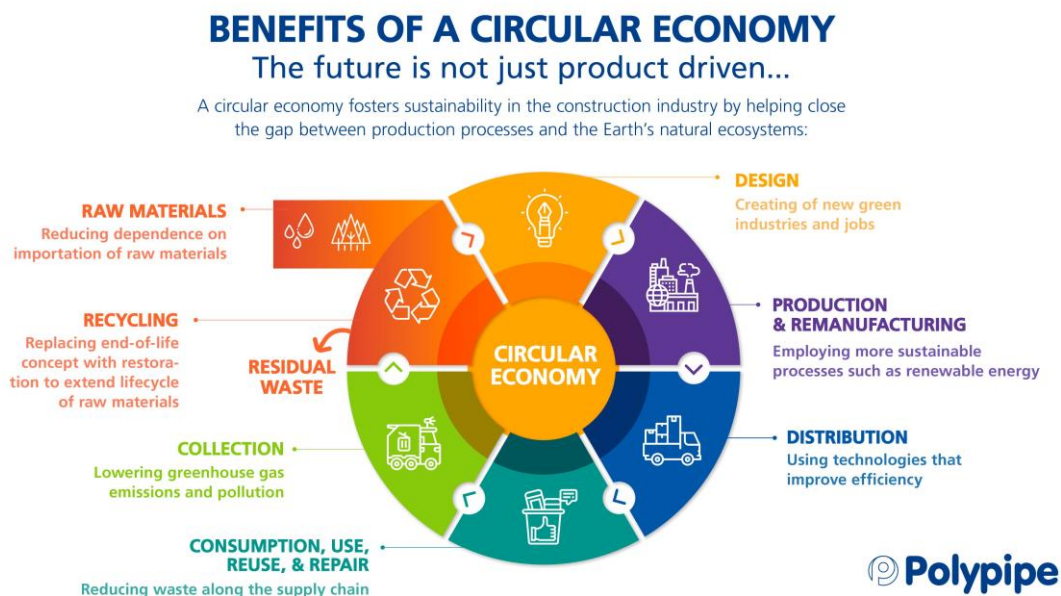

1. **Volume** - information is a unique resource that is constantly and exponentially growing. This overgrowth brings with it serious challenges, problems and opportunities.
2. **Velocity** - an important characteristic of big data, which is related to the speed with which big data is created, collected, used and most of all updated.
3. **Variety** – the question regarding the type of data that is created, collected, processed and analyzed for the purposes of developing the circular economy model is essential.
4. **Variability** - the variability of data, especially when the data is in a large volume, could lead to serious and difficult to overcome problems, which is why this problem needs to be considered carefully.
5. **Veracity** – this big data challenge is unique and key to the circular economy model, as the more the volume of big data worldwide grows, the more artificial intelligence takes part in creating, analyzing and disseminating information, the more the veracity of all information is diminished or compromised.
6. **Validity** - when there is a huge amount of changing information, the question of its validity arises, since data analysis should be carried out only on cleaned and verified data. Otherwise, analyzing unverified or incorrect information would have negative consequences on the precision of economic decisions.
7. **Vulnerability** - this is one of the most important challenges facing the modern economy and the possibilities of transition to a circular economy, since the use of big data hides great dangers and risks. The issue of big data security is always active and never resolved definitively, and this fact should be taken into consideration by all economists, managers, specialists, government officials, etc.

8. **Volatility** - there are many factors that contribute to the so-called Volatility of big data. Part of the main reasons are that big data is dynamic, it constantly changes and develops, depends on factors such as place, space, time. Also, factors such as seasonal fluctuations, random fluctuations, trending, etc. are present in big data and must be considered.

9. **Visualization** – the characteristics of big data, its complexity, multifacetedness, diversity, etc. turn into a real challenge the way in which they can be presented for the needs of analyzes in the economy.

10. **Value** - this aspect of big data is of leading importance and meaning regarding the transition to a circular economy, since it is precisely in the value of the performed analyzes that the possibility of competitive advantage, the possibilities for innovation, risk management, the management of favorable opportunities, the improved understanding of customer needs and ways to achieve the all-important "improved customer experience".

Benefits of using big data to transition from a linear economic model to a successful circular economy model:

Current macroenvironment is dynamic, diverse, and complicated, so big data sources cannot be processed with traditional software, hardware, or data management tools. There is a real need of implementation of big data analytics tools in the decision-making process. Big data refers to access, collects and store a large volume of data that is difficult to utilize using traditional data processing methods and platforms. These modern big data technologies evaluate these vast amounts of data in a short time, and generate predictive models through machine learning, and statistical techniques. In this context, big data analytics employs tools such as machine learning algorithms, and facilitates exploration of meaningful decisions through understanding the structure and relationships of data.[16]

BENEFITS OF A CIRCULAR ECONOMY
The future is not just product driven...

A circular economy fosters sustainability in the construction industry by helping close the gap between production processes and the Earth's natural ecosystems:

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[16] Kazançoğlu, Y., Big Data-Enabled Solutions Framework to Overcoming the Barriers to Circular Economy Initiatives in Healthcare Sector. Int. J. Environ. Res. Public Health 2021

There are variety of benefits:

Machine learning tools can be described as a subset of artificial intelligence (AI), which incorporates algorithmic approaches, allowing computers to solve problems without the need for complex computer programming.[17] The integration of machine learning technologies into the contemporary economic model has the potential to transform it into a better one - circular economy model.

Artificial neural networks can be defined as a computational approach that focuses on mathematical structures and models that have a series of connected processing elements, configuration, and function that perform parallel. Artificial intelligence offers many technological advances to businesses worldwide, such as cost-effective and optimal services in real-time, efficient and reliable collaboration among interdisciplinary stakeholders, and solutions for non-traditional care environments, transforming the current model to one that is closer to the idea of circular economy.

Cloud computing is generated from the development and integration of the many independent computing approaches and technologies that refer to utility computing, on-demand services, grid computing, and self-service internet infrastructures . Cloud computing technologies encourage and reinforce IT capabilities so that they can be accessible at all times and from every location. Cloud-based business operations big data analytics offer intelligence for more reliable and sustainable global business environment. Cloud computing can provide various benefits to organizations such as the minimization of technology-related costs (capital, operational expense saving, and labor cost) and accordingly better healthcare services , improved infrastructure and, efficient usage of resources, and increased technology standards and expertise.[18]

Data mining is the method of observing and revealing previously discovered knowledge, patterns, and trends in datasets, which is used to create meaningful data for generating predictive models. Data mining technologies comprise a number of different approaches such as data summarization, clustering, finding dependency networks, classification, evaluating changes, and specifying outliers. Usage of data mining can provide proactive solutions to the many barriers and challenges. These technologies aim to eliminate risks encountered by the organization, and facilitate decision-making processes of organizations through examining their patterns and trends. Data mining can assist organizations in management, detection of fraud, and abuses to determine unusual, abnormal, and outlier patterns.[19]

Statistical techniques are subsidiary mathematical structures that extract meaningful information and insights from the data by making predictions such as modelling, machine learning, data mining, multiple regression, discriminant analysis, logistic regression, nonparametric regression, and cluster analysis. The application areas of statistical techniques can be categorized as accounting and finance, health and medicine, research, manufacturing, marketing and business.[20]

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[17] Kazançoğlu, Y., Big Data-Enabled Solutions Framework to Overcoming the Barriers to Circular Economy Initiatives in Healthcare Sector. Int. J. Environ. Res. Public Health 2021

[18] Kazançoğlu, Y., Big Data-Enabled Solutions Framework to Overcoming the Barriers to Circular Economy Initiatives in Healthcare Sector. Int. J. Environ. Res. Public Health 2021

[19] Kazançoğlu, Y., Big Data-Enabled Solutions Framework to Overcoming the Barriers to Circular Economy Initiatives in Healthcare Sector. Int. J. Environ. Res. Public Health 2021

[20] Kazançoğlu, Y., Big Data-Enabled Solutions Framework to Overcoming the Barriers to Circular Economy Initiatives in Healthcare Sector. Int. J. Environ. Res. Public Health 2021

In resume, the transition from linear economy to circular economy is empowered by the big data analytics that result in:

1. Smooth Operations;
2. A reduced margin of error;
3. Enhanced Speed in lesser Time;
4. Improved Operational Safety for All;
5. Enhanced Connectivity;
6. Bringing in Intelligence in Business;
7. Improved customer experience.

Actors that could be involved: private and governmental organizations, companies, specialists from various fields of science and business, researchers, managers.

2.7. Business scenario for implementation of Artificial Intellect (AI) in the process of design of products and services

This business scenario is based on the idea of implementing the Artificial Intellect Instruments in the phase of design and creation of a better products and services that will be closer to the requirements of the circular economy model. The circular economy is a model aimed at extending the life cycle of products. In practice, this means sharing, borrowing, reusing, repairing and recycling existing materials and products as long as possible. When a product reaches the end of its life, the materials from which it is composed can continue to be used in other ways. This can be done over and over again and thus minimizes waste disposal. The concept of a circular economy is built in opposition to the traditional linear model where raw materials are used, things are created from them, they are consumed and the leftovers are thrown away. This model relies on large quantities of cheap and accessible materials and energy sources.[21]
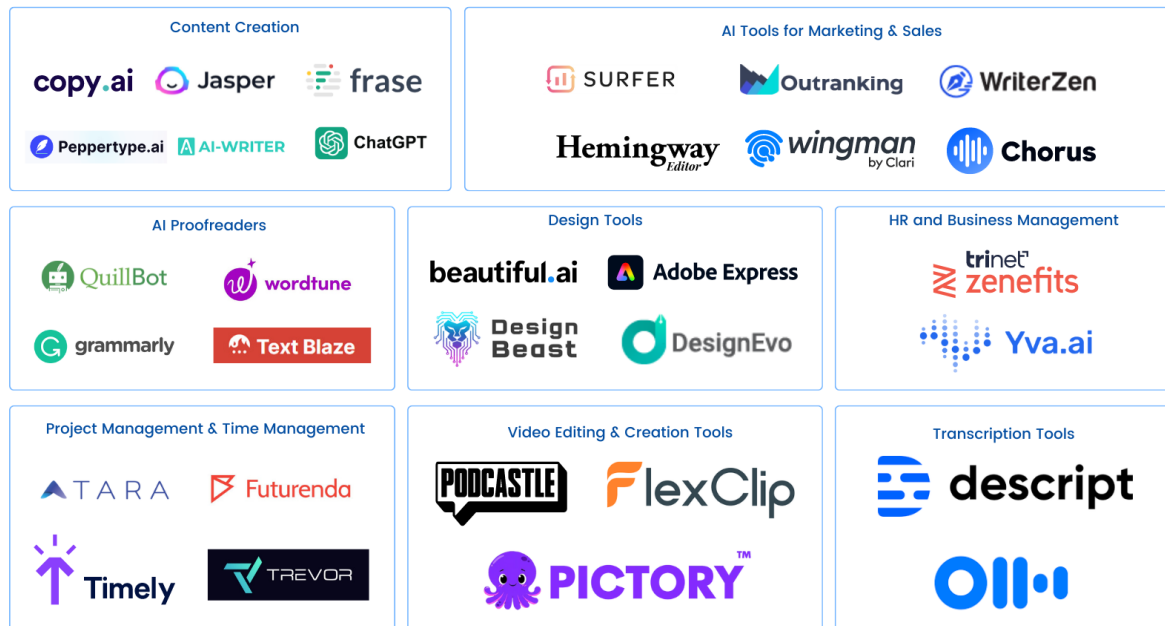
The business idea has the potential to influence positively the process of recycling raw materials reduces the risks associated with their procurement – the EU becomes less dependent on global crises, price changes and geopolitical pressures. This is particularly true for key raw materials needed to develop technologies to meet climate goals, such as batteries and electric motors. In this direction, the European Commission presented in March 2020 a new plan to promote the circular economy, which includes proposals for sustainable product design, waste reduction and expanding consumer rights, including the right to repair goods. Special attention is paid to resource-intensive sectors such as electronics and communications, plastics and textiles, and construction. [22]

This business scenario will be aimed at finding real ways to support this important process - using the power of artificial intelligence in the design of products and services, in a way that will facilitate and enable the transition to reliable products that can be reused, improved and repaired would lead to the accumulation of less waste.

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[21] https://www.europarl.europa.eu/news/bg/headlines/economy/20151201STO05603/
[22] https://www.europarl.europa.eu/news/bg/headlines/economy/20151201STO05603/

Best AI Tools

At the core of the business scenario is the use of artificial intelligence in the design process of advanced products and services, as designing more efficient and more sustainable products would help limit the consumption of energy and other resources. According to estimates, more than 80% of the impact of a product on the environment is determined already in the initial design phase. Packaging is becoming a growing problem – each European generates nearly 180 kg of packaging waste per year. The improvement of packaging design should be linked to the promotion of reuse and recycling. It is necessary to use the power of artificial intelligence to find sustainable solutions that will allow the design of products and materials to be carried out in a way that allows multiple use and recycling, will stimulate innovation in various sectors of the economy.

### Nature of Artificial Intelligence:
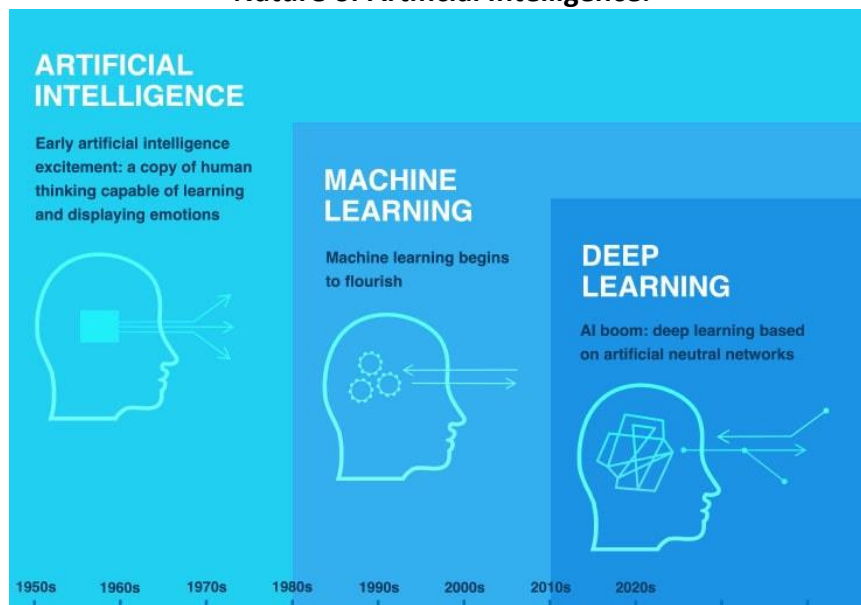
Artificial Intelligence (AI) can be defined as the ability of a machine to demonstrate abilities inherent in humans - to reason, learn, plan or create. We talk about artificial intelligence when technical systems monitor their environment, receive data (which is prepared by others or which they collect themselves), process it and perform actions related to achieving a specific goal. Artificial intelligence systems are able to adapt their behaviour to some extent by analyzing the results of previous actions and operate autonomously.[23]

In this context comes and the core idea of this business scenario - to present and highlight the importance of Artificial Intelligence for the contemporary and the future macroeconomy of the world. Some AI technologies have been around for over 50 years, but real breakthroughs have been achieved in recent years thanks to increased processing power, the collection of massive data sets and the development of new algorithms.

Application of artificial intelligence in the production of goods and services:

This could be a base for a process of creation and design of efficient, innovative and environmentally friendly products and services that could do the positive impacts worldwide. Many scientists, researchers, specialists, managers and entrepreneurs already do their best to understand and adopt the Artificial Intellect solutions in their business processes with the core aim - a better product for a better world and a better customer experience.
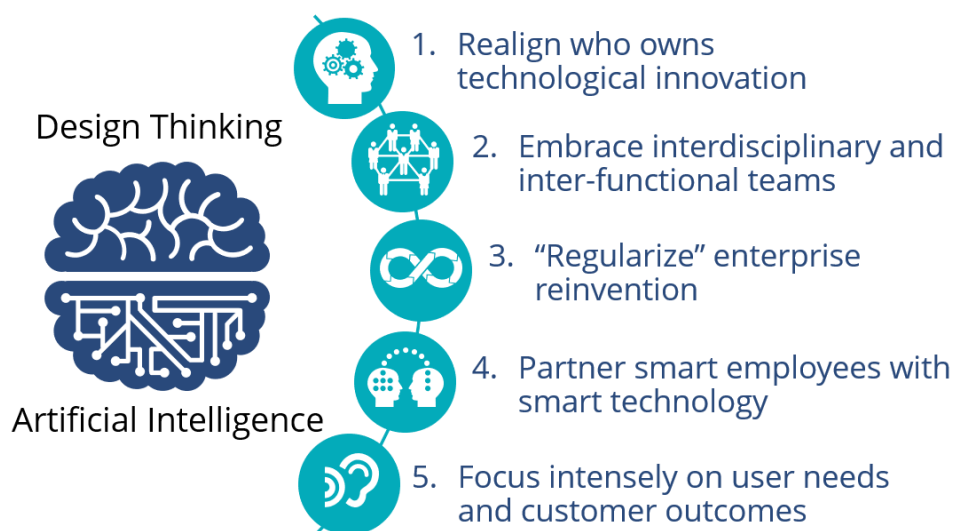
Key benefits from the implementation of AI in the process of design of the products and services:

Integrating an AI product development process can support many aspects of a business. From architecture to manufacturing, AI has something for every industry.

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[23] ttps://www.europarl.europa.eu/news/bg/headlines/society/20200827STO85804/izkustveniiat-intelekt-kakvo-predstavliava-i-kak-se-izpolzva

Generally there are several areas that could be improved by AI integrations:

- Project management;
- Software project requirements gathering;
- Product development strategy;
- Software frontend design;
- AI-powered software product security;
- Software architecture design;
- Artificial intelligence in quality assurance and others.

These improvements are basis for the following benefits of Artificial Intellect in product development[24]:

1. **Quicker decision making:** AI product development processes and machine learning tools involve using algorithms to generate immediate decisions for products. For this reason, many companies now rely on AI for making quicker, more accurate decisions that are consistent with prior conclusions. AI also eliminates the need to double and even triple-check work for accuracy because it focuses on providing error-free feedback from large amounts of data in a matter of seconds.
2. **Process optimization in a product development team:** AI product development processes assist with projects from beginning to end. They are focused on identifying any issues that may affect the progress of a project and offer quick solutions to eliminate any potential setbacks. This includes identifying if a team has the required skills and resources for a project, or if additional team members should be added. Furthermore, AI helps to automate processes and provide error-free results for tasks that are otherwise prone to mistakes thus saving both time and money.
3. **Better customer service:** 96% of customers report that good customer service plays an important role in their loyalty to a brand. Fortunately, AI is improving product development and making positive contributions to customer service systems. AI helps to address customer needs and offer solutions to issues they may be facing. It even goes one step further to prioritize urgent needs. In addition, by providing feedback that is categorized as negative, neutral, and positive, companies are enabled to make any necessary adjustments quicker than ever before.
4. **Cost savings:** As mentioned in prior sections, AI can drastically reduce costs. From process optimization to mitigating risk by ensuring hackers are not accessing confidential information (or any information at all), AI improves product development through cost reduction. AI also offers cost savings and improves time management through automation and assistance with repetitive, mundane tasks.
5. **Speeding up development processes:** Another example of artificial intelligence improving product development is by speeding up processes throughout the entirety of projects. This is done in a variety of ways. One is its ability to address any gaps in a project, such as a lack of skill sets or not having enough team members to complete tasks on time. AI also assists by determining which tasks will take the longest and offering suggestions as to how certain tasks can be automated. Further, AI can act as support for product development team members without putting product quality at risk. In fact, it does quite the opposite. Developers and

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[24] https://neoteric.eu/blog/ai-in-product-development-examples-and-benefits/

testers are among those who have the potential to benefit most from AI coding assistance. By detecting any errors or issues in code, testing times are drastically reduced.

Parties that could be involved: artists, designers, scientists, researchers, specialists, managers, entrepreneurs, companies and institutions worldwide.

2.8. Business scenario for the optimization of waste collection process in big cities on the base of Machine Learning (ML) and Artificial Intellect (AI)

This business scenario is focused over the important and difficult problem with the waste generation in the big cities all over the world and the process of collection of it. With the process of globalization, in the practice and theory, there arises one interesting phenomenon - the concept of Smart cities. Worldwide many researchers, scientists and managers think about the realization of this concept as a way for finding a sustainable solution of the problem with the inefficient waste collection in the big cities. The Smart cities are thought to be a powerful instrument and are suggested to be able to tackle the challenges towards the waste collection. Also this concept is a key element in the process of promotion of circular economy model and the dream of sustainable progress.
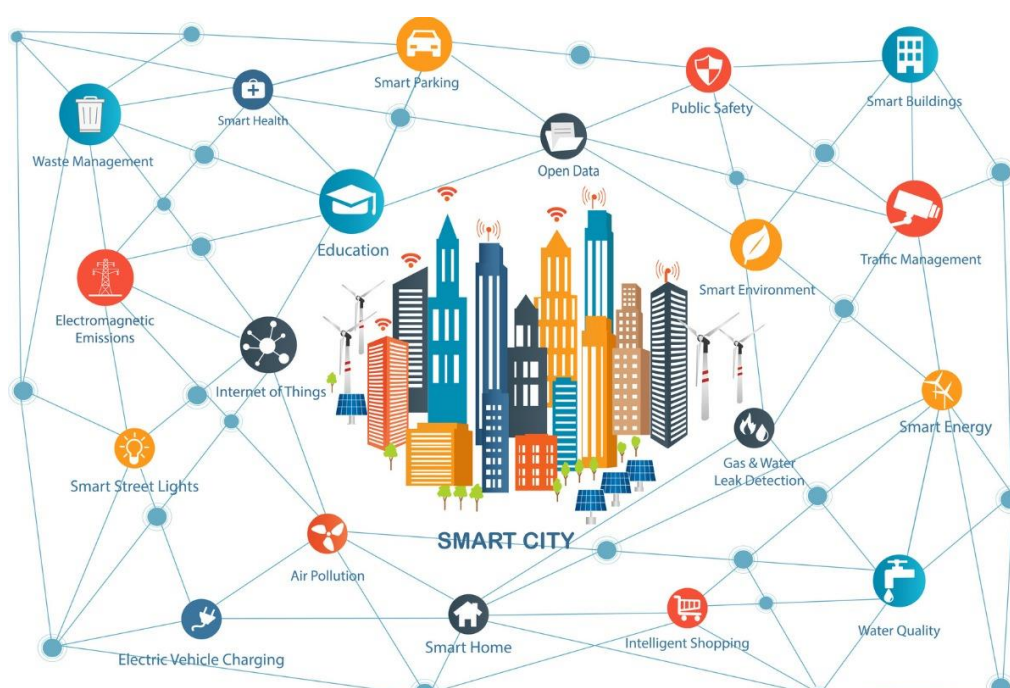

In the scientific literature[25] it is stated that very soon it will be impossible to manage the enormous amount of waste that the world generates every day. Scientists state clearly that this problem will hit the globe with massive power. Thus, it is better to take all the necessary actions required for the effective management of waste. Therefore, we must adopt the best techniques and practices to treat waste efficiently in order to have healthy environment. Worldwide, there is an enormous increase in the generation of waste per day. Approximately 1.9 billion tons of waste is generated annually, with a minimum of 35% that is not treated securely. As per the reports, the waste generated per person per day varies from 0.17 to 4.67 kilograms. The overall waste is anticipated to exceed about 45 billion tons by 2055, which will be over double growth for the identical period. Income and generation of waste are directly proportional to each other. Waste is a huge income source, so its treatment and disposal must be done in the best possible way. It is estimated that, by 2050, per day waste

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[25] Xiangru Chen, Machine learning approach for a circular economy with waste recycling in smart cities

generation of the low-income and middle-income nations would rise to 45%, and for the high-income countries, it can increase to 20%.[26]

In this context, humans examine digitalization, especially artificial intelligence, in environmental technology and how automated waste recycling may help transition towards a sustainable environment[27]. Waste classification is an important step towards effective sorting and separation into various models and types[28]. The waste categorization can optimize the performance of the complete process to achieve them efficiently[29]. The demand for smart sorting is therefore increasing to promote intelligent recycling. The rest is divided into the significance of automated waste recycling and sustainability to improve the effectiveness of the smart city.[30]Researchers gathers their opinion according to the following general idea - a proven way for reducing of the impact of waste on the environment, health and other areas is the implementation of waste management.

The implementation of the proposed waste management strategies resulted in significant improvements in waste reduction, recycling, and disposal processes. Inefficient waste-collecting methods have resulted in the spread of garbage throughout the city. Thus, there is a real need the way waste is collected to be connected with the tools of the new reality as machine learning (ML) and the Internet of Things (IoT).
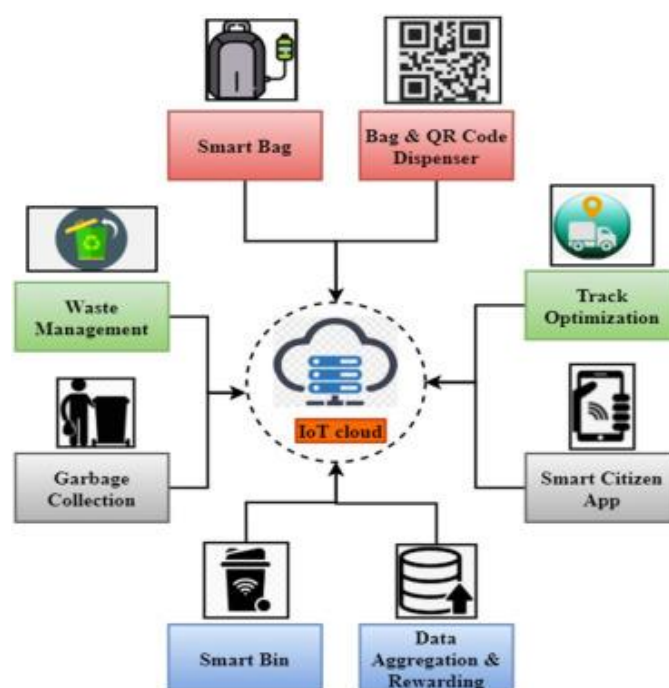
Machine learning (ML) plays a crucial role in automated sorting techniques leads to greater precision and better waste separation quality. In addition to navigational and tracking capacities storage waste processing analysis and optimization of the required information would in the end, enhance the entire waste management efficiency by improving the waste collection by advancing the program.

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[26] Abdallah, M., Abu Talib, M., Feroz, S., Nasir, Q., Abdalla, H., & Mahfood, B. (2022). Waste Management 4.0: An Application of a Machine Learning Model to Identify and Measure Household Waste Contamination—A Case Study in Australia. Sustainability

[27] Ajwang et al., 2021

[28] Pardini et al., 2020

[29] Alqahtani et al., 2020

[30] Aarthi M., Bhuvaneshwaran A., Iot based drainage and waste management monitoring and alert system for smart city

Machine learning (ML) and the Internet of Things (IoT) are being used to create smart and effective waste management solutions. Machine learning (ML) has the potential to greatly enhance waste management efficiency, leading to numerous economic advantages. By optimising waste collection routes, timings, and frequencies, ML can decrease fuel consumption and vehicle maintenance expenses for municipalities. This optimisation also supports a circular economy, where resources are reused and recycled, ultimately reducing the demand for raw materials and lowering production costs.
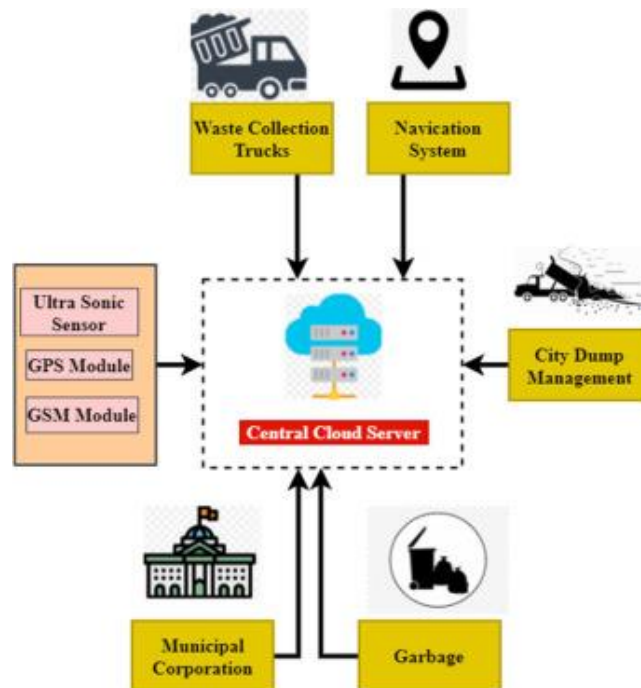
The present business scenario focus the attention of researchers and readers over the fact that ML-based waste management systems can supply real-time data about waste levels, allowing waste management companies to make better decisions regarding resource allocation and operational efficiency. This can result in reduced operational costs and increased profitability for waste management firms. This process is described with the following picture:
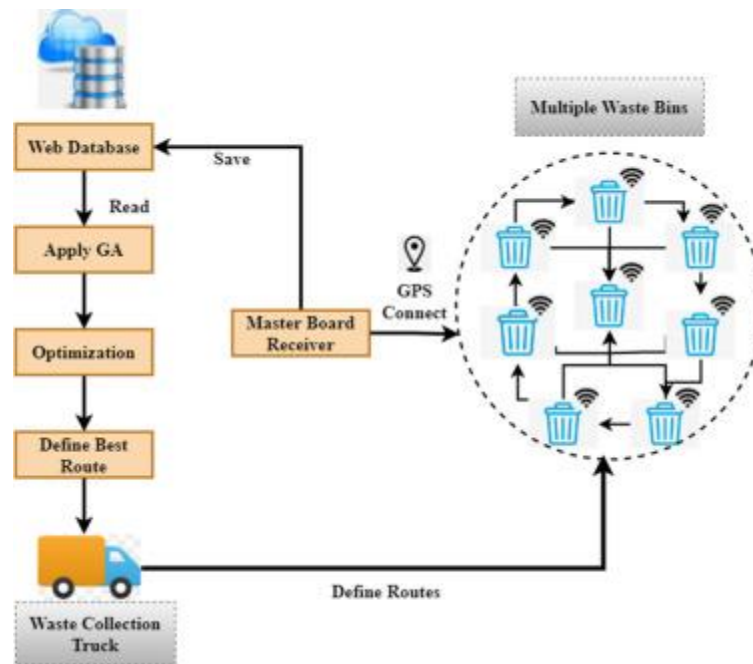
In this business scenario are going to be presented a summary of the main recommendations of scientists and researchers for improving waste management strategies:

1. Expanding waste management planning beyond municipalities to involve regional and national stakeholders.

2. Implementing and expanding waste reduction policies and regulations, such as extended producer responsibility and waste disposal fees.

3. Encouraging repair and durability for reuse of products, resource recovery, and waste-to-energy initiatives.

4. Establishing a reporting protocols to gather data from waste audits on a yearly or continuous basis to enable effective collection and data analysis.

Also, the present business scenario is focused over real-life examples of ML Applications in Waste Management:

- Adaptive Waste Collection Systems;

- Waste Prediction Models;

- Smart Waste Sorting Robots;

- Waste-to-Energy Optimization;

- Environmental Impact Assessment.

Challenges and Opportunities in Implementing ML and Smart Technologies in Waste Management:

While the potential benefits of ML and smart technologies in waste management are significant, there are also several challenges that must be addressed to effectively implement these technologies.

Some of these challenges include:

- Data quality and availability;
- Integration with existing systems;
- Privacy and security concerns. It is very important to be mentioned that this business scenario is focused over the fact that despite the abovementioned challenges, the opportunities for ML and smart technologies in waste management are vast.

Recommendations for Further Integration and Improvement:

To further integrate and improve waste management using machine learning and smart technologies, several recommendations can be considered:

- Encourage collaboration between public and private sectors to develop and implement innovative waste management solutions.

- Invest in research and development to advance ML algorithms and smart technologies specifically tailored for waste management applications.

- Promote public awareness and education on waste reduction, recycling, and proper disposal practices to encourage responsible waste management behavior.

- Explore the potential of emerging technologies, such as blockchain and augmented reality, to enhance waste management systems and processes.

Parties that could be involved: private companies, government, institutions, scientists, researchers, managers, entrepreneurs, society.

2.9. Business scenario for application of the managerial concept for management of positive opportunities in direction of creation of new, better and sustainable products

This business scenario will focus the attention over the idea that if a specific managerial concepts are used in the phase of research and development of new products and services form the companies all over the world this could have a big positive effect for the environment and the transition from linear economic model to a circular economic model. The main idea is that if the specialists, researchers, designers, managers and employees are being known about the fact that there is a proven managerial concept that could optimize their efforts and also could clear new opportunities for a new product design or the improvement of the already produced.

The contemporary managers worldwide have the responsible challenge of choosing between different existing or possible alternatives. In their intention for success, managers face many problems and difficulties. This requires decision-making in an environment of uncertainty, risks, adverse selection, moral hazard, market failures etc. Such factors makes the decision-making a challenge that requires specific knowledge and skills. It is necessary to be considered the important issue of knowing and using the methods by which the empirical data from the processes in the organization could be analyzed. This is connected with the fact that in search of high efficiency and competitiveness, modern manufacturers are constantly expanding the range of implementation of artificial intelligence and automation of work processes.[31]

This business scenario is trying to present the relevance of this topic that it is due to the fact that the contemporary macroeconomic environment is complex. From one side, there is high intensity of business processes, dramatic changes caused by the COVID-19 pandemic, globalization, political instability, wars, rapidly changing international relations. From other side, there is a constant move towards technology as well as sustainable penetration of artificial intelligence in various fields of production, fierce competition between market participants and scarcity problem heavier than ever. This requires reducing as much as possible the subjective factor in the management decision-making process and replacing it with an approach that uses research of real data from the processes in the organization.

The experience of various companies around the world over the past few decades has unequivocally proven that in the management process, it is inherent in managers to make the mistake of running a company based on their own and limited perception of reality. It is important the managers to try to search for a better solutions, better design, better quality, longer life of their products. It is highly important to be presented the idea that towards the contemporary companies there are unknown and sometimes not visible positive opportunities that can be found and used as a catalysator of unprecedented growth and prosperity. Namely, the way in which managers respond to the challenges of the environment and the way in which decisions are made, they influence the style of management, and hence the overall behaviour of the organization. This is because there are a variety of factors from the micro and macro environment of the company that are able to have a direct or indirect impact on its activities, products and services.

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[31] Rosen Todorov, ANALYSIS OF VARIANCE - IMPORTANT INSTRUMENT FOR EFFICIENT MANAGEMENT IN DYNAMIC AND UNCERTAIN BUSINESS ENVIRONMENT

Benefits from the adoption of the managerial concept for management of the positive opportunities[32]:

- It is a widely accepted fact that innovations and in particular innovation projects are a powerful tool for achieving the company's strategic goals and in particular - for securing and maintaining the company's competitive advantages based on the development of new designs, new products and services, improvement of the design of existing products and services;

- Innovation projects can lead to huge beneficial effects and utilization of significant favorable opportunities for the company, which is actually the basis of a transition to a circular economy;

- When using the opportunity management approach, the company's strategy itself can be oriented towards providing various competitive advantages to its products, which unlocks hidden potential for qualitative and quantitative improvements in the production process, which in turn lead to a positive effect for environment;

- The analysis of the external environment allows important information to be collected, on the basis of which research and analysis can be made for potential improvements to products and services.

Challenges towards the adoption of the managerial concept for the management of the positive opportunities:

- There is a lack of knowledge about this possibility;
- There is a resistance against the change;
- There is a lack of appropriate management approach that could promote the idea;
- Usually there is a challenge with the process of data collection and the environment observation and exploration;
- This process could require investments, time and specialists.

Ways for adoption of the managerial concept for management of positive opportunities:

One of the ways to take advantage of the available favourable opportunities is the development and implementation of innovation projects. The choice of strategically favourable opportunities to which the firm will respond will depend on the firm's chosen strategic alternative. For the purposes of this business scenario, will be presented the advantages of a company that chooses to use the management concept under consideration.

The results may be:

- higher product quality;
- better technical or operational characteristics;

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[32] Tsvetan Tsvetkov, OPPORTUNITIES MANAGEMENT FOR INNOVATION BUSINESS PROJECTS, International Business School

- higher reliability;
- lower operating costs;
- higher taste qualities or other characteristics perceived as unique.

An important condition is that the advantages of the product are sufficiently identified and appreciated by the user. All the described advantages are combined in one generalized favorable impact for the environment, which is the essence of the transition from a linear economic model to a circular economy model.

Parties that could be involved: private companies, government, institutions, scientists, researchers, managers, entrepreneurs, society.

2.10. Business scenario for the implementation of Artificial Intellect (AI) as an important instrument for reaching positive impact upon the planet's biodiversity

> "Without nature, we have nothing. Without nature, we are nothing."
> — António Guterres, UN Secretary-General

This business scenario is aimed to present the very important idea that our lives as a human beings and as a society on the planet Earth are closely related to the biodiversity on the planet. The main idea of the presented idea is to highlight the importance of our coordinated and common action towards the better future of all species. But, in front of the realization of something in favour of the planet, we have to define clearly that there are huge problems already. As an evidence of this sad fact is the speech of the UN Secretary-General António Guterres who spoke at the historic UN COP15 biodiversity conference in Montreal, Canada in December 2022. He underscored the urgent need for action to protect nature and biodiversity. The main idea of his speech was directed in such way: *"Humanity has, for hundreds of years "conducted a cacophony of chaos, played with instruments of destruction. Now is the time to reverse this destruction."*[33]

It comes the important question that all people and organizations around the world must thought about:

Why we have to care about nature and biodiversity?

The researchers and scientists in the UN are united around the idea that it is obvious that the world is facing a planetary emergency of nature loss and climate change. It is made worse by the impacts of inequality, conflict, insecurity and health crises. The fact is that these crises are all interlinked. And nature is a big part of the solution. These integrated crises demand integrated solutions – and the solutions to all are fundamentally dependent on a functioning environment. Threats to nature are an existential risk to human survival.[34]

Thus, our society is obliged to do something. We have to understand that the Nature is humanity's most powerful asset and investing in it will help us fight back. Here comes the place of the main idea of this business scenario - biodiversity. Biodiversity is the collective term for the variety of life – biological diversity – on Earth, in all its forms. Biodiversity is the abundance and variation in nature responsible for our food, our water, our weather, even the air we breathe. Alongside its own intrinsic value and ecological roles, biodiversity provides us with clean water, pollination services, building materials, clothing, food and medicine, among many other physical and cultural contributions that species make to ecosystem services and people's lives[35][36]. The contradiction is that our endeavours to maximize short-term benefits have become unsustainable, depleting biodiversity and threatening the life-sustaining foundations of humanity in the long term[37].

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[33] https://www.undp.org/from-cacophony-to-harmony?gclid=EAIaIQobChMInceq3NWaggMVlotoCR15BgZxEAAYASAAEgIrS_D_BwE
[34] https://www.undp.org/from-cacophony-to-harmony?gclid=EAIaIQobChMInceq3NWaggMVlotoCR15BgZxEAAYASAAEgIrS_D_BwE
[35] Díaz, S. et al. Assessing nature's contributions to people. Science 359, 270–272 (2018)
[36] Chaplin-Kramer, R. et al. Global modeling of nature's contributions to people. Science 366, 255–258 (2019)
[37] Dasgupta, P. The Economics of Biodiversity: The Dasgupta Review (HM Treasury, 2021)

It is clearly stated from scientists, researchers, specialists, policymakers, citizens worldwide that something must be done in an urgent way. But that thing must be really powerful, because our damages are really huge. All the abovementioned different parties accept the idea that the Artificial Intellect (AI) could help and we must use it for good. In the specialized literature there are already described the fields where the AI could help:

6 Areas of Environmental Intelligence Transformed by AI
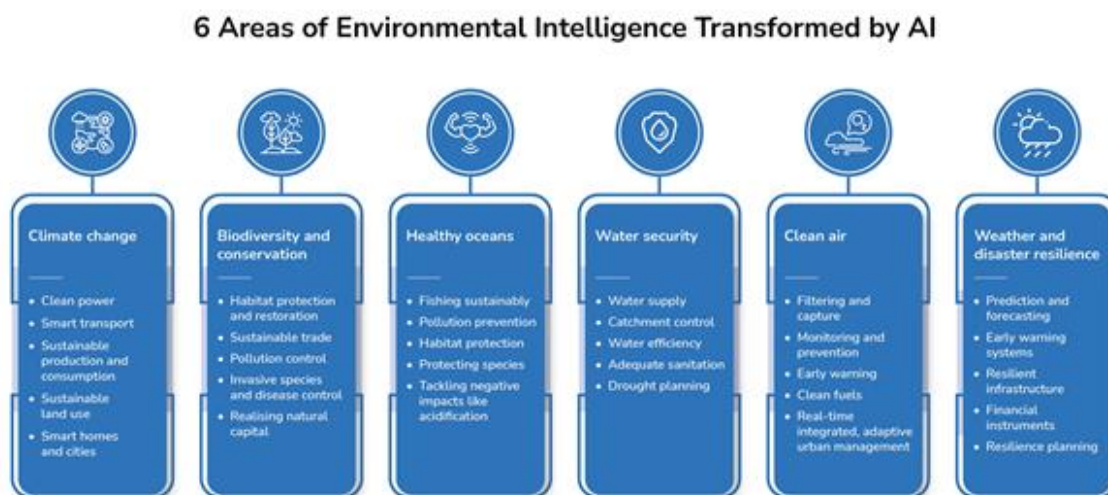
As it can be seen the biodiversity problem occurs in this analysis as a key element. Than, it comes the quotation how the AI could help us? And in this business scenario will be discussed ideas how the modern society could implement the power of AI for a good causes.
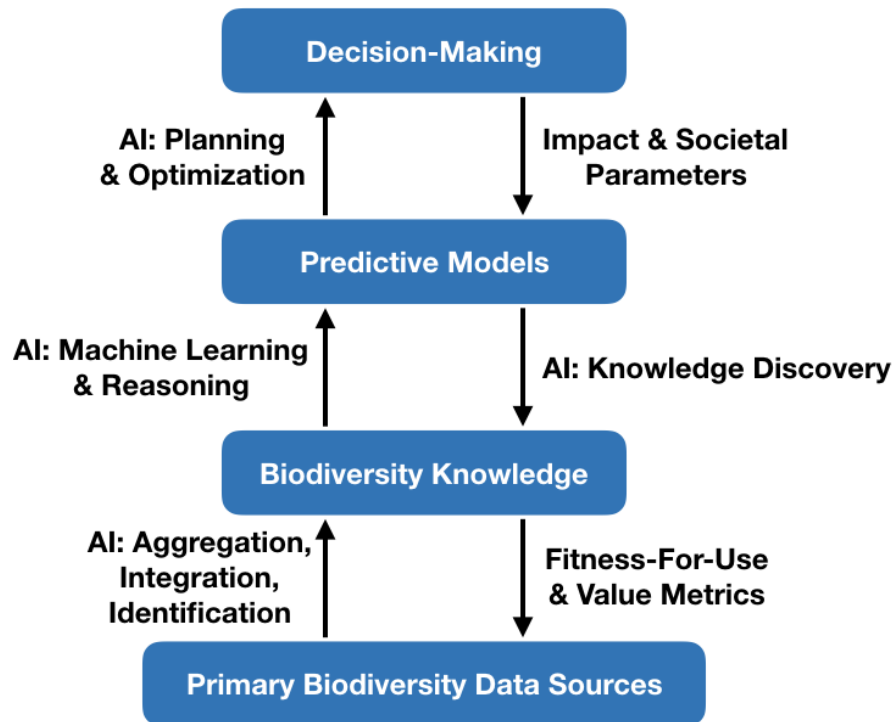
How AI could be used for the good of our planet

AI technologies have the potential to provide valuable insights into biodiversity changes, detect and attribute causes to those changes, and help prioritize and plan conservation efforts. An example of the AI application is the creation of an inferential framework that could guide detection and attribution analyses called 'detection attribution framework. It is an interlinked multi-steps process used to understand how human activities affect biodiversity and ecosystems, allowing scientists to systematically report on progress towards different areas of interest. The framework involves five key steps: causal modeling, observation, estimation, detection, and attribution. In recent years, AI has been applied to each of these processes in various ways.

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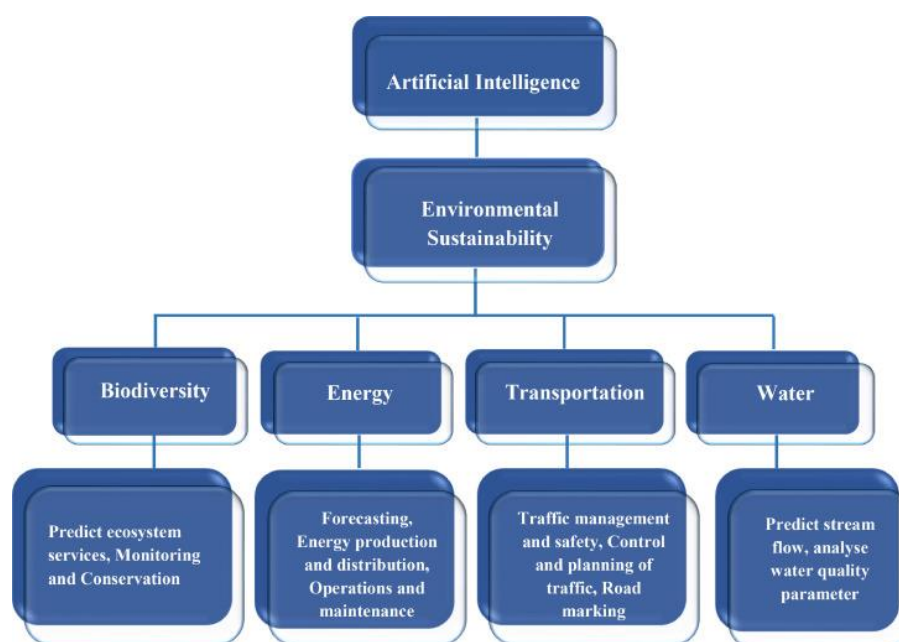
Applications of AI and machine learning in biodiversity science[38]:

1. **Under the causal modelling step,** structural equation models are used to understand the cause-and-effect relationships in the ecosystem and extracting causal fingerprints to test their transferability as well as understand change in different locations. Recently, recurrent neural networks have been used to learn the structure of these causal graphs from time series data. Another recent approach involves using text mining to extract semantic causal knowledge graphs from the primary literature.

2. **In the observation step,** machine learning algorithms are used to analyze large datasets of biodiversity observations, such as those from satellites, sensors, and cameras. AI-based methods can identify changes in the distribution, abundance, and traits of species over space and time.

3. **In the estimation step,** AI technologies can help create predictive models of future biodiversity change, based on current observations and different scenarios of human activities. These models can estimate the potential impacts of climate change, land use change, and other human activities on biodiversity and ecosystem services.

4. **In the detection step,** AI approaches combined with observations can help understand and detect the signal of change across very large areas.

5. **In the attribution step,** AI approaches are being used to identify the causes of observed changes in biodiversity, including the effects of human activities like climate change, land use change, and pollution. These approaches can use statistical models and causal inference methods to identify causal relationships and create causal graphs to understand the mechanisms driving biodiversity change.

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[38] https://aiforgood.itu.int/new-ai-for-biodiversity-series-how-can-we-use-ai-to-monitor-biodiversity-and-support-conservation-actions/

Overall, AI and machine learning have great potential to enhance our understanding of biodiversity and our ability to monitor and protect it. By combining traditional methods and datasets with these new approaches, we can gain insights into complex ecological processes and make more informed decisions about conservation and management.

Actors that could be involved: scientists, researchers, policymakers, private enterprises, government organizations, other organizations, society and every single citizen.