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The Impact of Artificial Intelligence in the business process in the Phase of Data Analytics

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Abstract

One of the key areas of an enterprise facility is supply, which consists of a chain of operations determining not only the efficiency of the product distribution, but also the quality of the product delivered to customers. A supply chain represents well-defined and efficiently managed organizational processes creating all the conditions for customers to receive high quality product and service.

This research explores the transformative influence of data analysis and digitalization on contemporary supply chain management. The integration of these technologies has redefined the dynamics of decision-making, visibility, and efficiency within supply chain processes. We investigate the role of data analysis in providing real-time visibility, predictive analytics for demand forecasting, and effective supply chain risk management. Additionally, we examine the impact of digitalization through the incorporation of technologies such as IoT, blockchain, and automation.

Keywords: IoT, SCM, Blockchain

Supply Chain Management (SCM) is a complicated diversified system that is dynamically changing with respect to the factors such as: investment policy, the level of scientific and technical development, the concentration of suppliers and customers, a geographical location of the system users, the level of demand and dynamics for products/services, a competitive environment, warehousing and transportation service costs and more. Therefore, stemming from the complexity of obtaining and processing of information, managers cannot always achieve high levels of supply chain optimization and rationalization. In addition, the supply chain constitutes completely integrated and customer-oriented system, which determines planning, formation, administration and management processes for internal/external material and the related flows and formulates the optimal factor of the added value.

A technical progress has brought new challenges to the people as to how healthy the products we daily eat are, because the number of hazardous products has already reached the apogee.

Supply chain management faces a paradigm shift with the infusion of data analysis and digitalization. This section introduces the research, emphasizing the significance of these technologies in reshaping traditional supply chain practices.

Main Part. Nowadays, the economic potential of many countries depends almost entirely on exports. In such countries, most people focus on purchasing cheap products giving a good chance to dishonest local entrepreneurs and exporters to add hazardous substances to the content of products that reduce the operating expenses tied to the production of goods and are much cheaper, but significantly damage human health and cause various diseases. Such types of products are mainly foodstuffs, building materials, clothing, toys, etc.

Data analysis enables organizations to make informed decisions by providing real-time visibility into supply chain processes, enhancing tracking capabilities, and optimizing overall supply chain efficiency. The utilization of predictive analytics, leveraging machine learning and statistical models, enhances demand forecasting accuracy, leading to efficient inventory management and improved customer satisfaction. Data analysis plays a crucial role in identifying, assessing, and mitigating risks, ensuring supply chain resilience in the face of unforeseen disruptions.

Today, digitization has become pervasive, transforming and influencing virtually every aspect of our lives. From personal interactions to business operations, education, healthcare, and beyond, the impact of digitization is profound. In business and industry, digitization is seen as a fundamental shift that goes beyond the adoption of digital technologies. It involves the integration of digital technologies into all aspects of business processes, fundamentally changing how organizations operate and deliver value. This includes the use of data analytics, cloud computing, artificial intelligence, and the Internet of Things (IoT) to optimize operations, improve efficiency, and create new business models.

In the realm of communication, digitization has revolutionized how we connect with each other. Social media, instant messaging, video conferencing, and other digital communication tools have transformed the way we share information and stay connected globally.

Education has undergone a significant transformation with the digitization of learning materials, online courses, and virtual classrooms. Students now have access to a wealth of educational resources at their fingertips, breaking down geographical barriers and providing opportunities for remote learning.

Healthcare has embraced digitization to enhance patient care, streamline administrative processes, and facilitate medical research. Electronic health records, telemedicine, and health monitoring devices contribute to more efficient and accessible healthcare services.

In everyday life, digitization has become ingrained. Smartphones, smart homes, and wearable devices are examples of how digital technologies have seamlessly integrated into our routines, providing convenience and connectivity.

While the benefits of digitization are immense, it also raises important considerations, such as data privacy, cybersecurity, and the digital divide. As we continue to embrace digitization, it is crucial to address these challenges to ensure a balanced and inclusive digital future[1].

IoT and Smart Sensors - Digitalization, incorporating IoT devices and smart sensors, enhances transparency and accountability by providing real-time data on the condition, location, and status of goods throughout the supply chain. The integration of blockchain technology ensures traceability and transparency, reducing the risk of fraud and optimizing the efficiency of supply chain processes.

Automation and robotics streamline supply chain processes, leading to increased efficiency, reduced operational costs, and faster order fulfillment.

Data Security and Privacy: As organizations rely on data for decision-making, securing sensitive information becomes paramount, requiring robust cybersecurity measures. Seamless integration of diverse technologies poses a challenge, emphasizing the need for interoperable systems and platforms for effective communication across the supply chain ecosystem. The future of supply chain management lies in the continued evolution of artificial intelligence and machine learning, promising advancements in demand forecasting, routing, and scheduling. [2-3]

Sustainability and Circular Supply Chains: Emerging trends focus on leveraging data for sustainable practices, assessing and improving the environmental impact of supply chain activities.

The purpose of our research is to carry out an analysis of the product identification information and to identify hazardous products at the customs checkpoints and the locations the vendible items are delivered to customers from. Through this experimental research, we have highlighted several commodity groups and substances that are potentially harmful and dangerous to human health. The table below shows three groups with the subgroups of toxic elements and their admissible indicators.

Commodity group	Toxic elements		Admissible indicator	An indicator higher than allowed %	Customer age
Meat and meat products	Lead	A	0,1	28%	Adolescent and adult
	Arsenic	B	0,05	10%	
	Cadmium	C	0,3	28%	
	Grison	D	Inadmissible	3-5%	
Milk and dairy products	Lead	A	0,05	26%	Adolescent and adult
	Arsenic	B	0,05	8%	
	Cadmium	C	0,02	11%	
	Pesticides	D	0,01	15%	
Toys	Antimony	A	0.75	29%	Adults
	Arsenic	B	0.4	14%	
	Cadmium	C	0.1	17%	
	Mercury	D	0.18	36%	

The large amount of accumulated information about products and different types of households allows us to benefit from Machine Learning to identify the data and take the following measures. After identifying the product (prepared for sale) identification records it is possible to carry out information analysis on the basis of a pre-designed algorithm. According to the content of the received message, an Information Management Center Operator analyzes the received information and reveals its main part - the incident type and automatically selects the category of toxic elements the admissible indicator of which is predetermined in the algorithm [4-5].

Then, the recorded information will be sent to all active operators in order to thoroughly analyze the relevant data for each product [6]. The operator's task is to identify the product containing the most harmful concentrations. To do this, the main process is to pre-process and analyze the data and develop the appropriate algorithms for Machine Learning. Frequently, we are given the minimum possibility to control the process at the primary data collection stage and, therefore, the following anomalous data occur habitually:

- External values of the spectrum - for example, adverse effects arising while transporting the products or breaking the packaging requirements;
- Impossible data identification;
- Incomplete data;
- Data inappropriate for learning - for example, information not related to the suitability of the product.

Analyzing the data without filtering these and many other anomalous cases can lead us to erroneous results. We use Python – a programming language – for the data processing and analysis. Initially, we remove "Triage"-type actions (the action, when several operators process information simultaneously):

keep=False The parameter provides a complete deletion of the duplicated records. df_orig = df_orig.drop_duplicates(subset=['CALL_ID'], keep=False)

It is important that the following columns are not filled in:

Expulsion of incomplete data from the following columns is important:

dropna მეთოდი how='any'

By specifying the parameter, all the lines, containing, at least, one of the given columns without data, can be removed.

df_orig.dropna(subset=['CASE_ID', 'Prod_ID', 'DATE_CREATED', 'CASE_TEMPLATE_ID', 'NO M', 'CATEGORIES', 'SPENT_MINS'], how='any', inplace=True)

Identification numbers with non-standard lengths can be deleted.

df = df[df['NOM'].map(len) <= 13]

df[df['NOM'].str.match(pattern)]

Anomalous cases occurred due to a variety of reasons can be deleted.

We have categorized the customers' age under One Hot Encoding method, while we have selected the following transitional age as categories: 0-40 days old; among the ages of 1, 6, 15, 60. We have divided the age into the following categories (see the illustration in Figure 1):

```
df['AGE_0_40'] = 0
df['AGE_40_1'] = 0
df['AGE_1_6'] = 0
df['AGE_6_15'] = 0
df['AGE_15_60'] = 0
df['AGE_60_120'] = 0

for i, row in df.iterrows():
  if math.isnan(row['INJURED_PERSON_AGE_DAYS'])==0 and math.isnan(row['INJURED_PER
SON_AGE_MONTHS'])==0:
    if 0 <= row['INJURED_PERSON_AGE_DAYS'] + row['INJURED_PERSON_AGE_MONTHS'
] * 30 <= 40 :
      df.loc[i,'AGE_0_40'] = 1
    elif 40 < row['INJURED_PERSON_AGE_DAYS'] + row['INJURED_PERSON_AGE_MONTH
S'] * 30 <= 365 :
      df.loc[i,'AGE_40_1'] = 1
  elif math.isnan(row['INJURED_PERSON_AGE_DAYS'])==0 and math.isnan(row['INJURED_P
ERSON_AGE_MONTHS']):
```

Figure 1

We use Python Programming and a set of machines - Weka (a collection of machine learning algorithms for data mining tasks) for the data analysis and visualization. Weka constitutes a collection of machine learning algorithms and, also, contains the tools that can be used for data pre-processing, classification, clustering, association rules and visualization [2]. We used Weka visualization tools to create visual representation of the correlation coefficient for the data. The visualization fragments are listed below, which should approximately give us a model for the interdependence of data.

Figure 2 below shows the relationship between the concentration indicator and unacceptable quantities of admissible substances. Each point on the graph represents a separate case. The content of the substances not allowed in the product is filled with orange color, while those that are identified and marked with an admissible quantitative indicator - with blue color.

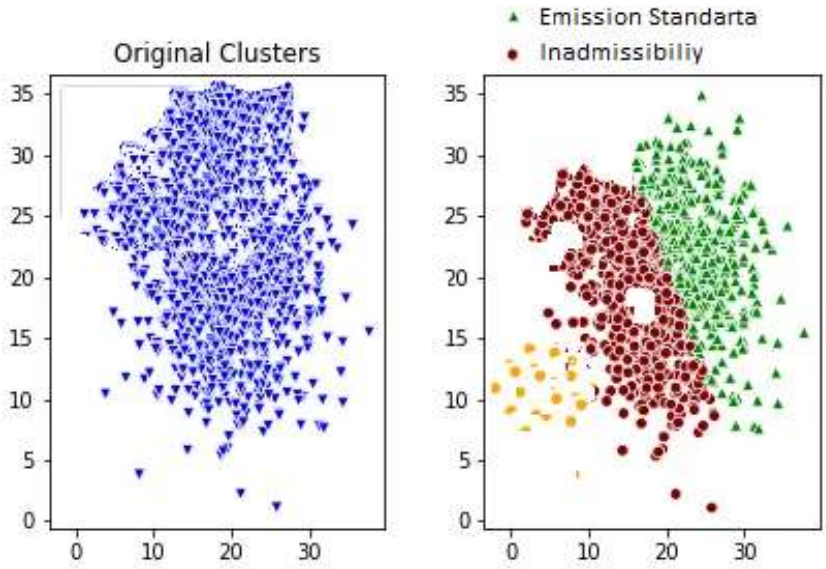

Figure 2

In the graph we can create result of the analysis carried out by different operators to identify one harmful substance. Weka Tools allow us to analyze the product in accordance with various parameters and visualize it.

Conclusion. Artificial intelligence is recommended to be used in the supply chain, since it is one of the most effective tools for monitoring and controlling the delivery of safe products. Through the Python programming language, we perform extract, transform, load (ETL) and data preprocessing operations, as a result of which, a collection of the data with the structure required for machine learning has been obtained. Using the Python programming language (the product exported 3 years ago) and Weka Tools we have analyzed the obtained dataset and identified, deleted and corrected anomalous cases that, if not taking them into consideration, could have negatively affected the results of machine learning. Thus, we are given the results that allow us to protect people from hazardous products.

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ხელოვნური ინტელექტის გავლენა ბიზნეს პროცესების მონაცემთა ანალიზზე

ლილი პეტრიაშვილი, ირინა ხომერიკი
საქართველოს ტექნიკური უნივერსიტეტი

აბსტრაქტი

საწარმოს ობიექტის ერთ-ერთი მთავარი სფეროა მიწოდება, რომელიც შედგება ოპერაციების ჯაჭვისაგან, რომელიც განსაზღვრავს არა მხოლოდ პროდუქტის განაწილების ეფექტურობას, არამედ მომხმარებლებზე მიწოდებული პროდუქტის ხარისხსაც. მიწოდების ჯაჭვი წარმოადგენს კარგად განსაზღვრულ და ეფექტურად მართულ ორგანიზაციულ პროცესებს, რაც ქმნის ყველა პირობას მომხმარებლისთვის მაღალი ხარისხის პროდუქტისა და მომსახურების მისაღებად.

ნაშრომში წარმოდგენილია მონაცემთა ანალიზისა და დიგიტალიზაციის ტრანსფორმაციულ გავლენა მიწოდების ჯაჭვის თანამედროვე მენეჯმენტზე. სხვადასხვა ტექნოლოგიების ინტეგრაციამ ხელახლა განსაზღვრა გადაწყვეტილების მიღების, ხილვადობისა და ეფექტურობის დინამიკა მიწოდების ჯაჭვის პროცესებში. ჩვენს მიერ ჩატარებული კვლევის საფუძველზე მივირეთ მონაცემთა ანალიზის როლის ეფექტურობა რეალურ დროში ხილვადობის უზრუნველსაყოფად, მოთხოვნის პროგნოზირების, ანალიტიზისა და მიწოდების ჯაჭვის რისკის ეფექტურ მართვაში. გარდა ამისა, ჩვენ განვიხილავთ დიგიტალიზაციის გავლენას ისეთი ტექნოლოგიების ინკორპორაციის გზით, როგორიცაა IoT, blockchain და პროცესების ავტომატიზაცია.

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