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EVALUATING THE BENEFITS, CHALLENGES, AND RISKS OF DIGITAL PLATFORMS IN THE TRANSPORTATION INDUSTRY

Summary

Research Objective - The primary objective of the research is to study the impact of digitalization on the transportation industry and to determine how this process contributes to improved efficiency, sustainability, and customer satisfaction. Additionally, the research aims to analyze the challenges arising from the implementation of digital technologies and explore ways to address them.

Research Methodology - The study was conducted using qualitative and quantitative analysis methods. The analytical approach included examining the application of big data technologies, real-time monitoring, and artificial intelligence. Furthermore, the impact of digitalization on transportation systems was assessed based on expert interviews and statistical data analysis.

Practical Significance of the Research - The findings of the research will be useful for creating more efficient and secure management systems in the transportation sector, promoting sustainable solutions, and enhancing customer satisfaction. Additionally, the research provides practical recommendations for mitigating risks associated with digitalization, such as cybersecurity threats and privacy issues.

Research Results:

- Digitalization improves transportation management efficiency, reduces operational costs, and enhances safety levels.
- Artificial intelligence and big data technologies enable precise planning and real-time coordination.
- Key challenges include high initial costs, cybersecurity threats, and workforce displacement.
- Strategies have been proposed to address these challenges, including infrastructure reinforcement, employee retraining, and data protection measures.

Originality and Scientific Innovation of the Research - The study combines the topics of digitalization and sustainability, offering a new scientific approach to the transportation sector. The results obtained through the integrated application of artificial intelligence, big data, and real-time monitoring technologies provide a unique contribution from both theoretical and practical perspectives. The research also examines specific challenges of digitalization in Azerbaijan's transportation system, paving the way for scientific innovations in this area.

Keywords: digitalization, digital platform, big data analytics, operational efficiency, cybersecurity, real-time monitoring, customer satisfaction, data protection, privacy breach

Introduction

Digital applications are gaining prominence in the transportation sector, driven by the need for greater efficiency, sustainability, and customer satisfaction. Integrating these applications fundamentally changes how transportation systems are managed, coordinated, and optimized. Recent advancements in digital technologies like artificial intelligence and big data analytics have significantly reshaped the transportation industry, providing more precise planning, real-time monitoring, and enhanced user experiences, thus fueling a powerful digital transformation. With recent advances in digital technologies like artificial intelligence and big data analytics, the transportation industry has experienced a powerful digital transformation [5]. These technologies

enable more precise planning, real-time monitoring, and improved user experiences [1]. However, like any major shift, the adoption of digital applications presents both benefits and challenges. A thorough understanding of these advantages and challenges is crucial to evaluating their long-term sustainability and impact on the sector.

Advantages and Disadvantages of Digital Programs? What Are the Risks of Transport Applications?

Digital applications are gaining prominence in the transportation sector, driven by the need for greater efficiency, sustainability, and customer satisfaction. Integrating these applications fundamentally changes how transportation systems are managed, coordinated, and optimized. Recent advancements in digital technologies like artificial intelligence and big data analytics have significantly reshaped the transportation industry, providing more precise planning, real-time monitoring, and enhanced user experiences, thus fueling a powerful digital transformation. However, like any major shift, the adoption of digital applications presents both benefits and challenges. A thorough understanding of these advantages and challenges is crucial to evaluating their long-term sustainability and impact on the sector.

One of the main benefits of digital applications in transportation is their ability to increase operational efficiency. Tools such as real-time traffic management systems and intelligent transportation systems enable service providers to optimize routes, manage schedules efficiently, and minimize delays. For example, digital tools that provide real-time traffic information allow logistics companies and public transportation agencies to dynamically adjust routes and schedules, resulting in fuel and labor cost savings. Real-time traffic management systems and intelligent transportation tools allow service providers to optimize routes, manage schedules, and reduce delays [3].

A significant advantage of these applications is improved safety. Machine learning technologies, for instance, analyze historical accident data, weather conditions, and real-time traffic situations to predict potential hazards, allowing transportation authorities to take preventive measures, such as rerouting or adjusting speed limits. Additionally, vehicles that heavily rely on digital systems are designed to minimize human errors, a major cause of accidents. These systems can detect obstacles, monitor driver behavior, and enable emergency vehicle control, thus enhancing the safety of the transportation network. Digital applications also improve customer experiences by providing real-time schedule updates, delay notifications, alternative routes, and advance booking options [2].

Here's a table summarizing the advantages, disadvantages, and risks of digital programs in the transportation industry, along with key statistical insights (table 1):

Risks of Transport Applications

However, digital applications also introduce notable challenges, with cybersecurity being a primary concern. As transportation systems become more interconnected and rely on digital infrastructure, they are more susceptible to cyberattacks. As transportation systems become more interconnected, they become vulnerable to cyber-attacks, which could disrupt city traffic systems or even autonomous vehicles, posing risks to public safety [4]. For instance, a breach in a city's traffic control system could cause widespread disruptions, or hackers taking control of an autonomous vehicle could pose safety risks to the public. Ensuring cybersecurity in digital transportation systems demands substantial investments in advanced technologies and detection systems, though full protection against these threats may not always be achievable.

Another challenge with digital programs is the initial cost. Transitioning from traditional to digitally integrated transport management requires significant investments in hardware and software. For instance, installing IoT devices in vehicles, implementing AI-based route optimization, and building data management infrastructure all require substantial resources. Small and medium-sized enterprises in the transportation sector may struggle with these costs, potentially widening the gap between large and small companies. Additionally, digital applications often

necessitate ongoing technical support, software updates, and maintenance, adding to operational costs. Small and medium-sized enterprises may find it challenging to afford these costs, creating potential disparities in the sector [1].

Table 1.

Potential impacts of digital platforms in the transportation sector

Aspect	Details	Statistics
Advantages		
Efficiency	Optimizes operations by automating processes, reducing delays, and enhancing route planning.	Digital tools improve operational efficiency by 15-25% (McKinsey).
Real-Time Data Access	Enables real-time vehicle tracking, improving fleet management and customer satisfaction.	78% of passengers prefer real-time updates (customer surveys).
Cost Reduction	Automation reduces labor costs and enhances fuel efficiency.	Annual savings in operational costs: 10-15% (industry studies).
Safety Enhancements	AI-powered systems detect and prevent potential safety issues.	
Sustainability	Reduces emissions and fuel consumption through optimized logistics.	
Customer Experience	Digital platforms improve booking, updates, and communication.	
Disadvantages		
High Initial Costs	Developing and implementing digital infrastructure is expensive.	
Cybersecurity Risks	Increased connectivity creates vulnerabilities to cyberattacks.	20% of transportation companies face cyberattacks annually (cybersecurity reports).
Workforce Impact	Automation can displace workers in traditional roles.	Automation may affect 10-30% of traditional roles by 2035 (industry predictions).
Dependence on Technology	System outages or failures disrupt operations.	
Privacy Concerns	Handling customer and operational data raises ethical issues.	
Complexity	Challenges in integrating new systems with legacy infrastructure.	
Risks		
Cybersecurity Threats	Hacking can cause data breaches or operational disruptions.	
Reliability Issues	Technical glitches or server failures can lead to delays and inconveniences.	
Data Mismanagement	Misuse of sensitive data can lead to regulatory penalties.	
System Downtime	Dependence on software increases risks of significant service interruptions.	
Over-Reliance on Automation	Reduced human oversight can exacerbate unforeseen errors.	
Ethical Concerns	AI-based decision-making may result in biased or unfair outcomes.	

Digitalization in transportation also impacts the workforce. As tasks become automated, the demand for traditional roles, such as dispatchers, route planners, and drivers, may decline. While digital applications create new opportunities, particularly in data analytics and system management, the transition is challenging for those in traditional roles. The workforce will need to develop skills to manage digital systems, analytical tools, and software. This shift requires high IT literacy, and a lack of skilled workers in this area may pose challenges during the initial phase.

Moreover, digitalization raises the issue of unequal access to new job opportunities. Some population segments, particularly in underdeveloped areas or among older generations, may lack access to adequate education or opportunities to acquire new skills, widening socio-economic divides. Investing in training and retraining programs is essential to address these challenges. Governments and private companies should provide programs to help workers adapt to new roles, from technical courses to on-the-job training. Additionally, partnerships between educational institutions and businesses can facilitate a smoother transition. Implementing social support programs for those affected by workforce shifts may include temporary payments, training subsidies, or new job creation in related industries. In the long run, digitalization tends to yield positive effects, including improved working conditions and higher demand for skilled workers.

Table 2.

Risks of Transport Applications

Risk Category	Description	Statistics
Cybersecurity Threats	Vulnerabilities to cyberattacks such as ransomware, malware, and phishing, which can disrupt operations.	- **Ransomware Attacks:** Identified as a prime threat in the transport sector. - **Data-Related Threats:** Significant concern due to potential breaches.
System Reliability Issues	Technical glitches, software bugs, or hardware failures leading to service disruptions and delays.	- **Operational Technology Breaches:** 43% of transportation and logistics organizations experienced four or more OT cybersecurity breaches in the past year.
Data Mismanagement	Improper handling of sensitive customer or operational data, leading to privacy violations and regulatory fines.	- **Data Breaches:** 56% of transportation and logistics organizations are increasingly concerned about OT cybersecurity breaches.
System Downtime	Dependence on digital systems can result in significant service interruptions during outages or cyber incidents.	- **NotPetya Attack Impact:** Infected nearly 50,000 endpoints and thousands of applications across 130 countries, severely affecting operations.
Over-Reliance on Automation	Excessive dependence on automated systems may reduce human oversight, potentially exacerbating unforeseen errors.	- **Automation Challenges:** Increased connectivity and automation heighten cybersecurity risks in transportation systems.
Ethical Concerns	Use of AI in decision-making processes may lead to biased or unfair outcomes, affecting service quality.	- **AI Implementation Issues:** Ensuring ethical use of AI remains a challenge in the transport sector.

Privacy concerns also arise from the extensive use of digital applications in transportation. Many platforms collect and store substantial user data, including travel habits and financial information. While this data is valuable for optimizing services, its management can cause anxiety among users. Poor data handling can lead to privacy breaches, identity theft, and loss of consumer trust. Balancing data use for innovation with strict data protection is crucial to maintain user confidence. Additionally, the reliability of digital applications can be a potential drawback. Technical malfunctions or connectivity issues can disrupt transportation operations, particularly in areas with weak infrastructure, reducing the effectiveness of digital solutions. Over-reliance on digital systems without adequate backup or contingency plans may weaken transportation network reliability.

The digitalization of the transportation industry offers numerous benefits, such as increased efficiency, safety, sustainability, and improved customer experiences. However, it also brings challenges, including cybersecurity risks, high costs, workforce displacement, privacy concerns, and reliability issues. As the industry continues to adopt digital applications, a balanced approach that maximizes benefits while mitigating potential downsides—through regulation, cybersecurity investment, and workforce training — is essential to build smarter, safer, and more sustainable transportation systems for the future.

Here's a dynamic bar chart showcasing the statistical impact of various risks in transportation applications. Each bar represents a different risk category, with percentages indicating the extent of their impact.

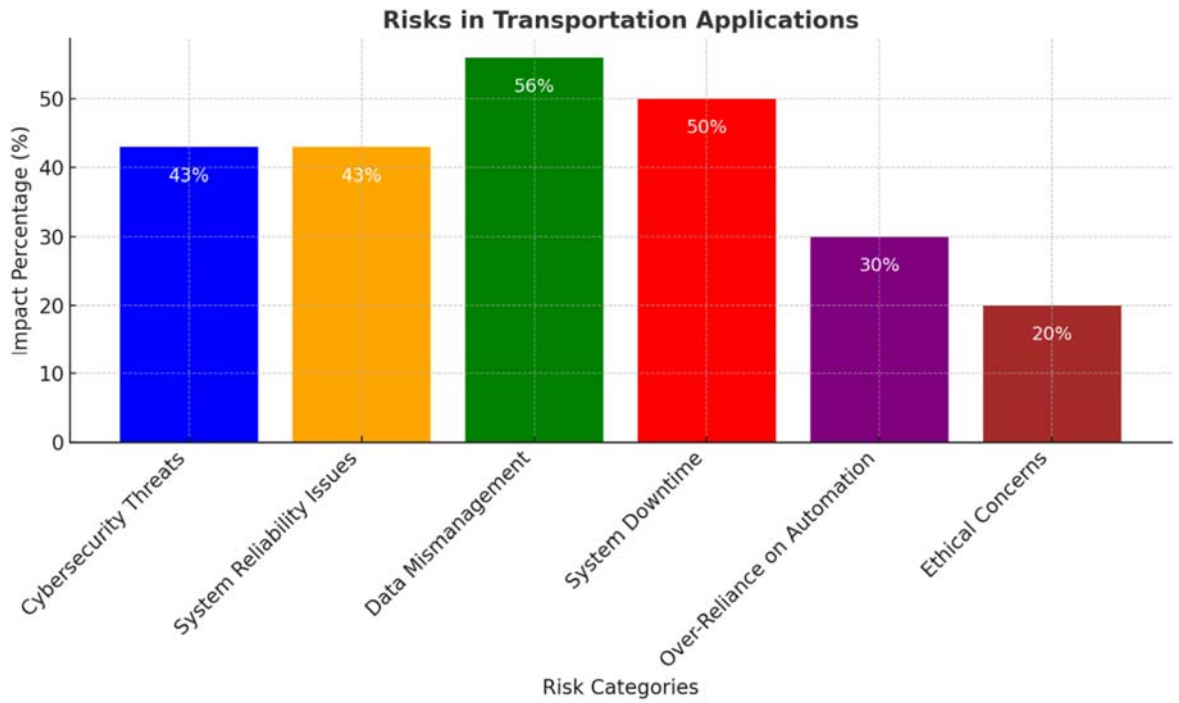


Chart 1. Risks in transportation applications

Conclusion

The conclusion is that while digitalization in the transportation industry offers substantial benefits — such as enhanced efficiency, improved safety, better sustainability, and enriched customer experiences — it also introduces challenges that require careful management. Key advantages include real-time data capabilities that optimize routes and schedules, reduce operational costs, and improve safety. However, challenges such as cybersecurity risks, significant

upfront costs, workforce disruptions, privacy concerns, and the dependency on technology pose real risks.

To successfully integrate digital applications in transportation, a balanced approach is necessary. This involves securing systems against cyber threats, investing in retraining programs to upskill the workforce, and implementing robust data protection practices. Additionally, companies and governments should plan for technical reliability and accessibility challenges to ensure the technology’s long-term sustainability. By proactively addressing these issues, the transportation sector can leverage digital tools to create a more efficient, resilient, and customer-centric system while preparing for the inevitable societal and economic shifts that come with technological advancements.

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Nəqliyyat sektorunda rəqəmsal platformaların faydaları, çağırışları və risklərinin qiymətləndirilməsi

Xülasə

Tədqiqatın məqsədi - Tədqiqatın əsas məqsədi nəqliyyat sənayesində rəqəmsallaşmanın təsirini öyrənmək, bu prosesin səmərəliliyə, dayanıqlılığa və müştəri məmnuniyyətinə necə töhfə verdiyini müəyyənləşdirməkdir. Bununla yanaşı, rəqəmsal texnologiyaların tətbiqi nəticəsində yaranan problemləri və onların həlli yollarını analiz etmək də tədqiqatın əsas hədəflərindən biridir.

Tədqiqatın metodologiyası - Tədqiqat keyfiyyət və kəmiyyət analiz metodlarından istifadə etməklə həyata keçirilmişdir. Analitik yanaşma çərçivəsində böyük verilənlərin analizi, real vaxt monitorinqi və süni intellekt texnologiyalarının tətbiqi təcrübələri öyrənilmişdir. Əlavə olaraq, mütəxəssis müsahibələri və statistik məlumatların təhlili əsasında rəqəmsallaşma prosesinin nəqliyyat sistemlərinə təsiri qiymətləndirilmişdir.

Tədqiqatın tətbiqi əhəmiyyəti - Tədqiqatın nəticələri nəqliyyat sektorunda daha səmərəli və təhlükəsiz idarəetmə sistemlərinin yaradılması, dayanıqlı həllərin təşviqi və müştəri məmnuniyyətinin artırılması üçün faydalı olacaqdır. Eyni zamanda, tədqiqat rəqəmsallaşma ilə bağlı mümkün risklərin, məsələn, kiber təhlükəsizlik və məxfilik problemlərinin aradan qaldırılması üçün praktiki tövsiyələr təqdim edir.

Tədqiqatın nəticələri:
- Rəqəmsallaşma nəqliyyatın idarə olunmasında səmərəliliyi artırır, əməliyyat xərclərini azaldır və təhlükəsizlik səviyyəsini yüksəldir.
- Süni intellekt və böyük verilənlər texnologiyaları vasitəsilə dəqiq planlama və real vaxtda koordinasiya mümkün olmuşdur.
- Əsas problemlər kimi yüksək ilkin xərclər, kiber təhlükələr və işçi qüvvəsinin ixtisarı müəyyən edilmişdir.
- Bu problemlərin həlli üçün infrastrukturun gücləndirilməsi, işçilərin yenidən hazırlanması və məlumatların qorunması üzrə strategiyalar təklif edilmişdir.

Tədqiqatın orijinallığı və elmi yeniliyi - Tədqiqat rəqəmsallaşma və dayanıqlılıq mövzularını birləşdirərək nəqliyyat sektorunda yeni elmi yanaşma təklif edir. Süni intellekt, böyük verilənlər və real vaxt monitorinq texnologiyalarının birgə tətbiqi ilə əldə edilən nəticələr həm nəzəri, həm də praktiki baxımdan unikal töhfələr verir. Tədqiqat həm də Azərbaycan nəqliyyat sistemində rəqəmsallaşma üzrə spesifik çağırışları araşdıraraq, bu sahədə elmi yeniliklərə yol açır.

Açar sözlər: Rəqəmsallaşma, rəqəmsal platforma, böyük məlumat analitikası, əməliyyat səmərəliliyi, kibertəhlükəsizlik, real vaxt rejimində monitorinq, müştəri məmnuniyyəti, məlumatların qorunması, məxfilik pozuntusu.

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Оценка преимуществ, вызовов и рисков цифровых платформ в транспортной отрасли

Резюме

Цель исследования - изучить влияние цифровизации на транспортную отрасль, определить, как этот процесс способствует повышению эффективности, устойчивости и удовлетворенности клиентов. Также целью исследования является анализ проблем, возникающих при внедрении цифровых технологий, и поиск путей их решения.

Методология исследования - Исследование было проведено с использованием качественных и количественных методов анализа. В рамках аналитического подхода изучались опыт применения технологий больших данных, мониторинга в реальном времени и искусственного интеллекта. Кроме того, влияние процесса цифровизации на транспортные системы оценивалось на основе экспертных интервью и анализа статистических данных.

Практическая значимость исследования - Результаты исследования будут полезны для создания более эффективных и безопасных систем управления в транспортном секторе, продвижения устойчивых решений и повышения удовлетворенности клиентов. Кроме того, исследование предоставляет практические рекомендации по устранению возможных рисков, связанных с цифровизацией, таких как киберугрозы и проблемы конфиденциальности.

Результаты исследования:
- Цифровизация повышает эффективность управления транспортом, снижает операционные расходы и повышает уровень безопасности.
- Технологии искусственного интеллекта и больших данных позволяют осуществлять точное планирование и координацию в реальном времени.
- Основными проблемами являются высокие первоначальные затраты, киберугрозы и сокращение рабочих мест.
- Для решения этих проблем предложены стратегии по укреплению инфраструктуры, переобучению сотрудников и защите данных.

Оригинальность и научная новизна исследования - Исследование объединяет темы цифровизации и устойчивости, предлагая новый научный подход к транспортной отрасли. Результаты, полученные благодаря совместному применению искусственного интеллекта, больших данных и технологий мониторинга в реальном времени, вносят уникальный вклад как с теоретической, так и с практической точки зрения. Исследование также анализирует специфические вызовы цифровизации в транспортной системе Азербайджана, открывая новые возможности для научных инноваций в этой области.

Ключевые слова: цифровизация, цифровая платформа, аналитика больших данных, операционная эффективность, кибербезопасность, мониторинг в реальном времени, удовлетворенность клиентов, защита данных, утечка конфиденциальной информации.