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Leveraging digital transformation & artificial intelligence in the
transport industry (SMBs): Solving economic and global
competitiveness challenges

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LEVERAGING DIGITAL TRANSFORMATION & ARTIFICIAL INTELLIGENCE IN THE TRANSPORT INDUSTRY (SMBs)

Solving Economic and Global Competitiveness Challenges



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Abstract

The transportation sector is undergoing significant transformation, with small and medium-sized businesses (SMBs) facing numerous challenges that impact their operational efficiency and profitability. Rising fuel costs, supply chain disruptions, regulatory compliance, fleet management inefficiencies, labor shortages and high turnover, high risks and insurance costs, and port congestion; all while customers demand faster and just-in-time deliveries, are among the critical obstacles these businesses encounter.

Great news! Holistic digital transformation and artificial intelligence (AI) offer innovative solutions to overcome these challenges. This research explores how SMBs in the transportation industry can leverage digital transformation and AI-driven technologies to transform and reinvent the business to enhance operational efficiency, reduce costs, reinvent the customer experience, create new revenue streams and generate more profits.

The study aims to provide proven methods and strategies on how to approach digital transformation effectively, contrary to the popular trends and beliefs that lead most businesses into investing in technological trends and having minimal returns on their investments.

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1 Introduction and Research Overview

The transportation industry is at a crossroads, facing unprecedented challenges which threaten its sustainability and growth. Small and medium-sized businesses (SMBs) in particular are grappling with economic pressures, global disruptions, and evolving industry demands.

This report is related to broader study on the same subject, “***Harnessing Digital Transformation & Artificial Intelligence for Solving Challenges & Sustaining the Transport Industry***”ⁱ, which proposed solutions to the National Academies of Sciences' 2024 report “***Critical Issues in Transportation for 2024 and Beyond (2024)***”ⁱⁱ.

The National Academies identified five major categories of challenges impacting transportation, including: economic and global competitiveness, safety, public health, equity, and climate Change. This report specifically focuses on the first category mentioned; economic and global competitiveness; and explores solutions that SMBs can implement to solve these obstacles through strategic digital transformation that also includes the use of AI.

Using the ***Digital Transformation Success Formula*** outlined in ***Leveraging Digital Transformation Success Formula***ⁱⁱⁱ, we provide a proven approach to implementing complete business digital transformation that addresses every aspect of the business, including the business strategy and leadership, the technology, the people or organization and the business processes.

The Digital Transformation Success Formula is a 360-degree approach to business transformation, growth and sustainability in the increasingly complex digital age.

2 The Economic and Global Competitiveness Gap in the Transportation Industry

Assessing the economic and global competitiveness gap leads us to the following challenges and their brief descriptions.

Challenges	Brief Description
Labor shortages and employee retention	Difficulty hiring and keeping skilled workers, high turnover rates.
Ports congestion	Delays in cargo processing, various bottlenecks, increased shipping times across all the supply chains in the USA.
Regulatory and compliance challenges	Complex and evolving rules, increasing operational burdens.
Rising fuel costs and inflation	Increased transportation expenses, reduced profit margins.
Economic fluctuations	Market instability impacting demand, pricing, and investment.
Supply chain disruptions	Unreliable material flow, delays, and rising logistics costs.
National and international instability	Political and economic uncertainties affecting operations.
Just-in-Time inventory risks	Vulnerability to supply delays, stock shortages, and lost sales.
Rising insurance costs	Higher premiums due to increased risks and claims.
Inefficiency and outdated operations	Old legacy systems, manual processes, and lack of optimization.

3 What Is Digital Transformation?

Digital transformation is the strategic integration of digital technologies and business innovation strategies into all aspects of a business, fundamentally transforming the business operation, the business model, the organization, the technological infrastructure, the values that are delivered, and beyond technologies, it also requires an individual shift that fosters continuous innovation, agility, and customer-centricity.

Today, the success rate of digital transformation is barely 30%, according to research by Boston Consulting Group. Other studies suggest it may be as low as 20%. The main reason is the false belief and trends that digital transformation is equal to technological innovation, missing too many parts of its essence.

Solving the transportation sector economic and global competitiveness challenges requires more than technology and AI but a strategic digital transformation approach and that is the purpose of The Digital Transformation Success Formula, one of our signature digital transformation frameworks.

3.1 The Digital Transformation Success Formula

The digital transformation (DX) success formula is equal to:

$$DX = \frac{\text{Individual Transformation} \times \text{Business Transformation} \times \text{Technology Transformation}}{\text{Fear}}$$

Digital Transformation Requires:

1. **Individual Transformation** – People must be empowered to transform themselves, develop agility to lead and adapt to change, cultivate a new mindset, and become digitally enabled for an era vastly different from the previous industrial age.
2. **Business Transformation** – This involves strategic business analysis and reinvention to adapt and create new strategies, processes, procedures, and rules for the digital era. Every business process must be reassessed for digital relevance; otherwise, challenges are inevitable. Regardless of the business unit, the common denominator is data. Investing in data to become a data-driven organization should be a top priority for businesses.
3. **Technology Transformation** – As the driving force behind digital transformation, technology must be implemented with a future-oriented vision, the right strategies, and clear objectives. Without these elements, even the most successful technology implementation may fail to deliver a satisfactory ROI or justify the investment. AI is a major technology but does not operate in isolation. Having a well-defined technology strategy is essential.

4. **Fear Management** – Fear runs high during times of transformation. Organizations should reduce fear among employees and foster an environment that encourages innovation and adaptability to change. A supportive culture enables people to embrace new ways of working, take risks, leverage opportunities, and contribute to shaping the future. Otherwise, fear can turn individuals into barriers to progress rather than catalysts for change.

3.2 The Competitive Advantage of The Digital Transformation Success Formula

Many businesses today are making the same mistake with AI and digital technology that early manufacturers made with electricity, implementing new tools without rethinking their strategy and processes.

When electricity was first introduced, factories simply replaced steam engines with electric motors but kept outdated layouts, resulting in minimal efficiency gains. It wasn't until companies redesigned their workflows around electric power that they unlocked massive productivity improvements. Similarly, businesses that adopt AI without a strategic digital transformation framework often fail to see real returns, leading to high failure rates.

The *Digital Transformation Success Formula* ensures that technology is integrated holistically—aligning business strategy, processes, and people—to drive exponential efficiency, competitive advantage, and long-term sustainability. Bridging the Gap with the digital Transformation Success Formula.

3.3 Individual Transformation

3.3.1 Transforming the Individual for Organization Success

Organizational transformation is fundamentally linked to individual transformation, as sustainable business evolution depends on the adaptability and growth of its workforce. In the contemporary labor market, employees increasingly seek purpose, professional development, and engagement beyond financial incentives. Routine and manual jobs, once considered stable, now face declining job satisfaction, contributing to labor shortages and retention challenges. The COVID-19 crisis accelerated a significant shift in workforce priorities, prompting organizations to reevaluate job structures and align them with evolving expectations.

3.3.2 Reinventing the Employee Experience

Businesses should cultivate agility and innovation within their workforce while mitigating uncertainty around technology and artificial intelligence (AI). Rather than viewing AI as a replacement for human labor, organizations should strategically integrate AI into workflows to

enhance productivity, reduce errors, and support human decision-making. This requires a structured approach, including reskilling initiatives, job redesign, and the development of AI-augmented teams that leverage both human expertise and digital intelligence.

Labor shortages and employee retention remain pressing issues. SMBs must re-evaluate job structures, introduce tech assistance, and create incentives to keep employees motivated. Modernizing the workplace with digital tools can enhance job satisfaction, efficiency, and overall retention.

3.4 Converting Fear into Fuel

The human brain is not naturally wired to handle the pressure of transformation, leave our comfort zones, embrace risk, and innovate. On top of that, we are overloaded with information daily. It is a necessity to adapt and become agile.

The good news? Brain science proves we can. Our brains can create new cells at any age through neuroplasticity. With the right support, transformation is possible.

3.5 Business Transformation

3.5.1 Leadership and Strategic Business Reinvention for the Digital Age

Business leaders in the transportation industry should redefine their vision, business models and develop their digital agility to leverage the opportunities of the digital age. Outdated traditional and industrial business models need reinvention to incorporate a balanced mix of digital and physical operations, enabling new business lines, revenue streams, and enhanced client services.

The post-COVID-19 era has reshaped customer expectations and workforce dynamics, making it essential for leaders to embrace innovation, agility, and a purpose-driven approach. Leadership in the digital age is no longer about rigid structures but about inspiring and aligning teams with a shared vision, as people now prioritize new values and meaningful work more than ever.

3.5.2 Process Reinvention, Optimization, and Automation

Outdated processes are the causes of inefficiencies, delays, and increased operational costs. Process reinvention and optimization are critical for businesses seeking to improve accuracy, speed, and adaptability in response to market demands.

The integration of AI and automation enables businesses to streamline workflows, reduce errors, and enhance both employee and customer experiences. However, effective automation requires a strategic approach. Processes should be optimized, tested, and refined before full automation to prevent inefficiencies from being amplified.

3.5.3 Technology Selection and Integration for Process Optimization

Choosing the right technology for process reinvention is essential to achieving long-term efficiency. Businesses must select tools that integrate seamlessly with existing systems and support future scalability. This decision should happen here in the business transformation to align with the business goals. At least the type of technology should be considered in the business strategy, though the final decision of the brand may be considered in the technology transformation section below.

1. **Digitizing Paper-Based Processes**
Transitioning manual workflows to digital platforms reduces paperwork, improves data accessibility, and minimizes errors. Cloud-based document management systems can streamline approvals, compliance tracking, and real-time collaboration.
2. **AI-Integrated ERP Systems for Cross-Departmental Efficiency**
Enterprise resource planning (ERP) systems powered by AI can provide real-time insights across various business units, enhancing coordination and reducing silos. AI-driven ERP systems enable predictive analytics for supply chain management, customer service, and financial planning.
3. **Optimizing Business Processes with AI and Data Sharing**
Integrated AI systems can automate decision-making, optimize resource allocation, and facilitate better interdepartmental communication. Data-sharing mechanisms between departments ensure that all units have access to accurate, real-time information for more effective decision-making.
4. **Automating Interdepartmental Workflows**
Businesses can leverage automation to streamline interdepartmental workflows, such as inventory tracking, logistics planning, and compliance reporting. AI-powered automation tools help eliminate bottlenecks, improve response times, and enhance overall productivity.

3.5.4 AI and Automation: Enhancing Efficiency and Innovation

AI adoption in Process Reinvention should be strategic, ensuring that automation complements human intelligence rather than replacing it. Business automation should always be preceded by strategic job repurposing and process reinvention. Remember that leaders remain accountable and responsible for automation outcomes and future business evolution.

1. **AI for Virtual Assistants and Customer Service**
AI-powered chatbots and virtual assistants can handle routine administrative tasks, reducing employee workload and improving customer response times.
2. **AI for Smart Logistics and Supply Chain Optimization**
AI-driven analytics can optimize delivery routes, manage inventory, and predict supply chain disruptions. AI-enhanced transportation management systems (TMS) can improve fleet efficiency, reduce fuel consumption, and minimize delays.

3. Predictive Maintenance for Operational Continuity

AI-based predictive maintenance tools can analyze vehicle performance data to anticipate breakdowns before they occur. This proactive approach reduces downtime, lowers maintenance costs, and enhances fleet reliability.

3.5.5 Reinventing Customer Experience

With the rise of online shopping and the growing expectation for fast, seamless deliveries, the transportation industry must redefine the customer experience to stay competitive. Delivery is no longer just a logistical process but a key differentiator that shapes brand perception and customer loyalty. Businesses should integrate AI-driven insights, omnichannel engagement, and flexible delivery options to enhance the user experience and adapt to modern lifestyles.

Furthermore, integrating an omnichannel support system, spanning phone, apps, websites, and social media, ensures consistent and seamless interaction across all touchpoints. AI chatbots and virtual assistants can proactively notify customers of potential delays, suggest alternative solutions, and enhance communication. By reinventing customer experience with technology-driven personalization, flexibility, and risk management, transportation businesses can strengthen customer loyalty, improve efficiency, and gain a competitive edge in the digital economy.

3.5.6 Business Automation with AI and other Smart Technologies

The integration of AI, Robotic Process Automation (RPA), agentic AI, generative AI, IoT, and other advanced technologies such as drones and robots is revolutionizing business operations by automating routine tasks, improving efficiency, and enhancing decision-making. These technologies, when strategically adopted, can elevate human productivity, ensuring that automation complements rather than replaces human roles. This balance is key to unlocking their full potential and enabling businesses to scale effectively in a fast-evolving landscape.

AI plays a critical role in automating administrative tasks, such as scheduling, data entry, and customer service inquiries, through virtual assistants and chatbots. By handling repetitive tasks, AI frees up human employees to focus on higher-value activities. In the logistics industry, smart logistics solutions powered by AI optimize delivery routes, forecast demand, and improve warehouse management, ensuring faster, more accurate order fulfillment.

RPA enables businesses to automate manual, rule-based processes like invoicing, payroll, and customer data entry, reducing errors and speeding up operations. This can result in significant cost savings, especially in back-office functions. For example, a logistics company can implement RPA to automatically process orders and trigger the dispatch of deliveries without human intervention, enhancing operational efficiency.

Furthermore, drones and robots are increasingly being used for physical tasks like inventory management, delivery, and surveillance. Drones can be deployed for last-mile deliveries, reaching remote or congested areas quickly, while robots in warehouses can streamline sorting, packing, and shipping processes. These technologies not only improve speed and accuracy but also reduce human labor costs and safety risks.

By leveraging a combination of AI, RPA, IoT, drones, and robots, businesses can automate complex processes, enhance decision-making with real-time data, and maintain a balance between human oversight and automation. For example, AI-driven predictive maintenance can monitor vehicle conditions in real time, anticipating breakdowns before they happen, reducing downtime, and minimizing maintenance costs. As businesses continue to embrace automation, the use of these advanced technologies will drive greater efficiencies and help organizations stay competitive in an increasingly automated world.

3.5.7 Risk Management and Data-Driven Decision-Making

Effective risk management is crucial in the transportation industry, where disruptions can significantly impact operations, safety, and customer satisfaction. With the integration of AI-powered risk analysis and predictive tools, businesses can proactively identify potential threats and mitigate risks before they escalate. Utilizing data-driven insights helps enhance decision-making, enabling companies to stay agile in the face of uncertainties.

AI-powered risk analysis can assess various factors, such as weather conditions, traffic patterns, and fleet performance, to predict and mitigate risks. Additionally, predictive maintenance uses real-time data from vehicle sensors to monitor fleet health, anticipating potential breakdowns and preventing costly repairs or delays. Transportation companies can deploy fatigue detection systems that continuously monitor driver behavior and alert them to take necessary breaks, minimizing the risk of accidents due to exhaustion.

3.5.8 Ensuring Effectiveness in Compliancy Achievement

Regulatory compliance in the transportation sector is a complex and resource-intensive process, often requiring significant manual effort to capture, analyze, validate, and report regulatory data. As compliance requirements continue to evolve, organizations should adopt digital solutions that streamline these processes, reduce human error, enhance operational efficiency and reduce administrative burdens.

Key Strategies for Enhancing Compliance in the Transportation Industry

1. Automating Data Collection and Validation.
2. Blockchain for Compliance Tracking and Transparency
3. Enhancing Cybersecurity for Regulatory Data Protection
4. Integrating Compliance into Digital Workflows

3.6 Technology Transformation

3.6.1 Building the Business Backbone: Cloud, Data, Security, Technology and Integration

A robust business backbone is essential for sustaining long-term growth, ensuring operational efficiency, and driving digital transformation. In the digital economy, data is a critical asset, and businesses must invest in the right infrastructure to capture, manage, secure, and process it effectively. This requires a cohesive technology strategy that eliminates disconnected silos and fosters seamless integration between systems, enabling real-time data-driven decision-making across all business units.

More digital technologies to consider are: IoT, blockchain, digital twins, VR, mobility techs, and more, depending on the business.

Key Considerations for Building a Scalable and Future-Ready Business Backbone

1. Cloud-Based Infrastructure for Scalability and Agility

Migrating to cloud-based systems ensures that businesses can scale efficiently while maintaining flexibility in operations. Cloud solutions enhance accessibility, enabling teams to work from anywhere while ensuring centralized data management and security. Whether leveraging public, private, or hybrid cloud solutions, businesses must choose platforms that align with their operational needs and long-term vision.

2. AI-Driven Enterprise Resource Planning (ERP) and CRM Systems

AI-powered ERP systems streamline workflows, improve process automation, and enhance interdepartmental collaboration. Modern ERP solutions integrate finance, supply chain, HR, marketing, sales, and various customer relationship management (CRM) functions, ensuring real-time visibility and operational efficiency. When selecting an ERP, businesses should prioritize open architectures and API-driven solutions to facilitate seamless integration with third-party applications.

3. Secure Data Migration and Data Skills Investments

A successful digital transformation strategy involves secure and structured data migration from legacy systems to modern platforms. Ensuring data integrity, compliance, and security during this process is critical. Businesses must implement robust cybersecurity frameworks, including multi-factor authentication (MFA), encryption, and threat detection systems, to protect sensitive information and mitigate cyber risks. Furthermore, establishing data governance and investing in data skills in the organization are smart moves that will generate ROI for years.

4. Adopting Interoperable and Open Integration Systems

To avoid vendor lock-in and future scalability issues, organizations should adopt technology ecosystems that are interoperable and designed for open integration. Choosing solutions that support industry-standard protocols (such as RESTful APIs, GraphQL, and microservices architecture) ensures that businesses can continuously adapt and integrate emerging technologies without disrupting core operations.

5. Mobile-First and User-Centric Platforms

As businesses become more mobile and distributed, enabling seamless access to critical business applications through mobile-friendly interfaces is essential.

Employees, customers, and partners should be able to interact with enterprise systems effortlessly, ensuring enhanced productivity and engagement.

6. Security

Ensuring robust cybersecurity measures is essential for maintaining the integrity of a transportation business's digital infrastructure. Security implementation should include AI-powered threat detection, encryption protocols, multi-factor authentication (MFA), and continuous system monitoring to protect sensitive data and prevent cyber threats.

Industry-recognized security certifications processes can be made more efficient with the use of digital technologies. However, security and data-driven education for the employees or everyone in the organization is essential because humans are the weakest link for security breach.

4 Case Studies

4.1 Hilton Haulage - Case Study^{iv}

Hilton Haulage, a leading trucking company, sought to address driver fatigue, a factor in 20% of road accidents. To enhance safety, they trialed the *Guardian by Seeing Machines* system, using AI-equipped in-cab cameras to detect driver fatigue and distraction across six trucks. The trial uncovered unexpected fatigue patterns, including microsleeps occurring early in shifts. Based on these insights, Hilton Haulage expanded the system to 22 vehicles and eventually implemented it across its entire 200+ fleet. The AI technology, now a standard safety feature, provided key benefits:

- **Enhanced Safety:** Reduced fatigue-related incidents through real-time driver alerts.
- **Health Interventions:** Helped identify drivers with sleep disorders for medical support.
- **Cultural Shift:** Fostered proactive discussions on fatigue management and safety.

Hilton Haulage's adoption of AI-driven fatigue monitoring demonstrates how digital transformation can improve driver well-being and operational safety in the transportation industry.

4.2 Case Study 2 - DHL^v

DHL integrated Internet of Things (IoT) technology into its logistics operations, providing real-time data on the location, status, and condition of shipments. This integration has led to improved operational efficiency, reduced costs, and enhanced customer satisfaction by ensuring timely and transparent deliveries.

4.3 Case Study - 3 Men Movers^{vi}

A Texas-based moving company, 3 Men Movers, implemented artificial intelligence (AI) technologies to enhance safety and optimize routing. By installing AI-driven cameras to detect distracted driving and utilizing advanced routing technology to avoid high-traffic and high-risk areas, the company achieved a 91% accuracy rate in detecting distracted driving and reduced accidents by 4.5% within the first three months of implementation.

4.4 Uber

Founded in 2009, Uber revolutionized the transportation industry with its rideshare service. The Uber app introduced features such as real-time tracking, dynamic pricing, and efficient driver-passenger matching based on proximity. These innovations have optimized operations and significantly enhanced the user experience, contributing to Uber's rapid growth and market penetration.

4.5 Transport for London (TfL)

TfL has been a pioneer in digital innovation, notably through the adoption of contactless payment systems across its network. This system not only offers convenience but also automatically calculates the best value fare based on a customer's journey history, ensuring they always pay the lowest fare. This initiative has streamlined operations and improved customer satisfaction.

5 The Road Ahead: Assess Your Current Position, Develop and Achieve Your Vision

Digital transformation, like any transformation, is a continuous journey that unfolds in multiple phases rather than a one-time project. Whether a transportation business has been an early adopter of digital technologies or is just beginning to embrace them, the key to long-term success lies in ongoing evaluation, strategic adaptation, and a vision beyond industry trends.

While keeping up with the latest trends is essential, businesses should look deeper than surface-level shifts to identify opportunities that truly enhance their operations, customer experience, and overall efficiency. Trends may come and go, but a well-designed digital strategy, aligned with long-term business growth goals, ensures sustained competitive advantage.

To navigate this journey effectively, transportation companies should implement a continuous monitoring and evaluation process to assess their current digital maturity, identify gaps, and determine the right technologies to integrate. Technology evolves rapidly, and while core strategies may provide direction, they must be periodically updated to incorporate the latest advancements.

6 Conclusion

Digital transformation and AI adoption offer SMBs in the transportation sector a powerful means to overcome operational inefficiencies, enhance customer experience, and drive profitability. That will also directly reduce larger challenges associated to ports congestion and supply-chain disruption. By reinventing their operations and business models, businesses can leverage the digital opportunity to deliver innovative solutions, become more efficient, optimize routes, reduce costs, improve safety, and increase ROI.

While large enterprises and governmental institutions are already transforming, SMBs have a unique opportunity to implement scalable, cost-effective digital solutions tailored to their needs for improving the whole supply chain experience. Investing in digital transformation and AI will not only help address current industry challenges but also position SMBs for long-term success in an increasingly data-driven and automated digital economy.

Author Biography

About M. Nadia Vincent, MBA, PMP

Marie Nadia Vincent, MBA, is a renowned business and technology leader, CEO of Digital Transformation Leaders, a management consulting firm specializing in information technology and digital innovation services.

An Executive Advisor and Senior Business Consultant specializing in digital transformation, AI adoption, and business innovation, she is ranked among the Top 10 Global Thought Leaders in Digital Transformation, AI, and Leadership by Thinkers360. Mrs. Vincent has over two decades of experience leading digital transformation and technology innovation in organizations ranging from Fortune companies to SMBs in Europe and the USA.

Mrs. Vincent has advanced technology innovation and digital leadership experience in the energy, transportation and supply chain, banking, insurance, retail, defense, government, electronic payments, financial settlements, food manufacturing, hospitality, and public administration sectors. She also coaches and develops continuous education programs for business professionals globally.

Mrs. Vincent has worked educating and evangelizing businesses with or in partnership with organizations such as Microsoft, SAP, The National Academies of Sciences, Engineering and Medicine, the US Air Force, and PMI. She holds two executive education certificates from MIT SLOAN in Management & Leadership, and Strategy & Innovation. She also has an MBA, a bachelor's in business administration, and an associate of applied sciences in technology.

Author of ***The Digital Transformation Success Formula*** and ***Leveraging Digital Transformation - Proven Leadership and Innovation Strategies to Engage and Grow Your Organization***, she is dedicated to helping businesses thrive in the digital economy. Multicultural and passionate, she consults globally and empowers leaders to innovate and succeed.

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- iii **Leveraging Digital Transformation: Proven Leadership and Innovation Strategies to Engage and Grow Your Organization Hardcover – March 1, 2020** by [M Nadia Vincent](#) (Author), [David A Maynard](#) (Foreword), **Edition** 2nd Edition ed. **Print length:** 252 pages **Publisher:** Aviva Publishing **Publication date:** March 1, 2020 **Dimensions:** 6 x 0.69 x 9 inches **ISBN-13:** 978-1950241521
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