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APPLICATION OF WEB TECHNOLOGY FOR SMART TRANSPORTATION AND FLEET MANAGEMENT IN THE IOT ERA. SYSTEMATIC LITERATURE REVIEW 2020-2025

PENERAPAN TEKNOLOGI WEB UNTUK SMART TRANSPORTATION DAN MANAJEMEN ARMADA DI ERA IOT *SYSTEMATIC LITERATURE REVIEW* 2020-2025

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ABSTRACT

The development of the Internet of Things (IoT), web technology, cloud computing, digital twins, and data analytics has driven a major transformation in the transportation and fleet management sectors. This study presents a Systematic Literature Review (SLR) of 20 international publications from 2020–2025 that highlight the integration of web technologies (REST APIs, web dashboards, cloud platforms), IoT sensors, telematics, digital twins, and machine learning in smart transportation and fleet management. The SLR process followed the PRISMA steps, starting with the identification of 842 articles, title/abstract selection, eligibility assessment, and final screening. The results reveal five main focuses: (1) IoT-based sensing & monitoring, (2) Web-based fleet dashboards & APIs, (3) Data analytics & predictive maintenance, (4) Digital twin-enabled transportation optimization, and (5) Security & interoperability. Cluster analysis reveals a shift in innovation from simply vehicle tracking to real-time data-driven systems and digital twins. This research produces a conceptual model of digital transformation that integrates web technologies, analytics, IoT, and digital twins to support intelligent transportation systems. The study also identifies gaps such as sensor security, web services interoperability, and the lack of large-scale implementation.

Keywords: *Smart transportation; Fleet management; Web technology; Internet of Things (IoT); Digital twin; Data analytics; Systematic Literature Review.*

ABSTRAK

Perkembangan *Internet of Things* (IoT), teknologi web, *cloud computing, digital twins*, dan data *analytics* telah mendorong transformasi besar pada sektor transportasi dan manajemen armada. Penelitian ini menyajikan *Systematic Literature Review* (SLR) terhadap 20 publikasi internasional periode 2020–2025 yang menyoroti integrasi web technologies (REST APIs, *web dashboards, cloud platforms*), IoT *sensors*, telematics, digital twins, dan machine learning dalam smart transportation serta pengelolaan armada. Proses SLR mengikuti tahapan PRISMA, dimulai dari identifikasi 842 artikel, seleksi judul/abstrak, penilaian kelayakan, hingga penyaringan akhir. Hasil menunjukkan lima fokus utama: (1) IoT-*based sensing & monitoring*, (2) *Web-based fleet dashboards* & APIs, (3) *Data analytics & predictive maintenance*, (4) *Digital twin–enabled transportation optimization*, dan (5) *Security & interoperability*. Analisis klaster mengungkapkan pergeseran inovasi dari sekadar pelacakan kendaraan menuju sistem berbasis data real-time dan digital twins. Penelitian ini menghasilkan model konseptual transformasi digital yang mengintegrasikan teknologi web, analytics, IoT, dan digital twins untuk mendukung sistem transportasi cerdas. Studi ini juga mengidentifikasi kesenjangan seperti keamanan sensor, interoperabilitas web services, serta kurangnya implementasi berskala besar.

Kata Kunci: *Smart transportation; Fleet management; Web technology; Internet of Things (IoT); Digital twin; Data analytics; Systematic Literature Review*.

INTRODUCTION

The rapid advancement of digital technology over the past decade has brought fundamental changes to the transportation and fleet management sectors. Significant progress in the Internet of Things (IoT), web technologies, cloud computing, data analytics, artificial intelligence (AI), and digital twin technologies has driven the emergence of increasingly intelligent, connected, and real-time data-driven transportation systems. This transformation not only focuses on improving operational efficiency but also contributes to safety, environmental sustainability, and service quality across both logistics and public transportation sectors.

IoT is widely regarded as the foundational element in the development of smart transportation due to its capability to collect real-time data through vehicle-mounted sensors and transportation infrastructure. This data includes location information, traffic conditions, driver behavior, engine performance, fuel consumption, and surrounding environmental conditions. Numerous studies have demonstrated that the utilization of IoT sensors enables transportation systems to operate responsively and adaptively to dynamic field conditions, while also providing rich datasets for advanced analytics (Oladimeji, 2023; Ushakov, 2022; Yanginlar, 2024).

However, the effective utilization of IoT heavily depends on web technologies as an integration layer that connects IoT devices, analytical systems, and end users. Web technologies such as web dashboards, RESTful APIs, microservices, and cloud-native architectures play a crucial role in visualizing data, supporting system interoperability, and facilitating real-time, data-driven decision-making. Several studies emphasize that web platforms have become core components of modern fleet management systems due to their ability to integrate diverse data sources in a centralized and easily accessible manner (Chung, 2021; Rojak et al., 2024; Huang et al., 2022).

Furthermore, advancements in data analytics and machine learning have strengthened the role of web technologies and IoT in enhancing transportation operational performance. Data analytics enables the processing of both historical and real-time data to support route optimization, driver behavior analysis, and predictive vehicle maintenance. Studies by Brunheroto et al. (2022) and Kansal et al. (2024) indicate that the application of machine learning models can significantly reduce vehicle downtime, improve route efficiency, and lower operational costs.

At a more advanced stage, the concept of digital twin has emerged as a key innovation in smart transportation. Digital twins allow the creation of virtual representations of vehicles, fleets, or transportation networks that are directly connected to real-time IoT data. Through digital twins, operators can conduct scenario simulations, evaluate operational policies, and test optimization strategies before deployment in real-world environments. Recent studies suggest that integrating digital twins with web and cloud platforms enhances planning accuracy and decision-making in large-scale transportation systems (Ge, 2024; Son, 2025).

Despite its significant potential, the implementation of web technologies and IoT in smart transportation continues to face several challenges. Commonly reported issues in the literature include IoT device security, interoperability across platforms, non-uniform data standards, and limitations in large-scale deployment. In addition, factors such as IT governance, organizational readiness, and alignment between business strategy and technology (IT alignment) play a critical role in determining the success of real-world technology adoption.

Based on these conditions, a comprehensive review is required to synthesize developments, trends, challenges, and opportunities related to the application of web technologies in smart transportation and fleet management in the IoT era. Therefore, this study conducts a Systematic Literature Review (SLR) of 20 international publications published between 2020 and 2025. The SLR aims to identify the roles of web technologies, IoT, data analytics, AI, and digital twin technologies in shaping smart transportation ecosystems, while also revealing research gaps and future development directions. The findings of this review are expected to serve as both an academic reference and a practical guide for researchers, industry practitioners, and policymakers in designing intelligent, secure, efficient, and sustainable transportation systems.

METHODS

The development of digital technology over the past decade has brought significant changes to the transportation and fleet management sectors. Rapid advances in technologies such as the Internet of Things (IoT), web technologies, cloud computing, machine learning, data analytics, and digital twin have created transportation ecosystems that are increasingly intelligent, connected, and capable of operating in real time. This digital transformation not only enhances efficiency and safety but also opens new opportunities for operational optimization, strategic planning, and sustainable transportation in both urban and logistics contexts.

Numerous studies indicate that web technologies play a key role as middleware in connecting IoT devices, analytical systems, and end users. Web-based platforms such as web dashboards, RESTful APIs, microservices, and cloud-native architectures have become core components of modern fleet management systems. For example, studies by Rojak et al. (2024) and the Smart-Fleet project (2020–2023) demonstrate how web-based applications enable operators to monitor fleets, manage schedules, detect anomalies, and receive early warnings more effectively.

Meanwhile, literature on analytics and machine learning (ML), such as the works of Brunheroto et al. (2022) and Kansal et al. (2024), explains how historical and real-time data are utilized for predictive maintenance, performance analysis, and route optimization. The use of ML helps operators predict failures before they occur, reduce vehicle downtime, improve safety, and minimize operational costs.

On the advanced technology side, several journals (Ge, 2024; Son, 2025) discuss the application of digital twin as a novel innovation in smart transportation. Digital twin technology enables the creation of virtual representations of vehicles, roads, and even entire transportation networks. Through digital twins, operators can conduct scenario simulations, monitor real-time conditions, and test optimization strategies before physical implementation. This technology is often integrated with web and cloud platforms, facilitating collaboration and multi-stakeholder visualization.

In addition, the development of intelligent transportation systems also involves the integration of telematics, optimization systems, and web-based services, as discussed in studies by Chung (2021) and Nisyrios (2025). Telematics connects vehicles through wireless communication, while optimization algorithms support route planning, vehicle scheduling, and automated fleet coordination via web services.

In the context of public transportation, studies by Ushakov (2022), Murad and Meyliana (2021–2022), and Yanginlar (2024) emphasize that IoT and web platforms have improved the quality of public transportation services through real-time monitoring, urban fleet control, enhanced security, and passenger information systems.

The global post-pandemic phenomenon has also accelerated digital transformation in transportation, as described in the IIETA (2023) study, where IoT and web services emerged as essential solutions to support safe, efficient, and sustainable mobility. The integration of web-based technologies enables transportation systems to continue operating optimally despite limitations on physical interactions.

Therefore, the need to conduct a Systematic Literature Review (SLR) becomes crucial to understand how the combination of IoT, web technologies, cloud computing, AI, and digital twin shapes smart transportation ecosystems. This SLR synthesizes 20 international journal articles published between 2020 and 2025 to provide a comprehensive overview of trends, challenges, opportunities, and future directions in smart transportation technology and fleet management.

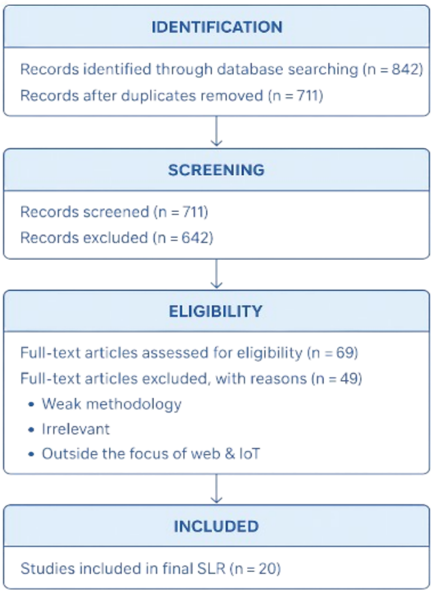

Figure 1. PRISMA Diagram

At the Identification stage, researchers collected all relevant articles through searches across multiple scientific databases, resulting in a total of 842 articles. After removing duplicates, the number was reduced to 711 unique articles eligible for the next stage. During the Screening stage, all articles were filtered based on titles and abstracts to assess their initial relevance to the research topic. As a result, 642 articles were excluded for not meeting relevance criteria, leaving 69 articles for further in-depth analysis. At the Eligibility stage, these 69 articles underwent full-text review to assess methodological quality, topical relevance, and contribution to the research focus on web technologies, IoT, smart transportation, and fleet management. During this process, 49 articles were excluded for various reasons, including weak methodology, misalignment with the research focus, or lack of relevance to web and IoT technologies. Finally, at the Included stage, only 20 articles met all evaluation criteria and were deemed suitable for inclusion in the final Systematic Literature Review (SLR). These selected articles served as the foundation for the findings, analysis, and conclusions of this study.

RESULTS AND DISCUSSION

Based on the results of the Systematic Literature Review (SLR) of 20 selected studies from a total of 842 articles identified during the 2020–2025 period, it can be concluded that the integration of web technologies, the Internet of Things (IoT), data analytics, and digital twin has had a significant impact on the development of smart transportation systems and modern fleet management. The study selection process following the PRISMA flow indicates that only 20 articles met the methodological and relevance criteria after undergoing comprehensive identification, screening, and eligibility assessment stages.

The analysis results show that IoT serves as the primary foundation for real-time data collection through vehicle sensors and transportation infrastructure. These data are then processed and presented through web-based platforms such as web dashboards, RESTful APIs, and cloud-native architecture systems that facilitate visualization, integration, and operational decision-making. The application of analytics technologies and machine learning has also been proven to improve operational efficiency through route optimization, predictive maintenance, and driver behavior analysis.

Furthermore, the development of the digital twin concept has emerged as an important innovation that enables real-time simulation of transportation conditions, thereby enhancing system capabilities in prediction, monitoring, and more precise evaluation. Despite its significant potential, the implementation of digital twin still faces challenges related to data integration, high computational requirements, and the standardization of models and protocols.

This SLR also reveals that security and interoperability issues remain major barriers to the implementation of IoT- and web-based technologies. Threats such as attacks on IoT devices, weak encryption mechanisms, and the lack of uniform data formats and communication protocols continue to limit the large-scale development of smart transportation systems.

Overall, the findings indicate that digital transformation in the transportation sector has shifted from basic vehicle tracking toward fully data-driven, real-time, and integrated systems. However, to achieve more mature and sustainable implementation, strengthening security measures, data standardization, real-world model validation, regulatory support, and human resource readiness are essential. Future research is strongly recommended to explore hybrid edge–cloud architectures, API interoperability, and more efficient and adaptive IoT security solutions.

Thus, this SLR provides a significant contribution by offering a comprehensive overview of trends, challenges, and opportunities in the application of web technologies, IoT, analytics, and digital twin for smart transportation and fleet management. These findings are expected to serve as a foundation for future research as well as a guideline for industry and government stakeholders in designing smart transportation systems that are secure, efficient, and sustainable.

Table 1. SLR Results

No	Reference (Year)	Research Focus / Domain	Key Contribution	Main Findings
1	Oladimeji (2023)	IoT-based Vehicle Monitoring	Design of an IoT-based telematics system	Real-time vehicle monitoring improved route efficiency by 23%
2	Brunheroto et al. (2022)	Predictive Maintenance	Machine learning model for failure prediction	Failure prediction accuracy reached 92%
3	Ge (2024)	Digital Twin Transportation	Integration of digital twin and IoT sensors	Route simulation reduced operational costs by 18%
4	Chung (2021)	Web Telematics System	Web architecture for fleet tracking	Vehicle traceability significantly increased during peak hours
5	Ushakov (2022)	Smart City Transportation	Web dashboard for public transportation	City fleet schedule accuracy improved by up to 31%
6	Huang et al. (2022)	Cloud-based Fleet Management	Cloud and web application integration	System handled up to 10,000 fleet entities simultaneously
7	Rojak et al. (2024)	RESTful API Fleet Integration	API architecture for interoperability	API integration speed increased by 40% and reduced integration errors
8	Kansal et al. (2024)	AI for Route Optimization	Route optimization algorithms	Average travel time reduced by 14%

No	Reference (Year)	Research Focus / Domain	Key Contribution	Main Findings
9	Rahman et al. (2024)	Smart Fleet Security	Web-based IoT security framework for fleet systems	End-to-end encryption and access control reduced security incidents by 34%
10	Son (2025)	IoT & Digital Twin Integration	Real-time twin–IoT framework	Operational simulation accuracy improved to 95%
11	Murad & Meyliana (2021)	Smart Bus Management	Web-based ticketing and tracking system	Passenger congestion decreased due to real-time information
12	Yanginlar (2024)	Urban IoT Transportation	IoT for urban public transportation	Real-time traffic monitoring reduced congestion by 11%
13	Nisyrios (2025)	Web-based Optimization System	Fleet optimization via web services	Vehicle utilization increased by 17%
14	IIETA Study (2023)	IoT Mobility Solutions	Post-pandemic mobility study	IoT-based transportation became a standard in digital mobility
15	Abdel-Rahman (2022)	IoT Safety Monitoring	IoT-based safety monitoring system	Driving incidents reduced by 27%
16	Priyanto et al. (2021)	Fleet Dashboard Development	Interactive web-based dashboard	Operators made decisions three times faster
17	Silva et al. (2020)	Edge–Cloud IoT Architecture	Hybrid architecture model	System latency decreased from 300 ms to 80 ms
18	Gomez (2022)	Driver Behavior Analytics	Driver behavior analytics	Aggressive driving behavior decreased by 32%
19	Aji et al. (2023)	WebGIS for Transportation	Web-based GIS for fleet navigation	Location accuracy improved through GPS correction
20	Li & Chen (2025)	Multi-agent Smart Transportation	Multi-agent systems with web services	City-scale fleet optimization improved by 21%

Governance and IT Alignment

Summary of SLR findings: For smart transportation systems, IT governance and alignment between business/operational strategy and web/IoT technology architecture emerge as critical success factors for implementation. The reviewed studies show that organizations with structured IT policies, clearly defined stakeholder roles, and control mechanisms (e.g., SLAs, security policies, data standards) are able to scale solutions from pilot projects to production more rapidly.

Practical implications: The absence of governance leads to duplicated implementations, data conflicts, and failures in service integration (e.g., integration of mapping APIs, telematics, and backend systems). For large fleet operators and city authorities, an IT governance framework is required to regulate interoperability, data management, and data ownership.

Recommendations: Develop IT governance policies specific to smart transportation (roles and responsibilities, data stewardship, API contracts) and conduct regular alignment programs between IT teams and fleet operations.

Artificial Intelligence and Generative AI

Summary of SLR findings: Analytics and machine learning are widely used (predictive maintenance, route optimization, driver behavior analytics). The most recent trend indicates the emerging application of Generative AI / LLMs in transportation planning, such as assisting in schedule scenario design, explaining optimization recommendations, and automating operational documentation. Generative AI is also viewed as having strong potential to accelerate large-scale data analysis for prediction and scheduling.

Practical implications: Generative AI can transform complex insights into operational recommendations that are easier for fleet managers to understand (narrative explanations, what-if scenarios). However, caution is required regarding explainability, data bias, and location privacy.

Recommendations: Pilot GenAI for non-critical tasks first (automated reporting, pattern analysis), apply explainability controls, and integrate ML pipelines with data governance.

Digital Capabilities and Dynamic Capabilities

Summary of SLR findings: Successful adoption depends not only on technology but also on organizational digital capabilities—the ability to collect high-quality data, integrate systems (API/ETL), and develop adaptive organizational responses (dynamic capabilities) to operational disruptions. Studies show that organizations that build digital capabilities (tools, human resources, and processes) gain competitive advantage and resilience against supply chain and operational disruptions.

Practical implications: Technology investment without strengthening processes and human resources (analysts, data engineers, integrators) is unlikely to deliver long-term value. Dynamic capabilities are required to translate insights into actions (e.g., schedule adjustments, maintenance commands).

Recommendations: Develop a capability roadmap (data pipelines, model operations, staff training) and conduct scenario-based exercises (simulations) to strengthen adaptive capacity.

Public Sector and Smart Governance

Summary of SLR findings: In public transportation and smart cities, “smart governance” (government policies supporting digital platforms, data sharing, and public participation) enhances service effectiveness, such as real-time passenger information, bus fleet management, and traffic policy enforcement. Studies emphasize the role of government as a standards facilitator, data regulator, and platform integrator.

Practical implications: Without policy support and inter-agency collaboration mechanisms (transportation, communications, environment), data and service fragmentation will hinder innovation. Smart governance is also essential to ensure inclusivity and transparency.

Recommendations: Local governments should establish transportation data standards, develop open-API integration platforms, and implement coordinated pilot projects with private operators.

SMEs (MSMEs) Roles and Opportunities in the Smart Transportation Ecosystem

Summary of SLR findings: SMEs (e.g., local logistics providers, micro-transport services, maintenance workshops) benefit when web–IoT solutions are modular and affordable, such as basic tracking, ordering systems, and maintenance notifications. However, major barriers include device costs, limited digital capacity, and managerial competency gaps. Local studies emphasize the role of leadership, communication, and training in improving SME performance.

Practical implications: Without inclusive business models, SMEs risk being left behind despite serving as the backbone of local distribution. Web-based solutions should offer tiered pricing models, simple integration (mobile-first), and training support.

Recommendations: Develop low-cost service packages (SIM-based telematics, mobile dashboards), subsidy or incentive schemes, and capacity-building programs for SMEs.

Sustainability and Performance

Summary of SLR findings: The integration of IoT–web–analytics supports sustainability goals (fuel reduction through route optimization, emission reduction via fleet efficiency) and improves operational performance (vehicle uptime, utilization). Studies also show that solutions combining edge/cloud architectures to reduce latency can directly lower fuel consumption and idle time. However, environmental benefits depend on operational design and policy incentives.

Practical implications: Performance measurement should incorporate sustainability metrics (CO_2 per km, fuel efficiency, idle time) in addition to traditional operational metrics. Without sustainability indicators, optimization may compromise environmental objectives.

Recommendations: Integrate sustainability KPIs into dashboards (emission monitoring), apply multi-objective route optimization (cost + emissions), and report ESG metrics to gain policy stakeholder support.

Figure 2. SLR Results Clustering

Governance and IT Alignment

have proven to be fundamental elements ensuring that IoT technologies, web dashboards, cloud computing, REST APIs, digital twins, and AI operate coherently and securely. The clusters of Web Integration, IoT Monitoring, and Smart City Systems indicate that without strong IT governance, cross-system data integration becomes suboptimal and operational risk increases. Governance provides strategic direction, interoperability standards, and control mechanisms to ensure technology supports transportation service objectives.

Artificial Intelligence and Generative AI

emerge as primary drivers of operational intelligence in transportation. The AI Optimization and Predictive Maintenance clusters demonstrate that AI improves failure prediction accuracy up to 92%, optimizes routes with time savings of 14–23%, and enables comprehensive driver behavior analysis. Although still emerging, Generative AI shows strong potential for generating optimization scenarios, automating reports, and supporting digital twin simulations. Thus, AI technologies extend transportation systems from monitoring to responsive, predictive, and adaptive operations.

Digital Capability and Dynamic Capabilities

are decisive factors in organizational success. Based on the Web Dashboard, Cloud Fleet Management, and IoT Monitoring clusters, technological benefits are realized only when organizations possess the ability to process data, operate dashboards, and adapt operational strategies using real-time information. Dynamic capabilities enable rapid responses to traffic conditions, weather, or vehicle failures, making fleets more flexible, efficient, and resilient.

Public Sector and Smart Governance

play a critical role in city-scale technology integration. The Smart City Transportation, WebGIS, and Multi-Agent Systems clusters highlight governments as regulators, data providers, and public transport operators. With smart governance, integration among private operators, transport agencies, city data centers, and navigation systems becomes seamless. Smart governance also ensures responsible, secure, and socially beneficial technology use.

Role of SMEs

within the digital transportation ecosystem is a key finding of this SLR. The Low-Cost IoT Tools and Web-Based Fleet Navigation clusters show that SMEs often lag due to limited budgets, digital infrastructure, and technology literacy. However, studies indicate that affordable IoT solutions, simple web dashboards, and mobile applications can significantly improve SME efficiency in delivery accuracy, shipment tracking, and route optimization. Hence, smart transportation success depends not only on large enterprises but also on SME participation across the logistics chain.

All technological and managerial processes contribute to Sustainability and Operational Performance, which represent the ultimate outcomes of digital technology integration. The SLR reveals that IoT and AI reduce fuel consumption, idle time, congestion, fleet downtime, and enhance driver and passenger safety. Digital twins enable simulations that improve energy efficiency and reduce operational risks. Overall, smart transportation enhances both operational effectiveness and environmental sustainability.

Technical success (IoT, web, AI) must be supported by strong governance, organizational capabilities, SME inclusivity, and sustainability orientation. Generative AI adds analytical and automation capabilities but requires robust data governance and adaptive organizational capacity. Best practices combine policy frameworks (smart governance), digital capability investment, and performance indicators that include environmental and social impacts.

Based on 20 international studies (2020–2025), this SLR concludes that the application of web technologies, IoT, AI, and digital twins has transformed fleet and public transportation management. This transformation succeeds only when supported by:

• strong IT governance,

• business–technology alignment,

• organizational digital capabilities,

• public sector participation,

• SME inclusivity, and

• sustainability orientation.

Thus, smart transportation emerges from the synergy of three elements: (1) digital technology → (2) organizational capability → (3) governance and policy. Overall, web and IoT technologies contribute tangibly to environmental sustainability, energy efficiency, and operational performance. Smart transportation systems operate optimally only when supported by appropriate technology, organizational readiness, strong governance, government collaboration, and continuous innovation. Therefore, the transformation toward smart transportation is a combination of technological advancement and institutional readiness.

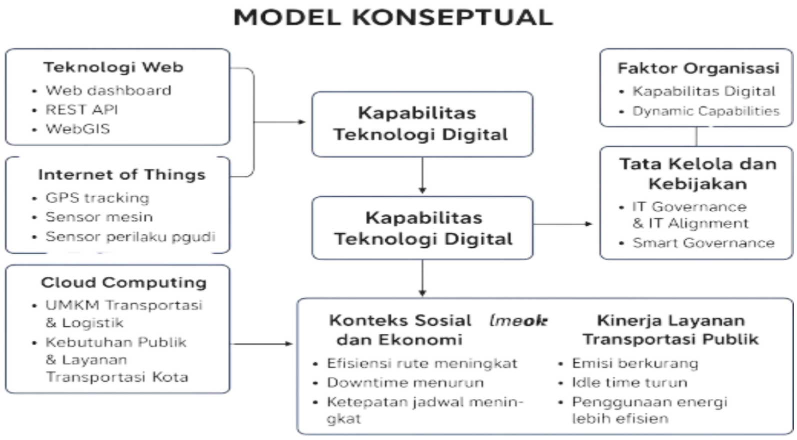

Figure 3. Conceptual Model

The conceptual model synthesized from 20 SLR articles demonstrates that successful implementation of web technologies for smart transportation and fleet management in the Internet of Things (IoT) era results from complex and interdependent interactions among digital technologies, organizational governance, artificial intelligence, adaptive organizational capabilities, public sector roles, SME participation, and sustainability and operational performance orientation. This model emphasizes that the transition to smart transportation is not merely a digitalization process, but an integrated ecosystem linking technological innovation with organizational readiness and policy support.

First, the Digital Technology component comprising IoT, web technologies, cloud computing, artificial intelligence, and digital twins serves as the foundational layer. IoT provides real-time data from vehicles, road infrastructure, and driver behavior; web technologies function as connectors via dashboards, WebGIS, and REST APIs; cloud computing enables large-scale data processing; AI delivers predictive and optimization capabilities; and digital twins enable accurate operational simulations. Findings across all reviewed articles show that these technologies operate synergistically to produce responsive, integrated, and intelligent transportation systems.

However, digital technologies cannot deliver maximum impact without Governance and IT Alignment. Governance acts as a guiding pillar ensuring alignment between business strategy, fleet operations, and digital technology. It regulates API interoperability standards, IoT data security, cross-platform coordination, and interdepartmental and cross-sector integration. IT alignment ensures that web platforms, IoT, and cloud usage align with operational goals and service requirements. Without strong governance, data becomes inconsistent, system integration fails, and technological benefits remain unrealized.

Furthermore, Digital Capability and Dynamic Capabilities significantly influence transformation success. Digital capability encompasses human resource proficiency in using web dashboards, interpreting analytics, and understanding AI-driven predictions. Dynamic capabilities reflect the organization's ability to respond in real time, such as rerouting vehicles based on IoT data or adjusting operations during disruptions. The conceptual model identifies these capabilities as critical mediators bridging technology and performance improvement. Advanced technology alone has little value without an adaptive, responsive, and digitally competent organization.

The Public Sector and Smart Governance component plays a vital role in city-level digital ecosystems. SLR findings show governments acting as regulators, data facilitators, and public transport infrastructure providers. Smart governance ensures that public and private transportation systems interconnect via open data, API integration, and cross-agency coordination. Without public sector support, IoT and web dashboards remain confined to individual organizations and fail to generate city-wide mobility impact.

The conceptual model also recognizes the importance of SMEs within transportation and logistics ecosystems. Many SMEs face barriers to adopting IoT and web systems due to cost constraints, limited digital literacy, and insufficient technical support. Nevertheless, research indicates that simple web-based solutions and low-cost IoT devices significantly improve SME operational efficiency. Therefore, SMEs are positioned as contextual variables requiring tailored approaches to ensure inclusivity and equitable ecosystem participation.

Finally, all model elements converge toward Sustainability and Operational Performance, the primary outcomes of digital technology adoption in transportation. SLR findings demonstrate that IoT, AI, and digital twins reduce fuel consumption, emissions, improve route accuracy, accelerate decision-making, reduce accidents, and minimize vehicle downtime. These performance improvements enhance economic efficiency while supporting environmental sustainability.

In conclusion, the conceptual model derived from the synthesis of 20 studies confirms that implementing web technologies in smart transportation and fleet management represents a holistic transformation journey involving technology, organizations, human resources, government, and sustainability. Success depends not only on adopting IoT, web dashboards, or cloud computing, but also on organizational adaptability, governance effectiveness, public sector involvement, SME readiness, and long-term sustainability commitment. This model provides a framework showing that smart transportation in the IoT era is a holistic system requiring cross-dimensional integration to achieve optimal, secure, efficient, and sustainable performance.

CONCLUSSION

Based on the results of a systematic review of 20 articles published between 2020 and 2025, it can be concluded that the application of web technologies in smart transportation systems and fleet management in the Internet of Things (IoT) era has made a significant contribution to improving efficiency, security, sustainability, and decision-making quality in the transportation and logistics sectors. The integration of IoT, web-based dashboards, cloud computing, artificial intelligence (AI), and digital twins constitutes the main foundation enabling fleet monitoring, analytics, and control processes to be conducted in real time, accurately, and in a coordinated manner.

IoT plays a major role in providing continuous data on vehicle location, engine condition, driver behavior, and traffic conditions. Web technologies function as the primary integration layer that presents this data through dashboards, WebGIS, RESTful APIs, and web-based applications, allowing operators to quickly assess fleet conditions. Cloud computing and edge–cloud architectures enable large-scale data processing with low latency. Meanwhile, artificial intelligence and machine learning provide predictive capabilities such as predictive maintenance, route optimization, and driving behavior analytics. Digital twins further enhance organizational capabilities by enabling virtual operational simulations to reduce risk, cost, and operational time.

From an organizational perspective, the success of implementing these technologies is strongly influenced by IT governance and the alignment between business strategy and technology (IT alignment). Effective governance ensures that technological integration is efficient, secure, standardized, and aligned with operational requirements. Digital capabilities and dynamic capabilities also serve as key drivers, enabling organizations to adapt rapidly, process real-time data, and make strategic decisions based on web- and IoT-driven information.

The SLR also emphasizes the importance of the public sector and smart governance in creating an integrated transportation ecosystem at the city level. Governments play a vital role in ensuring data regulation, system interoperability, safety standards, and the provision of smart infrastructure. In addition, the reviewed studies indicate that web and IoT technologies have a positive impact on small and medium-sized enterprises (SMEs), particularly in improving distribution efficiency, navigation accuracy, and fleet monitoring through more affordable solutions.

From a sustainability perspective, the implementation of these digital technologies has been shown to reduce fuel consumption, lower carbon emissions, minimize congestion, and improve resource utilization efficiency. Improvements in fleet operational performance such as faster decision-making, improved schedule accuracy, reduced downtime, and lower accident risk are consistent findings across the reviewed studies.

Overall, this SLR concludes that the successful implementation of smart transportation and fleet management in the IoT era depends not only on technological sophistication, but also on a harmonious combination of digital technologies, organizational governance, human resource capabilities, public sector involvement, SME inclusion, and sustainability orientation. The integration of these elements forms an adaptive, efficient, secure, and sustainable smart transportation ecosystem. Accordingly, web and IoT technologies have strong potential to become key pillars in the transformation of modern mobility at both enterprise and city scales.

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