SMART TECHNOLOGY AND THE POSSIBILITIES OF INCREASING THEIR USE IN LOGISTICS

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Abstract

This article is a representation of key smart technologies introduced in digital technologies within operational sustainability. The key values of smart technologies in logistics operations have been reviewed within the operational practices. The importance of smart logistics in the new era of digital age renovated the transition for business allowance. The values of digital technologies within operational surroundings can be measured within the valuable operations. The relevance of using digital technologies within operational practices can be renovated within this segment. The systematic research delivers further reading with major solutions and adjusted best opportunities within business management. Key opportunities and methodological adjustments have been outlined within the introductory part of this article. Only secondary articles and keyword selection tools approaches have been utilized within the solutions of operational deliverables.

Keywords: smart technologies in logistics, smart logistics, innovation in logistics.

Introduction

The development of Smart Technologies (ST) is an essential element in this competitive landscape of the digital era. The importance of using smart technologies is affiliated with innovation and transition of the logistics and transportation industry worldwide. Seamlessly, digital technologies such as "Internet of Things (IoT), Artificial Intelligence, Ultra-Wideband, Augmented Reality, Virtual Reality, Automation, and Robotics" perform efficiently in logistics and supply chain operations. Digital convenience and mobility controls in logistics supply operations are controlled using these smart technologies in businesses. As per Chung, (2021), "DHL plc" is one of the leading logistics suppliers using AI, and IoT for the supply chain convenience in recent times. Controlling the logistics and transportation AI-driven route tracking and IoT drones are seamlessly enabling logistics operations in this regard. On the other hand, Ding *et al.,* (2021) argued that IoT-driven inventory control can be crucial for the strategic development of movement within internal warehousing and local suppliers controlling operations. Management of labelling and warehousing inventory tracking operations are estimated in IoT-based data analytics increasing convenience for business.

Consistency in the logistics and supply chain market introduced AI and IoT market share consistently rising in the global market. The global logistics and supply chain market has been increased up to $3794.4 billion and it will reach 7.2% of CAGR by the end of 2032. Moreover, the AI in the logistics market has increased by $348.62 billion with growth of up to 45% of CAGR at the end of 2032. The global expansion rate of use market expansion of smart technologies supports innovation in indoor operations and connectivity in international transportation management. The allowance of digital networking connectivity further supports the growth and resilience within operational inventory management. IoT-driven analytics also take over digital analytics and operate the solutions of digital operations in business (Tran-Dang *et al.,* 2022). Market forecast and demand controls in global logistics and supply chains can be operated with the indulgence of digital smart technologies in business operations. Potential analysis of this study introduces the current usage of smart technologies in the rapid usage of global logistics supply chain analytics for business in recent times.

Research Aim: The review of Smart technologies usage and its possibilities in the logistics and transport industry. The following objectives are relevant to reach the key aims of this study:

- To analyse the current trends of smart technologies in the logistics and transportation industry.
- To identify the potential benefits of using smart technologies in the logistics industry.
- To evaluate the possibilities of smart technologies in the logistics sector.

Description and Use of Research object and methods

**Research Object:** Usage of smart technologies in the logistics sector.

This article follows a secondary data-driven methodology to allow the existing in-depth data analytics in the logistics sector. The importance of using secondary research on the current landscape and the relevance of accurate databases will be introduced in this regard. The significance of using secondary methodology is also convenient enough to identify the exact results of smart technology usage in logistics operations. Application of "Keywords identification" and "Search Engine Optimisation (SEO)" strategies are convenient enough to find the secondary databases relevant to the logistics operations. It has been ensured that all those sources are publicly available and authentic in terms of "Google Scholar, JSTOR, ProQuest, MDPI, Semantic Scholar, Science Direct". A systematic research review allows potential deliverables of data-driven analytics and supports the following standards of peer-review of each article. Indulgence of

an in-depth review of qualitative data about smart technologies includes authentic databases within this scenario of data analysis (Oladimeji *et al.,* 2023). The convenience of content analysis with a secondary qualitative database is the best approach to deal with operational sustainability. The convenience of using content analysis allows the development of an operational quality review and delivers the best approaches for outlining the exact outcomes of this study. The deliverables of content analysis delivered the best results of qualitative review within a research which is quite effective to derive the predictive analysis in this scenario.

Research results and discussion

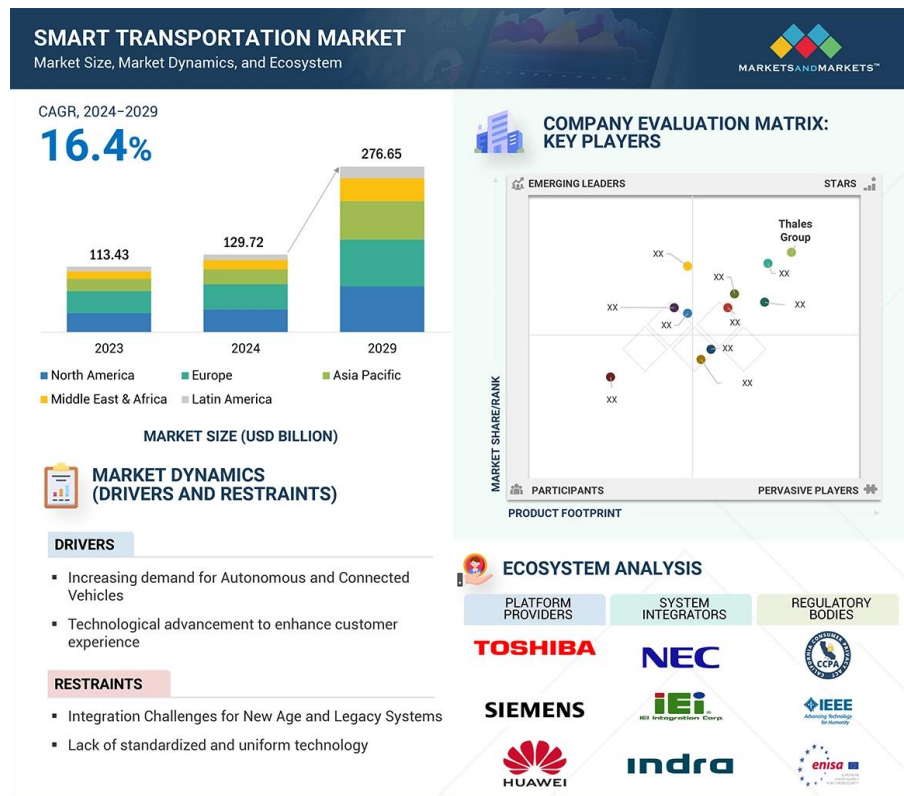### Trends of Smart Technologies in the Logistics Sector

In this amid of digital business competencies in the logistics industry, the convenience of using smart technologies in controlling tasks is the main operation for the business. Especially, the logistics and transportation industry allows digital networking technologies in recent trends to improve the mobility of service management. The latest trends in using smart technologies in terms of Artificial Intelligence are the biggest epitome of digital excellence within logistics operations. In addition, Elsanhoury *et al.,* (2022), the convenience of "ultra-wideband" in indoor mobility is another latest technology that supports convenience in business. This previous research described the resilience of digital analytics and supporting the smart technologies development within the potential outcomes. Emphasising on the impact of smart technologies such as "Ultra-wideband, IoT and AI-driven" solutions will be the main evidence to be enlisted as greater solutions of business sustainability (Ding *et al.,* 2021). The socio-economic growth of maintaining sustainability raised mobility for the logistics sector using technical acceleration to the businesses.
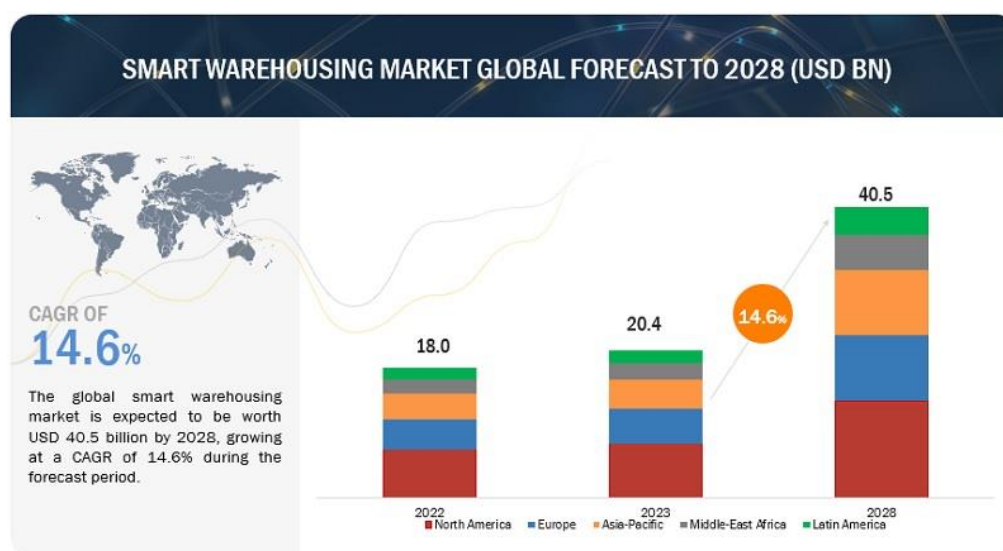
Source: Marketsandmarkets, 2024a.

Figure 1. Growth of Smart Technology in the Global Logistics Industry

Digital and smart warehousing technology (see figure 1) is the largest transition in logistics supply chain management. The average growth of market share has increased by 14.6% of CAGR in 2028 with a total increase up to $40.6 billion in market revenue. The convenience of using digital presence within warehousing operations can raise the standards of market reach and sustainability. The global smart logistics market will enrich up to 22.8% of CAGR with a total of $251.26 billion in 2034. Execution of smart technologies handles internal data tracking and warehousing operations eventually in the logistics sector. The possibility of demand forecasting and measuring customer demands in the initial stage is the best part that consists of smart technologies (Sun *et al.,* 2022). The operational balance of lean manufacturing and digital inventory management has been controlled using smart optimisation in business. Innovation in "smart ultra wideband" controls the innovative warehousing management and indoor data tracking. Especially, warehousing operations mobilized after the innovation of advanced robotics in this digital era. Reviewing the previous analysis Lagorio *et al.,* (2022), further supports the analytical range of change management and sustainable development in smart technology. Smart Lean manufacturing and social support in digitalisation attends a mobility to the digital logistics operations. The execution of social development and supply chain analytics will enlist a better transition for businesses. Mobility and acceleration using smart solutions and operational change management. The digital presence of AI-driven route tracking is the latest epitome of experiments with logistics operations.

Figure 2. Smart Transportation Market Size

The illustration (see figure 2) of recent trends within smart technologies the logistics delivery companies prefer digital technologies predominantly for their operational work. For example, the current epitome of "FedEx, and Blue Dart" are allowed to be the best technologies of AI-driven solutions within business. On the other hand, "Bezos plc" introduced "Autonomous mobile Robotics" in the delivery operations (Lagorio *et al.,* 2022). The introductory DHL corporation has been allowed to support IoT-driven data surveillance in warehousing operations. These smart warehousing solutions increase acceleration in productivity for delivery supply chain operations. The latest trend of allowing augmented reality in inventory data tracking confronts innovative solutions in digital presence which is the core function to be highlighted in this article. As per Jefroy *et al.,* (2022), the innovative smart logistics in real-time tracking and time management solutions activated parts for service quality improvements. The transition of creative time management and data-driven delivery maintenance are the main precedents to be adjusted within the smart transportation trends in the logistics sector.

Key Benefits Smart Technologies in Logistics

Analysing the potential benefits of smart technologies and their convenience time management is the predominant practice to be accelerated in the logistics industry. Controlling effective deadline management is the biggest advantage of using digital technologies to support functional movements. Focusing on the characteristics of smart technologies, real-time tracking is the latest epitome of generating time convenience for logistics supply chain operations. Controlling the time management optimization creates more value for the service providers to capture major customer satisfaction management (Büyüközkan & Ilıcak, 2022). Developing customer relationship practices and operating time management support is the latest part to be enlisted in the logistics industry. Reshaping the logistics industry with digital innovation is the greatest example of smart technologies. Changing the direction of the logistics supply chain increases the demand for smart technologies in business. Raising digital networking generates easy supplier engagement and digital negotiation opportunities. Easy access to international delivery and trade agreements with digital networks is another convenient part to be adjusted within the smart technology relationship. Converting a wide area with route tracking solutions is another inventory solution to be adjusted in the logistics industry (Kadłubek *et al.,* 2022). Most used technology such as AI control data visibility, data-driven analytics, supply forecast, time convenience, real-time tracking, and quick inventory solutions" for logistics operators. For example, "Bezos plc" renovated its warehousing operations with autonomous robotics in the indoor inventory solution.
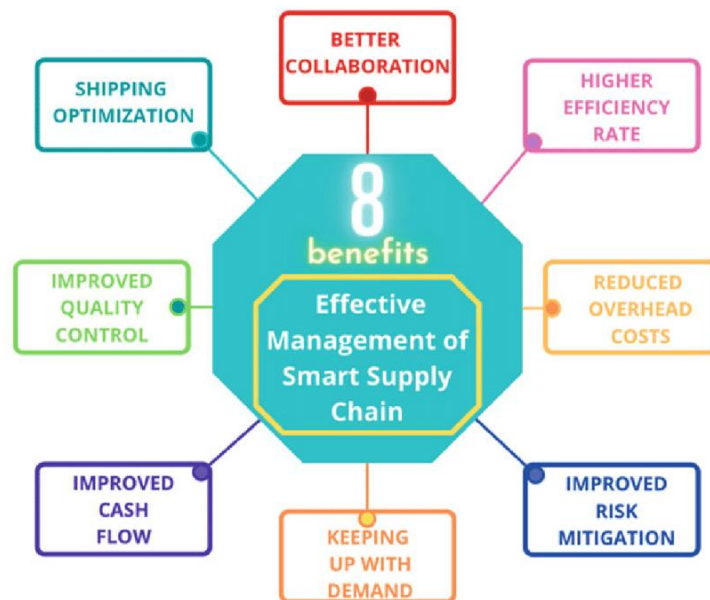
Figure 3. Benefits of Smart Logistics for Businesses

Introducing the key benefits (see figure 3) of a Smart logistics system raising financial contributions and risk minimisation are rational to be added in this regard. Especially, the main convenience of using smart logistics controlling the delivery details and shopping operations. Tracking the routes with AI-powered drones allows the risks of time management and delays within performance management. The route tracking mobilises a delivery result more conveniently to the business operations. Eventually, supply chain and resource management have also been improved using smart technology within business. Easy information-sharing opportunities and updated values within the business are allowed using smart logistics operations in this regard (Lagorio *et al.,* 2022). The previous research also admitted that Smart organisations using digital business outcomes in logistics create customised logistics services. Encompassing a digital transition in route tracking and smart surveillance are illustrated within this study. Creating values and changes within the smart solutions will be entitled within the complementary balance of research-based outcomes (Feng and Ye, 2021). The social engagement of networking and engagement of connectivity also supported by smart technology within businesses. The digital business allowance and productivity of logistics suppliers are increased using these digital technologies to support functional movements (Sergi *et al.,* 2021). On the other hand, cost-budgetary values are another convenient area to be discovered using smart logistics operations in the business (Wang & Sarkis, 2021). For example, riding overhead and shipping costs using smart technologies is the best opportunity for smart logistics management in delivery operations. In particular, DHL insulated AI-driven vehicles to take remote work within delivery maintenance. The regulatory operations of delivery practices are enabled with smart route tracking and avoidance of traffic control using AI-powered sensors.

The best part of developing smart technologies in logistics is tracking the forecast of demand and risks simultaneously. Analysing the predictive review for demand forecast and assuming risks can be beneficial for the logistics delivery management after introducing the operational deliverables. The risk minimisation option also includes the reshaping option for the data-driven analytics within this delivery method. The allowance of predictive analysis registered the best practice of deriving potential outcomes of change management within the business. Controlling risk minimisation activities with AI-driven solutions ensured a better decision-making opportunity in logistics management as well.

Possibilities of Smart Technologies that increasing Demands in the Logistics sector

The possibilities of using smart technologies are headed towards a new direction and visible transition to the logistics industry. Reshaping the digital trends within the logistics business contributes to the digital technologies within business solutions. The reshaping of the new digital era has led to a massive collaboration between the logistics and IT industries in recent times (Golpîra *et al.,* 2021). Especially, the demand for AI in logistics operations consistently increases gradually which demands within the solutions. The digital relationship with route tracking operations within operational deliverables can be entitled within the smart technologies. The operational deliverables of tracking the predictive analysis is another directional relevance to be entitled within the logistics operations. The optimisation of smart technologies provides customer support to businesses which is the biggest transition in the digital era (Rejeb *et al.,* 2021). The creativity and innovation in direction strategies reduce the physical stress in warehousing operations in logistics operations. Innovation in robotics and digital presence increases access to international logistics and transport operations. Key values of early mobilization predictions and risk-sharing opportunities are the main evidence that allows more balance within the productivity of this business in recent times.

In addition, the substitution of human intelligence in the logistics industry is the biggest opportunity that supports the operational deliverables. The consistency and accuracy in the workflow are the best parts to be adjusted within the

solutions of operational deliverables. The relevance of using digital technologies allows a better transition to be adjusted within the creativity within the business. Reduction of human intelligence delivered the minimisation of budgetary cost control in recent times. Cost minimisation and reducing risks with intelligent solutions are the future directions for increasing the demands of smart technologies in the logistics industry. Innovative devices for controlling the route and time management solutions are relevant to support the operational metrics in business intelligence (Roshid *et al.,* 2024). The resilience of using digital support to technological adjustments is linear and beneficial to deliver the best scenario of operational sustainability. Constructing a sustainable future by reducing CO_2 and other greenhouse gases using AI-operated vehicles is the resounding best outcome of this research. Calculative risk minimisation using smart technologies can be a resilient movement of designing best opportunities to unlock better business operations in logistics operations (Tang *et al.,* 2021). Digital support to the logistics industry renovated the structure of business heading towards better opportunities and includes major solutions to the business as well.

Conclusions

Concluding remarks regarding this article it delivered the best results regarding smart technologies implemented within the logistics sector and its possibilities towards future directions. The balance of real-time tracking and inventory solutions are activated using the solutions of inventory management within the business. On the other hand support from this real-time tracking and inventory lean manufacturing controlled using the smart technologies such as AI, IoT, Machine Learning, Autonomous robotics, and Augmented Reality" in the business. The controls in digital security and time management real-time tracking experiences have been easily operated using smart technologies in this regard. It has been concluded that changes within operational deliverables using smart technologies respring the transitional activities within business. The conclusive evidence further supported the trends of digital technologies within logistics practices. The smart logistics in operational management allows a better transition to the financial deliverables and adjusted more resilience to the business functions. The future security will be changed heading towards a new direction within the transitional movement in the logistics industry.

References

1. Büyüközkan, G., & Ilıcak, Ö. (2022). Smart urban logistics: Literature review and future directions. *Socio-Economic Planning Sciences*, *81*, 101197.

2. Chung, S. H. (2021). Applications of smart technologies in logistics and transport: A review. *Transportation Research Part E: Logistics and Transportation Review*, *153*, 102455.

3. Ding, Y., Jin, M., Li, S., & Feng, D. (2021). Smart logistics based on the internet of things technology: an overview. *International Journal of Logistics Research and Applications*, *24*(4), 323-345.

4. Elsanhoury, M., Mäkelä, P., Koljonen, J., Välisuo, P., Shamsuzzoha, A., Mantere, T., ... & Kuusniemi, H. (2022). Precision positioning for smart logistics using ultra-wideband technology-based indoor navigation: A review. *Ieee Access*, *10*, 44413-44445.

5. Feng, B., & Ye, Q. (2021). Operations management of smart logistics: A literature review and future research. *Frontiers of Engineering Management*, *8*, 344-355.

6. Golpîra, H., Khan, S. A. R., & Safaeipour, S. (2021). A review of logistics internet-of-things: Current trends and scope for future research. *Journal of Industrial Information Integration*, *22*, 100194.

7. Jefroy, N., Azarian, M., & Yu, H. (2022). Moving from Industry 4.0 to Industry 5.0: what are the implications for smart logistics?. *Logistics*, *6*(2), 26.

8. Kadłubek, M., Thalassinos, E., Domagała, J., Grabowska, S., & Saniuk, S. (2022). Intelligent transportation system applications and logistics resources for logistics customer service in road freight transport enterprises. *Energies*, *15*(13), 4668.

9. Lagorio, A., Zenezini, G., Mangano, G., & Pinto, R. (2022). A systematic literature review of innovative technologies adopted in logistics management. *International Journal of Logistics Research and Applications*, *25*(7), 1043-1066.

10. Marketsandmarkets. (2024a). *Smart Warehousing Market by Offering (Hardware, Software, Services), Technology (AI & Analytics, Robotics & Automation), Application (Inventory Management, Predictive Analytics), Warehouse Size, Vertical and Region - Global Forecast to 2028*, Retrieved on: 11th March 2025, Retrieved from: https://www.marketsandmarkets.com/Market-Reports/smart-warehousing-market-199732421.html

11. Marketsandmarkets. (2024b). *Smart Transportation Market Growth*, Retrieved on: 11th March 2025, Retrieved from: https://www.marketsandmarkets.com/Market-Reports/smart-transportation-market-692.html

12. Oladimeji, D., Gupta, K., Kose, N. A., Gundogan, K., Ge, L., & Liang, F. (2023). Smart transportation: an overview of technologies and applications. *Sensors*, *23*(8), 3880.

13. Rejeb, A., Keogh, J. G., Leong, G. K., & Treiblmaier, H. (2021). Potentials and challenges of augmented reality smart glasses in logistics and supply chain management: a systematic literature review. *International Journal of Production Research*, *59*(12), 3747-3776.

14. Roshid, M. M., Waaje, A., Meem, T. N., & Sarkar, A. (2024). Logistics 4.0: A Comprehensive Literature Review of Technological Integration, Challenges, and Future Prospects of Implementation of Industry 4.0 Technologies. *International Journal of Technology, Knowledge and Society*, *20*(1), 65.

15. Sergi, I., Montanaro, T., Benvenuto, F.L. and Patrono, L., 2021. A smart and secure logistics system based on IoT and cloud technologies. *Sensors, 21(6),* p.2231.

16. Sun, X., Yu, H., Solvang, W. D., Wang, Y., & Wang, K. (2022). The application of Industry 4.0 technologies in sustainable logistics: a systematic literature review (2012–2020) to explore future research opportunities. *Environmental Science and Pollution Research*, 1-32.

17. Tang, Y. M., Chau, K. Y., Xu, D., & Liu, X. (2021). Consumer perceptions to support IoT based smart parcel locker logistics in China. *Journal of Retailing and Consumer Services*, *62*, 102659.

18. Tran-Dang, H., Krommenacker, N., Charpentier, P., & Kim, D. S. (2022). The Internet of Things for logistics: Perspectives, application review, and challenges. *IETE Technical Review*, *39*(1), 93-121.

19. Wang, Y., & Sarkis, J. (2021). Emerging digitalisation technologies in freight transport and logistics: Current trends and future directions. *Transportation Research Part E: Logistics and Transportation Review*, *148*, 102291.