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**DIGITÁLIS ÁTALAKÍTÁS A LOGISZTIKAI VÁLLALKOZÁSOKBAN
VIETNAMBAN
DIGITAL TRANSFORMATION IN LOGISTICS BUSINESSES IN
VIETNAM**

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1. INTRODUCTION

The logistics industry is the foundation of the economy, smoothening the supply chain from production phase to end users. In the context of post-Covid 19 and Industry 4.0, it is an even more significant opportunity to bolster the productivity of logistics industry via digital transformation. The intergration of digital technologies in logistics has tranformed the way enterprises operate and deliver their services. The digitization of Logistics represents a shift that is revolutionizing supply chain operations, enhancing efficiency, and improving customer experiences. From the adoption of IoT (Internet of Things) to advanced robotics, and even the integration of drones, technology is now integrated in every aspect of the Logistics landscape. These development not only streamline processes but also offer opportunities for growth, cost reduction, and sustainability. As such, understanding the dynamics of digital transformation in Logistics is of critical importance not only for industry insiders but also for policymakers, researchers interested in the modernization of Logistics ecosystem in Vietnam.

This paper seeks to layer a foundation on concepts, roles, content and influencing factors of digital transformation within logistics enterprises in Vietnam. The adoption of different technology platforms, such as IOT (Internet of Things), AI, advanced robotics and more are especially highlighted by comparing the intergration of the technology in Vietnam to the world.

Our study aims to address the following fundamental questions:

- (1) What are the significant concepts, roles and influencing aspects associated with digital transformation process in the Vietnamese Logistics enterprises?
- (2) What is the current status quo of digital transformation in Logistics enterprises in Vietnam, including achievements and limitations?
- (3) How is the current status of digital transformation in Logistics enterprises in Vietnam comparing to the world?

This research offers a holistic approach by providing a comprehensive analysis of digital transformation in Logistics enterprises in Vietnam. It uncovers the current state of digital transformation, assesses achievements and challenges, and places the Vietnamese Logistics sector within the global technological context.

In the subsequent sections, the research will elaborate on the research methodology used in this study (Section II) and review the relevant literature on Logistics and digital transformation, including an examination of the technology platforms driving change (Section II). The paper will then present the research findings in Section IV, where the status of digital transformation in Vietnamese Logistics enterprises is analyzed, compare technology platform adoption, highlight how aligning it is between Vietnam and the world and discuss implications

for further advancements in the sector. Finally, the research will conclude the paper in Section V, highlighting the limitations of the study (Section IV).

2. RESEARCH METHODOLOGY

The article focuses on digitalization in Vietnamese Logistics businesses using qualitative research methods to conduct an integrative review of different literature materials. The data used in the article written is compiled from secondary sources, includes government decisions, government plans, Government Report and other sources. This is the scientific basis for the authors to form Theoretical framework: concept, role, content, process, technological platform and influencing factors for digital transformation in Logistics enterprises. Through the use of research synthesis, the authors provide make comments and assessments of the status quo of digital transformation in Logistics businesses in Vietnam, thereby proposing feasible solutions to enhance digital transformation in businesses.

3. LITERATURE REVIEW

3.1. The definition of Logistics

Logistics is a specialized term, originating from the Greek word. Logistics has a concept that originates from the military need to supply the army during the movement of troops from the base to the front line.

Logistics as a business-related concept originated in the 1950s. Logistics is a component of the supply chain, including all tasks related to commodities including: packaging, shipping, storage, preservation, until the goods are delivered to the consumer final absorption. In particular, logistics is one of the "logistics service" industries, most simply defined as the process of organizing, arranging, packaging, marking and preserving goods, and transporting them. When goods arrive at the port, they must go through the export or import customs clearance process.

In 1998, Christopher defined logistics as follows: "Logistics is the strategic management of the procurement, transportation and storage of raw materials, components and finished goods inventory and the flow of related information through an organizational process. Organize and implement marketing channels". Logistics does not stop at handling or transportation, but also includes a combination of activities such as customer service, communication, localization, logistics (Stock and Lambert, 2001) and related planning.

In 2001, the US Council of Supply Chain Management Professionals (CSCMP) introduced a precise and comprehensive concept. Accordingly, Logistics can be characterized

as a component of the supply chain cycle that involves the planning, execution, and efficient management of the movement and storage of goods and services, as well as two-way communication between the point of origin and the point of consumption to satisfy consumer demands.

In 2003, in the work Supply Chain Strategy, President of Georgia Logistics Research Institute, USA, Mr. Edward Frazelle commented: "Logistics is the process of transferring materials, information and money from suppliers to suppliers to final consumer". Thus, logistics encompasses all operations (services) associated with transportation and logistics, such as supply chain management, production tracking, transportation, warehousing, distribution processes, and customs. Alternatively said, logistics can be thought of as a group of multi-stage tasks inside a larger process.

In 2004, the United Nations Trade and Development Forum (UNCTAD) said: "Logistics is get what you need at the right place and time." Although it is relatively commonly used, according to the author, this is not a typical definition, because it does not present the connotation and content of activities and operations of the concept of logistics.

In 2015, in his PhD thesis on State management of Logistics services at Hai Phong Port, author Nguyen Quoc Tuan said: "Logistics is a chain of continuous activities, related to each other, affecting each other". Therefore, logistics is a process related to a variety of different activities within the same business, from strategy building to detailed, particular activities to implement the strategy.

3.2. The definition of digital transformation

Research scholars around the world have considered digital transformation a strategy, a process or as a business model. They normally emphasize "the adoption of innovative digital technologies to allow improvements in key business activities". In the background of digital transformation, not all technologies have to be digital. For example, freight trucks, forklifts or conveyors can become an element of digital transformation when equipped with technological components so that they can be tracked, located as well as located speed. Morakanyane et al (2017) further developed the function of "leveraging digital capabilities" by humans in digital transformation. Value creation is considered as an important output of digital transformation. This value includes: improved customer experience, operational efficiency, differentiation strategy, competitive advantage, business model development, cost savings fee,... .

"Digital transformation phenomena are context-specific and can follow a unique path". Therefore, when it comes to "digitalization phase", it is important to: (1) Recognize the

beginning stages of digital transformation, i.e. assess the company's digital maturity using a technical framework, (2) Understanding where someone is going, i.e. the value that digital disruption offers to stakeholders, including employees and customers, (3) Identify obstacles and (4) Implement success contributors through successful practices in digital transformation.

3.3. The application of digital transformation in Logistics

This research paper will examine ten technology platforms contributing to the digital transformation of supply chain management. These accelerators cover a wide range of technical developments, including but not restricted to big data analytics, artificial intelligence (AI), the Internet of Things (IoT), and AR, or augmented reality and wearable electronics, advanced robotics, drones and 3D printing,. A succinct overview of the technological platforms catalysts is presented in the subsequent sections:

3.3.1 Big Data Analytics:

In this contemporary era, the ubiquitous usage of the Internet, proliferation of social media platforms, and the proliferation of smart interconnected devices have generated an unprecedented influx of data. This extensive and intricate dataset is commonly referred to as "big data". Professionals in the supply chain domain are actively seeking effective techniques to capture, organize, and analyze this expanding reservoir of data in order to derive valuable insights for business operations. Big data analytics emerges as a particularly promising means to address this challenge (Kache and Seuring, 2017).

The perception of big data analytics pertains to the application of sophisticated analytical techniques, such as predictive modeling, statistical analysis, among others, to a vast and diverse array of datasets. The overarching objective is to enhance operational efficiency, refine customer demand forecasting, and identify novel opportunities. Within the background of supply chain management (SCM), Hahn and Packowski (2015) have delineated four primary use cases for analysis of big data, namely: (1) Monitoring and exploration, (2) Detection and reaction, (3) Forecasting and action, and (4) Planning and optimization. Building upon this, Brinch (2018) has presented a comprehensive framework for big data utilization in SCM.

The research conducted an exhaustive assessment of the domains within SCM, holding big data analytics applicability and quantified the extent to which analytics are integrated into these SCM sectors. The following represent key areas where big data analytics exerts its influence within SCM:

(1) Production Planning and Demand Forecast: A prominent application of big data analytics in SCM involves revolutionizing traditional demand forecasting by incorporating extensive customer data alongside internal sales data. This intelligent forecasts approach, as advocated by Hofmann and Rutschmann (2018), enhances forecast accuracy and empowers supply chain managers to grasp insights into demand, consumer preferences, and optimal pricing strategies. This, in turn, enables them to identify market trends and challenges.

(2) Procurement and Supply Risk Management: Wang et al. (2016) emphasized the utility of predictive analytics in procurement processes, enabling the control of supply risks and evaluation of supplier performance. Furthermore, big data analytics is instrumental in optimizing the design of supply chain networks.

(3) Product Design and Development: In recent years, data analytics has gained considerable traction in product design and development. Abundant customer information, derived from past purchases and online behavior, serves as a valuable resource for designers seeking to interpret shifts in customer preferences and requirements (Jin et al., 2016).

3.3.2. Internet of Things:

Commonly known as IoT, it represents a global network comprising objects and devices equipped with the capacity to engage in mutual communication. These pieces of equipment are interconnected, supervised, and regulated through wireless wired, or hybrid systems (Lee and Lee, 2015). IoT harnesses an array of technologies and devices, including sensors, RFID (Radio Frequency Identification) chips, and analytical engines, among others, to forge a closer and more profound integration between the physical and information realms.

From the vantage point of supply chain management, IoT holds the capacity to significantly improve transparency and visibility throughout the supply chain. It stands to augment operational effectiveness, diminish supply chain hazards, and reduce costs by delivering clear and real-time insights into the stream of information, materials, and products. IoT enables organizations to preemptively identify issues before they materialize and proactively seek solutions. IoT has the potential to elevate decision-making capabilities within the supply chain. IoT enables the exchange of information between computerized connected equipment over the Internet, fostering machine-to-machine interactions and autonomous decision-making with minimal or zero human intervention.

The adoption of IoT in supply chain management, as elucidated by scholars encompass the following aspects:

(1) Monitoring and Control: IoT devices find utility in monitoring and controlling systems by collecting data on machine performance and system efficiency. This empowers management team and automated controllers to maintain real-time oversight from any location at any given time.

(2) Information Sharing and Collaboration: IoT facilitates the sharing of information and collaboration among individuals, between individuals and objects, and among objects, thereby enhancing situation awareness and mitigating information delays.

(3) Data Analytics: IoT devices generate copious amounts of data, which can be channeled into analytical and intelligence tools to inform decision-making. This data proves invaluable in discerning market trends and shifts in consumer preferences, enabling businesses to offer more customized products and enhance customer satisfaction.

(4) Goods Localization in Warehouses: IoT technology aids in locating goods within expansive warehouses. Goods are tagged with IoT devices while in distribution centers, simplifying their retrieval and ensuring accurate identification and management.

(5) Goods Tracking: IoT devices could be affixed to containers or the raw materials and products themselves, transmitting location data that can be captured by GPS systems. This data can then be employed to track the transportation of goods.

3.3.3. Cloud computing

Commonly referred to as "cloud," can be described as a paradigm for executing software programs and storing data through the Internet, rather than relying on personal or local servers. It affords virtual access to software, hardware, platforms, and storage resources, which can be scaled and accessed on a subscription basis. Cloud computing involves the utilization of remote servers and data centers to store, share, and access software applications, information technology services, and data over the Internet, effectively on-demand. Detailed information about various cloud service models and deployment types can be found in existing literature (Che et al., 2011; Kavis, 2014).

The modern supply chain has evolved into complex multi-tier networks characterized by the electronic exchange of large volumes of data among partners. Cloud computing streamlines this intricate web of systems by consolidating documents and data in one central location.

3.3.4. Artificial Intelligence (AI)

AI, a widely - used term encompassing various technologies, spans from machinery and computers to systems capable of emulating human cognition with remarkable flexibility and adaptability (Kaplan, 2016). AI, in its diverse forms, possesses the capacity to acquire knowledge, identify patterns, comprehend behaviors, engage in reasoning, derive meaningful conclusions, assimilate novel ideas, and learn autonomously from the experience (Agrawal et al., 2017). The primary objective of AI advancement is to design interfaces that are both intuitive and adaptable, accommodating dynamic. AI can be classified into two distinct categories: (1) Assisting humans in their tasks, without control over the output, and (2) Operating autonomously, free from human control. The utilization of AI has the ability to revolutionize Supply Chain Management (SCM).

3.3.5. Blockchain

Blockchain technology is characterized as a distributed ledger system, representing a virtual electronic ledger that operates in a decentralized, open-source, and distributed fashion for the secure storage of transactional data (Pilkington, 2016). Historically, transactions between two parties necessitated reliance on a central arbitrator. However, the advent of blockchain technology has transformed this landscape, enabling multiple parties to engage in transactions without the need for a central server. The nonappearance of a central server enhances network security by eliminating the vulnerability of centralized systems to hacking. This innovative technology is poised to revolutionize various industries, particularly those involved in digital information exchange, with the potential to significantly enhance transparency and traceability in supply chain management (van Hoek, 2019).

Blockchain technology offers several valuable applications within the realm of SCM:

(1) Enhanced Inventory Management:

Blockchain technology bolsters inventory accuracy by ensuring the prevention of duplicate storage of items in different locations. It also mitigates the risk of items getting lost within the distribution chain. Once an item is logged into the inventory management system, its visibility at ends of the distribution system is guaranteed.

(2) Augmented Transparency:

Blockchain technology introduces unprecedented transparency into the supply chain. Every movement of a product is meticulously recorded on a public ledger, offering a level of transparency previously unattainable. Moreover, the distributed ledger facilitates real-time tracking, reducing the potential for human error and further contributing to organizational transparency.

(3) Trustless Chains:

Blockchain technology creates a trustless environment by enabling individuals to access comprehensive product details independently, obviating the need to rely on third parties. Smart contract technology adds an additional layer of trust by automating payments, placing funds in escrow until the agreed-upon shipment has been authenticated as delivered.

3.3.6. Augmented reality (AR) and wearable devices

Augmented Reality (AR) represents an communicative interface with the physical world, where real objects are enhanced by the incorporation of computer-generated and continuous data. It is defined by Barfield (2015) that ARAugmented Reality as the expansion of the physical environment through the integration of layers of computer-generated information within real-world contexts. AR, simply put, involves overlaying computer-generated sensory inputs. AR applications seamlessly merge the virtual and real realms, facilitating interactions between them.

In the logistics and supply chain sectors, AR is progressively revolutionizing traditional paper-based, slow processes, ushering in a technology-driven era. Within supply chain management, AR has the potential to expedite production, reduce machinery downtime, and cut in-house expenditures., ultimately improving productivity.

The functions of AR in Supply Chain Management (SCM), include the following:

(1) Accelerating Order Picking: Traditional warehouses often rely on manual processes involving paper lists or handheld scanners for item selection, which can be slow and error-prone. Furthermore, workers require costly training to execute this task effectively.

(2) Last-Mile Delivery Enhancement: The last-mile delivery phase is often the most costly part of the logistics process. DHL (2014) reports that delivery personnel spend at least 40% of their time searching for the right parcels based on their memory

of stacking sequences. Using AR, each driver can access vital data and information regarding specific parcels simply by viewing the parcels with their wearable display. This information includes details about the items, their weight, shipping addresses, and real-time space requirements within the delivery vehicle, streamlining the delivery process.

(3) Assembly and Repair Applications: AR devices find utility in assembly and repair tasks. AR glasses offer advanced image perception capabilities that enable operators to inspect heavy machinery and identify technical or structural flaws. Moreover, they offer live video tutorials for error diagnosis and resolution.

3.3.7. Social media

Social media is defined as “the utilization of portable technologies and web-based applications that facilitate the creation and exchange of user-generated content” (Kaplan and Haenlein, 2016). In the past, many organizations established policies that dissuades their employees from engaging with social media during working hours. However, this perspective has undergone a profound transformation in recent years. Presently, businesses are increasingly embracing social media as a means to extend their online presence. The realm of social media has garnered significant attention from both corporations and researchers, particularly in the context of exploring its applications in marketing, product and service promotion, and brand expansion. The widespread adoption of social media, with more than two billion regular users (Markova and Mircevska, 2013), represents an unprecedented opportunity.

Social media platforms have played a pivotal role in enhancing communication between customers and companies, bridging the gap and fostering closer relationships. Importantly, they have the potential to enhance a variety of aspects of supply chain management, offering advantages such as improved communication, heightened visibility, enhanced control, and reduced operational and labor costs. Organizations can harness the data generated and stored through social media platforms for purposes such as price prediction, information dissemination, public relations, and crisis management. The ensuing section outlines the diverse applications of social media platforms in supply chain management:

(1) Social media serves as a direct channel for customers to communicate with companies, allowing them to share views and feedback regarding products and services. This facilitates companies in gathering valuable insights and addressing customer concerns, ultimately enhancing customer service.

(2) Social media platforms offer a valuable source of innovation priorities. Supply chain managers can leverage social media to indicate innovative features desired by customers, with a wide range of organizations using it to collect customer recommendations for ongoing improvements.

(3) Social media platforms have the potential to significantly boost a company's online visibility and global business promotion. They also aid in identifying potential suppliers and business partners.

3.3.8. 3D Printing

3D Printing is referred to as additive or layered manufacturing, is a process employed to fabricate solid objects in three dimensions. It transforms a 3D digital software model into the final product by incrementally constructing it layer by layer, devoid of the need for cutting tools or moulds. This method exhibits minimal infrastructure requirements and offers heightened mobility, enhanced programmability, and increased adaptability. 3D printing leverages lightweight alloys and minimizes material usage, enabling expedited cycle times through rapid prototyping and the cost-effective production of intricate products in limited quantities. Additive manufacturing is reshaping the traditional supply chain model. In the future, supply chains will no longer adhere to the conventional SCOR model; instead, they will be initiated by customer orders. In this evolved supply chain paradigm, customers initiate orders, prompting the operation of highly automated local 3D printing facilities to produce and deliver finished products, often utilizing drone technology. Consequently, 3D printing simplifies supply chain operations, rendering them highly responsive and adaptable.

The applications of 3D printing in Supply Chain Management (SCM) have been documented by various authors (Chan et al., 2018; Oettmeier and Hofmann, 2016; Ryan et al., 2017)

(1) The demand for warehousing finished products becomes obsolete. With the assistance of 3D printing, businesses are able to transfer to on-demand production,

leading to cost - savings by significantly reducing inventory requirements.

(2) Traditional operational business models optimize costs by manufacturing in bulk at low costs. In contrast, additive manufacturing allows profitability even when producing small quantities, enabling companies to sell customized products to customers at reasonable prices.

(3) The advent of 3D printing enhances manufacturing agility, making it better equipped to respond to shifts in customer demand. Digital product files in the 3D printing process enable the cost-effective production of new iterations with little or no additional expenses.

3.3.9. Advanced robotics

Historically, robots were primarily employed for executing monotonous and repetitive tasks, which necessitated intricate programming for configuration and execution, and exhibited limitations in terms of adaptability during operations. However, the advent of autonomous robots has effectively addressed these challenges. Autonomous robots are pre-programmed devices capable of autonomously performing diverse tasks with minimal to no human involvement. They require reduced setup time and supervision and come in various sizes, possess varying degrees of intelligence, exhibit diverse functionalities, dexterity, mobility, and cost profiles. These robots possess the capacity to make independent decisions by learning from their environment (Bechtsis et al., 2017).

While earlier robotic applications were primarily centered around the movement of goods within warehouses, the contemporary use of robots has transcended the boundaries of basic warehouse and fulfillment center operations. Recent advancements have endowed robots with human-like capabilities. Notably, the incorporation of haptic sensors has enabled robots to experience a sense of touch, enabling them to manipulate a wide array of objects, from delicate components to multi-surfaced metal assemblies.

The applications of robotics in Supply Chain Management (SCM), are as follows (Sarc et al., 2019; Bogue, 2016):

(1) Over time, the flexibility and creativity of robots have undergone significant enhancement through the integration of machine learning and artificial intelligence into the systems. Additionally, innovations such as the ability to connect robots via the Internet of Things (IoT) has been incorporated into robotic devices. These advancements enable robots to work alongside human workers rather than in isolation, thereby fostering increased productivity, and efficiency in the production systems.

(2) Autonomous robots significantly boost the productivity of warehouses. Initially introduced by "Amazon" through the "Kiva" system, these robots were initially used to enhance the picking and packing processes, consequently reducing lead times. Subsequently, Amazon expanded the utilization of these autonomous robots across various fulfillment centers, resulting in a substantial increase in warehouse productivity.

(3) Inventory robots are deployed for monitoring shelf stocks and retrieving products for customers. These robots allow customers to select products using a touch screen interface and then autonomously navigate the shelves to retrieve the chosen items. Simultaneously, these robots also collect data on shopping patterns, which can be leveraged to optimize inventory replenishment.

3.3.10. Drones

Drones, formally designated as unmanned aerial vehicles, are aircraft that are operated remotely or can autonomously navigate using onboard sensors, GPS, and software-controlled flights embedded in their systems. Drones possess the capability to swiftly transport small items, thereby replacing traditional methods such as forklifts and conveyor systems commonly employed in the movement of goods within distribution centers. Unlike other methods, drones do not rely on lasers for navigation within warehouses. These unmanned aerial vehicles have far-reaching socio-economic applications, including defense and notably, supply chain operations, where they find utility in warehouse management.

The applications of drones within the context of supply chain operations are delineated by several researchers (Xu et al., 2018; Rabta et al., 2018):

(1) Drones play a pivotal role in the digital transformation of warehouses. They excel in reaching confined storage spaces, operating at elevated heights, locating hard-to-find items, and transmitting real-time data to the cloud, facilitating seamless integration with warehouse management systems.

(2) Drones are able to perform a range of inventory management tasks, including inventory auditing and stocktaking. Traditionally, these tasks involve manual labor, with employees reaching designated locations using forklifts and manually scanning item barcodes. This process is not only time-consuming and labor-intensive but also costly (due to high labor expenses), hazardous (working at heights), and prone to errors. Additionally, they can inspect the condition of items, reducing labor costs, improving inventory accuracy, and minimizing risks for the workforce.

3.4. Digital transformation in Logistics in Vietnam

3.4.1. Concepts and roles of digital transformation in Logistics enterprises

There is a wide range of different concepts about logistics, each different organization and country presents the concept from different perspectives. In Vietnam, according to the provisions of the 2005 Commercial Law on the topic: “Logistics services are commercial -

related activities” in which traders perform one or more stages including receiving goods, packaging, storing, carrying out customs procedures and other steps. Logistics is defined as a chain of activities in the circulation of goods from the place of production to the destination of consumption, meeting customer requirements and generating profits.

A prerequisite for logistics organizations to increase efficiency is digital transformation, which is especially significant given the growth of the digital economy and the robust expansion of e-commerce. Operational effectiveness is demonstrated by the following elements:

Firstly, digital transformation contributes to improving management efficiency in logistics businesses. Currently, under the impact of the scientific and technological revolution, the trend of converting from traditional production and business to digital platforms is becoming increasingly popular and is considered an effective solution to help businesses. market penetration and expansion. That creates many opportunities for logistics businesses in the process of managing and improving the quality of human resources through online training activities with domestic and international training facilities, linking between businesses and logistics forums.

Secondly, digital transformation contributes to optimizing the operations of logistics businesses. Digital transformation is a condition for departments in a logistics enterprise as well as businesses in the system to be interconnected, automate processes and improve the ability to access, interact with customers, and distribute information. Analyze and evaluate customer needs more accurately as well as increase customer experience. At the same time, digital transformation helps logistics businesses properly use human resources and optimize employee productivity to create new, higher value.

Thirdly, digital transformation helps logistics businesses reduce costs and improve competitiveness. Digital transformation in logistics activities with the use of cloud computing platform technologies, artificial intelligence, Internet of Things (IoT), Blockchain, automation and robotics helps optimize management decisions, process, minimizing intermediaries and human resources, improving efficiency, thereby contributing to minimizing all types of costs, lowering prices.

3.4.2. Content of digital transformation in Logistics businesses

According to the business field and specific conditions, the digital transformation process takes place quickly or slowly, converting part or all of the operations of logistics enterprises. However, digital transformation in logistics enterprises is basically a transformation on the following contents:

Firstly, change the logistics businesses' awareness of digital transformation. Digital transformation is both a change in physical, technical infrastructure and a transformation in the awareness of leaders and workers in the enterprise. As a result, leaders are required to be deeply and comprehensively aware of the benefits and tendency of digital transformation and the effects of digital transformation on business operations, and the issue of incorporating digital transformation into the appropriate overall strategy appropriate to the reality and capabilities of the business, building determination for digital transformation in the board of directors and the entire enterprise. If workers do not proactively improve their qualifications, professional expertise, creativity, and adapt quickly to rapid changes in technology, they will not be able to adapt to job requirements.

Secondly, build and upgrade systems for digital transformation at logistics enterprises. The infrastructure system in logistics is an indispensable element in the digital transformation of businesses, means of transport, management facilities, human resources, corporate culture... Digital layer is the totality of broadband telecommunications infrastructure elements and digital platforms such as the Internet of Things, AI, big data, network security and electronic payments. During the digital transformation process, logistics businesses must focus on building and upgrading these infrastructures, in which infrastructure serves as the foundation for both executing digital transformation and supporting company operations. In logistics companies, digital infrastructure serves as the foundation for digital transformation. Application of digital technology in logistics businesses includes: Application of digital platforms in business operations and application of digital platforms in business operations.

Fourthly, build digital human resources in logistics businesses. Entering digital transformation, manual labour will be substituted by digital technology, so a strong digital workforce will be the main factor determining the effectiveness of digital transformation as well as the development ability. development of logistics businesses in both the immediate and long term. Building digital human resources in logistics businesses needs to ensure basic standards: Ability to become proficient at digital technology equipment, ability to adapt quickly to the working environment and scientific and technological progress. new, have a disciplined style, work ethics and the ability to think innovatively and creatively.

3.4.3. Digital transformation process in Logistics enterprises

The majority of logistics businesses carry out digital transformation according to the following process:

Step 1: Comprehensively assess the situation and clearly define the digital transformation goals of the business. Comprehensive and accurate assessment of all aspects of the business from infrastructure, operating processes, human resource quality, business efficiency to the level, needs, capabilities and effectiveness of digital transformation is the basis for businesses to set digital transformation goals for each stage, for each department, and each stage to ensure compliance with the capacity of the business.

Step 2: Plan and build a strategy to implement digital transformation. Logistics enterprises make digital transformation plans for each stage and each specific department, including: Content, implementation time, implementation department, investment capital, number of human resources and expected results. At the same time, logistics businesses, based on their own characteristics, firmly grasp the Party's socio-economic development guidelines, laws, state policies and instructions from relevant ministries and branches. related to building a digital transformation strategy consistent with the overall strategy of the business and the overall development of the industry and economy. It is necessary to determine the scale, digital transformation department, technology used, test new technology, evaluate progress, effectiveness and replicate the digital transformation model throughout the enterprise.

Step 3: Digitalize data and processes in the business. This is the central step of the digital transformation process in logistics businesses. Here, information and documents are converted into digital data and stored on the enterprise's server system, which is the basis for businesses to apply technology solutions to automate and optimize business operations, services, processes, business and production, reporting processes, and cooperation within the enterprise.

Step 4: Prepare human resources for digital transformation in businesses. High-quality human resources, strong expertise and good adaptability are the decisive factors for the success of digital transformation in logistics businesses. Therefore, logistics businesses need to prepare human resources well through recruitment, training, and fostering personnel, especially focusing on technology-related skills.

Step 5: Apply digital technology to the logistics process. Enterprises base on each stage of the plan and the level of digital transformation of the business to select and apply appropriate digital technologies and gradually access new, modern technologies.

3.4.4. Technology platforms in digital transformation in Logistics businesses

Digital transformation in logistics businesses depends mainly on scientific and technological advances. Currently, depending on scale, needs and capabilities, businesses apply technology at different levels, including popular platform technologies:

First of all, the Internet of Things (IoT). IoT helps increase visibility in every step of the supply chain and improve inventory management efficiency. With a 4G LTE-based sensor system, faster data transmission, less latency enables real-time cargo visibility, condition monitoring and fleet management, including: Vehicle connectivity via global positioning system (GPS), smart warehouse, connected port system, connected container system.

Secondly, artificial intelligence (AI). AI algorithms combined with machine learning help logistics businesses proactively deal with fluctuations in demand such as: intelligent forecasting systems allow managers to plan supply chain processes and reduce costs. operating fees; Self-propelled vehicles and drones help transform traditional delivery services into automated delivery. Additionally, AI-based automation technology helps businesses automate administrative tasks and speed up information-intensive activities.

Thirdly, cloud computing. Cloud computing helps logistics businesses solve communication obstacles and allows businesses to collaborate, share data securely, and collect data from management systems to analyze overall logistics processes. At the same time, cloud-integrated logistics services provide global reach and are not limited by physical space. In addition, cloud-based software-as-a-service solutions help logistics businesses reduce risks and costs of maintaining information technology infrastructure.

Fourthly, Blockchain technology. Blockchain technology helps logistics businesses make transactions transparent in the entire logistics process. At the same time, smart contracts based on Blockchain technology enable faster approvals and customs clearance by reducing processing times at checkpoints. Blockchain technology can automate other stages in logistics such as transportation operations management, freight planning, delivery and internal vehicle management.

Fifthly, Big Data and data analysis. Big data is substantial volumes of data from a variety of sources created by humans tools and machines, including media information, internal enterprise digital data... The combination of big data and data analytics provides useful insights to improve warehouse productivity, performance management and optimal use of resources. logistics resource.

Sixthly, automation technology and robotics. This technology helps logistics businesses optimize manual work, and improve work productivity through automation systems. Robotics have high sensing capabilities, accurate analysis, and the ability to easily self-learn tasks such as packing, arranging, classifying, retrieving and transporting goods, thereby helping businesses reduce human resources. , increase productivity and be more flexible in warehouse management.

3.4.5. Influencing factors of digital transformation in Logistics

Lanzolla & Anderson (2008) highlight the application of digital technology platforms as an enabler of digital transformation. Digital technologies can include cloud computing, big data, mobile, or search-based applications. Also following this point of view, Hess & colleagues (2016) emphasize the role of humans in promoting transformation processes.

Swen & Nadkarni (2020) previous studies showing that internal factors that affect the digital transformation ability of businesses are categorized into 3 main groups: 33% focus on technology, 34% focus on organization and 33% focus on both technology and organization. In studies focusing on organizations, 4 factors are mentioned a lot and directly affect the expected results of digital transformation of businesses: leadership, digital business strategy and corporate culture. For research focusing on technology, the application of technology platforms for business activities such as: systematically storing data information, communicating with customers, communication and internal communication ministries and other activities that affect the business's ability to digitally transform. In this article, it is called (5) technology platform.

Leadership: Changes in leadership thoughts and actions considerably affect a business's ability to digitally transform. Those changes contain: rapid optimization of leadership decision-making processes through instant access to open information and data and changes in learning and development leadership development. Furthermore, leadership team needs to have a digital mindset to lead the digital transformation process.

Digital business approach: Bharadwaj (2000) believes that information technology plays an important role in organizations activities. It both assists management and has developed into an essential element in building corporate strategy. Digital business strategy is the process of creating and putting into action a business plan to accomplish long-term objectives using a digital technology platform.

Corporate culture: An organizational culture that consistently shares and validates data is necessary for digital transformation. Employees must have a data attitude and work and business processes must be highly transparent in order to achieve this. Additionally, the digital transition may lead to culture clashes between younger staff members who are proficient in digital technology but lack experience and more seasoned staff members who have extensive knowledge in traditional business but are not as innovative. (Kohli & Johnson, 2011) technology.

Technology platforms: Digital transformation will change work structures, job roles and workplace requirements. Digital interconnectedness enables the emergence of cross-location

teams across the entire enterprise. In this context, traditional hierarchical work structures gradually disappear and new opportunities appear beyond the enterprise. A digital workplace must be relevant, disciplined, imaginative, and independent of work location. Thus, how a business has a technology application platform in its current operations will affect its possibility to successfully transform digitally in the future.

4. RESEARCH RESULTS

4.1.. Current status quo of digital transformation in Logistics businesses in Vietnam

4.1.1. Achievements in digital transformation in Vietnamese Logistics businesses

Logistics businesses in Vietnam have recognized the great importance of digital transformation, especially in the phase of production.

Looking at the Vietnam Report (2022), Logistics businesses have been paying more attention to investing in digital transformation, attaining 100% of businesses spending their budget for this, of which 86% are expecting the adoption of such technology will bring about remarkable merits. Furthermore, in term of performance, 36% of businesses believe the combination of technology and Logistics will enhance customer experience worldwide significantly.

The level of application of digital technology in Logistics businesses is displayed in **Figure 1**. Such adoption has become the key trend in the operational strategies of businesses.

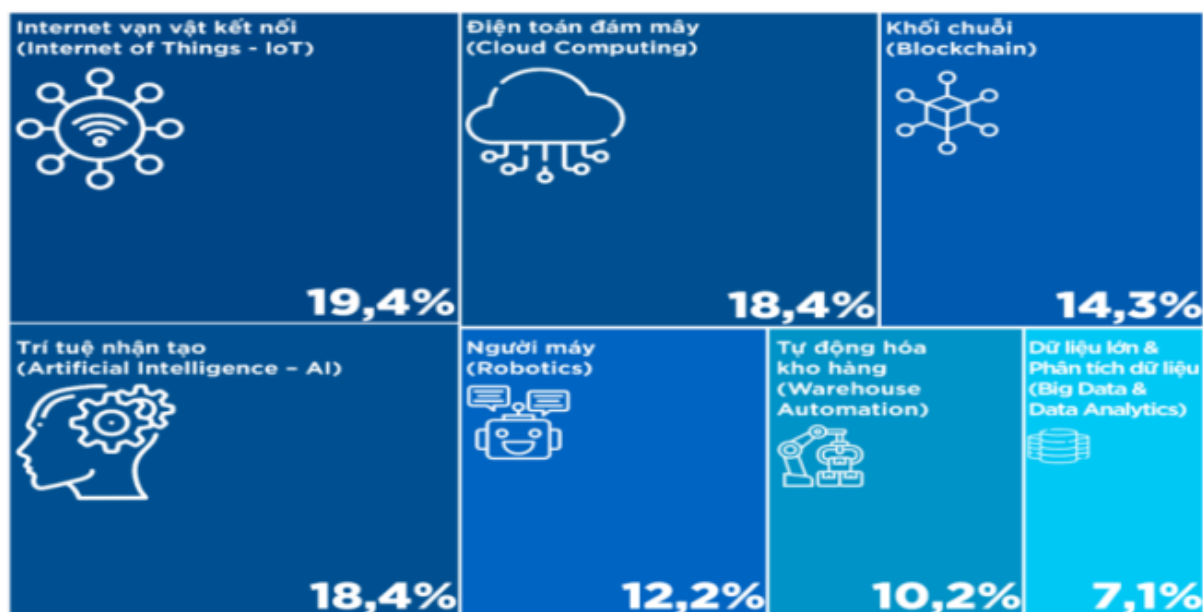


Figure 1: Technology platforms used by logistics businesses

Source: Vietnam Report, 2022

In general, we can see that logistics businesses in Vietnam have witnessed impressive progress in their journey of digital transformation with visible number stated in the chart. To be precise, beside several fundamental technological tools that have been around have been commonly used in the supply chain of Logistics businesses, emerging technology platforms have also become a pivotal part of the businesses. The proportion of logistics businesses employing application of 4.0 advances for their operation and production is approximately 68%. Among them, there are IoT (19.4%), cloud computing (18.4%), artificial intelligence (18.4 %), big data and blockchain (14.3%) (Vietnam Report, 2022).

With the long-lasting consequences of the COVID-19 pandemic, 58% of Logistics service providers have shortened their technology roadmaps, the proportion of businesses with high and very high levels of technology application has increased rapidly in many platform technologies. , in which robotic process automation (RPA) reached 100%, big data reached 80% (see **Figure 2**)

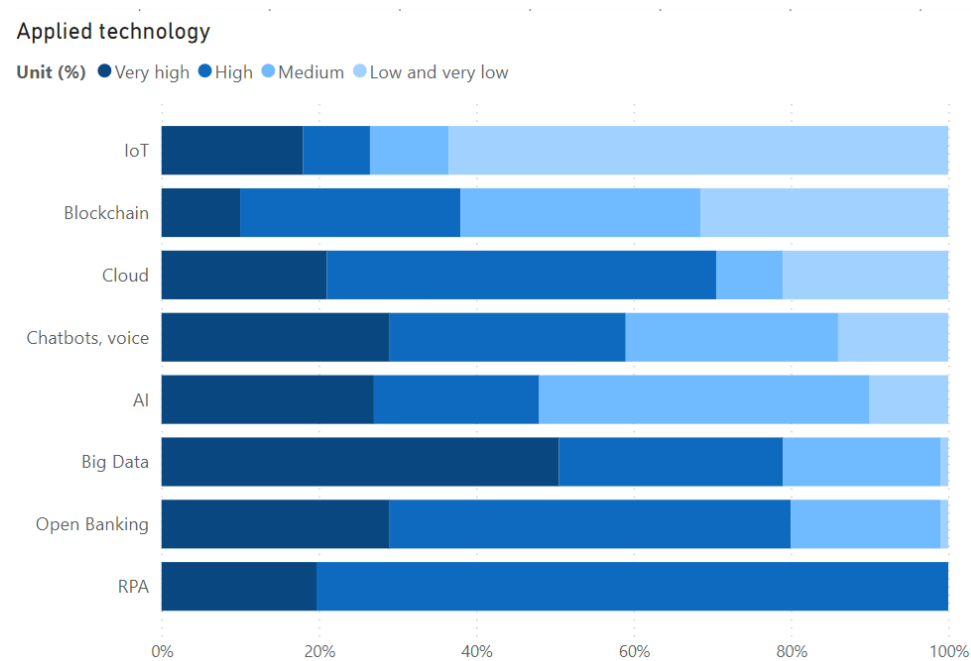


Figure 2: Applied technology at different levels in logistics businesses

Source: Vietnam Report, 2021

All stages of Logistics business operations have also begun to apply digital technology. In details, FMS (delivery management software) are adopted by 75% of businesses. The numbers are 63.89% for OMS software (order management software) and WMS (warehouse

management software), 61.11% for TMS (transportation management software) (Ministry of Industry and Trade, 2021) (see **Figure 3**).

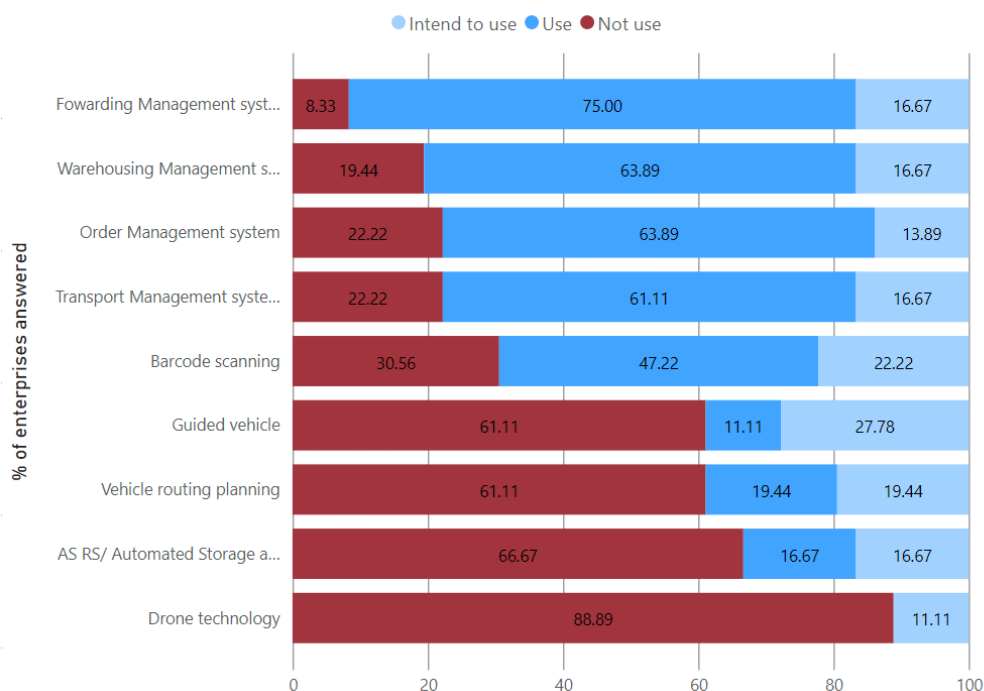


Figure 3: Adoption of technology in logistics businesses

A number of large businesses such as Da Nang Port, Saigon Newport Company, Chu Lai Logistics, etc. have focused on applying such technology platforms on a large scale. By doing that, the interconnectedness among functions or departments is heightened, transforming the management model, creating connections with the business model, and bringing optimal efficiency to the business. For instance, Da Nang Port has deployed the use of Electronic Information Portal - DNP ePORT to improve customer service quality by connecting shipping lines to deploy: Electronic delivery orders - eDO; Connecting electronic customs - eCustom; Non-cash electronic transactions - ePayment; Electronic invoice - eInvoice (Ministry of Industry and Trade, 2020).

Digital transformation has contributed to improving service quality in Logistics businesses, creating conditions for the formation of Logistics centers with a high level of digital technology application, especially businesses providing services to the market. Europe, America and China. Many businesses have joined the world Logistics passport program, improving relationships with international customers. This shows that the reputation and competitiveness of many Vietnamese Logistics businesses have improved significantly. For example, Saigon New Port Company, after successfully applying advanced production management programs, has reduced ship arrival time by 55%; Reduce delivery time by 3/4;

Reduce 60% of unsafe incidents at work, traffic safety... Hai Phong Port has officially used electronic invoices instead of paper value-added invoices in goods sales and supply activities. service. The use of electronic invoices has helped customers shorten payment time by more than 90% and management units save up to 80% of costs for each invoice (Ministry of Industry and Trade, 2020).

4.1.2. Limitations in digital transformation in Vietnamese Logistics businesses

Although Logistics businesses understand the role of digital transformation and encourage it gladly, the digital transformation process in these businesses has not yet met expectations.

A general trend is the use of basic information technology tools such as phone, SMS, email, fax, website, LAN, WAN within the majority of logistics businesses in Vietnam. They are aware of the importance of information technology adoption, but the practice of adoption is still limited. For instance, Forwarding management system (FMS), transport management (TMS), warehousing management system (WMS), etc. are implemented in a quite fragmented unsystematic approach. forwarding management system is applied at 75%. It is 63.89% for order management system and warehousing management system (OMS and WMS), and 61.11% for transport management system (TMS).

Newer technology optimizing the operation and production such as vehicle routing planning (VRP) or automated storage and retrieval system AS/RS, etc. Are adopted by very few businesses at the respective rates of 19.4%, 16.67% and 11.11%. Meanwhile, the drone is completely unused in this industry.

The digital transformation process of Logistics businesses is also combating a myriad of difficulties, from crafting the adoption processes to selecting the technology, according to the Vietnam Logistics Report 2021 (Ministry of Industry and Trade, 2021).

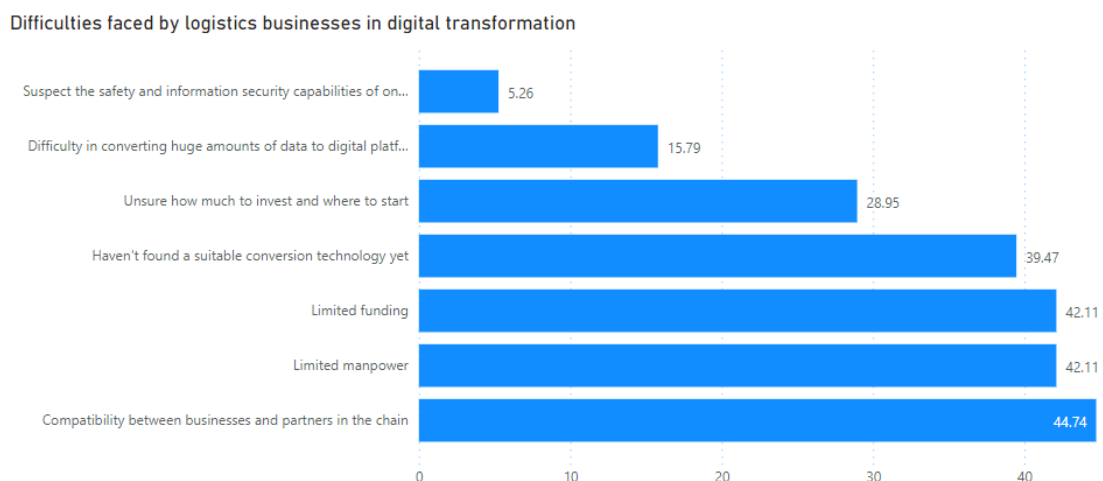


Figure 4: Difficulties faced by logistics businesses in digital transformation

Source: Vietnam Logistics report 2021 (Ministry of Industry and Trade, 2021).

Figure 4 indicates that, during the digital transformation process, many Logistics businesses have been struggling. Up to 28.95% of businesses have difficulty building business plans and strategies, they do not know how much to invest and where to start; 15.79% of businesses have difficulty digitizing data and processes on digital platforms, leading to limited access to digital resources between departments within the business as well as compatibility between businesses within the business chain (Ministry of Industry and Trade, 2021).

Human resource preparation is another major limitation for Logistics businesses. Up to 42.11% of businesses said that their human resources are limited and their ability to use technology platforms mentioned above in the business. It is still at an average level, hindering and slowing down digital transformation process in businesses.

Choosing and applying digital technology appropriate to the scale and level of the business also faces many challenges due to limited investment budget (42.11%), concerns about safety and security. information security of online platforms (5.25%).

Besides the above difficulties and challenges, the level of application of technology platform in Logistics businesses is not as high as Blockchain (40%), IoT, Big Data (80%), and AI (50%). The rest are still at average, low and very low levels. Technology solutions applied in low-level business processes mainly focus on customs declaration activities, transportation management, warehousing, delivery, and barcode scanning. Few businesses have come to the phase of using tools that can optimize operations such as VRP (vehicle routing system), automatic storage and retrieval system AS/RS or automatic pickup trucks. The equivalent rates are 19.4%, 16.67% and 11.11% respectively. Moreover, the drone technology has not been used at all.

4.2. Comparing level of technology platforms application between Vietnam and the worldwide trends.

4.2.1. Technology platforms used in the world and in Vietnam

4.2.1.1. Technology used worldwide in digital transformation in Logistics

Digital transformation in the logistics industry has been significantly propelled by the adoption of ten key enabling technologies, which have been detailed analyze in 3.3. These transformative technologies include: ((Agrawal, P. and Narain, R. (2023))

- (1) Big data analytics
- (2) IoT
- (3) AI
- (4) Cloud computing

- (5) Social media
- (6) Blockchain
- (7) AR and wearable electronics
- (8) 3D printing
- (9) Advanced robotics and
- (10) Drones

The adoption of these technologies has varied in terms of level and scope across different regions and sectors within the logistics industry.

Big data analytics has emerged as a pivotal tool in optimizing operations, enabling real-time decision-making, and enhancing supply chain visibility. According to a study by Accenture (2019), 78% of logistics companies have already implemented big data analytics solutions to streamline their processes. IoT technologies have witnessed widespread adoption, facilitating the tracking and monitoring of goods in transit, enhancing warehouse operations, and providing valuable data for predictive maintenance. A report by MarketsandMarkets (2020) indicates that the global IoT in logistics market is expected to grow at a compound annual growth rate (CAGR) of 12.0% from 2020 to 2025.

AI applications in logistics have expanded rapidly, with machine learning algorithms being utilized for demand forecasting, route optimization, and predictive analytics. A survey conducted by DHL (2020) revealed that 82% of logistics companies have integrated AI into their operations, leading to a reduction in costs and an increase in efficiency. Cloud computing has become a cornerstone of logistics operations, enabling real-time collaboration, data storage, and accessibility from any location. According to a study by Gartner (2021), cloud adoption in the logistics industry is projected to grow at an annual rate of 17.5% through 2025.

Social media platforms have evolved beyond communication tools to serve as marketing channels and customer engagement platforms for logistics companies. Research by Capgemini (2020) highlights that 65% of logistics companies leverage social media for customer interactions and marketing campaigns. Blockchain technology has gained traction in logistics for its ability to enhance transparency, traceability, and security in supply chain transactions. A report by Deloitte (2021) notes that 54% of logistics professionals consider blockchain to be a critical tool for supply chain management.

AR and wearable electronics have found applications in warehouse operations, offering hands-free guidance to workers and improving order picking accuracy. A study by ABI Research (2019) estimates that the global market for AR in logistics will grow at a CAGR of 67.1% from 2019 to 2024. 3D printing technology is increasingly utilized for rapid prototyping,

spare parts production, and on-demand manufacturing in the logistics industry. A report by Allied Market Research (2021) projects the global 3D printing market in logistics to grow at a CAGR of 25.4% from 2021 to 2028.

Advanced robotics have revolutionized warehouse automation, with robots handling tasks such as picking, packing, and sorting. Research by McKinsey & Company in 2020 suggests that the adoption of robotics in logistics is poised to grow at a CAGR of 20% over the next five years. Drones have emerged as a disruptive force in last-mile delivery, enabling faster and more cost-effective transportation of goods. A study by Frost & Sullivan (2020) predicts that the global drone logistics market will grow at a CAGR of 21.3% from 2020 to 2025.

In conclusion, the logistics industry has witnessed a substantial integration of these ten enabling technologies, each offering unique advantages and driving efficiencies across various aspects of the supply chain. The level of adoption has varied, with some technologies like big data analytics and IoT experiencing widespread implementation, while others like AR and wearable electronics are gaining momentum. These technological advancements have fundamentally reshaped logistics operations, enhancing visibility, efficiency, and customer satisfaction. As the industry continues to evolve, a deeper integration of these technologies is expected to further propel the digital transformation of logistics.

4.2.1.2. Technology platforms used in Vietnam: A comparison

The adoption of technology in the logistics sector plays a pivotal role in enhancing operational efficiency and competitiveness. In the context of Vietnam, the logistics industry has embraced several key technological enablers, including Big Data Analytics, Internet of Things (IoT), Artificial Intelligence (AI), Cloud Computing, Blockchain, Advanced Robotics, and Drones. Notably, the most widely adopted technologies in the Vietnamese logistics landscape are IoT, AI, Cloud Computing, and Blockchain, as expounded in Section 4.2.1.

A comparative analysis of technology adoption between the global logistics industry and the Vietnamese counterpart reveals distinct patterns. In Vietnam, Big Data Analytics, AI, and Cloud Computing have achieved a commendable level of implementation, reflecting a concerted effort by Vietnamese businesses to harness the potential of these technologies for operational optimization. However, it is imperative to note that the adoption of certain technologies, including Social Media, Augmented Reality (AR) and Wearable Electronics, and 3D Printing, remains limited within the Vietnamese logistics domain. This differential adoption pattern underscores the industry's endeavor to align with global technological trends while navigating distinct regional constraints and opportunities.

Furthermore, the prevalence of IoT, AI, Cloud Computing, and Blockchain technologies in Vietnam's logistics sector signifies a progressive stride towards aligning with international standards. This alignment is particularly significant in light of the global logistics landscape, where these technologies are considered foundational for achieving operational excellence, supply chain transparency, and real-time decision-making. However, it is noteworthy that certain technologies, such as Social Media and AR/Wearable Electronics, have yet to gain widespread traction in Vietnam, indicating areas where further investment and technological integration may be warranted.

Overall, the logistics industry in Vietnam exhibits a commendable commitment to technological advancement, particularly in the domains of IoT, AI, Cloud Computing, and Blockchain. Nevertheless, the variance in adoption rates across different technologies highlights the nuanced approach required to bridge the gap with global trends. Efforts to augment the adoption of technologies such as Social Media, AR/Wearable Electronics, and 3D Printing warrant consideration to ensure comprehensive integration of enabling technologies across the Vietnamese logistics landscape. In doing so, the industry can further enhance its competitive positioning on both regional and global scales.

4.2.2. Sequencing in applying technology in digital transformation in logistics in Vietnam

An ISM-based model has been proposed for the identified enablers of DSC that provides the sequence in which the technological enablers should be implemented in different tiers. A model based on Interpretive Structural Modeling (ISM) has been introduced in Figure 5 (Agrawal, P. and Narain, R. (2023)) to delineate a structured approach for the implementation of identified enablers in the realm of Digital Supply Chain. This model offers a systematic framework, outlining the sequence in which technological enablers should be integrated across various tiers. Notably, an examination of the model suggests that Vietnam's trajectory of technology adoption aligns coherently with this proposed framework.

Fundamentally, the foundational technology platforms, encompassing IoT, Big Data Analytics, Blockchain, AI, and Cloud Computing, have assumed precedence and witnessed substantial uptake within the Vietnamese logistics landscape (see

). This strategic prioritization reflects a judicious approach towards establishing a robust technological foundation. These technologies, being the linchpin of digital transformation, lay the groundwork for subsequent integrations and optimizations.

Furthermore, the model underscores a logical progression in the adoption of complementary tools and technologies. While certain elements may not have been embraced with the same level of intensity as the foundational platforms, their nascent adoption indicates a discernible

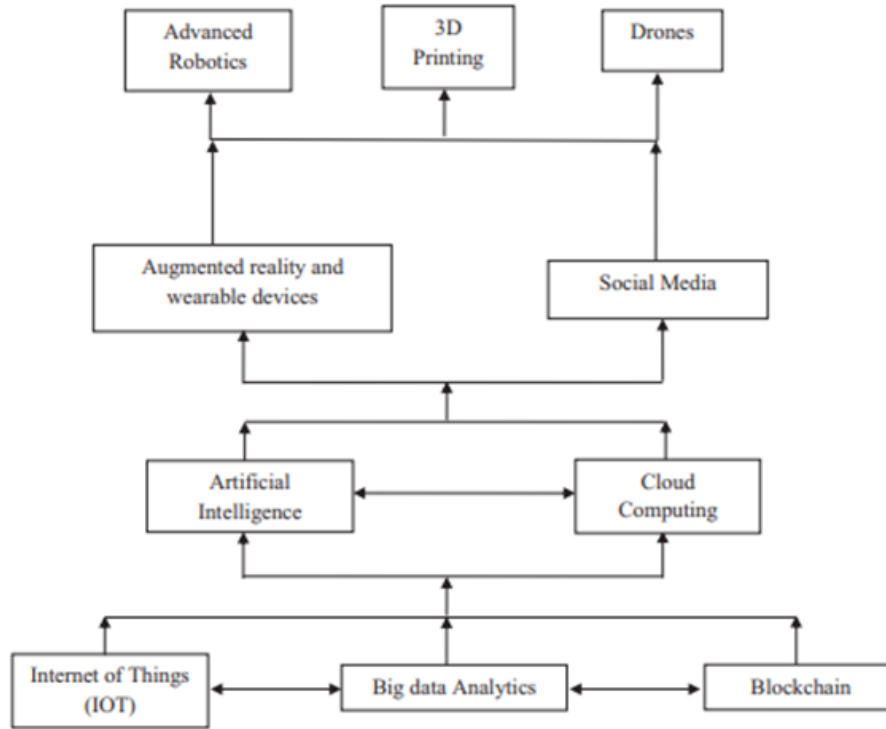


Figure 5: ISM-based model for technology platforms in digital supply chain

adherence to a structured sequence of technological assimilation. This judicious sequencing is instrumental in ensuring that technologies requiring a robust foundation from the aforementioned platforms are introduced in a manner that maximizes their efficacy and integration potential.

In essence, the alignment of Vietnam's technology adoption trajectory with the proposed ISM-based model is indicative of a strategic and well-considered approach towards the digital transformation of the logistics industry. By prioritizing the establishment of a strong technological foundation, Vietnamese enterprises are poised to derive optimal value from subsequent technology integrations. This methodical progression not only reflects a prudent utilization of resources but also positions Vietnam favorably in the context of global technological trends within the logistics sector.

5. DISCUSSION AND IMPLICATIONS FOR PROMOTING DIGITAL TRANSFORMATION IN VIETNAM'S LOGISTICS BUSINESSES

Digital transformation is an inevitable trend that helps Vietnamese Logistics businesses improve service quality, competitiveness and reach the international market and achieve goals set by the Government of By 2025, the contribution of logistics to GDP reached 5% - 6%, the growth rate of services in Logistics reached from 15% to 20%, logistics service outsourcing rate

achieved 50%-60%, Logistics costs declined equivalent to from 16% to 20% GDP, ranked by the global LPI reaches 50th or higher (Decision No. 221/Q D-TTg)

Nevertheless, in order to achieve agenda and accomplish digital transformation in the logistics sector, there needs to be close coordination between the Government and private businesses. In which the State plays a key role, creating, orienting, and being a "midwife" for businesses to promote digital transformation, while businesses have a decisive role in the entire process.

On the State side, the government policies should be opened and updated to the world trend to be ready to accept and test new things in a controlled manner. It is also the government mission to create a culture of accepting and testing new things, etc. (Decision No. 221/Q D-TTg).

Accordingly, the Government should complete the legal framework on national digital transformation, especially in the Logistics industry, highlighting key issues of security, privacy and technology. They shall research, amend and promulgate new rules and regulations pertaining to cross-border, multimodal, and logistics services. By doing so, all policies and support from the government is leaning towards companies undergoing digital transformation and startups providing digital technology solutions. At the same time, the system of legal documents to handle fraudulent acts in cyberspace, such as acts of exploiting and illegally exploiting private and personal information online, should also be revised and published. Furthermore, the authority should develop digital infrastructure, meeting the rapidly increasing demand for connection and data processing. It can also play a role of a facilitator, orienting and guiding Logistics businesses to deploy digital transformation.

On the business perspective, it is necessary to raise awareness within the business about the important role of digital transformation in the development of the business and all employees. Build a reasonable roadmap suitable to the capabilities of the business, including reviewing goals, re-evaluating existing data, improving processes for all or part of business operations, and transforming the model business, management model.

Logistics businesses need to not only develop strategies but also plan for training, recruitment, and use of human resources appropriate to the conditions of the business. In addition, businesses should proactively build facilities, implement internal training programs, and encourage officers and employees in the business to self-study and accumulate knowledge in applying technology to their business practices. It is necessary to make reasonable use of enterprise human resources according to their strengths and expertise. It is also crucial to have

reasonable remuneration to promote creative capacity and the ability to quickly adapt to technological changes.

Businesses need to research and select technologies suitable to the financial capacity and scale of the business to ensure criteria such as optimal, modern, up-to-date with trends and have features suitable for specific characteristics. businesses, meeting actual requirements during operation. It is necessary to build a shared database throughout the enterprise, invest in research and development to create positive changes in products and services, and constantly upgrade existing technology systems. Be aware of security policies and tools to protect business secrets, customer information and prevent risks in business operations.

Businesses need to promote seamless connections between Logistics businesses and between Logistics businesses and information technology businesses to share knowledge, experience, and build trust between businesses; Form a network of large businesses, capable of leading the market, finding and sharing orders, reducing Logistics costs, improving the competitiveness of businesses... At the same time, linking will create Conditions for businesses to accelerate the digital transformation process, choosing appropriate technologies at reasonable costs.

Businesses need to strengthen links with associations and Logistics service businesses in the ASEAN region and around the world; Attracting a large number of foreign Logistics businesses to do business and cooperate with Vietnamese businesses.

6. CONCLUSIONS

With the main aim to address the digital transformation in the logistics sector in Vietnam regarding its status quo, a comprehensive synthesis has been conducted. The logistics industry is the foundation of the economy, smoothening the supply chain from production phase to end users. In the context of post-Covid 19 and Industry 4.0, it is an even more significant opportunity to bolster the productivity of logistics industry via digital transformation.

Firstly the study points out some main key concepts, roles, influencing factors and especially different technology platforms serving the logistics transformation in the world and in Vietnam. It then assess the current status of digital transformation in logistics businesses in Vietnam, highlighting the strengths and limitations of this progress in Vietnam through a thorough, complex synthesis of different Vietnamese government reports, logistics reports and articles. Our findings highlight that digital transformation is one of the key trends in logistics industry in Vietnam. Businesses here have adopted different technology for the sake of fasten this process. Though different tools are utilized in different levels and some advanced ones are

still somewhat a “new-born child” for enterprises here, it is evident and undeniable that they have made an impressive progress embracing new technology for the sake of improving operation and production. It is evident that there is a gap between the current state of digital transformation and the desired benchmarks. The challenges are also clear, mainly arriving from difficulties to choose tools and from embracing them in the beginning phase.

The article also compare the tools adopted in the world to Vietnam. By using the ISM map created by Agrawal, P. and Narain, R., the author witnessed an aligning trends in Vietnam and the world in the journey of utilizing new technology platforms. Vietnam understand its mission and prioritize some fundamental tools such as AI, IoT and more, making it a foundation for even more advanced transformation.

Finally, some solutions to enhance and fasten this process is presented. The collaboration between the State and private businesses is suggestive as digital transformation is the story of the whole interconnected economy and society. From the business side, enterprises should raise the awareness even further in this journey of adapting. Conducting human training, developing strategies and selecting and prioritizing technology are also highly recommended to implement.

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