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ПЕРСПЕКТИВИ РОЗВИТКУ ЦИФРОВОЇ ТРАНСФОРМАЦІЇ В ТРАНСПОРТІ ТА ЛОГІСТИЦІ

Актуальність. Ланцюжок постачання в найближчому майбутньому буде швидше і самоорганізованіше. Цей безпрецедентний темп змін буде зумовлений кількома радикальними технологіями, які обережно будуть прийняті учасниками галузі протягом наступних 15 років.

Мета та завдання. Мета цієї статті визначити рівень впровадження цифрових технологій у транспортних галузях, визначити перешкоди для їх широкого розповсюдження, а також оцінити безпосередні перспективи використання електронного документообігу, веб-платформ, штучного інтелекту, великих даних у галузі транспорту та інфраструктури.

Результати. Нова ера цифровізації спричинила кілька технологічних досягнень, створивши нові потужні цифрові інструменти, які будуть використані для кардинального перетворення галузей, включаючи логістику, протягом наступних кількох років. Повільна швидкість прийняття цифрових технологій приносить величезні ризики, які, якщо їх ігнорувати, можуть бути катастрофічними навіть для найбільших відомих гравців у бізнесі. Використання електронних систем в організації перевезень та управлінні логістичними процесами має такі переваги: більш легке планування відправлень; економія часу за допомогою веб-бронювання транспортних засобів; покращений робочий процес із документообігу; прямий доступ до статистики та звітів; оптимізоване управління замовленнями та товарними запасами.

Метою автоматизації роботи в портах і терміналах є введення цілком нового рівня узгодженості при обробці вантажів, і як результат - зниження витрат праці, мінімізація людських помилок та затримок в роботі, зменшення викидів вуглецю, порівняно з терміналами, що експлуатуються вручну.

Висновки. Швидка еволюція нових технологій та їх доступний характер спонукають людей сприймати їх на масовому рівні, полегшуючи їхнє життя. Це змушує економічних суб'єктів та їх оточення до трансформації з метою поліпшення або підтримки конкурентної позиції. Оцифрування допоможе забезпечити високі результати бізнесу та краще контролювати торгові та операційні ризики в одному місці. Хмарні технології в процесі оцифрування бізнес-процесів розкриють можливість для транспортних та торговельних компаній швидше реагувати на запити клієнтів та зміни у зовнішньому середовищі, ніж сьогодні.

Ключові слова: оцифровка, ланцюг поставок, доставка, глобальна платформа, автоматизація

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DEVELOPMENT PROSPECTS OF DIGITAL TRANSFORMATION IN TRANSPORTATION AND LOGISTICS

Topicality. *The supply chain of tomorrow will be leaner, faster and most importantly, self-orchestrated. This unprecedented pace of change will be driven by a few radical technologies that will be cautiously adopted by industry participants over the next 15 years.*

Aim and tasks. *The aim of this article to determine the level of implementation of digital technologies in transport industries, identify obstacles to their wide distribution, as well as assess the immediate prospects for the use of electronic document management, web platforms, artificial intelligence, large data in the field of transport and infrastructure.*

Research results. *This new era has seen several technological advances fuse, creating powerful new digital tools that will be used to dramatically reshape industries, including logistics, over the next few years. This slower rate of digital adoption brings enormous risks that, if ignored, could be potentially catastrophic for even the biggest established players in the business. There are benefits of using e-carrier to manage shipments and logistics, such as: easier planning of shipments; save time with web booking of transport; improved workflow with a document management system; direct access to statistics and reports; optimised order management and inventory overview.*

The purpose of bringing automation to ports and terminals is to introduce a whole new level of consistency when handling cargo, and the results are: reduced labor costs, minimization of human errors and delays, reduced carbon emissions compared to manually operated terminals.

Conclusion. *The rapid evolution of new technologies and their affordable nature is driving people to adopt them on a massive level, making their lives easier. This forces entities and their ecosystems to transform in order to improve their competitive position and sometimes even to maintain it. Digitalization will help to deliver better business results and to better control trading and operational risks in one place. Timing is, of course, another opportunity as shipping and trading companies need to be able to react much faster today than they did in the past. Cloud technology within the digitalization wave will unleash those opportunities.*

Keywords: *digitalization, supply chain, shipping, global platform, automation.*

Problem statement and its connection with important scientific and practical tasks. The fast development of digitalisation drastically keeps changing the needs and requirements of information. Today, we expect to have access to information, products and services anywhere via computers, web portals and different kinds of devices. This creates brand new business opportunities.

Over the past two decades, our lives have been transformed by the Internet. The Web revolution has happened in three waves:

- first the desktop Internet in the 1990s,
- then the mobile Web in the 2000s,
- and now the third age of the Internet.

However, limited IT capacity can hinder the market growth. 25% of logistic and transportation companies do not have a digital strategy in place. This is a bothering situation to more than half of companies and as a befitting measure, companies rely on external partners. Other strong barrier is resistance to change. One fourth of total transportation companies don't own an appropriate digital strategy and generally rely on conventional technology and legacy software to manage workflows and communicate with

partners. There is lack of collaboration between business development teams and technology.

According to the Council of Supply Chain Management Professionals (CSCMP), logistics can be defined as the process of efficiently planning, executing, and monitoring the flow of raw materials, work-in-progress inventory, finished products, services, and related information, from the point of origin to the point of consumption (including external and internal movements, as well as incoming and outgoing movements) with the aim of fulfilling the customer's needs.

The aim of supplier management is to secure a company's demand through an efficient supplier network and thereby contribute to the value creation [1].

The main reason why high technologies are so necessary for the transport infrastructure of Ukraine is that they are able to ensure the transparent adoption of administrative decisions and thereby reduce corruption risks and increasing the investment attractiveness of the country as a whole.

In fact something remarkable has happened: more packages than ever before are now being shipped. On any single day, a staggering 85 million packages and documents are delivered around the world.

The main factor that motivates enterprises industry to introduce modern technology, is optimization of expenses and reduction of risks of inefficient or excessive spending of funds.

No wonder that disruptive companies such as Amazon and also newcomers focus on speed and often aim to take more control of parts of the supply chain or simply cut intermediaries where they can.

Obviously this aspect of speed and time isn't new for the logistics and transportation industry. After all, the 7Rs of business logistics go back a long time: the right product/item in the right quantity to the right customer in the right condition at the right place, right time and right cost [2].

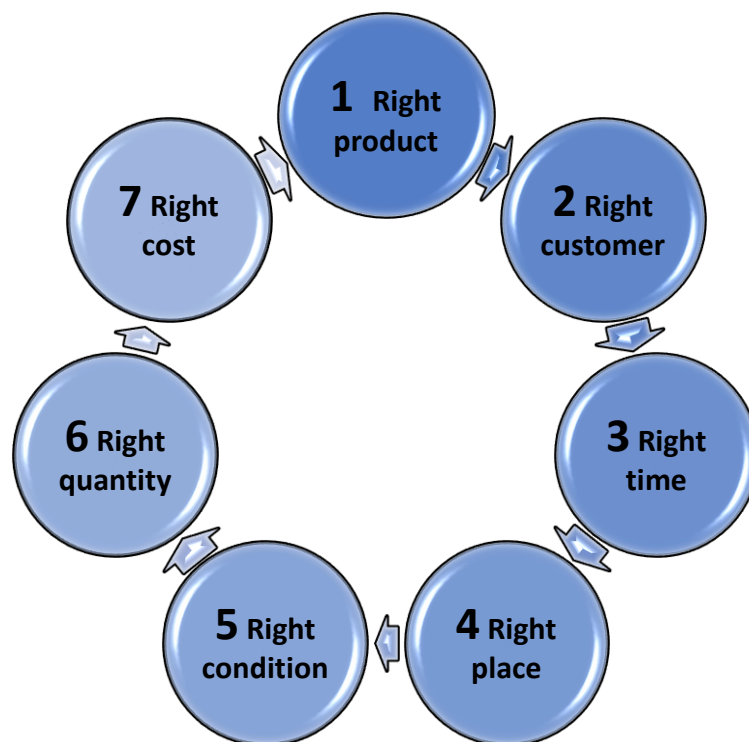


Fig. 1. 7-Rs of logistics

Source: Author's development

The use of digital technology, for obvious reasons, entails digital risks. Cyber threats are fraught with stopping a business that should run smoothly.

More significantly, digital platforms will become increasingly important in the logistics industry, allowing small companies to have a global reach and compete with the sector's established giants. Over the next few years, the race to build a dominant global platform will transform the customer's experience of logistics and will be the central issue in determining which enterprises will be the winners and losers in a truly digital logistics industry.

Analysis of recent publications on the problem. The pressures of cost and competition will continue

to drive digitalization. The value chain will change dramatically, and the importance of data-based services will continue to rise. Mobility and transportation are easy targets for the digital economy and will place established companies in direct competition with their digital counterparts. The tech giants have only just begun to transform the market. The Porter's 5 forces model (Porter, 2008) [3] was used to analyze competitive forces affecting the logistics service industry. The analysis was carried out through the prism of changes related to technological innovations and startups that appear in the industry, i.e., on the suppliers and customers' side (vertical competition) and as a result of the threat of new entrances and the appearance of substitutes (horizontal competition)

Allocation of previously unsolved parts of the general problem. In practice other industries have had to learn that monopoly-type constellations can form in a very short time, for example, eBay and Amazon for B2C marketplaces, Alibaba for B2B marketplaces and PayPal for online payments. Many established companies are helpless in the face of this technological change [1-2, 4-6].

Formulation of research objectives (problem statement). This study aims to present changes that are taking place in the market of logistics services as a result of the development of digital technologies and show their influence on the business models of logistics service providers.

Deduction method was used to discuss how technological changes affect business models in the logistics services industry. That resulted in indicating, on the one hand, the existing threats and on the other, the main characteristics of an innovative business model that has become a kind of 'must have' for the industry. The solutions based on hybrid models combining 'the old' with 'the new'.

An outline of the main results and their justification. Digitalization means using technology to produce and explore new value-creating opportunities, reforming a business model, and moving a business to a digital industry. It's also used to describe digital data storage in an online database.

We have identified five themes that will be central to the digital transformation of the logistics industry over the next decade [4].

Table 1

Five key digital themes

| | |
|-------------------------------|---|
| Information services | Digitally enabled information services will put data at the heart of a logistics business through initiatives such as logistics control towers and analytics as a service, and helping in reducing operating costs while improving efficiency of operations. |
| Logistics services | Digitally enabled logistics services will help in trade growth through the creation of digitally enhanced cross-border platforms. It will also allow logistics companies to satisfy the growing need of customers for faster same-day deliveries, and promote the concept of city logistics, which will allow firms to operate in 'megacities'. |
| Delivery capabilities | New delivery capabilities will allow logistics to harness technologies such as digital trucks and drones to find more efficient ways to deliver shipments, while 3D printing and crowdsourcing offer new ways to think of manufacturing and logistics processes. |
| Circular economy | Circular economy will foster a more sustainable product life cycle, helping to lessen the logistics industry's environmental footprint by reducing carbon dioxide (CO2) emissions, air pollution and waste material. |
| Shared logistics capabilities | Shared logistics capabilities, through shared warehouse and shared transport capabilities, are expected to increase asset utilization in the near future. |

Source: World Economic Forum / Delivering change: digital transformation in logistic

The globalisation of industry, and hence supply chains, is inevitable. However, to enable the potential benefits of global networks to be fully realised, a wider supply chain perspective must be adopted [5]. In today's digital business reality most good old rules of logistics and supply chain management still are valid but the stakes are higher than ever. And it just moves faster and is far more integrated with interconnected processes and obviously data from several sources. Individual companies in an agile supply chain need to align their operations by redesigning the flow of goods, information and management practices. The aim is the virtual organisation, where groups of supply chain partners agree common terms for working together [6].

Three key digital actions

| | |
|---|---|
| <p>Develop new business model and offerings</p> | <p>New Digital Platforms. Building robust new platforms will help remove supply chain inefficiencies, solve problems associated with asset underutilization, improve demand-supply matching, and increase visibility and connectivity across systems.</p> <p>Advanced Analytics. Putting powerful data-driven solutions to work can create new analytics tools that, in turn, can be sold to clients to help them optimize their own operations and efficiencies.</p> <p>Control Tower. Providing solutions that boost operational visibility and connectivity between previously siloed systems allows stakeholders to more seamlessly connect to one another throughout the supply chain.</p> |
| <p>Digitalize core operations</p> | <p>Advanced Analytics. Similar to the benefits derived from the offering of new analytics tools, logistics organizations themselves can use advanced analytics to optimize operations in pricing, routing, and partial load shipment consolidation.</p> <p>Customer Experience. Putting in place a digital front end not only provides customers with a convenient one-stop shop experience, it also improves internal operational visibility and automates previously manual processes.</p> <p>Process Automation. Increasing the automation of core internal business processes can help ease labor-intensive logistics operations, like digitizing procurement with e-auctions.</p> <p>Equipment Data. Digitally monitoring equipment health facilitates more effective predictive maintenance.</p> <p>Next-Generation Solutions. Eyeing future operational improvements via robotics, artificial intelligence, and even augmented reality can help further elevate a logistical organization’s operational efficiencies in distribution, warehousing, and picking and packing.</p> |
| <p>Build a robust internal digital foundation</p> | <p>Talent. Logistics enterprises must actively target and attract smart digital talent in order to compete, maintain efficiencies, grow into new areas, and deliver on the promise of value for customers.</p> <p>Systems. Proffering the tenets and benefits of digital throughout the logistics organization helps rationalize investments in more flexible technology systems throughout the value chain.</p> <p>Agility. Logistics concerns need to be nimble in solution development in order to maintain the pace of digital and maximize its benefits.</p> |

Source: BCG (Boston Consulting Group) / Digital Transformation in the Logistics Industry

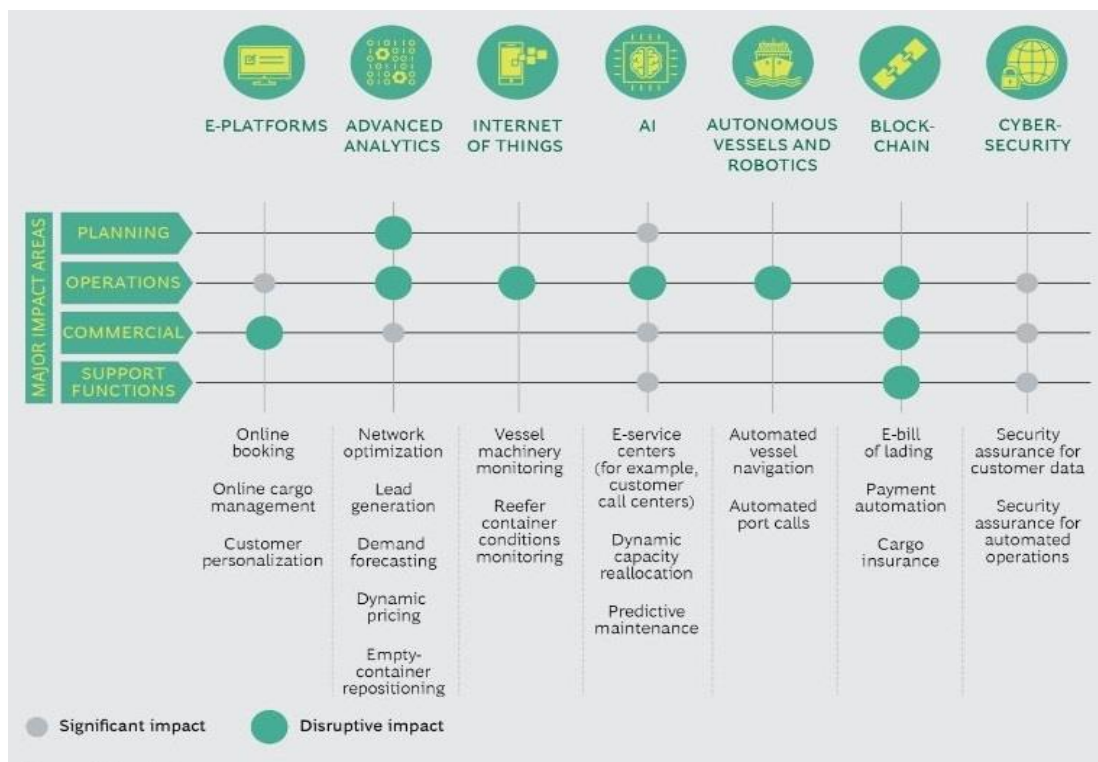


Fig. 2. Seven Digital Trends will transform Container Shipping

Source: BCG (Boston Consulting Group) / Digital Transformation in the Logistics Industry

Today the maritime transportation market has become a core element for every industry and will continue to grow as the world's population is constantly growing and thus new needs have to be satisfied. According to the International Maritime Organization over 90 % of the world's trade is carried by sea and it is the most cost-effective way to move goods and raw materials all around the world. Not only the demand for transportation by sea has changed but also the way how business is conducted today [7].

Only 6 % of the biggest freight forwarders and ocean carriers have online booking services. The one-third of them don't allow leaving online quotes.

Some innovations like smart pallets, containers, and automated ports have already become a universal standard.

Today the main challenge lies in integrating different systems into one. A company might work with an ERP system or an ETRM system (Energy Trading and Risk Management) and wants to have a shipping solution in place, that's where the challenge starts. Communication is key and those different systems need to be able to talk to each other. The digital evolution has not come to an end yet and will continue to shape the industry's future in every aspect.

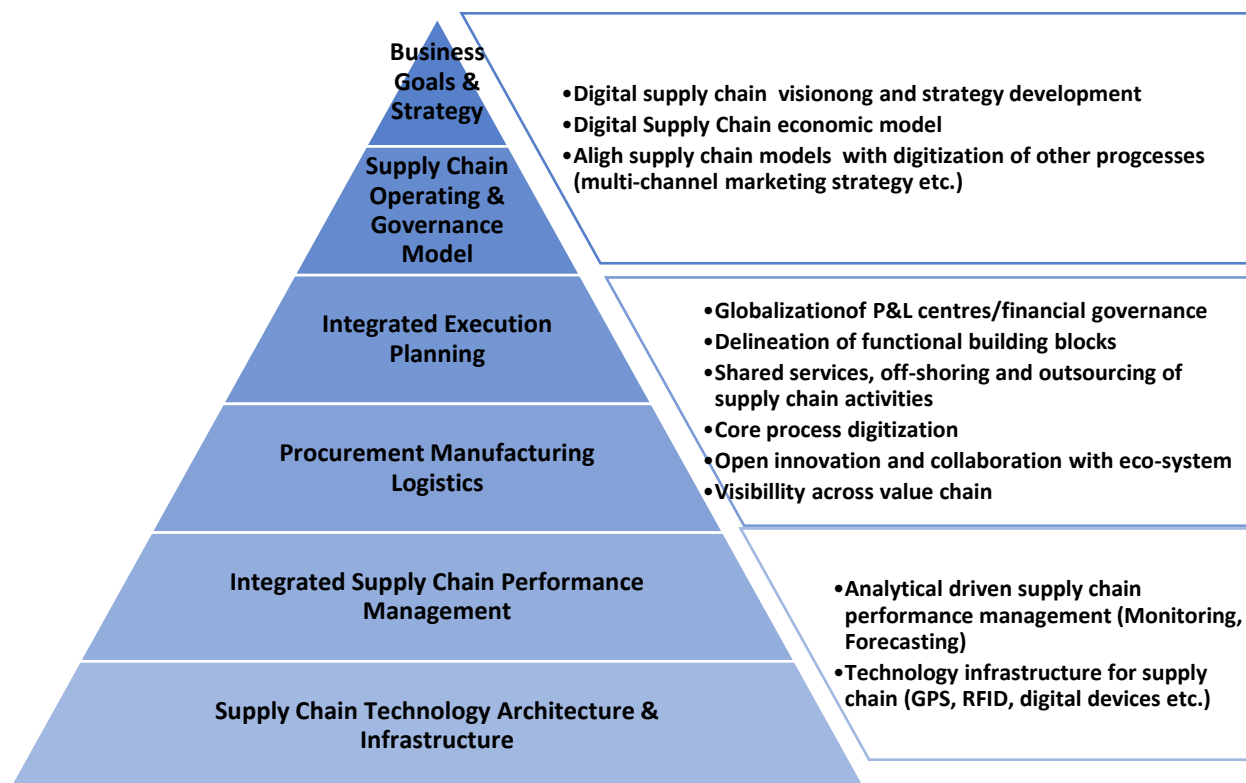


Fig. 3. Framework for Digital Transformation of Supply Chain Management

Source: Capgemini Consulting analysis

There are various ways in which technological improvements can facilitate cooperation and increase its efficiency.

Method #1 - Using a digital virtual collaboration platform

Suppliers, customers, and competitors start using the same management platform. All shipment data and information on global markets is recorded in the software, and each business contributes its expertise. Also, it's easier to pay for the technical support of such a platform, splitting the costs of development and maintenance.

Method #2 - Strategic management

Strategic long-term analysis implies that two or more partners have similar objectives and unite their resources to achieve those goals. Such objectives are penetrating new fields, developing new technologies, bypassing governmental controls, and many others. Collaboration participants invest in IoT tracking technologies and share big data algorithms. With digitalization, their collaboration would now be powered with detailed data on every transportation aspect.

Method #3 - Digitalizing joint ventures

When the firm is looking for new market opportunities, it's wise to connect with a local company which would provide resources, expertise, and labor adapted for that specific market. With online B2B platforms, logistics companies could automate the search of such a partner.

Five benefits of using e-carrier to manage shipments and logistics:

1. Peace of mind and easier planning of shipments

Being able to track your cargo in e-carrier from start to final destination is beneficial for a number of reasons. Having instant access to information about your shipment makes it easier for you to plan and make a decision regarding connecting transports and deliveries. That way, you can make appropriate alternative arrangements to minimise inconveniences and delays. Thereby, cargo tracking in e-carrier also makes for a smoother cooperation between you and other actors in the supply chain.

2. Save time with web booking of your transport

Web booking is a common feature of E-solutions used in the transport industry. If you know what, when and how you want to ship your goods, you can just as well enter this information yourself straight into the web booking system. Skipping the email conversations with the carrier will save you a lot of time and secure data quality. Either you book your shipment with e-carrier or with your own E-solution, using EDI communication with us to automatically transfer the data as soon as you enter it.

3. Improved workflow with a document management system

Using e-carrier and its document management system when handling your shipment offers the advantage of a high level of structure. By uploading the associated documents to a specific shipment, they are right at hand whenever needed for all parties involved.

4. Direct access to statistics and reports

Companies often need detailed reports regarding collected data on their shipments. For example, reports that include statistics of shipment volumes, punctuality of transports and emissions by different modes of transport. Our emission tool is in the forefront within the transport industry and can provide you with emission figures down to shipment level. You can whenever you want download emission reports. It is valuable to be able to generate and access the reports instantly by yourself instead of needing to send a request to the carrier to generate them for you. E-carrier offers the possibility to create and save setups for fully customised reports that only include the statistics you are interested in.

5. Inventory overview and optimised order management

Market changes bring both possibilities and challenges to the table. Therefore, structure, automation and overview are becoming essential aspects of every business to keep all operations on track and eliminate errors in the order processing. We save time in your daily work. The order management system (OMS) in e-carrier is functioning as a platform centralising all of your orders received from multiple sources. Also, the system lets you insert, monitor and search for orders to make planning of transports easier [8].

According to B2B research group Marketsandmarkets, the semi and fully automated container terminal market is currently worth \$9.09 billion. This is expected to jump 20 % to \$10.89 billion by 2023 [9].

The report credits the growth to increasing demand for larger container vessels, high labor costs in developed nations and rising competition among container terminals. As it stands, Asia Pacific holds the largest share in the automated container terminal market, followed by Europe and North America.

The purpose of bringing automation to ports and terminals is to introduce a whole new level of consistency when handling cargo, and at reduced labor costs and carbon emissions compared to manually operated terminals [10].

The benefits are clear. Inefficiencies with port and carriers cost the industry as much as \$17 billion a year and a fully automated terminal can reduce the number of workers required by at least 45 %.

There's also the reduction of human errors and delays, and the fact that fully automated terminals are capable of providing $\frac{24}{7}$ service - through the night, in complete darkness, and with no need for a caffeine or bathroom break.

But for reasons ranging from unions to costs, not all terminals are jumping straight in to benefit from this. In fact, of all the terminals in the world, only 3% are either semi or fully automated [11].

Crowdsourcing is a potential game changer for the industry. It will make the sector more competitive, and major trucking companies could be at a risk of losing \$310 billion of operating profits to players enrolled on crowdsourced platforms.

Crowdsourcing platforms – the 'Uber' of logistics – can be a game changer. By helping smaller firms raise utilization levels, they will make the industry more competitive, and bring societal benefits such as logistical cost reductions for customers of \$800 billion. They could also reduce CO₂ emissions by 3.6 billion tonnes, while generating additional income for consumers who decide to use their personal vehicles to

benefits. These include lower carbon emissions, less traffic congestion, lives saved through reduction in accidents, increase in cross-border trade as a result of platforms simplifying trade, and discounts to customers on account of increased utilization levels. Digital alone has the opportunity to reduce emissions from logistics by as much as 10 to 12% by 2025. We estimate the total benefits to customers and society to add up to approximately \$2.4 trillion coming primarily from three initiatives: crowdsourcing, digitally enhanced cross-border platforms, and shared warehouse agreements.

Conclusions and perspectives of further research. Digital platforms will become increasingly important in the logistics industry, allowing small companies to have a global reach and compete with the sector's established giants. Over the next few years, the race to build a dominant global platform will transform the customer's experience of logistics and will be the central issue in determining which enterprises will be the winners and losers in a truly digital logistics industry. The time and complexity required for these initiatives to reach scale across the market vary significantly.

Uberization is one of the digital tools that have proven their worth. Efficiency primarily in the transport sector. It provides solutions for sharing vehicles and providing intelligent mobility of freight.

We have identified certain underlying requirements that are the building blocks for the digital transformation of the logistics industry. Two of the most important 'no-regret' capabilities are: companies should improve their collection of data from all along their value chain; and enterprises should ensure they have the capability to analyse big data streams to derive insights that improve operational efficiency and enable the launch of new services, such as last-mile delivery.

Digital logistics wins over traditional logistics in various aspects. Digital logistics bases all strategies and planning on tangible data and metrics. With big data innovations, forecasting future activities and performing tangible improvements becomes much easier.

Digital logistics uses enterprise logistics platforms that facilitate collaboration between partners and competitors, as well as connecting all components of the transportation process. Now supply chains are connected with warehouses, retail, and end clients.

Logistics industry becomes more flexible and safer. When all vehicles are monitored via the same systems, each package is labeled and controlled, there is no chance of a parcel getting lost. Also, it prevents miscommunication between logistics services providers, saving resources (both economical and environmental benefits) and increasing the speed of the process.

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