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VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

FACULTY OF BUSINESS MANAGEMENT

DEPARTMENT OF FINANCIAL ENGINEERING

Neda Ingaunytė

IDENTIFICATION AND RISK ASSESSMENT OF DIGITAL SOLUTIONS FOR FORWARDING COMPANY

Master's degree Thesis

Financial Engineering study programme, state code 6211LX060

Financial Technologies (FinTech) specialisation

Finance study field

Vilnius, 2023

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OBJECTIVES FOR MASTER THESIS

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Tasks for the Master's Final Thesis:
1. Based on theoretical literature analysis, identify the main processes of forwarding companies, digital solutions for their optimisation and risks of implementing such solutions.
2. Based on the methodological scheme, present the methods used for risk assessment after implementation of identified digital solutions for a forwarding company.
3. To conduct a survey to identify and analyse the risks of digital solutions for forwarding companies.
4. To conduct a case study for a selected forwarding company to implement and assess the risks of digital solutions.

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Annotation

The research underlines the transformative potential of digital solutions in supply chain organisations, highlighting their key role in improving process efficiency and companies` competitiveness. The role of a forwarding company is important within the overall supply chain as it is responsible for managing the flow of information. However, as a part of the supply chain network, the forwarding company faces many general supply chain challenges, such as fragmentation, lack of visibility, under utilised resources and costly manual processes. By providing real-time data-driven solutions for freight transport, financial technology (FinTech) has the potential to improve the global competitiveness of the trade and logistics industry. Therefore, the term digital solutions is used in this research as the main term for both digital and FinTech solutions. This research aims to identify and assess the risks of digital solutions for forwarding companies to optimise their processes. A comprehensive analysis reveals the most important digital solutions and associated risks. The survey results of forwarding companies indicate an ongoing implementation of digital solutions, with invoice automation leading the way. A case study using the AHP method identifies a "document flow and management system" as a promising solution, demonstrating significant time and cost savings. Risks analysis based on the results of respondents` responses and a case study of a selected forwarding company shows that "employee resistance to digital technology adoption in logistics" risk has the highest probability and impact score and must be considered when implementing digital solutions. Future research directions include exploring emerging digital and FinTech solutions, analysing the associated benefits and risks, conducting longitudinal studies, and performing comprehensive cost-benefit analyses for implementation in forwarding companies.

Keywords: Digital solutions, supply chain, forwarding company, risk identification, risk assessment

Antrosios pakopos studijų **Finansų inžinerijos** programos magistro baigiamasis darbas	
Pavadinimas	**Skaitmeninių sprendimų ekspedicinėje įmonėje identifikavimas ir rizikos vertinimas**
Autorius	**Neda Ingaunytė**
Vadovas	**Indrė Lapinskaitė**

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Anotacija

Tyrimas atskleidžia transformacinį skaitmeninių sprendimų potencialą tiekimo grandinės įmonėms, pabrėžiant jų esminį vaidmenį gerinant procesų efektyvumą ir didinant įmonių konkurencingumą. Ekspedicinės įmonės vaidmuo yra svarbus visoje tiekimo grandinėje, nes ji yra atsakinga už informacijos srauto valdymą. Kaip tiekimo grandinės tinklo dalis, ekspedicinė įmonė susiduria su daugeliu bendrų tiekimo grandinės problemų, tokių kaip duomenų susiskaldymas, bendro vaizdo matomumo trūkumas, nepakankamai išnaudojami ištekliai ir brangūs rankiniai procesai. Finansinės technologijos (FinTech), teikdamos realaus laiko duomenimis pagrįstus krovininio transporto sprendimus, gali padidinti pasaulinį prekybos ir logistikos pramonės konkurencingumą. Dėl šios priežasties, terminas "skaitmeniniai sprendimai" šiame tyrime vartojamas kaip pagrindinis terminas tiek skaitmeniniams, tiek FinTech sprendimams. Šio tyrimo tikslas – nustatyti ir įvertinti skaitmeninių sprendimų ekspedicinėje įmonėje rizikas, siekiant optimizuoti jų procesus. Išsami analizė atskleidžia pagrindinius skaitmeninius sprendimus ir susijusias rizikas. Apklausos rezultatai rodo, kad skaitmeniniai sprendimai nuolat diegiami, o pirmaujantis sprendimas yra sąskaitų faktūrų automatizavimas. Pasirinktos ekspedicinės įmonės tyrime, kuriame taikomas AHP metodas, „dokumentų mainų ir valdymo sistema" nustatyta kaip perspektyvus sprendimas, įrodantis, kad jos įdiegimas sutaupytų daug laiko ir išlaidų. Rizikos vertinimas, pagrįstas ekspedicinių įmonių respondentų atsakymų rezultatais ir pasirinktos ekspedicinės įmonės atvejo analize, atskleidžia, kad „darbuotojo pasipriešinimo skaitmeninių technologijų diegimui logistikoje" rizika turi didžiausią tikimybės ir poveikio balą, ir į ją būtina atsižvelgti diegiant skaitmeninius sprendimus. Ateities tyrimų kryptys apima naujų skaitmeninių ir „FinTech" sprendimų tyrinėjimą, susijusių naudos ir rizikos analizę, longitudinių tyrimų atlikimą ir išsamių kaštų ir naudos analizių, skirtų diegimui ekspedicinėse įmonėse, atlikimą.

Prasminiai žodžiai: Skaitmeniniai sprendimai, tiekimo grandinė, ekspedicinė įmonė, rizikos identifikavimas, rizikos vertinimas

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2023-12-21
(Date)

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

INTRODUCTION

Today, digital transformation is a major trend in the business world. The way we do business and almost every aspect of our globalised economy has been transformed by digital solutions. They are designed to facilitate business processes, reduce service and administrative costs, reduce environmental impact and contribute to more efficient work. One of the elements of rapid digitalisation is financial technology (FinTech). FinTech is facilitating the rapid growth of financial services through increased investment in key financial sectors such as banking, e-commerce, insurance, and personal finance management, and is making a significant contribution to the global economy (Kaur et al., 2021). According to Kenyon's (2021) analysis of four years of data, the FinTech Barometer shows that the number of organisations planning to implement a digital transformation strategy within 6 to 11 months has more than doubled from 17 % in 2019 to 35 % in 2021.

Many industries, such as logistics and supply chains, are increasingly affected by digitalisation. Academics have extensively studied and debated the potential of this phenomenon to transform societies, economies, and organisations (Herold et al., 2021). To remain competitive and grow, logistics and supply chain companies need to improve their value proposition to shippers and their customers. This includes improving operational efficiency by addressing industry challenges such as fragmentation, lack of visibility, underutilised resources, costly manual processes, and often, outdated customer interfaces. Additionally, it aims to provide a better customer experience through innovative, faster and greener logistics solutions (Cichosz et al., 2020). Therefore, FinTech is rapidly emerging and attracting considerable attention due to its potential to revolutionise supply chain networks in various industries. As the supply chain consists of different parties, supply chain finance has to deal with different supply chain members and cross-border transactions, and problems such as information asymmetry, long processing time, and difficult coordination among members arise (Kao et al., 2022). The study by Upadhyay et al. (2021) found that invoice processing, a key back-office task, requires a significant amount of manual effort. The manual handling of tasks such as capturing invoice data, reconciliation and approval leads to various challenges that ultimately result in a time-consuming process. The article suggests that the faster an organisation adapts to such an automated system, the easier it will be to focus on growing the business.

The role of a forwarding company is important within the overall supply chain as it is responsible for managing the flow of information. However, as a part of the supply chain network, the forwarding company faces many of the same issues. Although most companies

are innovating and using digital solutions, such as entering freight and customers into the system digitally, all freight documents are still submitted on paper and invoices and receipts are often incorrect, missing or not reported due to irregularities throughout the supply chain (Casanova et al., 2022). However, it has also been suggested that additional risks may arise during the implementation of digital solutions. Kern (2021) found that as improvements are made, cybersecurity risks become a major challenge for data-driven lifecycles. The increased level of vulnerability due to seamless digital integration is significantly higher compared to less connected traditional systems.

Relevance of the topic. FinTech is gaining significant attention and is emerging due to its potential to revolutionise supply chain networks in various industries (Wamba et al., 2020). This is because customers are increasingly looking for transparency and instant access to data across the supply chain. By providing real-time data-based solutions for freight transport, FinTech has the potential to enhance the global competitiveness of the trade and logistics industry. Therefore, the term digital solutions will be used in this thesis as the main term for both digital and FinTech solutions. As there are a large number of digital solutions, choosing a digital solution may be a very complex problem for a forwarding company. Digital solutions such as blockchain may help to promote security and service levels in the supply chain and reduce maintenance costs (Tipping & Kauschke, 2016), another digital solution - invoice automation – may reduce the risk of errors (Upadhyay et al., 2021). When implementing digital solutions, great attention should be paid to the risks that may arise. Forwarding companies in a supply chain network that want to ensure the competitive movement of goods must not only identify their main problems and be able to implement digital solutions that ensure the smooth movement of data and eliminate the problems of information fragmentation that occur throughout the supply chain but also assess the risks that arise and be prepared to manage them.

Problem. How to identify and assess the risks of digital solutions for forwarding company?

Research object: Risks of digital solutions for a forwarding company

Goal. To identify and assess the risks of digital solutions for a forwarding company

Objectives:

1. Based on theoretical literature analysis, identify the main processes of forwarding companies, digital solutions for their optimisation and risks of implementing such solutions.

2. Based on the methodological scheme, present the methods used for risk assessment after implementation of identified digital solutions for a forwarding company.

3. To conduct a survey to identify and analyse the risks of digital solutions for forwarding companies.
4. To conduct a case study for a selected forwarding company to implement and assess the risks of digital solutions.

Methods: Theoretical aspects regarding the influence of digital solutions and risks during their implementation in logistics and supply chain were analyzed through comparative and systematic logical analysis of scientific literature. A brainstorming session with experts of forwarding company was conducted to identify digital solutions and risks during their implementation. A quantitative survey of forwarding companies, application of multi-criteria decision analysis AHP method, risks register and risks map were used to evaluate the identified digital solutions and risks. Qualitative survey, unstructured interview and risks maps were used to identify the priority risks and rank digital solutions for a forwarding company.

Limitations: The brainstorming method is limited to the insights of experts as the content of the solution depends on the creativity of the participants, the competence of the participants determines the content of the solution.

Quantitative survey: to conclude all Lithuanian forwarding companies, so that the result obtained for the confidence level of 95 % would be within +/- 10 per cent error, the sample size must be 97 respondents. To select the respondents for this survey, it was decided to use non-probability sampling. It should be remembered that non-probability samples do not guarantee representativeness, the conclusions should not be generalised to the whole population, and the accuracy of the sample cannot be objectively estimated.

The AHP method is limited to 12 digital solutions that were excluded after theoretical analysis, brainstorming session and survey of forwarding companies and is mainly based on experts` opinions, as the experts are employees of the selected forwarding company and the results may be more related to the company`s situation, the results may be slightly different when analysing other forwarding companies.

The results of the qualitative survey and unstructured interview on the identification of digital solutions and the assessment of risks, which are limited to 6 excluded risks, are based on the answers and opinions of the experts of the selected forwarding company and the results could be different if other forwarding companies were analysed.

1. THEORETICAL ASPECTS OF DIGITAL SOLUTIONS AND RISKS IN THE FORWARDING COMPANY

1.1. Main processes of a forwarding company and possibilities of their optimisation

Before analysing the processes of the forwarding company, it is beneficial to understand the whole supply chain process and the forwarding company`s place in it. The whole supply chain process is complicated, involving the movement of material, financial and information flow. The main task of supply chain management is to optimise and improve production processes. A supply chain is seen rather than many different operations: supply, production distributions and both the supplier and the consumer are included in the systems planning process (Mikuckienė & Šateikienė, 2022).

New approaches and technologies are necessary to connect the participants in modern supply chains and facilitate a transparent yet secure exchange of materials, finances and information, as stated by Guerpinar et al. (2020). One of the hurdles to overcome is that the participants of multi-party supply chains are often inhibited from providing relevant information. According to Saberi et al. (2018), the entire procedure might encounter challenges such as inadequate coordination with suppliers, absence of responsibility, and the inability to monitor the activities of partners in real time. Current supply chains rely heavily on centralised and sometimes disparate and stand-alone information management systems within supply chain organisations.

Summarising the supply chain participants and processes, a supply chain scheme based on Guerpinar et al. (2020), Saberi et al. (2018), and Farooque et al., (2019) was constructed and illustrated (see Fig. 1).
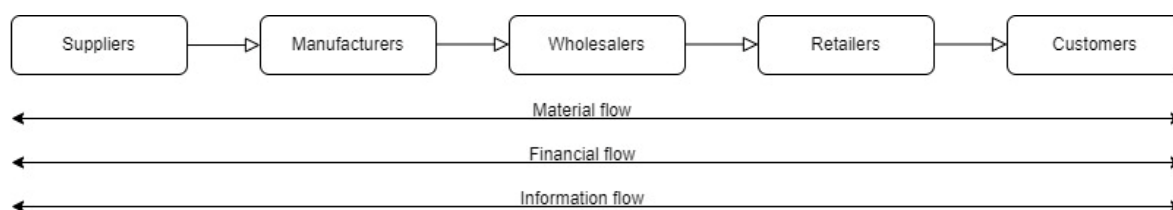
Fig. 1. Scheme for the general supply chain

Source: compiled by the author based on Guerpinar et al. (2020), Saberi et al. (2018), Farooque et al. (2019)

Usually, the supply chain consists of 5 main participants: suppliers, manufacturers, wholesalers, retailers, and customers. Between each participant, such processes as material,

financial, and information flows emerge, and the forwarding company is responsible for the accurate movement of the information flow.

Forwarding companies emerged when carriers delegated certain responsibilities to transport companies, who oversee vehicle fleets, reducing transportation costs. Meanwhile, freight forwarders handle the logistical aspects of transporting cargo to ensure safe and efficient delivery to its intended destination (Kontautaitė et al., 2013).

Freight forwarding in the Civil Code of the Republic of Lithuania (2000) is defined as the organisation of cargo transportation and related actions described in the forwarding contract. The forwarding company agrees to provide or coordinate services related to cargo transportation for the customer (CC Art. 6.824 part 3).

Forwarding activities are defined as the performance of additional actions related to the transportation of goods. According to Labanauskas (2012), it is such operations as:

1. Delivery of the cargo from the sender`s warehouse to the loading location and delivery from the unloading location to the recipient`s warehouse.
2. Acceptance of the cargo in the warehouse of the sender or delivery of the goods to the receiver`s warehouse.
3. Handling of cargo transportation and insurance documents, customs formalities, and storage of cargo in a warehouse belonging to the forwarder.
4. Other services related to the transportation of cargo.

The role of a forwarding company holds a significant place within the entire supply chain as it is accountable for managing the movement of data flow. From a procedural standpoint, the activities of a forwarding company can be illustrated by a structured scheme (see Fig. 2).
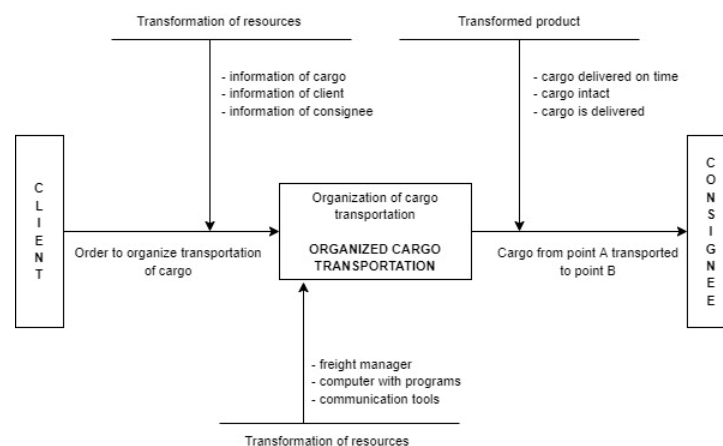
Fig. 2. The process of cargo transport by a forwarding company

Source: Kontautaitė & Zinkevičiūtė (2013)

15

A company receives an order from a customer to arrange a shipment, providing resources such as information on cargo, customer, and consignee. These resources go through the transformation process, which is related to the organization of cargo transportation, and the customer receives a fully prepared cargo transportation from such a company. When the consignee receives the cargo on time, intact and the customer remains satisfied with the quality of service, added value is created. Resources such as freight managers, computers with computer programs and communication tools are needed for this process to function properly.

A forwarding company becomes necessary when the company needs the most optimal, non-traditional option for cargo transportation, which can be managed in response to changes, or the company seeks to save time. According to Palšaitis (2010), if the forwarding company operates in the logistics process, it must be able to manage large flows of information related to cargo storage, packaging, product descriptions and delivery at the right time. Transferring the logistics process to freight forwarding results in the following sequence:

1. Acceptance of the order from the customer.
2. Search for a vehicle.
3. Confirmation of order.
4. Preparation of documents.
5. Transportation.
6. Storage (if necessary).
7. Delivery to the recipient.
8. Payment for services.

When the cargo crosses state borders, the freight forwarder must prepare the necessary documents for the customs authorities according to the information provided by the customer. Given a large volume of cargo and the accompanying flow of documents, most of which are written on paper, the freight forwarder needs to monitor and control the entire route of its movement, including the crossing of customs posts.

1.2. Digitalisation as a tool to optimise forwarding companies` processes

The emergence of information technology has paved the way for the fourth industrial revolution (Industry 4.0), which has unlocked various technological opportunities such as automation, the Internet of Things, robotics, cloud computing, artificial intelligence, digitisation, and other advancements (Berger, 2016). Innovation and widespread digitalisation have rapidly expanded and had a diverse impact on various sectors, setting Industry 4.0 apart (Schwab, 2017). The manufacturing industry including the supply chain is witnessing the emergence of groundbreaking innovations that allow for the processing of massive amounts of

real-time data. These innovations are set to revolutionise service and manufacturing processes, as well as the dynamics between supply chain participants. With the rapid pace of digitalisation in the industry, traditional methods and business models that were once deemed the most suitable are experiencing a significant impact (Barrett et al., 2015). Most companies in the manufacturing and transport sectors are investing in digitalisation opportunities that have the potential to transform societies, economies, and organisations.

Operations such as the transportation of goods, storage, and distribution, considering the changes in the local and global markets, had to transform, caused of recent technologies and innovations. The digitalisation of forwarding companies has exciting potential to contribute to competitiveness. At the heart of any digitisation initiatives in forwarding companies is the need to have appropriate information and communication technologies (ICT) for data collection, storage, and processing, as well as strong digital communication within and between organisations (Wang & Sarkis, 2021).

As analysed in the 1.1. section, one of the main operations of the forwarding company is handling cargo transportation and insurance documents, customs formalities, and the transfer of accurate and correct data. According to Jurgis Adomavičius, the transport and logistics sector (including forwarding companies) is the most burdened with bureaucratic procedures, which hinders the development and competitiveness of this sector. Business processes carried out in paper format lead to higher administrative costs, and disturb employees` time, which hinders processes on an organisational scale – delays in work, erroneous data and information due to human factor errors.

The lowest level of digitisation is currently in road transport, with only 2 % of companies in the sector that have digitized their resources, including employees` digital competencies and the use of technology in product development (INFOBALT, 2019). At the Transport Innovation Forum "Transport and Logistics 2050" held in Vilnius in 2021, in the session "Moving towards digital logistics", Romas Austinskas, president of the Lithuanian national road transport association "Linava", said that the digitalisation of the documents of forwarding companies would help to reduce queues at the border and customs sections, as well positively affect the environment. Jurgis Adomavičius, Chairman of the Board of the Transport Innovation Association, said that one of the main problems when it comes to cargo transportation and insurance documents is that the data provided on paper, which usually consists of a set of 7 sheets with copies, is manually reprinted by the employee. Such a procedure is performed six times per route – sic and a half working house of one person (Transporto Inovacijų Forumas: Transportas ir Logistika 2050, 2021).

The slow development of digitalisation processes not only hinders the development of forwarding companies and the possibility of reducing administrative costs, but also negatively affects the competitiveness of forwarding companies. Developing technologies have affected not only companies but also the attitudes and wishes of society – modern customers want to know how and where cargo moves, and to receive clear and structured information about options and prices for the transportation of goods. The relationship of trust between companies and customers will increasingly depend on the accurate dissemination of information, which can be ensured by forwarding companies by digitalising their documents (Sullivan & Kern, 2021).

It is said that a company that has digitalised one of its processes can change the areas of activity of the entire company (Olanrewaju & Willmott, 2013). When a forwarding company digitalises manual tasks, it improves decision-making, opens the way for innovation and product development, allows customers to share their insights, and reacts in real time, thereby increasing the value of companies (see Fig. 3).
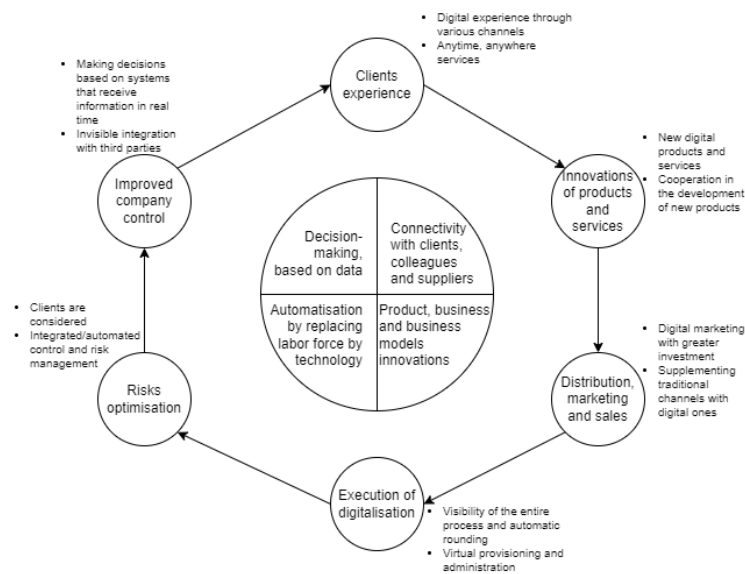
Fig. 3. Digitalisation`s impact on modern business processes
Source: Olanrewaju & Willmott (2013)

It can be said that if forwarding companies abandon the paper form of documents, not only administrative costs would be saved, but it would enable the company`s competitiveness to increase. Digitalising manual tasks would save work time, and improve overall company performance: optimal decision-making based on customer insights and real-time tracking. However, to bring the full picture of digital solutions for forwarding companies, it is necessary to analyse digital solutions that could affect other processes of forwarding companies.

A summary of the main digital solutions categories for a forwarding company is presented in Table 1.

Table 1. Summary of the main categories of digital solutions for a forwarding company

Authors	Digital solution	Definition	Effect on forwarding company
(Shi et al., 2016), (Su et al., 2020)	Identification (RFID system)	Radio Frequency Identification technology designed for wireless communication, has been used for more than two decades to track and manage products and inventory.	This system improves the performance of logistics operations; and provides data about the product even while it is moving; by marking the movement of cargo and goods in warehouses in real-time, the number of possible errors is reduced.
(Seyedan & Mafakheri, 2020)	Systems based on Big Data	It is a concept that emphasises that the volume of data is so large that it requires new processing and storage methods and systems.	The proper management of such data makes it possible for the forwarding company to make more accurate decisions, predict possible events and model situations that may have specific consequences for all participants in the supply chain.
(Somapa et al., 2018), (Marston et al., 2011), (Muchahari & Sinha, 2013)	Cloud computing	Cloud technology offers technology based on an elastic usage model, where the user (organisation) pays only for the information resources they need.	For forwarding companies, it allows them to store, manage, and process data using a network of remote servers on the Internet and allows third parties to manage IT systems on behalf of their clients.

Source: compiled by the author based on Shi et al. (2016), Su et al. (2020), Seyedan & Mafakheri (2020), Somapa et al. (2018), Marston et al. (2011), Muchahari & Sinha (2013)

According to Table 1, digital solutions significantly impact the operations of forwarding companies:

5G, fifth-generation mobile telecommunications technology. It will provide up to twenty times the speed of 4G (Gov.UK, 2020). This technology will be the basis for other advanced innovations such as identification: RFID systems, which became a key technology in the logistics and management industry due to its distinctive features such as the low cost of RFID tags, and the easiness of the RIFD tags` deployment and integration within the items to be tracked and location tracking (Álvarez López et al., 2018).

Internet of Things – a global network of things that have connections to controls, sensors, and software and can collect, exchange and process various information, the operation of which is based on the mutual activity of current, existing, or completely newly developed communication and information technologies (Hopkins & Hawking, 2018).

Big data-based systems. It is a concept that emphasizes that the volume of data is so large that it requires new processing and storage methods and systems. Online cloud

technologies are being developed to manage them. Big data usually includes data sets with sizes beyond the ability of commonly used software tools to capture, curate, manage, and process the data within a reasonable time (Mockus, 2014). The proper management of such data makes it possible to make more accurate decisions, predict events and model situations that may have certain consequences for all participants in the supply chain.

Cloud computing. It enables third parties to manage IT systems on behalf of clients, especially for forwarding companies allowing them to store, manage, and process data using a network of remote servers on the Internet. Cloud technology offers technology based on an elastic usage model, where the user (organisation) pays only for the information resources they need. Such flexibility and convenience lower barriers to market entry for SMEs (Marston et al., 2011).

Building a shared ecosystem. Typically, internet-based platforms function as intermediaries to match demand and supply, but as digitalization expands, they have begun to evolve. The digital community platform, the ecosystem, enables organizations that develop businesses together to share information and simplify the process of daily operations between cargo transportation.

In conclusion, digitalisation technologies have a significant impact on the operations of forwarding companies. The main technologies used are dedicated to the accurate collection, storage, and processing of data: identification (RFID system) and location tracking systems. A deal of attention is also being paid to information-sharing platforms based on the one-stop-shop principle. They create conditions for reducing administrative costs, help to avoid errors in entering the same data into the system several times and increase trade flows.

1.3. Overview of financial technologies as part of digital solutions

Digital solutions and innovative technologies offer enormous potential to overcome massive development challenges and can contribute to achieving the goal of universal access to all business services (Moşteanu, 2019). As a new term in the financial industry, FinTech has become a popular term that describes novel technologies adopted by financial service institutions (Gai et al., 2018). It covers different processes, techniques, and technologies, from cyber security to fast financial services deliveries. Financial technologies are recognized as one of the most important innovations not only in the financial industry but are emerging rapidly due to favourable regulation, sharing economy and, most importantly, constantly improving information technologies (Lee & Shin, 2018).

According to Arner et al. (2016), the FinTech sector is made up of various products, users, and service groups:

- Finance and investing. Financial technology companies in this category create innovative solutions that help manage finances more conveniently and quickly, invest, manage investments, and therefore monitor, and follow the latest market developments.

- Financial operations and risk management. The area which attracts the most investments, which especially became evident after the 2008 crisis, when the focus became relevant to risk regulation and improvement.

- Payments and infrastructure. This is one of the main specifications of FinTech. The payment infrastructure is built on secure and fast transactions that can be executed globally in different currencies, replacing traditional payment methods.

- Data protection. FinTech solutions for data protection are digital and in control of large information flows, which requires special attention due to emerging challenges to ensure security and customer trust.

FinTech is becoming one of the most important innovations in the financial sector that is changing the previously mentioned groups and sub-sectors, reducing costs, and increasing the quality of provided financial services. FinTech business models are developed in such a way that they are accessible to many service users, considering not only the price but also the adaptability of the service. FinTech companies are divided into three main categories (see Fig. 4).
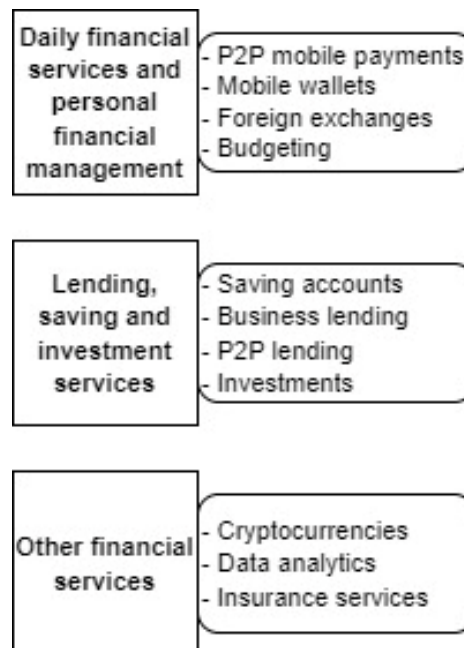
Fig. 4. Classification of FinTech companies

Source: Mavlutova et al. (2021)

Examining the benefits of financial technology, FinTech areas such as payments, financing and lending, insurance, and crowdfunding are extremely encouraging economic growth. The financial technology sector creates new and more efficient jobs generating higher wages, productivity, people`s economic well-being and greater turnover (Leong & Sung, 2018). Mobile payments, new lending, saving, and insurance platforms have an impact on the economy and allow the user to control income and expenses more effectively, while a larger number of users in the financial technology company ensures new and increasing investments. According to K. Leong & A. Sung (2018), this can be explained in such a way that the FinTech service provider can provide certain services to its users and the substantial number of them as well as prices of certain services would allow the accumulation of capital, which would allow further development. More capital allows improvement of infrastructure and promotes the emergence of new talent, and experts in the field, which leads to the maximization of income, costs are minimized, and added value is created not only for the bank but also for the national economy (Vives, 2017). Regardless of whether it is a financial technology enterprise, an insurance company or another institution, the development of organizations and people`s financial involvement and interest are evaluated as a positive thing that helps both the economy's growth and people`s well-being.

In the latest Ernst & Young's (2019) report on the global FinTech adoption rate of FinTech solutions among SMEs is poised to rise: 22 % of non-adopters already use FinTech services in three categories and by that measure, the global adoption rate could surge from 25 % to 64 %. According to the EY Global FinTech Adoption Index, these are the main reasons for using FinTech globally (see Fig. 5).
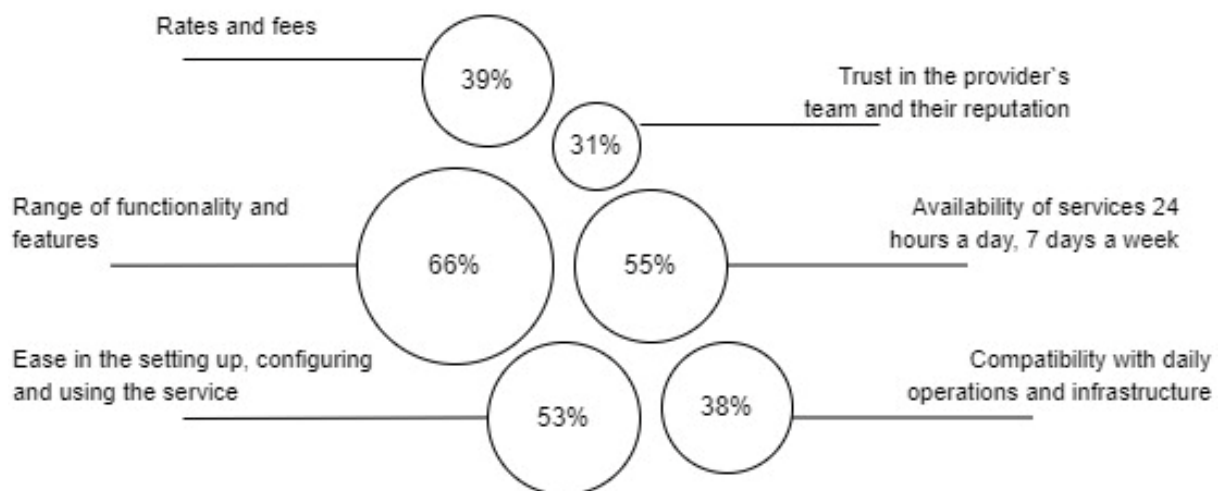
Fig. 5. Top reasons for using FinTech globally

Source: Ernst & Young (2019)

Across five markets that were a part of the research: China, USA, UK, South Africa and Mexico, enterprises choose financial technology solutions because they provide a good range of functionality and features, have services available all the time, and are easy to set up, configure and use.

FinTech applications can be classified into four major operational business processes (see Table 2).

Table 2. Relationship between FinTech and business value

FinTech categories:	How emerging technologies can create business value
Payments	From a business point of view, payment innovations should enhance sales, improve automation efficiency, and improve customer retention. Such technologies as ERP, CRM, RFID, Internet of Things, management of databases, distributed ledger and others could be used.
Advisory service	New developments in advisory service technologies could improve efficiency, enhance profits, or increase market share. Technologies such as ERP, CRM, RFID, Internet of Things, management of databases, distributed ledger, and others, could be used.
Financing	From a business point of view, the development of FinTech could improve the process of information sharing, lower transaction costs, enable new financing alternatives or support better financing decision-making. An RFID system could be considered as a FinTech solution that improves business models.
Compliance	Although compliance processes can reduce risks, enhance trust, and reduce transaction costs, they often do not directly add value to the business.

Source: Leong & Sung (2018), Senyo et al. (2022)

Businesses could use FinTech solutions to improve their processes in three main ways: payments, advisory services, and financing. Such innovations should enhance sales, improve automation efficiency, and customer retention, enhance profits or increase market share, improve the process of information sharing, cut transaction prices, and enable new financial solutions or support better financial decision-making.

To bring the whole picture of digital solutions for forwarding companies, after analysing processes of forwarding company and FinTech solutions categories, the term digital solutions in this work will be used as the main term for both digital and FinTech solutions that could be used to enhance the forwarding company`s sales, improve automation efficiency etc. However, it is important to identify which solutions would be worth implementing for the forwarding company regarding its current situation, technologies, innovations, and main problems. Further in this work, the leading digital solutions that could positively affect forwarding company`s processes and will be analysed in this paper are:

- Invoice automation - one of the leading solutions for forwarding companies and could cut costs in the supply chain (mainly by cutting administrative costs) and decrease the risk of error (Upadhyay et al., 2021).

- Cash flow stabilisation for logistics service providers – the solution allows the transfer of invoices to the client within 24 hours, and the client can track invoices and determine how often and how many of them are sold (Holland Fintech & Dinalog, 2017).

- Digitisation of the waybill, which is the main document for all transport and logistics sectors, could introduce a paperless process which minimises waste while improving returns in processes (Casado et al., 2021).

- Digital expense management software (provides online invoice approvals and workflows, processes company purchases, tracks approvals, and manages travel and entertainment expense reports) would allow the storage of receipts digitally and keep the forwarding company compliant with fiscal rulings (Arsan et al., 2009)

- Monitoring drivers' behaviour and adjusting insurance solutions would reduce accident costs and save on fuel (Soleymanian et al., 2019).

- Inventory financing solutions (a line of credit or short-term loan useful for businesses that must pay their suppliers in a shorter period than it takes them to sell their inventory to their customers) reduce financing risks (Chakuu et al., 2020).

- Blockchain solution for industry-wide supply chain visibility – would enhance efficiencies and improve the visibility of the supply chain (Kottler, 2018).

- Quick payments solution using an external financer solution would guarantee stable cash flow within the company (Ayub & Mehar, 2021).

In summary, after analysing the impact of FinTech on the optimisation of companies` processes, the term digital solution will be used in the following as a term that includes not only digital but also FinTech solutions. 8 digital solutions were excluded which can have a positive impact on the activities of forwarding companies, will be further analysed using different methods, which will be explained in the methodological part of this thesis.

1.4. Risks of digitisation processes in a forwarding company

As analysed in section 1.3., the use of digital technology in transport and logistics allows companies to ensure strategic competitive advantages. As a result, a forwarding company could cut administrative costs, decrease the risk of error etc. However, the

implementation of digital technologies is associated not only with positive effects but also with risks (Bekmurzaev et al., 2020).

Logistics companies encounter various types of risks and are susceptible to their impacts. According to the International Organisation for Standardisation (ISO), risk is defined as the influence of uncertainty on objectives. Consequently, the probability of occurrence and consequences of an event are considered when assessing risk. According to Kodym et al. (2020), the main type of risk is economic, technical / IT, social, environmental, and legal/political:

1. Economic risk. The adoption of automation, digitisation, and networking technology in logistics comes with high infrastructure, implementation, and maintenance costs, creating financial risks for companies. Choosing the right time and method of investment is crucial to avoid poor investment in immature or unnecessary technologies. There is also a risk of reluctance from certain customers to pay for new technologies, and the lack of expertise and resources to develop data-based business models. Increased transparency in the supply chain brings concerns about possible dependence on technology providers and vulnerability in negotiations with key data (Heckmann et al., 2015).

2. Technological and IT risk. The implementation of digital solutions involves technical risks arising from the increasing complexity of merging mechanical and IT systems in the supply chain. There is a great dependency on technology and software, posing risks of system failure and vulnerability to cyberattacks. Building unified standards and clarifying data ownership are crucial to guarantee data quality and control. Cloud computing is a central technology in logistics and supply chain, but it entails risks such as loss of control, unauthorized use, and incomplete data deletion if relying on CSP services, making building a private cloud solution a more secure approach but requiring higher investments (Whitmore et al., 2015).

3. Social risk. These risks include job loss, particularly for employees whose activities can be automated. There is also a risk for employees who cannot adapt to new ICT requirements and may not have the necessary IT skills. Training should be provided but attracting and retaining skilled IT experts may also be expensive. A risk of overload and strain from new demands on employees and the loss of social interaction due to increased automation. Internal resistance and an inadequate corporate culture can also impede organizational transformation, potentially leading to missed opportunities and relocation of manufacturing and services (Gajbhiye & Shrivastva, 2014).

4. Ecological risk. The production of new machinery and equipment required for digital solution implementation involves a large amount of raw material and energy consumption, potentially offsetting efficiency gains. Data transmission, blockchain, and decentralised systems also require high computing power and energy consumption. Implementation of new technology may result in increased waste and emissions, particularly when replacing existing machinery that requires disposal. Customisation can save time, material, and energy, but it may also increase waste and recycling difficulty. A thoughtful implementation plan is key to ensuring that digital solution brings environmental benefits rather than risks (Sarkis & Zhu, 2018).

5. Legal / Political risk. Politicians can either support or create obstacles to the wider deployment of new technologies through legislation or political inactivity. Appropriate infrastructure is necessary to support and influence the implementation of digitalisation and networking in the economy. Legal issues, such as data protection, liability, labor law, intellectual property, and jurisdiction, need to be clarified to ensure the success whole industry. The lack of standards creates a risk that hampers cross-border cooperation. Questions remain unresolved, such as jurisdiction for online transactions or the role of "smart contracts" (Franco & Almeida, 2011).

Several authors and researchers have highlighted the importance of implementing digital solutions in logistics to improve efficiency and competitiveness. Digital solutions such as the Internet of Things, blockchain and artificial intelligence, have the potential to revolutionize the logistics industry. However, there are also risks associated with the implementation of these solutions. According to a study by Wang et al. (2021), the implementation of digital solutions in logistics can lead to increased cyber-attacks and data breaches. The study highlights the need for logistics companies to invest in secure and resilient digital infrastructure to mitigate these risks. Similarly, a study by Tavana et al. (2022), points out that the implementation of digital solutions in logistics can increase the complexity of supply chain operations. The study suggests that companies should carefully consider the costs and benefits of digital solutions to avoid adding unnecessary complexity to their operations. Therefore, it is important for logistics companies to carefully evaluate the risks and benefits of implementing digital solutions and to develop strategies to mitigate these risks.

1.4.1. Theoretical analysis of risk identification

The risk identification process is one of the most important to manage them because whether all possible types of risks are identified at this stage depends on the overall success of its management and whether the organisation will achieve its goals (Martinkutė-Kaulienė & Stasytytė, 2018). The organisation should apply such risk identification methods and tools that meet its goals and capabilities, as well as which are adequate in the case of possible risks. At this stage, it is important to have up-to-date information and appropriately qualified staff.

According to Martinkutė-Kaulienė & Stasytytė (2018), there are various methods used for risk identification:

- Facilitated workshops – bring together employees of various levels who have certain knowledge and experience that allow them to identify possible events related to the company`s strategic or operational goals.

- Brainstorming – it is a creative approach to risk identification similar to a facilitated workshop approach.

- Delphi technique – in this method, information about risky events is obtained from experts. Experts participate anonymously, thus avoiding bias and influencing other experts.

- Questionnaires and surveys – the questionnaire aims to find out the opinion of the respondents about the internal and external factors that can cause certain events.

- Interviewing – interviews are usually conducted by one or two people. The purpose of the interview is to find out the interviewee`s attitude and knowledge about real events in the past and possible events in the future.

- SWOT analysis – it is used to find out the organisation`s strengths, weaknesses, opportunities, and threats and to identify possible risks based on them.

- Hazard and Operability Studies – it is a complex method characterized by elements of brainstorming and process analysis.

- Event inventories – there are detailed lists of potential events common to similar companies operating in the same area, or lists of risks for a certain process or activity.

After a literature analysis of the implementation of digital solutions in logistics and brainstorming sessions with forwarding company`s experts, a few risks were revealed:

- The uncertainty of the future - considering uncertain future developments in digitalisation within the freight transport sector, it is crucial to identify effective

systems and models that enable all participants in the supply chain to operate efficiently (Pernestål et al., 2020), (Plotnikov et al., 2019).

- Issues with synchronizing participants in the digital supply chain - as all the supply chain parties are usually large, competitive companies, it may be a very challenging problem to reach a consensus between different companies (Cole et al., 2019).

- Employee resistance to digital technology adoption in logistics - employees are used to their work routine and a change of it may lead to a negative attitude towards newly implemented digitalised solutions. Therefore, it is necessary to conduct training, which would lead to a better understanding of such change in the company`s processes (Raza et al., 2023)

- Lack of a necessary number of specialists - due to the high speed of changes in logistics digitalisation, new specialists who understand how to use Due to high speed of changes in logistics during the digitalisation, new specialists who understand how to use (Bickauske et al., 2020).

- Unbalanced logistics system development in the digital economy transition - if there is a significant improvement in one element of the system in terms of speed and efficiency while all other elements remain unchanged, the implementation of the new system may have negative consequences (Barmuta et al., 2020).

- Blockchain crash or other system crash - digital technology enhances logistics operations by providing transparent and available information, but its immutability poses potential challenges. Once a transaction is confirmed, any errors or fraudulent activities may be difficult to rectify due to the permanent and reliable nature of digital records (Bekmurzaev et al., 2020).

To sum up, risk identification is one of the most important parts of the risk assessment and leads to the overall success of risk assessment. When identifying risks, it is necessary to have up-to-date information, understand the source of the risks and involve qualified employees to share the practical view of risks identification.

1.4.2. Theoretical analysis of risk assessment

The resulting risks can be assessed in several ways. Attention should be paid to what to include in the risk assessment process. Sometimes the risk analysis is performed and evaluated by the board of directors, and this process looks like a top-down risk assessment. Risk can also be assessed by involving individual employees and subordinate managers. This bottom-up risk assessment method is also valuable. For many organisations, a combination of

both risk assessment methods is suitable, their advantages and disadvantages are presented in Table 3.

Table 3. Advantages and disadvantages of top-down and bottom-up risk assessment methods

Top-down risk assessment method	
Advantages	Disadvantages
Organisation-wide risks are likely to be assessed – the highest-level risks will affect the entire business	Top-level managers and directors pay more attention to the external risks of the organisation.
The most important types of strategic organisational risk can be seen quickly; there will be enough of them to control	Managers may have limited knowledge of internal operational risks or the interdependence of types of risk in a business
The awareness of the importance of risk management by top managers is emphasized, which leads to the recognition and implementation of risk management activities at all levels of the organisation	Attitudes towards risk can be superficial because senior managers believe they can manage the crisis
Since risk assessment starts from the top, a single risk assessment methodology is usually used throughout the organization	New types of risks arising from the day-to-day activities of the organisation may not be fully identified.
Bottom-up risk assessment method	
Advantages	Disadvantages
High engagement is achieved at all levels of the organisation	Little attention will be paid to external strategic risks
An organisational structure can be applied when discussing the impact of operational risk	It takes more time and can be demotivating if the overall outcome of the organisation is not achieved quickly
Lower-level staff are more aware of internal risks within their department and their causes, which may be overlooked by higher-level managers	The process can be fragmented and overly detailed, resulting in a very narrow view of risk
The methodology may vary depending on local regulations and culture; it is good for international organisation	New types of risk arising from day-to-day business operations may not be identified by lower-level staff

Source: compiled by the author based on Martinkutė-Kaulienė & Stasytytė (2018), Hopkins (2018)

After risk assessment, risk maps are usually used to help identify risk responses, but while creating risk maps it is also important to consider aspects such as confidentiality, concepts, time, direction, and correlation (Martinkutė-Kaulienė & Stasytytė, 2018):

- Confidentiality - some of the forwarding companies and employees may wish to assess the impact and probability of risks confidentially and not answer questionnaire questions.

- Concepts - before proceeding with the survey it is important to clarify all concepts of the survey as what is important to one department, may not be important to another.

- Time – risk must be assessed only when implementing the digital solutions covered in the survey.

- Direction – the direction of risk will not be indicated.

- Correlation – risk maps do not include correlation between risks and ignoring it can lead to ineffective risk management.

All these aspects will further in this work cause limitations for the evaluation of risks, their probability and their impact on the forwarding companies.

In conclusion, the implementation of new technologies can bring potential risks to an organisation as well as benefits. Poor implementation can result in significant economic risk, particularly where the initial investment is high. It is important for forwarding companies to carefully consider which technologies are appropriate for their needs and when to implement them, and to identify any technical, social, environmental or legal risks associated with them. Uncertainty, challenges in aligning participants` efforts, employee resistance, skills shortages, imbalances in development, and potential blockchain failures are among the risks associated with adopting digital solutions. These risks are interrelated and overlapping, and risk management (including risk assessment) is necessary to avoid the threats of poor implementation. By identifying and mitigating these risks, the opportunities that digitalisation offers to businesses and consumers can be maximised.

1.5. Overview of previous research on risks and digital solutions in logistics companies

Digital solutions implementation in logistics has been a very recent research topic for many authors. Casado et al. (2021) have conducted a case study on the implications of the impact of digitalisation on the logistics sector: the CMR was taken as the object of study. According to the completed study, the benefits of e-CMR outweigh the drawbacks, despite some employers` reluctance to adopt it and the efforts made by authorities in various countries to implement new policies and procedures. Kottler (2018) has explored the potential of established blockchains in addressing supply chain challenges such as real-time monitoring, transaction transparency, and data authenticity. While it remains uncertain whether blockchain technology offers significant advantages in quality monitoring compared to existing technologies, it does provide full transparency and authenticity in transaction records. Furthermore, Arsan et al. (2009) in their research highlighted that automated expense control software is being increasingly adopted by companies to establish an almost paperless system for approval routing and expense management. These expense automation systems offer a range of features, including online invoice approvals and workflow, handling company purchases, monitoring approvals, and managing travel and entertainment expense reports. While such solution implementation provides clear benefits, it still needs testing and further development

as most of the organisations are becoming more and more multinational and the complexity of such organisations leads to the need for such digital solutions to be not software, but web-based.

However, new technologies and digital solutions can bring large benefits, but they also lead to drawbacks. Barmuta et al. (2020) did research and identified several challenges that hinder companies from digitising their business processes, such as employees' resistance to change lack of skills to navigate challenging conditions, and the need to train personnel in new knowledge and skills required for digital implementation. Bekmurzaev et al. (2020) believed that the issues of risk analysis in logistics in the context of digitalisation are poorly understood and it is necessary to anticipate risks and if possible, avoid or minimise them. The research included such risks as uncertainty about the future, shortage of skilled specialists, and imbalance in the development of various elements of the logistics system during the transition to the digital economy. Additionally, Jabbar et al. (2021) in their study exclude a few challenges of blockchain adoption in the supply chain. Several factors hinder the adoption of technology including a lack of understanding of new systems and scepticism regarding its longevity: even though many of the stakeholders recognize the potential of blockchain, they are still hesitant to invest due to the absence of industry-wide standards and practices. Herczeg et al. (2018) in their study of industrial symbiosis as a concept based on the idea of industrial ecosystems, establishing symbiotic relationships between economically independent industries in the supply chain, highlighted that a crucial concern revolves around effectively managing the lack of synchronisation in the supply chain when implementing new solutions.

In summary, the implementation of digital solutions in logistics and the risks of implementing such solutions is one of the latest research topics. There are ample opportunities for further research on the risks of implementation of digital solutions in logistics, and forwarding companies. Furthermore, future research could focus on the implementation opportunities of digital solutions in forwarding companies, while identifying the risks of the implementation process could lead to a better understanding of the advantages and disadvantages of such solutions implementation.

2. METHODOLOGY OF RISK ANALYSIS AND IMPLEMENTATION OF DIGITAL SOLUTIONS IN A FORWARDING COMPANY

To begin with, the methodology of identification and risks assessment of digital solutions in a forwarding company, a scheme of methods that will be used in this work is illustrated below (see Fig. 6).
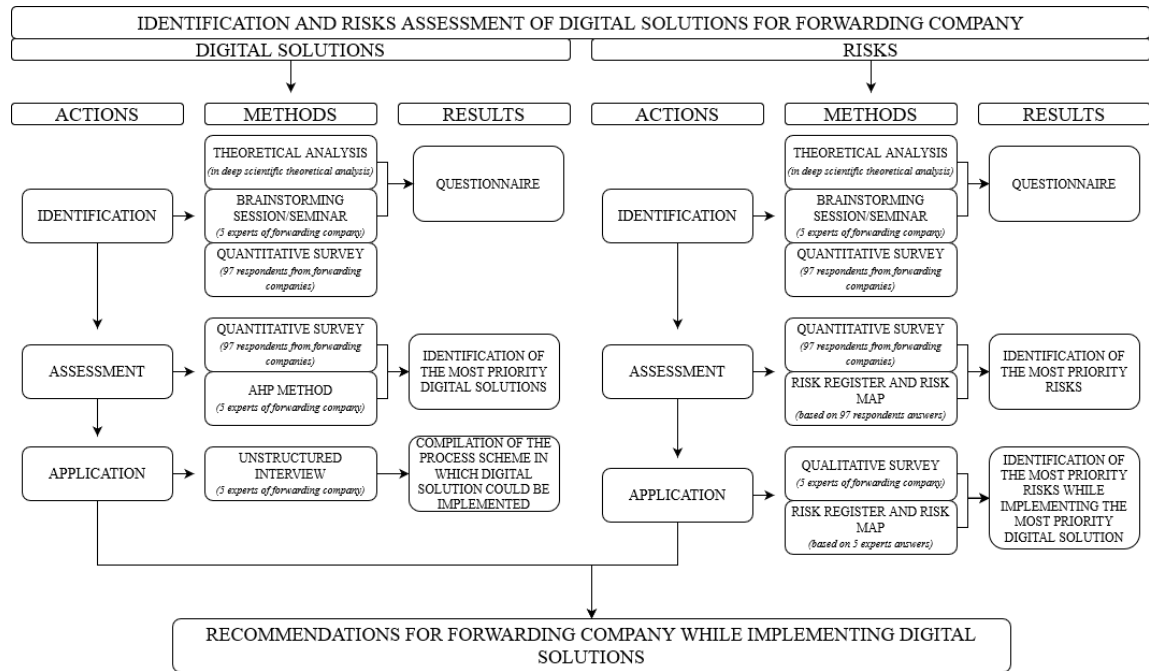
Fig. 6. The research scheme

Source: compiled by author

Identification and risks assessment of digital solutions in a forwarding company consists of two main parts of the research: digital solutions and risks.

First, it is important to identify digital solutions for forwarding companies. To begin with, the in-depth scientific theoretical analysis was conducted and then the brainstorming session with 5 experts of forwarding companies followed which resulted in the questionnaire for the quantitative survey of the respondents of forwarding companies. In the survey, respondents had the opportunity to also identify digital solutions which they are currently using or implementing in their forwarding company.

Secondly, the assessment of identified digital solutions began. For this aim, quantitative survey respondents, who are not yet using digital solutions in their company, had to evaluate the listed digital solutions' impact on their company`s overall performance. Furthermore, 5 experts of the chosen forwarding company participated in the AHP method by

conducting a pairwise comparison between identified digital solutions, which resulted in the identification of the most priority digital solutions.

Lastly, the digital solutions application was conducted using a method of unstructured interview with 5 experts of the chosen forwarding company, which led to the compilation of the process scheme in which the identified digital solution could be implemented. The process scheme finalises the research of digital solutions by illustrating how much time could be saved in the process in which digital solutions could be implemented.

In parallel, the risks analysis was conducted. To begin with, it is important to identify risks for forwarding companies while implementing digital solutions. To achieve this, an in-depth theoretical analysis of scientific sources was conducted and then the brainstorming session followed with the experts of 5 forwarding companies, which resulted in the questionnaire for the quantitative survey of the respondents of forwarding companies. In the survey, respondents had the opportunity to also identify risks for their forwarding company.

The assessment of risks consists of a quantitative survey of 97 respondents of forwarding companies, where they had to evaluate the impact and probability of the listed risk, therefore, based on the results of this survey, a risk register was conducted together with the risk map, which illustrates the results of the respondents. The assessment results in the identification of the most priority risks.

Finally, the results of risks were applied to help identify the most priority risks while implementing the most priority digital solution for the chosen forwarding company. To achieve this, a qualitative survey of 5 experts of the forwarding company had to evaluate listed risks probability and impact while implementing the most priority digital solution. After the results of the qualitative analysis were received, a risk register and risk map allowed to identify and illustrate the identification of the most priority risks while implementing the most priority digital solution.

The results of this research will make it possible to give recommendations to a forwarding company during the implementation of digital solutions.

This illustration has been created to give a general picture of the research that will be carried out in this work and to create conditions for not deviating from the general course of the research while completing all the stages and applying all the methods mentioned in it.

2.1. Methods for identifying digital solutions and risks

To identify the main digital solutions and risks for forwarding companies, a few methods will be used. This step aims to conduct a questionnaire on digital solutions and risks.

To begin with the identification of digital solutions and risks, a theoretical analysis and brainstorming session will be conducted. Additionally, for the identification of digital solutions, a quantitative survey will be conducted.

After deeply analysing scientific sources and summarising the main points in the theoretical part of this work, a brainstorming session with experts of forwarding company will be conducted. Brainstorming is a creative method used to identify certain events or stages (in the case of this research, digital solutions, and risks), similar to the seminar method.

Brainstorming is used in a group of people (e.g. company employees) to share ideas with everyone and create new ideas. This method promotes creativity, collaboration, and effective communication, and helps solve various social problems innovatively. Using this approach, employees` creativity can be harnessed to explore their perceived digital solutions and risks in the organization (Hopkins, 2018). Brainstorming is a method used to encourage learners to spontaneously present as many ideas as possible. For example, the moderator presents a problem or a situation, and the group participants reflect on it briefly and then express their thoughts – as many options for solutions to the problem as possible. Ideas and thoughts are expressed freely without trying to force them. The essence of the expressed thoughts is briefly written down or otherwise recorded. At the end, each expressed idea is examined, and evaluated, and conclusions are drawn.

The brainstorming method is applied in groups. The size of the workgroup is an important factor in the success of the method. Usually, the most effective number of participants is 5-7 people (Martinkutė-Kaulienė & Stasytytė, 2018). If there are fewer participants, fewer unexpected thoughts will be generated. Conversely, if the group is too large, not all participants will have the opportunity to express their opinions.

The brainstorming process consists of several stages:

1. The first generation of ideas.
2. The second generation of ideas.
3. Grouping of generated ideas.
4. Evaluation of ideas.

In the end, the moderator can document the ideas, fill out the risk register or use some other method for identification.

When organizing brainstorming sessions as an integral part of decision-making, it is important to follow certain recommendations:

- Do not criticize.
- To encourage and promote the generation of as many different ideas as possible.
- Write down all ideas.

- To supplement, expand and combine ideas already expressed.
- To incubate ideas (spend time summarising the presented ideas, and use them to generate new ideas).

Advantages of the method: the success of using the brainstorming method depends on special factors, which are as follows: complete relaxation of the participants, trust in each other, automatic functioning of the participants and sincere communication.

Limitation of the method: since the content of the solution depends on the creativity of the participants, the competence of the participants determines the content of the solution.

For this research, a group of 5 experts on forwarding company was chosen to identify digital solutions and risks for forwarding companies. According to the advantages of this method, the experts were from one forwarding company, which leads to complete trust in each other and sincere communication. As the competence of the participants determines the content of the whole session and identification of digital solutions and risks, the chosen participants are experts in that forwarding company and their positions in the forwarding company are: CEO, Chief accountant, Head of the expedition for North and Eastern Europe, Head of the expedition for South and West Europe, Head of Sales and Marketing.

As a result of the brainstorming session, a questionnaire on digital solutions and risks will be conducted, which will be used for the quantitative survey. The survey participants will also participate in the identification process, as the respondents will have the opportunity to provide risks and digital solutions that they are using or currently implementing.

2.2. Assessment methods of digital solutions and risks

To assess the identified digital solutions and risks, a few methods will be applied. For the assessment of digital solutions, a qualitative survey will be conducted, as the respondents who are not yet using digital solutions will have the opportunity to evaluate the listed digital solutions' impact on the overall company`s performance, furthermore, an AHP method will be used.

For the assessment of risks, a quantitative survey will be conducted in which the respondents will evaluate the probability and impact of listed risks, and based on the answers of the respondents, a risk register, and risk map will be conducted.

2.2.1. Quantitative survey to identify and assess digital solutions and risks

For both, digital solutions and risks, assessments, the first used method will be a quantitative survey of Lithuania`s forwarding companies in terms of implementation of digital solutions and risks.

As the name of the method suggests, data for it is collected by asking questions. From other data collection methods surveys are distinguished by the way questions are asked: the survey instrument is a questionnaire, which consists of pre-formulated and clear, immutable questions, which are presented in order (Gaižauskaitė & Mikėnė, 2014).

The questionnaire for this survey was prepared in advance based on the literature analysis and brainstorming session for digital solutions and risks identification with 5 experts of forwarding company (see Table 4).

Table 4. Survey`s questionnaire

Question	Comments and Measurements	Literature
1. Have you heard about the ongoing digitalisation processes in the transport and logistics sector?	Yes, No	(Korchagina et al., 2020); (Mikl et al., 2021)
2. Are you using digitalisation in your current company or currently implementing one?	*According to the responses to the 2 question, the following questions of the survey will differ.* Yes, No	(Sullivan & Kern, 2021), (Olanrewaju & Willmott, 2013)
If your answer to the second question was "Yes": 3. Which of the listed digital solutions you use or are currently implementing in your company: • Invoice automation • Cash flow stabilisation for logistics service provider • Digitalisation of waybills • Digital expense management software • Monitoring the behaviour of drivers and adjusting insurance • Inventory financing solution • Blockchain solution for industry-wide supply chain visibility • Quick payments with the use of an external financer • Other (provide your answer).	*3 question is used for the identification of digital solutions.* Yes, No	Upadhyay et al. (2021), Holland Fintech & Dinalog, (2017), Casado et al. (2021), Arsan et al. (2009), Soleymanian et al. (2019), Chakuu et al. (2020), Kottler (2018), Ayub & Mehar (2021), Pernestål et al. (2020), Barmuta et al. (2020), Bekmurzaev et al. (2020), Bickauske et al. (2020), Cole et al. (2019), Plotnikov et al. (2019), Raza et al. (2023), (Cichosz et al., 2020)

Question	Comments and Measurements	Literature
4. Have your company encountered or might encounter any of these risks during the implementation of digital solution (-s): • Ineffective system due to uncertainty of future • Issues with synchronizing participants in the digital supply chain • Employee resistance to digital technology adoption in logistics • Lack of necessary number of specialists • Unbalanced logistics system development in the digital economy transition • Blockchain or other system crash • Other (provide your answer)	*4 question is used for the identification of risks.* Yes, No	Upadhyay et al. (2021), Holland Fintech & Dinalog, (2017), Casado et al. (2021), Arsan et al. (2009), Soleymanian et al. (2019), Chakuu et al. (2020), Kottler (2018), Ayub & Mehar (2021), Pernestål et al. (2020) Barmuta et al. (2020), Bekmurzaev et al. (2020), Bickauske et al. (2020), Cole et al. (2019), Plotnikov et al. (2019), Raza et al. (2023), (Cichosz et al., 2020)
5. On a scale from 1 to 5, evaluate which of the listed risks caused the greatest impact on your current company`s activity: • Ineffective system due to uncertainty of future • Issues with synchronizing participants in the digital supply chain • Employee resistance to digital technology adoption in logistics • Lack of the necessary number of specialists • Unbalanced logistics system development in the digital economy transition • Blockchain crash • adoption in logistics • Lack of necessary number of specialists • Unbalanced logistics system development in the digital economy transition • Blockchain or other system crash	*5 question is used for the risk assessment.* 1 – the lowest impact 2 – less impact 3 – medium impact 4 – better impact 5 – the greatest impact	
6. On a scale from 1 to 5, evaluate how often the listed risks have occurred or could occur in your company: • Ineffective system due to uncertainty of future • Issues with synchronizing participants in the digital supply chain • Employee resistance to digital technology adoption in logistics • Lack of the necessary number of specialists • Unbalanced logistics system development in the digital economy transition • Blockchain or other system crash	*6 question is used for the risk assessment.* 1 – very rarely 2 – rarely 3 – neither rarely nor often 4 – often 5 – very often	
If your answer to the second question was "No": 7. On a scale from 1 to 5, evaluate the listed digital solutions, which implementation in the company would bring the greatest benefit to the overall performance of the company: • Invoice automation • Cash flow stabilisation for logistics service provider • Digitalisation of waybills • Digital expense management software • Monitoring the behaviour of drivers and adjusting insurance • Inventory financing solution • Blockchain solution for industry-wide supply chain visibility • Quick payments with the use of an external financer	*7 question is used for the identification of digital solutions.* 1 – the least beneficial 2 – less beneficial 3 – neither not beneficial nor beneficial 4 – more beneficial 5 – the most beneficial	

Question	Comments and Measurements	Literature
8. In your opinion, would your company encounter any of these risks during the implementation of digital solution (-s): • Ineffective system due to uncertainty of future • Issues with synchronizing participants in the digital supply chain • Employee resistance to digital technology adoption in logistics • Lack of necessary number of specialists • Unbalanced logistics system development in the digital economy transition • Blockchain or other system crash • Other (provide your answer)	*8 question is used for the identification of risks.* Yes, No	Upadhyay et al. (2021), Holland Fintech & Dinalog, (2017), Casado et al. (2021), Arsan et al. (2009), Soleymanian et al. (2019), Chakuu et al. (2020), Kottler (2018), Ayub & Mehar (2021), Pernestål et al. (2020), Barmuta et al. (2020), Bekmurzaev et al. (2020), Bickauske et al. (2020), Cole et al. (2019), Plotnikov et al. (2019), Raza et al. (2023), (Cichosz et al., 2020)
9. On a scale from 1 to 5, evaluate which of the listed risks would cause the greatest impact on your current company`s activity: • Ineffective system due to uncertainty of future • Issues with synchronizing participants in the digital supply chain • Employee resistance to digital technology adoption in logistics • Lack of the necessary number of specialists • Unbalanced logistics system development in the digital economy transition • Blockchain or other system crash	*9 question is used for the risk assessment.* 1 – the lowest impact 2 – less impact 3 – medium impact 4 – better impact 5 – the greatest impact	
10. On a scale from 1 to 5, evaluate how often the listed risks could occur in your company: • Ineffective system due to uncertainty of future • Issues with synchronizing participants in the digital supply chain • Employee resistance to digital technology adoption in logistics • Lack of the necessary number of specialists • Unbalanced logistics system development in the digital economy transition • Blockchain or other system crash	*10 question is used for the risk assessment.* 1 – very rarely 2 – rarely 3 – neither rarely nor often 4 – often 5 – very often	

Source: compiled by the author

The questionnaire of the survey consists of 10 complex questions, as it aims to achieve several goals:

- The second question of the survey separates the respondents who are using or currently implementing digital solutions from those, who are not yet using digital solutions, and the further questions for each group of respondents differ.

- Responses to the third and seventh questions will finalise the identification of the digital solutions process.

- Responses to the fourth and eighth questions will finalise the identification of risks process.

- Responses to the fifth, sixth, ninth and tenth questions will be used for the risks assessment and conduction of the risk register and risk map.

Sampling is a particularly important element of the research process of conducting surveys. When planning survey research, it is important to reasonably decide how many respondents need to be interviewed and how to select them.

In this survey, the population is forwarding companies. According to Lithuania`s State Data Agency, there is no exact number on how many forwarding companies are currently registered in Lithuania, it is only known, that at the beginning of 2023, there were 9144 operating economic entities in the whole transport and storage industry. Therefore, according to Cochran (1963, 1975), whose formula was described in the publication of Singh & Masuku (2014), to select a size sample for this forwarding companies` population, a sample size formula was used:

$$n = \frac{t^2 p(1-p)}{\Delta^2}$$ (1)

Where n – sample size, t – Student coefficient, expressing the level of confidence, p – expected distribution (i. e. what proportion chose one answer or another), Δ - is sampling error.

For this survey, the confidence level was chosen to be 95 % ($t = 1,96$). Therefore, as there is no prior data on the possible distribution of responses, in addition, surveys often include many essential questions, in formulas maximum expected distribution of results (50/50 per cent) and it means that $p = 0,5$, the sampling error is 10 % or $\Delta = 0,10$.

$$n = \frac{1,96^2 * 0,5(1-0,5)}{(0,10)^2} = 96,04$$ (2)

Intending to conclude all Lithuania`s forwarding companies so that at 95 % the result obtained for the confidence level would be within +/- 10 per cent error, the sampling size must be 97 respondents.

To choose the respondents for this survey, it was decided to use non-probability sampling. It should be remembered that non-probability samples do not ensure representativeness, the conclusions should not be generalized to the entire population, and the accuracy of the sample objectively is impossible to estimate. One of the non-probability sampling methods is purposive/judgemental sampling – the respondents' group is formed depending on the goals of the researcher. It means that the researcher decides which elements of the population of interest are the most informative about the characteristics being studied. This method was used for this survey to choose the respondents, which were forwarding companies and their employees.

2.2.2. Analytical hierarchy process for the assessment of identified digital solutions

After the survey, digital solutions identification will be completed (results of the third question) together with the part of the digital solutions assessment (results of the sixth question). To finish the assessment of digital solutions, an AHP method will be applied.

To assess the criteria and their effect on a project/alternative multiple criteria decision analysis methods are widely used. The AHP method will be further analysed and applied to identify digital solutions based on the judgement of the forwarding company`s experts.

AHP is a method of measurement through pairwise comparisons and relies on the judgements of experts to derive priority scales (Russo & Camanho, 2015). This method was developed by Dr Thomas Saaty in 1980 as a tool to help with solving technical and managerial problems. It aims at quantifying relative priorities for a given set of alternatives on a ratio scale, based on the decision-maker's judgments and the consistency of the comparison of alternatives in the decision-making process (Palcic & Lalic, 2009).

Psychologists argue that expressing one`s opinion on only two alternatives is easier and more accurate than simultaneously on all the alternatives (Saaty, 1980). One of the most prominent features of the AHP methodology is to evaluate quantitative and qualitative criteria and alternatives on the same preference scale (Franek & Kresta, 2014). While using this method, it is usually comparing to criteria simultaneously and uses points between 1 and 9. The most accurate guidelines for assessing the pairs can be found in Table 5.

Table 5. Value of criteria

Value	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
2	Weak or Slight	
3	Moderate Importance	Experience and judgment slightly favour one activity over another
4	Moderate Plus	
5	Strong Importance	Experience and judgement strongly favour one activity over another
6	Strong Plus	
7	Very Strong	An activity is favoured very strongly over another
8	Very, very Strong	
9	Extreme Importance	The evidence favouring one activity over another is of the highest possible order of affirmation.

Source: Saaty (1980)

Experts must decide which of the two criteria is more important and then assign a score to show how much more important it is.

Karim & Karmaker (2016) presented the stepwise procedure of AHP:

Step 1: Construct the structural hierarchy.

Step 2: Construct the pairwise comparison matrix.

Assuming n attributes, the pairwise comparison of attribute *i* with attribute *j* yields a square matrix A_{nxn} where a_{ji} denotes the comparative importance of attribute *i* concerning attribute *j*. In the matrix, $a_{ij} = 1$ when i = j and

$$a_{ij} = 1/a_{ij},$$

$$a = \begin{matrix} 1 \\ \dots \\ n \end{matrix} \begin{bmatrix} a_{11} & \dots & a_{1n} \\ \dots & \dots & \dots \\ a_{n1} & \dots & a_{nn} \end{bmatrix},$$

Step 3: Constructed normalised decision matrix

$$c_{ij} = a_{ij} \Big/ \sum_{j=1}^{n} a_{ij},$$ (3)

where:

$i = 1,2,3\dots,n; \; j = 1,2,3,\dots.,n.$

Step 4: Construct the weighted, normalised decision matrix

(4)

$$w_i = \sum_{j=1}^{n} c_{ij} \Big/ n, \, i = 1,2,3,\dots,n;$$

$$W = \begin{bmatrix} w_1 \\ \dots \\ w_n \end{bmatrix}.$$

Step 5: Calculate Eigenvector & Row Matrix

(5)

$$E = \frac{N^{th} roothvalue}{\sum N^{th} roothvalue};$$

$$Rowmatrix = \sum_{j=1}^{n} a_{ij} \times e_{j1};$$ (6)

Step 6: Calculate the maximum Eigenvalue, λ_{max}.

$$\lambda_{max} = \frac{Rowmatrix}{E}; \qquad (7)$$

Step 7: Calculate the consistency index & consistency ratio.

$$CI = \frac{(\lambda_{max} - n)}{(n-1)}; \qquad (8)$$

$$CR = \frac{CI}{RI}. \qquad (9)$$

When n & RI denote the index of matric & Randomly Generated Consistency Index respectively.

An expert evaluation was conducted using the AHP method to assess digital solutions and determine which solution would provide the greatest benefits to the company`s processes. Expert evaluations are applied in studies of various branches of the economy. Such evaluations require special expert knowledge and expert experience that only a small number of specialists have. The experience of innovative companies is especially valuable, but only a limited number of companies have it (Baležentis & Žalimaitė, 2011). Therefore, the method of expert evaluations is particularly applicable to the study of innovation development factors.

An expert method of individual assessment was chosen for this research – a survey by pairwise comparison. To proceed with this survey, it is important to decide on three main elements:

- Determining the number of experts. Determining the acceptable number of experts is guided by methodological assumptions formulated in classical test theory, which states that the reliability of aggregated decisions and decision-makers the number is connected by a rapidly disappearing nonlinear relationship. According to Rudzkienė and Burinskienė (2010), the solutions' reliability depends on the number of experts, and the reliability of the solution reaches 80 % when the experts' number is 5.

- Structure. The experts of forwarding company received a survey for pairwise comparison of digital solutions, which were excluded after literature analysis, brainstorming session and survey of forwarding companies. After the survey, an AHP method was applied to derive priority scales.

- Selection of experts. The experts were chosen regarding their positions in the forwarding company, their experience in the logistics and transport sector, and their

ability to evaluate the main problems of the forwarding company`s processes. The experts who have received the survey are the director of the company, Chief accountant, Head of the expedition for North and Eastern Europe, Head of the expedition for South and West Europe, and Head of sales and marketing.

After the analysis of scientific literature sources, brainstorming session with 5 experts from forwarding company and the results of the third question of the quantitative survey of 97 respondents from forwarding companies, digital solutions for forwarding companies were identified and evaluated. Five experts from forwarding companies received a survey and evaluated the identified digital solutions against each other, which allows us to assess the implementation of digital solutions in forwarding company using an analytical hierarchy process (AHP). An example of the survey given to the experts is illustrated in Appendix 1.

2.2.3. Assessment of identified risks using risk register and risk map

After completing the survey of forwarding companies, based on the responses to the fourth, fifth, seventh and eighth questions (see Table 4), the risk register and risk map will be conducted.

As the respondents of the survey are not only CEOs of forwarding companies but also employees of forwarding companies, a broader picture of risks assessment will be identified: CEOs will provide a structured view of the most important risks facing the companies and these may only include external risks, while lower-level employees will share their insights into internal risks within their departments that may be overlooked by CEOs or managers.

To evaluate risks, both qualitative and quantitative techniques can be used. Qualitative techniques are applied when risk is difficult to express quantitatively or when there is a lack of data for quantitative assessment, the quality of risk assessment using qualitative methods depends mainly on the knowledge and opinion of the involved specialists, their understanding of possible events, as well as environmental factors (Martinkutė-Kaulienė & Stasytytė, 2018). In this work a quantitative technique will be used as the two parameters – probability and impact – will be identified during the survey of forwarding companies (see Table 4).

After the survey and its respondents' assessment of risks, their probability and impact, it is possible to provide specific measures to manage this risk. All information received will be recorded in the risk register. Its purpose is to form an orderly list of the most important types of identified risks. The risk register`s essential elements are the risk and its assessment (Martinkutė-Kaulienė & Stasytytė, 2018). Usually, there are two types of risk registers: qualitative and quantitative. In quantitative, the impact and probability of risk are assessed in

numbers (points, money), and qualitative – insignificant words. An example of a qualitative risk register that will be used in this work is presented in Table 6.

Table 6. Example of a qualitative risk register

No.	Description of risk	The current level of risk		
		Probability	**Impact**	**Overall assessment**
1	Lack of the necessary number of specialists	Often	Medium	High

Source: compiled by the author based on Martinkutė-Kaulienė & Stasytytė (2018)

The probability and impact are predicted for each risk in the register, and the overall assessment level is found according to the scheme in Table 7.

Table 7. Risk probability and impact setting scheme

Probability	**Impact**				
	a) Lowest	b) Less	c) Medium	d) Better	e) The greatest
A. Very often	Low	Medium	High	Very high	Very high
B. Often	Low	Medium	High	Very high	Very high
C. Neither rarely nor often	Low	Low	Medium	High	Very high
D. Rarely	Low	Low	Medium	High	High
E. Very rarely	Low	Low	Low	Medium	High
Overall risk level assessment: low, medium, high, very high					

Source: compiled by the author based on Martinkutė-Kaulienė & Stasytytė (2018)

The overall assessment level can be low, medium, high, or very high, according to which, it will be known how strongly and urgently it is necessary to react to a specific risk.

It is necessary to fill out the risk register accurately: risks must be clearly described, indicating their cause, source, occurrence, size, and impact. If accurate, the risk register will be linked to the risk management plan and will encourage the application of intended impact measures and the communication of this to the managers.

To visualise risks impact and probability, after filling the risk register, a risk map will be used to identify and demonstrate the impact and probability of risks (see Fig. 7).
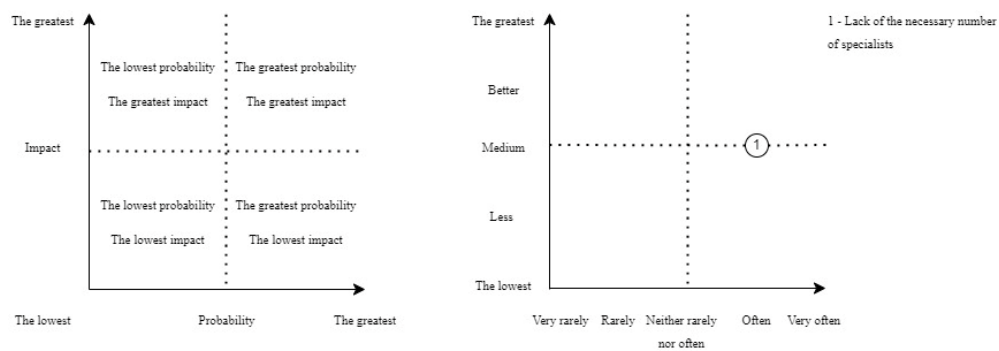
Fig. 7. An example of a risk map

Source: compiled by the author based on Martinkutė-Kaulienė & Stasytytė (2018)

In summary, after the quantitative survey, the AHP method and application of risk register and risk map methods identified digital solutions and risks will be assessed. Based on the results of digital solutions and risks assessment, a process scheme of the process in which the most priority digital solution will be implemented will be compiled and the most priority risks during the implementation of the most priority digital solutions will be identified.

2.3. Methodology applied to a case study of a forwarding company

To proceed with the application of digital solutions and risks, a few methods will be used. For the application of digital solutions, after their identification and assessment, a process scheme, in which the most priority digital solution will be implemented, will be conducted. To achieve this, an interview method will be used with the experts of the forwarding company.

Interviews are usually conducted by one or two people. The purpose of the interview is to find out the interviewee`s attitude and knowledge about real past events and possible future events. Interviews as a separate research method can be divided into many different types, starting from formalized interviews, where the questions are predetermined, to informal interviews, where the sequence of questions and their form are completely free. Four types of interviews are possible in research practice (Martinkutė-Kaulienė & Stasytytė, 2018):

1. Structured – the questions and the entire procedure are planned, or little is changed during the interview.
2. Unstructured – without a detailed plan, questions are asked in a free form; the situation is uncertain.
3. Non-imposed – the interviewer does not try to maintain the intended course of the conversation, but allows the person being examined to change it.

4. Directional – the interviewer pays special attention to the subjective answers of the respondent about the situation known to him, with which he got acquainted before the interview.

In this research, an unstructured interview was chosen as it is conducted based on a pre-thought-out plan, which includes only introductory and essential questions, the main topics of the interview are presented without specific question formulations. The researcher formulates questions during the interview depending on the course of the interview, on the established relationship between the researcher and the subject, or on the interview environment. This type of interview was chosen to brainstorm ideas for the current process in which the digital solution could be implemented and prognosis the possibilities of its optimization.

To identify the most priority risks while implementing the most priority digital solution, a qualitative survey and risk map will be conducted.

Surveys and questionnaires aim to find out the opinions of the respondents about the internal and external factors that can cause certain events. Questions can be open or closed depending on the objective. Questionnaires can be addressed to individuals or as part of a wider survey. It can be carried out internally or by involving customers, suppliers and other external parties.

In this research, as the aim is to asses risks that could occur while implementing the identified most priority digital solution in a selected forwarding company, a qualitative survey will be conducted to assess risks impact and probability by implementing the identified digital solution.

The respondents will be the 5 experts of the forwarding company and an example of a questionnaire for risk assessment is provided in Table 8.

Table 8. An example of a questionnaire for the experts of a forwarding company

No.	Identified risk	Risk probability assessment	Risk probability level	Score
1	Synchronizing participants in the digital supply chain	This can happen during the first … months after the implementation of the digital solution	Medium probability	2
…				…
No.	**Identified risk**	**Risk impact assessment**	**Risk impact level**	**Score**
1	Synchronizing participants in the digital supply chain	Could lose from … EUR	High impact	3
…				…

Source: compiled by author

The probability and impact are predicted for each risk in the register, and the overall assessment level is found according to the scheme in Table 9.

Table 9. Risk probability and impact setting scheme for evaluation criteria for experts of a forwarding company

Probability	Impact		
	a) Low	b) Medium	c) High
A. High	Medium	High	High
B. Medium	Low	Medium	High
C. Low	Low	Low	Medium
Overall risk level assessment: low, medium, high			

Source: compiled by author

The overall assessment level can be low, medium, or high, according to which, it will be known how strongly and urgently it is necessary to react to a specific risk.

To assess the results of the qualitative survey, an overall risk assessment level will be set, and based on the results, a risk map will be conducted. An example of a risk map was provided previously (see Fig. 7.).

3. EMPIRICAL RESEARCH ON THE IDENTIFICATION AND RISK ASSESSMENT OF DIGITAL SOLUTIONS IN FORWARDING COMPANY

3.1. The results of the quantitative survey

To identify and analyse the current situation of Lithuania`s forwarding companies in terms of the implementation of digital solutions, a quantitative survey was conducted. The forwarding companies` survey questions were prepared in advance using Google Forms (see Table 4). The questionnaire was shared with Lithuania`s forwarding companies CEOs and employees. In total, **97 respondents** (see Fig. 8) from Lithuania`s forwarding companies have participated in this survey.

Descriptive Statistics

|	N	Minimum	Maximum	Mean	Std. Deviation
Have you heard about digitalisation processes	97	0	2	,94	,317
Currently using digital solutions or implementing one	97	0	1	,69	,465
Valid N (listwise)	97				

Fig. 8. Descriptive statistics of the survey

Source: compiled by the author using the SPSS program

With the first question, the aim is to find out whether *employees and CEOs of forwarding companies have heard about the ongoing digitalisation processes in the transport and logistics sector* (see Fig. 9). 90 % of respondents have heard about digitalization processes in the transport sector, 2 % have not heard about it and 8 % were not interested yet in digitalisation processes in the transport sector.
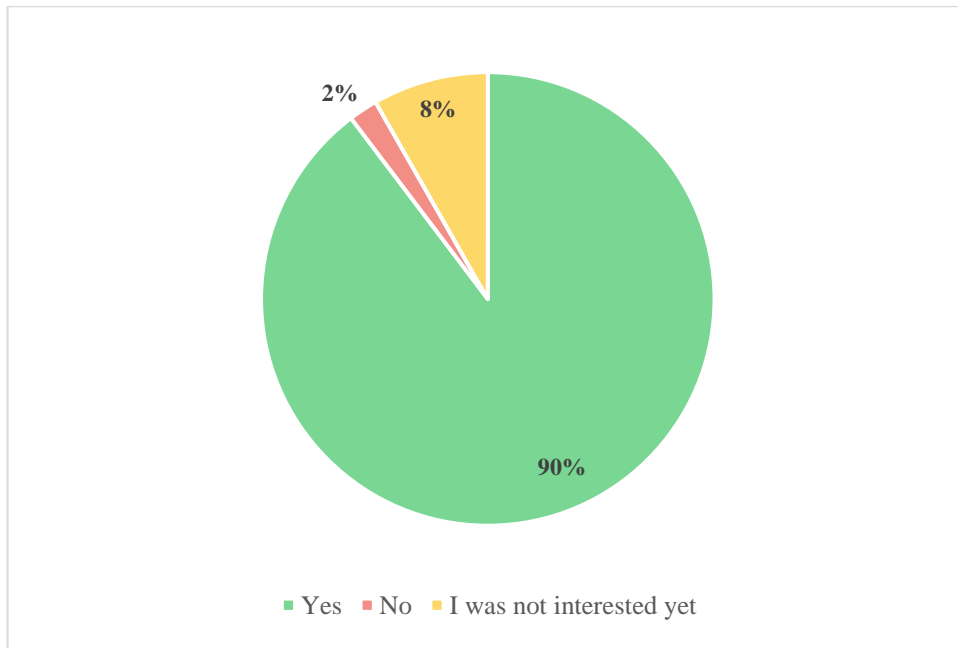
Fig. 9. Distribution of respondents on a question about their knowledge of ongoing digitalisation processes in the transport and logistics sector

Source: compiled by author

With the second question, respondents had to *identify whether they are using digitalisation solutions in their current company or currently implementing one* (see Fig. 10). More than two-thirds of respondents, 69 % (67 respondents), are currently using or implementing digital solutions in their current company. One-third of respondents, 31 % (30 respondents), are not yet using or implementing digital solutions.
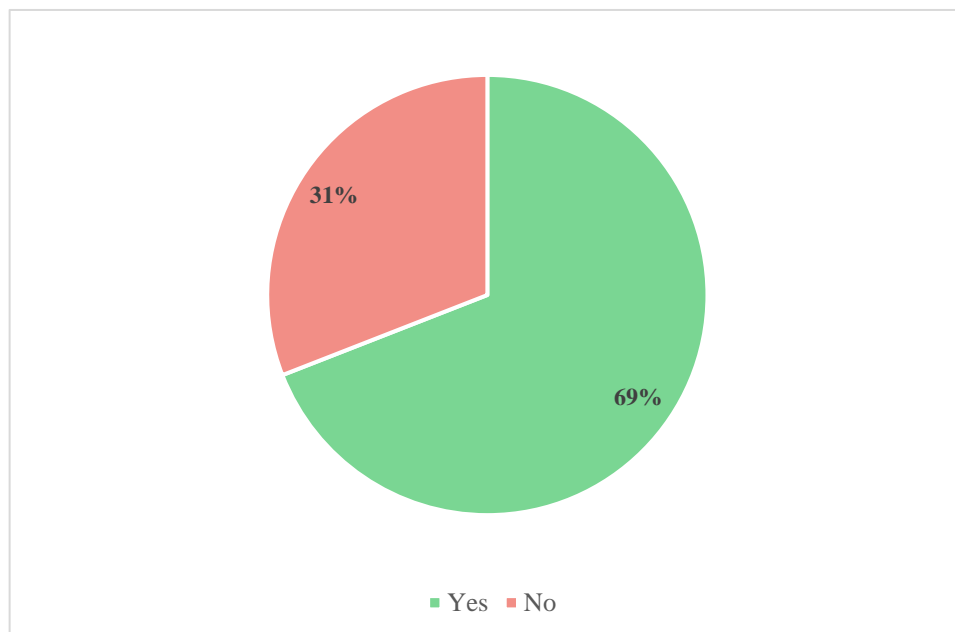
Fig. 10. Percentage of respondents who are using or currently implementing digital solutions

Source: compiled by author

The following questions have only been answered by those respondents, **who are already using or implementing digital solutions** in their current forwarding company, in total – 67 respondents.

The third question aims to identify, *which of the listed digital solutions are used or currently implemented in the respondents` current forwarding company* (see Fig. 11). The respondents could choose multiple answers to this question or provide their answers. According to the survey, the most used or currently implemented solution in forwarding companies is invoice automation - 59 (88,01%) out of 67 respondents. The second digital solution is the digitalisation of waybills, more than one-third of respondents (38,81 %) are using or implementing this solution. Inventory financing solution falls in the third place with 25,37% of respondents. The least used digital solution according to the answers of respondents is cash flow stabilisation for logistics service providers – 5,97 % (4 respondents) – have marked this solution as one which they are currently using or implementing. Respondents have also identified 4 other digital solutions that they are using in their current forwarding companies: their information system covering all areas related to the company`s management (mentioned twice), credit risk assessment of suppliers/carriers, transport management system, and customer self-service system. These identified digital solutions will be also included in the AHP method.
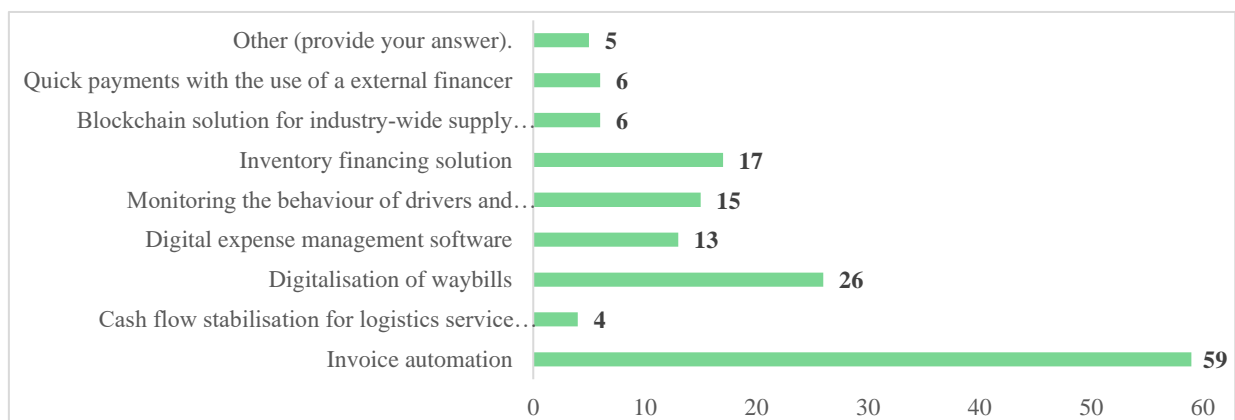

Fig. 11. Respondents` responses were distributed according to the digital solutions used in their forwarding companies

Source: compiled by author

The fourth question aims to understand if *respondents have encountered or might encounter any of the provided risks during the implementation of the digital solution (-s)* (see Fig. 12). While answering this question, respondents could choose multiple answers or provide their ideas. 59,71 % (40 respondents) mentioned, that they have encountered or might encounter with risk of employees' resistance to digital technology adoption in logistics. More than half of the respondents, 55,22 % (37 respondents) have noted that they have encountered or might

encounter another big risk – issues with synchronizing participants in the digital supply chain. Blockchain or other system crash was mentioned only by 8,96 % (6 respondents) and is the least encounterable risk according to the respondents. Respondents have also left a comment and mentioned that their problems might be in other areas and one of the respondents stated, that alignment of the system with internal company processes requires a lot of time to adapt functions/templates/settings/employee`s rights precisely according to the needs of their company and it might be the biggest risk for them.
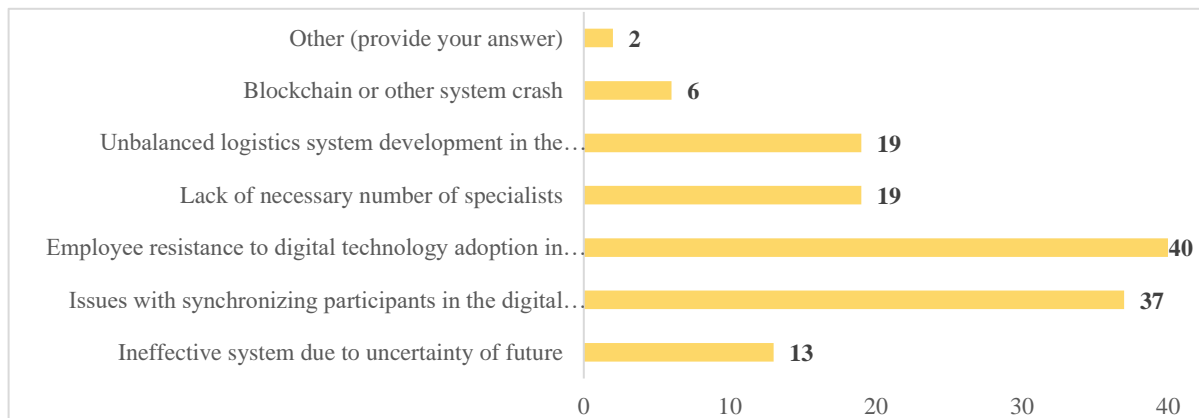
Fig. 12. Respondents` responses distribution on encountered risks during the implementation of digital solution (-s)

Source: compiled by author

With the fifth question, representatives of forwarding companies *had to evaluate on a scale from 1 to 5 which of the listed risks caused or would cause the greatest impact on their current company`s activity* (see Fig. 13). Respondents had to evaluate the impact of listed risks to their company from 1 to 5, where 1 – the lowest impact risk and 5 – the greatest impact risk. According to the results of the survey, three risks would cause the greatest impact on their company`s activity: employees resistance to digital technology adoption in logistics – 73,13 % (49 respondents) have noted that this solution would cause better or the greatest impact, respectively 56,72 % (38 respondents) and 55,22 % (37 respondents) noted that lack of necessary number of specialists and issues with synchronizing participants in the digital supply chain risks would be the most impactful risks for their companies` activity. According to 35,82 % (24 respondents) of representatives of forwarding companies, the least or less impactful risk is blockchain or other system crashes.
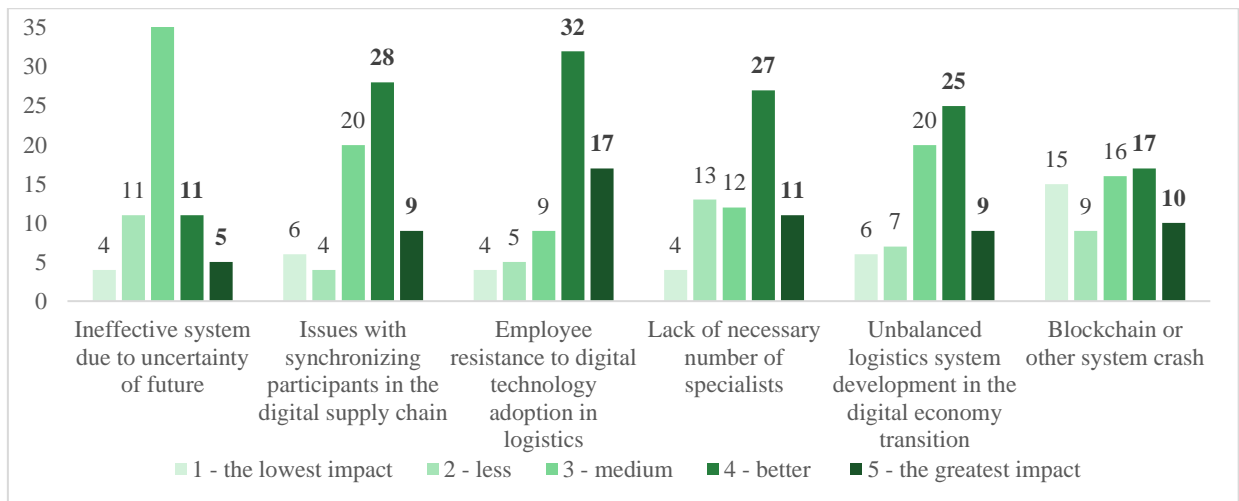
Fig. 13. Respondents` evaluation of listed risks that caused the greatest impact on their companies` activities

Source: compiled by author

The sixth and last question for the respondents who have implemented or are currently implementing digital solutions aims to *evaluate on a scale from 1 to 5, how often the listed risks have occurred or could occur in their company* (see Fig. 14). Respondents had to evaluate how often have they occurred or would occur with the listed risks from 1 to 5, where 1 – occur very rarely and 5 – occur very often. The respondents noted that they have occurred or would occur with two risks often or very often – employees' resistance to digital technology adoption in logistics and issues with synchronizing participants in the digital supply chain, respectively 76,12 % (51 respondents) and 67,16 % (45 respondents) of answers. According to the representatives of forwarding companies, the risk which has occurred or would occur very rarely or rarely is blockchain or other system crash risk with almost one-third, 29,85% (20 respondents) of answers.
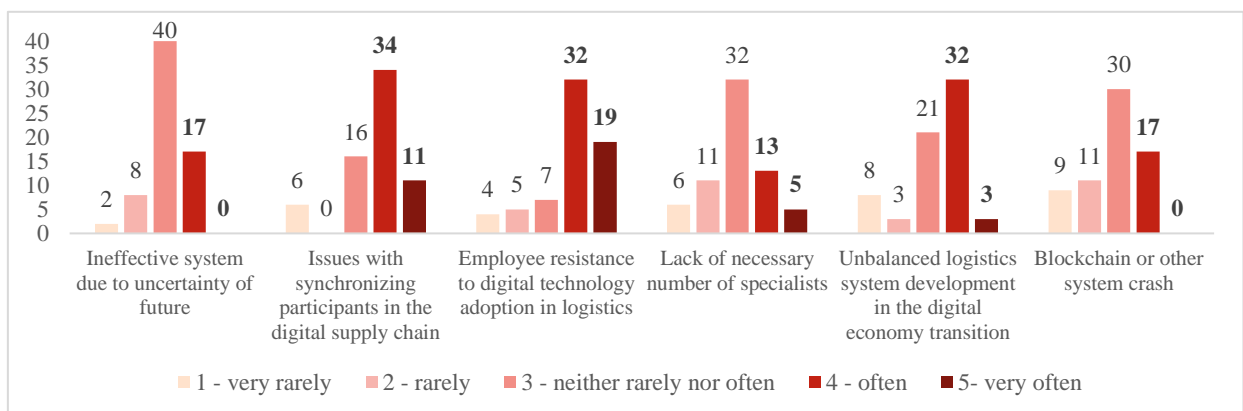

Fig. 14. Respondents` evaluation of listed risks frequency while implementing digital solution (-s) in their companies

Source: compiled by author

The following questions have only been answered by those respondents, **who are not using or currently implementing digital solutions** in their current forwarding company, in total – 30 respondents.

The seventh question aims to *evaluate from 1 to 5 which of the listed digital solutions implementation in the company would bring the greatest benefit to the overall performance of the company* (see Fig. 15). Respondents had to evaluate the listed digital solutions benefit to the company`s overall performance from 1 to 5, where 1 – the least beneficial and 5 – the most beneficial digital solution. According to the results of the survey, all of the 30 respondents stated, that the most or more beneficial implementation of digital solutions for their company`s overall performance would be the invoice automation solution. In the second place, the digitalisation of waybills solution was excluded as more or the most beneficial by 93,33 % (28 respondents) of answers. Representatives of forwarding companies have noted, that the least beneficial implementation of digital solutions for their company`s overall performance would be quick payments with the use of an external financer - 40 % (12 respondents) of representatives have marked this solution as the least or less beneficial.
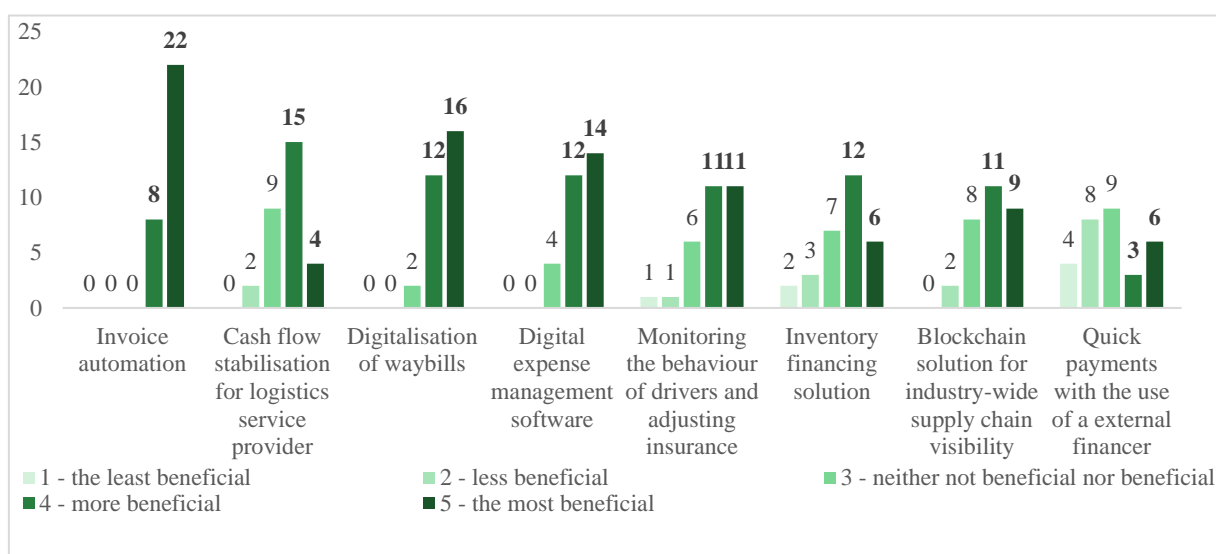
Fig. 15. Respondents` evaluation of digital solutions, which would bring the greatest benefit to the overall performance of their companies

Source: compiled by author

Eight question aims to *identify which of the listed risks forwarding companies encounter during the implementation of the digital solution (-s)* (see Fig. 16). While answering this question, respondents could choose multiple answers or provide their ideas. According to the representatives of forwarding companies that have not yet implemented any digital solution, 93,33 % (28 respondents) stated, that they most likely encounter the risk of lack of a necessary number of specialists and 90 % (27 respondents) stated that they would encounter with risk of

employee`s resistance to digital technology adoption in logistics. Two risks – an ineffective system due to uncertainty of the future and blockchain or other system crash – are held as the risks that would most likely not occur while implementing digital solutions, respectively one-third of answers (9 respondents) have stated this. One respondent stated that they would own the system and accordingly solve all the problems that they would encounter.
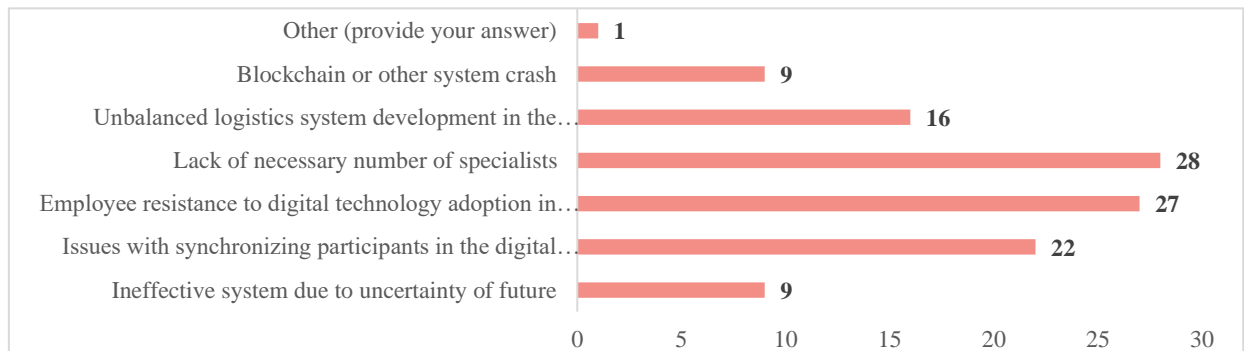
Fig. 16. Respondents` responses distribution of risks that could occur during the implementation of digital solution (-s)

Source: compiled by author

The ninth question aims to *evaluate on a scale from 1 to 5 which of the listed risks would cause the greatest impact on the respondent`s current company`s activity* (see Fig. 17). Respondents had to evaluate the impact of listed risks to their company from 1 to 5, where 1 – the lowest impact risk and 5 – the greatest impact risk. Two risks – issues with synchronizing participants in the digital supply chain and the risk of lack of a necessary number of specialists would cause better or a greater impact to more than half of respondents – 53,33 %. Also, two risks – an ineffective system due to uncertainty of the future and employee resistance to digital technology adoption in logistics are considered as the least or least impactful risks for 13,33 % (4 respondents) of answers.
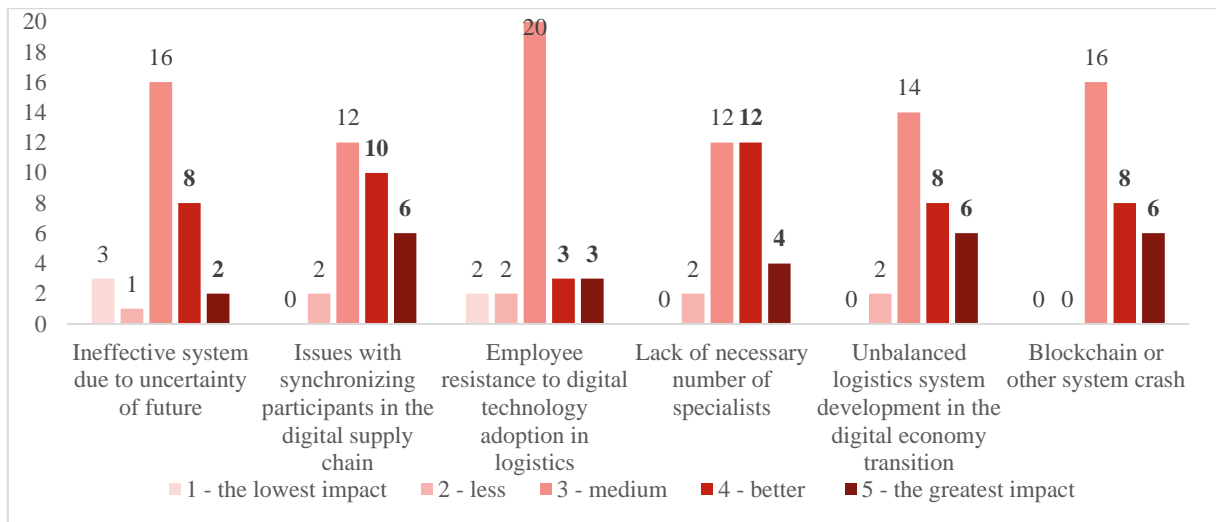
Fig. 17. Respondents` evaluation of listed risks that would cause the greatest impact on their companies` activities

Source: compiled by author

Tenth and the last question of the survey aims to *evaluate on a scale from 1 to 5 how often the listed risk could occur in the respondent`s company* (see Fig. 18). Respondents had to evaluate how often would their company occur with the listed risks from 1 to 5, where 1 – occur very rarely and 5 – occur very often. According to the answers of the survey, 73,33 % (22 respondents) of respondents believe that they would often or very often occur with the risk of unbalanced logistics system development in the digital economy transition. More than half of the answers, 53,33 % (16 respondents), believe that they would often or very often occur with the risk of lack of necessary numbers of specialists. 13,33 % (4 respondents) of representatives of forwarding companies have noted that ineffective systems due to the uncertainty of future and blockchain or other system crash risks would very rarely or rarely occur while implementing digital solutions in their company.
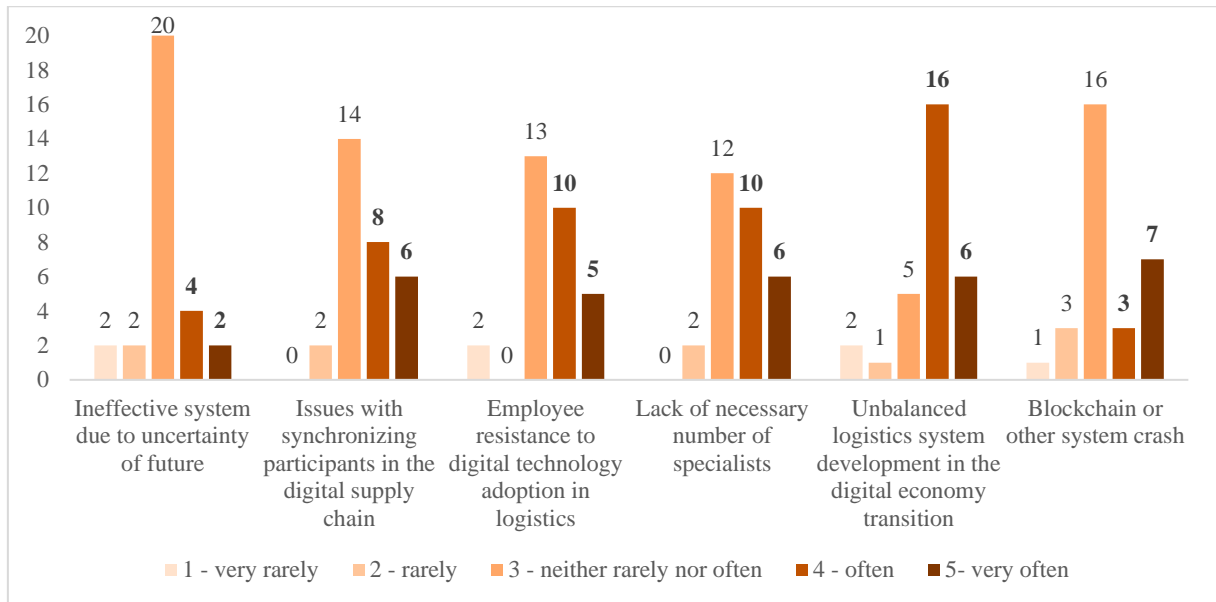
Fig. 18. Respondents` evaluation of listed risks frequency in their companies if implementing digital solution (-s)

Source: compiled by author

Also, respondents had an opportunity to share their ideas and leave a comment in the survey. One representative, who has implemented or is currently implementing digital solution in forwarding company stated that he believed that "The problem is structural and very much depends on the lack of conceptual specialists, because most of the sector`s employees are used to working "after the old days" and don`t even really want innovations. When starting to implement innovations, they initially accept them, but when faced with the first challenges (system errors, bad synchronization etc.) return to old habits. I think that in this case, smooth work of all chains is needed, starting with the manager, who can control the motivation not to abandon the started innovations, and ending with the drivers, who would have the opportunity to report problems". Another comment was left by the respondent who has not implemented digital solutions: "The burning innovation in the company is very slow due to people`s lack of preparation for it. Employees who have been working for the company for 5+ years are more sceptical of innovations. There is also weakness in the IT sphere, as the launch of the new process does not go as smoothly as wanted".

To sum up, two-thirds of representatives of Lithuanian forwarding companies use digital solutions and the most used or currently implemented digital solution is invoice automation. The respondents have also identified 4 digital solutions not mentioned in the survey: own information system covering all areas related to the company`s management mentioned twice, credit risk assessment of suppliers/carriers, transport management system, and customer self-service system. All of these are included in the AHP method. A third of

respondents, who do not currently use digital solutions, also believe that invoice automation would bring the greatest benefit to their company`s overall performance. However, the perception of risks differs between respondents who are using or currently implementing digital solutions and those who are not. Respondents, who are using or currently implementing digital solution (-s) believe that they would be most likely to encounter employee resistance to digital technology adoption in logistics and that the same risk would have the greatest impact on overall company activity, while respondents who have not yet implemented digital solutions agree that they would encounter the risk of employee resistance, but also identify issues with development of logistics systems in the transition to the digital economy as risks that would need to be considered, so that further risk assessment is needed.

3.2. Assessment of identified risks

After analysing quantitative survey results of Lithuania`s forwarding companies, it is necessary to further analyse risks and complete their assessment to have a full understanding of risks that may occur while implementing digital solutions.

According to the survey results, the understanding of risks varies between the respondents who are using or currently implementing digital solutions and those who are not yet implementing digital solutions, therefore, 2 risk registers will be compiled – one for the responses from the respondents who have implemented digital solutions, other one – for the respondents who have not yet implemented digital solutions.

The probability and impact of each evaluated risk are calculated from the averages of the responses from the survey. The risk register was compiled by the example of Table 6 and the overall assessment was based on the scheme (see Table 7).

According to the risk register of responses from respondents who are using or currently implementing the digital solution (-s) in forwarding company (see Table 10), 2 risks have the overall assessment of very high – issues with synchronizing participants in the digital supply chain and employee resistance to digital technology adoption in logistics. The rest of the risks according to the overall assessment are medium level.

Table 10. Risk register for responses from the respondents who are using or in the process of implementing a digital solution in a forwarding company

No.	Description of risk	The current level of risk		Overall assessment
		Probability	Impact	
1	Ineffective system due to uncertainty of future	Neither rarely nor often (average 3,03)	Medium (average 3,07)	MEDIUM
2	Issues with synchronizing participants in the digital supply chain	Often (average 3,5)	Better (average 3,66)	VERY HIGH
3	Employee resistance to digital technology adoption in logistics	Often (average 3,8)	Better (average 3,85)	VERY HIGH
4	Lack of necessary number of specialists	Neither rarely nor often (average 3,42)	Medium (average 3)	MEDIUM
5	Unbalanced logistics system development in the digital economy transition	Neither rarely nor often (average 3,36)	Medium (average 3,28)	MEDIUM
6	Blockchain or other system crash	Neither rarely nor often (average 2,97)	Medium (average 2,82)	MEDIUM

Source: compiled by author

According to the risk register of responses from respondents who have not yet implemented digital solution (-s) in the forwarding company (see Table 11), 4 risks have the overall assessment of very high – issues with synchronizing participants in the digital supply chain, lack of necessary number of specialists, unbalanced logistics system development in the digital economy transition and blockchain or other system crash. The risk of employee resistance to digital technology adoption in logistics is assessed as high and only one risk, an ineffective system due to uncertainty of the future is a medium level of risk.

Table 11. Risk register for responses from the respondents who have not yet implemented a digital solution in their forwarding company

No.	Description of risk	The current level of risk		Overall assessment
		Probability	Impact	
1	Ineffective system due to uncertainty of future	Neither rarely nor often (average 3,17)	Medium (average 3,07)	MEDIUM
2	Issues with synchronizing participants in the digital supply chain	Often (average 3,67)	Better (average 3,6)	VERY HIGH
3	Employee resistance to digital technology adoption in logistics	Neither rarely nor often (average 3,1)	Better (average 3,53)	HIGH

No.	Description of risk	The current level of risk		
		Probability	Impact	Overall assessment
4	Lack of necessary number of specialists	Often (average 3,6)	Better (average 3,67)	VERY HIGH
5	Unbalanced logistics system development in the digital economy transition	Often (average 3,6)	Better (average 3,77)	VERY HIGH
6	Blockchain or other system crash	Often (average 3,67)	Medium (average 3,4)	VERY HIGH

Source: compiled by author

To illustrate the differences between understanding of risks, 2 risk maps based on risk registers were compiled (see Fig. 19).
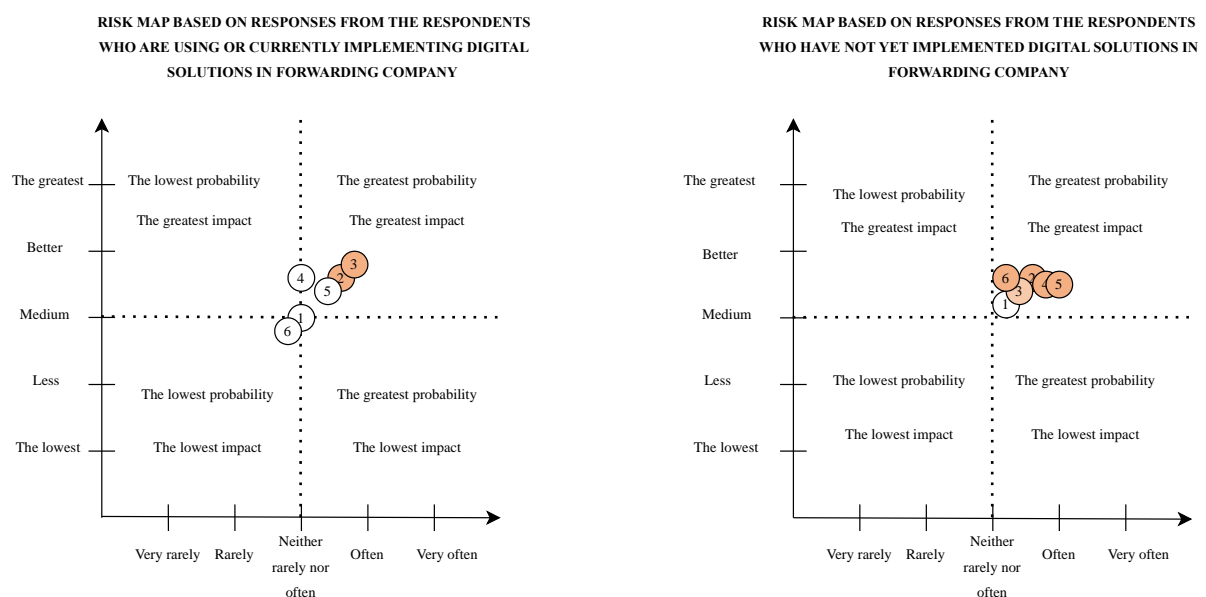

Fig. 19. Risks maps based on information from risk registers

Source: compiled by author

To sum up, according to the risk maps, respondents who are using or currently implementing digital solutions in forwarding companies have a more definite view on risks – employee` resistance to digital technology adoption in logistics and issues with synchronising participants in the digital supply chain stand out most of the rest of risks as the ones who have the greatest probability and the greatest impact while implementing digital solutions. The respondents who have not yet implemented digital solutions do not have one definite risk – all the mentioned risks are in the square of the greatest probability and the greatest impact and must be considered while implementing digital solutions.

However, to exclude the most priority risks and further assess them in a forwarding company, it is necessary to assess the answers of all respondents from the survey and fill out the risk register (see Table 12).

Table 12. A risk register for all survey respondents

No.	Description of risk	The current level of risk		
		Probability	**Impact**	**Overall assessment**
1	Ineffective system due to uncertainty of future	Neither rarely nor often (average 3,07)	Medium (average 3,07)	Medium
2	Issues with synchronizing participants in the digital supply chain	Often (average 3,52)	Better (average 3,64)	Very high
3	Employee resistance to digital technology adoption in logistics	Often (average 3,58)	Better (average 3,75)	Very high
4	Lack of necessary number of specialists	Often (average 3,47)	Medium (average 3,21)	High
5	Unbalanced logistics system development in the digital economy transition	Neither rarely nor often (average 3,43)	Medium (average 3,43)	Medium
6	Blockchain or other system crash	Neither rarely nor often (average 3,19)	Medium (average 3,00)	Medium

Source: compiled by author

According to the results from the respondents of the survey, 2 risks with the highest overall assessment are excluded: issues with synchronizing participants in the digital supply chain and employee resistance to digital technology adoption in logistics have the overall assessment as very high risks and the lack of a necessary number of specialists has the overall assessment of high. To illustrate the risk register results, a risk map was compiled (see Fig. 20).
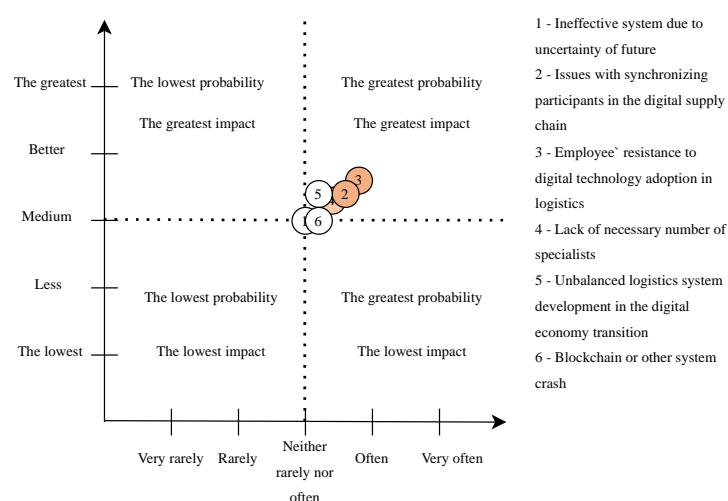

Fig. 20. Risks map of the overall respondent responses

Source: compiled by author

According to the overall answers from respondents of the forwarding companies (see Fig. 20), 3 risks were given the highest overall assessment - synchronizing participants in the digital supply chain, employee resistance to digital technology adoption in logistics and the lack of a necessary number of specialists. These 3 risks' impact and probability will be further analysed in the forwarding company while implementing the most priority digital solution – document flow and management system.

3.3. Case study of a selected forwarding company

After identifying and analysing digital solutions implementation in Lithuania`s forwarding companies, the AHP method was conducted to identify the most priority digital solution for forwarding company and according to the results, a process scheme was compiled together with the calculations for time and money that could be saved. After the digital solution was identified and the process by which it could be implemented was analysed, a risk assessment was conducted based on the evaluations of the forwarding company`s experts.

3.3.1. Ranking of identified digital solutions

Five experts from a forwarding company have completed a survey, which example is provided in Appendix 1 and evaluated earlier excluded digital solutions and 4 additional solutions that were identified in the survey one between another, the abbreviations of these digital solutions are:

- C1 – Invoice automation
- C2 – Cash flow stabilization
- C3 – Digitalisation of waybills
- C4 – Digital expense management software
- C5 – Monitoring the behaviour of drivers and adjusting insurance
- C6 – Inventory financing solution
- C7 – Blockchain solution for industry-wide supply chain visibility
- C8 – Quick payments with the use of an external financer
- C9 – Own system related to all areas of the company`s management
- C10 – Credit risk assessment of suppliers/carriers
- C11 – Transport management system
- C12 – Customer self-service system

A full survey of each expert can be found in the Appendix 2.

The answers to each expert`s survey were calculated using a geometric average in one matrix (see Table 13).

Table 13. Merged matrix of 5 experts` answers

Factor	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
C1	1,00	4,17	1,93	2,51	6,15	3,68	3,10	5,10	3,29	5,07	3,87	4,96
C2	0,24	1,00	0,35	0,58	3,18	1,52	0,30	1,52	0,36	1,52	0,66	1,25
C3	0,52	2,86	1,00	1,72	4,42	2,77	0,38	2,49	2,00	3,57	2,70	3,81
C4	0,40	1,97	0,58	1,00	2,00	1,00	0,19	1,89	0,31	1,00	0,50	1,32
C5	0,16	0,31	0,23	0,50	1,00	0,43	0,15	0,59	0,30	0,87	1,00	0,87
C6	0,27	0,66	0,36	1,00	2,35	1,00	0,18	1,32	0,31	0,87	0,57	1,32
C7	0,24	5,79	2,64	5,35	6,79	5,65	1,00	6,35	2,05	3,57	4,13	4,78
C8	0,20	0,66	0,40	0,53	1,68	0,76	0,16	1,00	0,30	1,00	0,66	1,52
C9	0,30	2,77	0,50	3,18	3,37	3,25	0,49	3,37	1,00	3,37	2,70	3,64
C10	0,20	0,66	0,28	1,00	1,15	1,15	0,28	1,00	0,30	1,00	0,80	1,25
C11	0,26	1,52	0,37	2,00	1,00	1,74	0,24	1,52	0,37	1,25	1,00	2,05
C12	0,20	0,80	0,26	0,76	1,15	0,76	0,21	0,66	0,27	0,80	0,49	1,00
Sum	3,99	23,17	8,91	20,13	34,23	23,69	6,67	26,80	10,86	23,87	19,08	27,75

Source: compiled by author

The matrix was normalised and compatibility analysis started:

CI = 0,066

where CI – consistency index

CR = 0,043,

Where CR – compatibility index.

As the compatibility index is 0,043 < 0,1, this means that the matrix is compatible. The weights of each digital solution are illustrated in Table 14.

Table 14. Results of experts` survey, after application of AHP method

| Factor	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	Sum	w
C1	0,251	0,180	0,217	0,125	0,180	0,155	0,465	0,190	0,303	0,212	0,203	0,179	2,659	0,222
C2	0,060	0,043	0,039	0,029	0,093	0,064	0,045	0,057	0,033	0,063	0,035	0,045	0,606	0,051
C3	0,130	0,124	0,112	0,085	0,129	0,117	0,057	0,093	0,184	0,149	0,142	0,137	1,459	0,122
C4	0,100	0,085	0,065	0,050	0,058	0,042	0,028	0,070	0,029	0,042	0,026	0,048	0,644	0,054
C5	0,041	0,014	0,025	0,025	0,029	0,018	0,022	0,022	0,027	0,036	0,052	0,031	0,344	0,029
C6	0,068	0,028	0,041	0,050	0,069	0,042	0,027	0,049	0,028	0,036	0,030	0,048	0,516	0,043
C7	0,061	0,250	0,296	0,266	0,198	0,239	0,150	0,237	0,189	0,149	0,216	0,172	2,423	0,202
C8	0,049	0,028	0,045	0,026	0,049	0,032	0,024	0,037	0,027	0,042	0,035	0,055	0,449	0,037
C9	0,076	0,119	0,056	0,158	0,098	0,137	0,073	0,126	0,092	0,141	0,142	0,131	1,350	0,112
C10	0,049	0,028	0,031	0,050	0,034	0,048	0,042	0,037	0,027	0,042	0,042	0,045	0,477	0,040
C11	0,065	0,065	0,042	0,099	0,029	0,074	0,036	0,057	0,034	0,052	0,052	0,074	0,679	0,057
C12	0,051	0,035	0,029	0,038	0,034	0,032	0,031	0,025	0,025	0,034	0,026	0,036	0,394	0,033

Source: compiled by author

According to Table 14, 3 solutions received the highest weights for the implementation in the forwarding company: C1 – Invoice automation solution, C3 – Digitisation of waybills and C7 – Blockchain solutions for industry-wide supply chain visibility.

To sum up, for further analysis, it was decided to merge C1 – Invoice automation and C3 – Digitalisation of waybill solutions and call it a document flow and management system. Due to the limitation of data, the C7 – blockchain solution, will be ignored.

After AHP analysis, it was decided to evaluate the current process of information and document flow in the forwarding company to prognosis how this process could be shortened, and how much time and costs could be saved if implementing a document flow and management system.

To compile a scheme of information and documents scheme, an interview with the forwarding company`s CEO and experts was conducted (see Fig. 21).
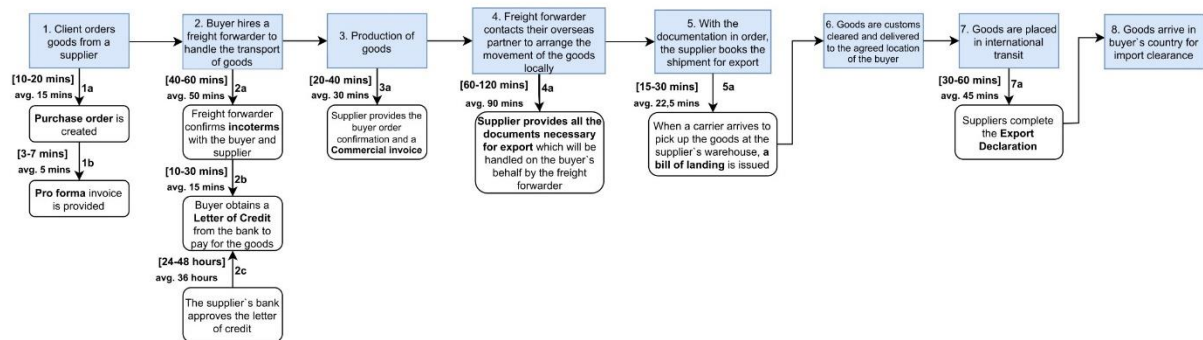
Fig. 21. Documents flow and management scheme of the forwarding company
Source: compiled by author and forwarding company`s experts

The process of forwarding company information flow consists of 8 main steps, which start from the client ordering goods from the supplier to the arrival of goods in the buyer`s country. In 6 out of 8 steps new information and documents are received and handling them requires a different amount of time. Indicators 1a, 1b until 7a marks the documentation flow of every step.

The time measure was selected as the measure which allows to count how many hours and how many employees it takes to complete one shipment in the forwarding company.

The most time is used in the 4th step – preparation of documentation for export, which is completed by freight forwarders, from 40 to 60 minutes takes confirmation of incoterms between buyer and supplier, which is also completed by freight forwarders.

Table 15. Information flow process before and after implementation of document flow and management system

Process of information flow	Avg. minutes (in the **current process** of forwarding company)	Avg. minutes (**if implementing** documents flow and management system)
Total of step 1	**20 mins**	**15 mins**
1a	15 mins	15 mins
1b	5 mins	**0 mins**
Total of step 2 (2c excluded)	**65 mins**	**65 mins**
2a	50 mins	50 mins
2b	15 mins	15 mins
2c (depends not on the forwarding company)	36 hours	36 hours
Total of step 3 (consists of 3a only)	**30 mins**	**15 mins**
Total of step 4 (consists of 4a only)	**90 mins**	**30 mins**
Total of step 5 (consists of 5a only)	**22,5 mins**	**15 mins**
Total of step 7 (consists of 7a only)	**45 mins**	**20 mins**
Total:	**272,5 mins**	**160 mins**

Source: compiled by author, based on the findings of forwarding company`s experts and literature sources

After analysing document flow and management systems together with experts, literature, and the current market of such systems, Table 15 was conducted, according to which, the implementation of document flow and management system could reduce the time of document management provided by forwarding company up to 59 %. Such a system would reduce the time of the 1b process (automatically adding it to the 1a), reduce half of the time of the 3a process, preparation of export documentation (4a) would be reduced around 3 times, 5a could be shortened up to 15 minutes and completion of export documentation (7a) would take only 20 minutes.

According to the experts of the forwarding company, on average, the forwarding company performs 17 linear transfers per week, 68 per month. Assuming that the average hourly salary of a freight forwarder in Lithuania is 9 EUR, it is possible to calculate how much freight forwarders` working time, spent processing documents, will be saved per month, and how much the forwarding company will save in wages paid for this process (see Table 16).

Table 16. Transfers processing before and after implementation of document flow and management system

Before implementation of the document flow and management system	After the implementation of the document flow and management system	Difference
Processing 68 transfers takes 18 530 min ~309 h (68 transfers x 272,5 min)	Processing 68 transfers takes 10 880 min ~181 h (68 transfers x 160 min)	7 650 min ~128 h (18 530 min – 10 880 min)
309 h x 9 EUR = 2,781 EUR	181 h x 9 EUR = 1,629 EUR	1,152 EUR

Source: compiled by author

After the implementation of the document flow and management system in the forwarding company, a freight forwarder will spend 128 working hours less on document management per month. Assuming that the average salary of a freight forwarder is 9 EUR (after taxes) per hour, the forwarding company would save 1,152 EUR (128 h x 9 EUR) in paid wages every month, which is dedicated to document processing.

In summary, after the implementation of document flow and management system forwarding company could reduce the time of document management by up to 59 %. Meanwhile, freight forwarders would spend 128 working hours fewer processing documents, and transferring their data into different systems. Forwarding company could save up to 1,152 EUR monthly in paid wages, which is dedicated to document processing. Implementation of such a system would make it possible to provide customers with better quality services and the opportunity to attract new customers and organise more transfers. The growing number of orders would increase the sales revenue and thus make the entire forwarding company more efficient.

3.3.2. Risks assessment in the implementation of document flow and management system

To further analyse the 3 main risks while implementing document flow and management system, 5 forwarding company experts had to evaluate the probability and impact of such risks (see Table 17).

Table 17. Criteria for risk probability and impact assessment

Risk probability assessment	Risk probability level	Score
This can happen during the first month after the implementation of the digital solution	High probability	3
This can happen during the first 3 months after the implementation of the digital solution	Medium probability	2
This can happen during the first 6 months after the implementation of the digital solution	Low probability	1

Risk impact assessment	Risk impact level	Score
Could lose 5,000 EUR	High impact	3
Could lose from 2,500 to 5,000 EUR	Medium impact	2
Could lose up to 2,500 EUR	Low impact	1

Source: compiled by author

Five experts of the forwarding company had evaluated the 3 risks, evaluation of each expert can be found in Appendix 3. An average score of their evaluations has been calculated and is provided in Table 18.

Table 18. Average risks probability and impact scores

No.	Identified risk	Risk probability score
1	Synchronizing participants in the digital supply chain	2,4
2	Employee resistance to digital technology adoption in logistics	3
3	The lack of the necessary number of specialists	1,8
No.	Identified risk	Risk impact score
1	Synchronizing participants in the digital supply chain	2
2	Employee resistance to digital technology adoption in logistics	2
3	The lack of the necessary number of specialists	1,4

Source: compiled by author

An overall assessment for the calculated averages has been set according to the setting scheme provided in Table 9 and the results are provided in Table 19.

Table 19. An overall assessment of the probability and impact of the risks

No.	Description of risk	The current level of risk		Overall assessment
		Probability	Impact	
1	Synchronizing participants in the digital supply chain	This can happen during the first 3 months after the implementation of the digital solution (average 2,4)	Could lose from 2,500 to 5,000 EUR (average 2)	Medium
2	Employee resistance to digital technology adoption in logistics	This can happen during the first month after the implementation of digital solutions (average 3)	Could lose from 2 500 to 5,000 EUR (average 2)	High
3	The lack of the necessary number of specialists	This can happen during the first 3 months after the implementation of the digital solution (average 1,8)	Could lose up to 2,500 EUR (average 1,4)	Low

Source: compiled by author

To illustrate the results of the experts' evaluation, a risk map was compiled (see Fig. 22).
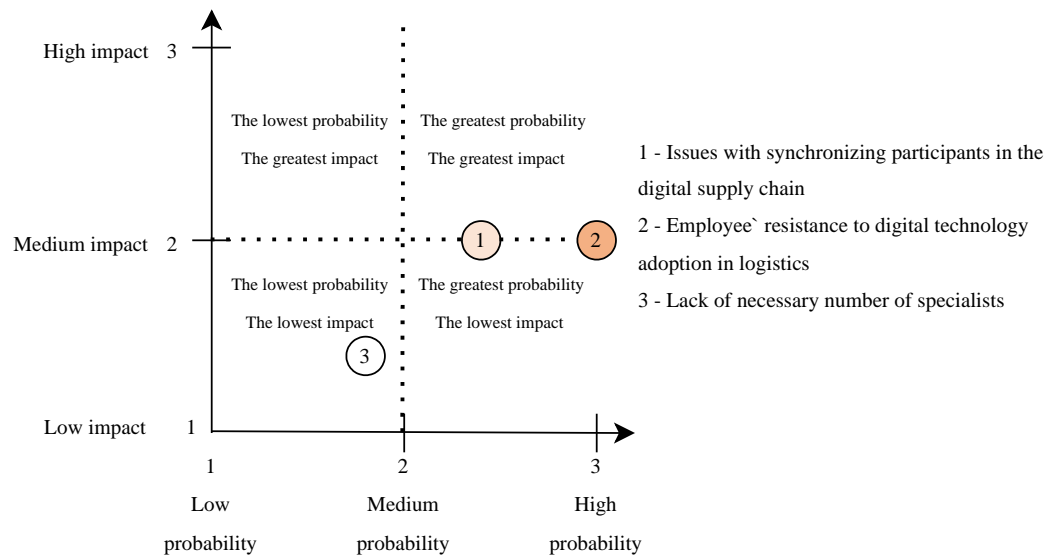
Fig. 22. Risk map based on experts` findings

Source: compiled by author

To sum up, based on the experts` assessment, the risk of employee resistance to the introduction of digital technology in logistics has the highest probability and could happen in the first month after the implementation of the document flow and management system, which could cause a loss of 2,500 to 5,000 EUR. The same loss of money could cause problems with the synchronisation of participants in the supply chain, but according to the experts, this risk is less likely than employee resistance. The risk of not having the required number of specialists is the one with the lowest probability and impact square (see Fig. 22).

CONCLUSIONS

1. After a thorough theoretical literature analysis, it was found that several authors and researchers have highlighted the importance of implementing digital solutions in logistics to improve efficiency and competitiveness. Therefore, after analysing the processes of forwarding company and FinTech solutions categories, it was decided that the term digital solutions will be used in this work as the main term for both digital and FinTech solutions that could be used to increase the forwarding company`s sales, improve the efficiency of automation, etc. Furthermore, 8 leading digital solutions and 6 risks in implementing digital solutions in forwarding companies were excluded and were further analysed in this work.

2. In this research, an in-depth theoretical analysis, a brainstorming session with 5 experts from forwarding company and a quantitative survey of 97 respondents from forwarding companies were conducted to identify digital solutions and risks. To assess the identified digital solutions, a quantitative survey of 97 respondents was conducted together with the AHP method with the pairwise comparison survey of the 5 experts of forwarding company. To assess the risks, a quantitative survey was conducted among 97 respondents, and based on the results, risks registers and risks maps were created. For the application of the obtained results of digital solutions identification and risk results application, a case study of a forwarding company was conducted.

3. Analysis of the results of a quantitative survey of 97 respondents from forwarding companies:

    a. 4 additional digital solutions were identified and included in the case study of a forwarding company (12 digital solutions in total). No new risks were identified by the respondents from the forwarding companies.

    b. Invoice automation is the most used or most beneficial digital solution for forwarding companies.

    c. Understanding of risks, which differs between respondents who use or are currently implementing digital solutions and those who have not yet implemented digital solutions. After analysing the overall responses, 3 risks received the highest overall scores and were further analysed in the case study.

4. A case study of a forwarding company`s implementation of digital solutions and risks analysis revealed that:

    a. 3 digital solutions: invoice automation, digitalisation of waybills and blockchain are the highest ranked. It was decided to merge the invoice automation and

digitalisation of waybills solution and further refer to it as a documents flow and management system.

b. By implementing a document flow and management system in the forwarding company, the time spent on document management could be reduced by up to 59 %. Meanwhile, freight forwarders would spend 128 working hours less on processing documents and transferring their data to different systems and the forwarding company could save up to 1 152 EUR monthly in paid wages dedicated to document processing.

c. The risk of employee resistance to the introduction of digital technology in logistics has the highest probability and could happen in the first month after the implementation of the documents flow and management system, which could cause a loss of 2,500 to 5,000 EUR.

RECOMMENDATIONS FOR A FORWARDING COMPANY

After the research, three digital solutions were identified for a forwarding company: invoice automation, digitalisation of waybills and blockchain were excluded. It was decided to merge invoice automation and digitalisation of waybills solution and further refer to it as a document flow and management system. Due to data limitations, the blockchain solution was ignored.

It is recommended to implement a document flow and management system, which would increase the efficiency of the forwarding company`s operational processes: sales revenue would increase by providing better service to existing customers and allowing to attract new ones, and it would make it possible to reduce administrative costs while saving the working time of freight forwarders.

To maximise the benefits of such a solution implementation, it is important to continuously increase and synchronize the customer`s connection to the new system. It is also important to disseminate information about the implemented system to all affected groups.

The time saved by freight forwarders should be used to enable them to serve a larger number of customers, provide better service to existing customers and increase the profit of a forwarding company. Although the newly installed system should simplify the work of the freight forwarders, the resistance of employees to the introduction of digital technology in logistics can prolong the payback period of the implementation of the document flow and management system. It is important to constantly encourage employees to use all the possibilities offered by the system and to show them the benefits.

Limitations and drawbacks

The methods of brainstorming, qualitative survey and unstructured interviews are limited to the insights of experts, since the content of the solution depends on the creativity of the participants, the competence of the participants determines the content of the solution. Furthermore, quantitative survey: to conclude all Lithuanian forwarding companies, so that the results obtained for the 95 % confidence level would be within +/- 10 per cent error, the sample size must be 97 respondents. To select the respondents for this survey, it was decided to use non-probability sampling and it should be remembered that such samples do not ensure representativeness, the conclusions should not be generalised to the entire population, and the accuracy of the sample cannot be objectively estimated. The AHP method used is limited to 12 digital solutions and is mainly based on the opinions of experts, and the results may be more related to the individual situation of the selected company - the results may be slightly different when analysing other forwarding companies.

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Appendices

Appendix 1. An example of pairwise comparison survey

A	Extreme important		Very strong		Strong importance		Moderate importance		Equal importance			Moderate importance		Strong importance		Very strong importance	Extreme importance	B
Invoice automation (C1)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Cash flow stabilisation (C2)
Invoice automation (C1)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Digitalisation of waybills (C3)
Invoice automation (C1)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Digital expense management software (C4)
…	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	…
Cash flow stabilisation (C2)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Digitalisation of waybills (C3)
Cash flow stabilisation (C2)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Digital expense management software (C4)
Cash flow stabilisation (C2)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Monitoring the behaviour of drivers and adjusting insurance (C5)
…	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	…
Digitalisation of waybills (C3)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Digital expense management software (C4)
Digitalisation of waybills (C3)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Monitoring the behaviour of drivers and adjusting insurance (C5)
…																		…
Digital expense management software (C4)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Monitoring the behaviour of drivers and adjusting insurance (C5)
Digital expense management	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Inventory financing solution (C6)

software (C4)																		
…																		…
Monitoring the behaviour of drivers and adjusting insurance (C5)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Inventory financing solution (C6)
Monitoring the behaviour of drivers and adjusting insurance (C5)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Blockchain solution for industry-wide supply-chain visibility (C7)
…																		…
Inventory financing solution (C6)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Blockchain solution for industry-wide supply-chain visibility (C7)
Inventory financing solution (C6)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Quick payments with the use of an external financer (C8)
Blockchain solution for industry-wide supply-chain visibility (C7)	**9**	8	**7**	6	**5**	4	**3**	2	**1**	2	3	**4**	5	**6**	7	**8**	9	Quick payments with the use of an external financer (C8)
…																		…

Source: compiled by author

79

A	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	B
	Extreme import		Very Strong		Importance		ate Import				ate Import		Importance		Very Strong		me Import	
Invoice automation (C1)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Cash flow stabilization (C2)
Invoice automation (C1)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Digitization of waybills (C3)
Invoice automation (C1)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Digital expense management software (C4)
Invoice automation (C1)	9	8	**7**	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Invoice automation (C1)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Invoice automation (C1)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Invoice automation (C1)	9	8	7	**6**	5	4	3	2	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Invoice automation (C1)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Own system related to all areas of company`s management (C9)
Invoice automation (C1)	9	8	**7**	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Invoice automation (C1)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Invoice automation (C1)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Digitization of waybills (C3)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Digital expense management software (C4)
Cash flow stabilization (C2)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	2	3	4	**5**	6	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Own system related to all areas of company`s management (C9)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Transport management system (C11)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Digitization of waybills (C3)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Digital expense management software (C4)
Digitization of waybills (C3)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Digitization of waybills (C3)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Digitization of waybills (C3)	9	8	7	6	5	4	3	2	1	2	3	**4**	5	6	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Digitization of waybills (C3)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Digitization of waybills (C3)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Own system related to all areas of company`s management (C9)
Digitization of waybills (C3)	9	8	7	**6**	5	4	3	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Digitization of waybills (C3)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Transport management system (C11)
Digitization of waybills (C3)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Digital expense management software (C4)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	1	2	3	4	**5**	6	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Digital expense management software (C4)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Own system related to all areas of company`s management (C9)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	1	2	3	**4**	5	6	7	8	9	Transport management system (C11)
Digital expense management software (C4)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Inventory financing solution (C6)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	2	3	4	5	6	**7**	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Own system related to all areas of company`s management (C9)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Transport management system (C11)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Customer self-service system (C12)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	**8**	9	Blockchain solution for industry-wide supply chain visibility (C7)
Inventory financing solution (C6)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Own system related to all areas of company`s management (C9)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Transport management system (C11)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	**7**	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Own system related to all areas of company`s management (C9)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Own system related to all areas of company`s management (C9)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Transport management system (C11)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Own system related to all areas of company`s management (C9)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Own system related to all areas of company`s management (C9)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Own system related to all areas of company`s management (C9)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Credit risk assessment of suppliers/carriers (C10)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Transport management system (C11)
Credit risk assessment of suppliers/carriers (C10)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Transport management system (C11)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)

Note: Answers of first expert

A	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	B
	Extreme importance		Very Strong		Importance		ate Import		Import ance		ate Import		Import ance		Very Strong		me Import	
Invoice automation (C1)						4												Cash flow stabilization (C2)
Invoice automation (C1)									1									Digitization of waybills (C3)
Invoice automation (C1)								2										Digital expense management software (C4)
Invoice automation (C1)					5													Monitoring the behavior of drivers and adjust insurance (C5)
Invoice automation (C1)			7															Inventory financing solution (C6)
Invoice automation (C1)								2										Blockchain solution for industry-wide supply chain visibility (C7)
Invoice automation (C1)		8																Quick payments with the use of an external financer (C8)
Invoice automation (C1)						4												Own system related to all areas of company`s management (C9)
Invoice automation (C1)				6														Credit risk assessment of suppliers/carriers (C10)
Invoice automation (C1)				6														Transport management system (C11)
Invoice automation (C1)					5													Customer self-service system (C12)
Cash flow stabilization (C2)												4						Digitization of waybills (C3)
Cash flow stabilization (C2)									1									Digital expense management software (C4)
Cash flow stabilization (C2)							3											Monitoring the behavior of drivers and adjust insurance (C5)
Cash flow stabilization (C2)								2										Inventory financing solution (C6)
Cash flow stabilization (C2)																	9	Blockchain solution for industry-wide supply chain visibility (C7)
Cash flow stabilization (C2)									1									Quick payments with the use of an external financer (C8)
Cash flow stabilization (C2)											3							Own system related to all areas of company`s management (C9)
Cash flow stabilization (C2)									1									Credit risk assessment of suppliers/carriers (C10)
Cash flow stabilization (C2)										2								Transport management system (C11)
Cash flow stabilization (C2)										2								Customer self-service system (C12)
Digitization of waybills (C3)					5													Digital expense management software (C4)
Digitization of waybills (C3)			7															Monitoring the behavior of drivers and adjust insurance (C5)
Digitization of waybills (C3)							3											Inventory financing solution (C6)
Digitization of waybills (C3)										2								Blockchain solution for industry-wide supply chain visibility (C7)
Digitization of waybills (C3)								2										Quick payments with the use of an external financer (C8)
Digitization of waybills (C3)								2										Own system related to all areas of company`s management (C9)
Digitization of waybills (C3)						4												Credit risk assessment of suppliers/carriers (C10)
Digitization of waybills (C3)							3											Transport management system (C11)
Digitization of waybills (C3)						4												Customer self-service system (C12)
Digital expense management software (C4)								2										Monitoring the behavior of drivers and adjust insurance (C5)
Digital expense management software (C4)									1									Inventory financing solution (C6)
Digital expense management software (C4)													5					Blockchain solution for industry-wide supply chain visibility (C7)
Digital expense management software (C4)									1									Quick payments with the use of an external financer (C8)
Digital expense management software (C4)											3							Own system related to all areas of company`s management (C9)
Digital expense management software (C4)									1									Credit risk assessment of suppliers/carriers (C10)
Digital expense management software (C4)										2								Transport management system (C11)
Digital expense management software (C4)									1									Customer self-service system (C12)
Monitoring the behavior of drivers and adjust insurance (C5)											3							Inventory financing solution (C6)
Monitoring the behavior of drivers and adjust insurance (C5)															7			Blockchain solution for industry-wide supply chain visibility (C7)
Monitoring the behavior of drivers and adjust insurance (C5)									1									Quick payments with the use of an external financer (C8)
Monitoring the behavior of drivers and adjust insurance (C5)											3							Own system related to all areas of company`s management (C9)
Monitoring the behavior of drivers and adjust insurance (C5)							3											Credit risk assessment of suppliers/carriers (C10)
Monitoring the behavior of drivers and adjust insurance (C5)									1									Transport management system (C11)
Monitoring the behavior of drivers and adjust insurance (C5)										2								Customer self-service system (C12)
Inventory financing solution (C6)													5					Blockchain solution for industry-wide supply chain visibility (C7)
Inventory financing solution (C6)									1									Quick payments with the use of an external financer (C8)
Inventory financing solution (C6)											3							Own system related to all areas of company`s management (C9)
Inventory financing solution (C6)									1									Credit risk assessment of suppliers/carriers (C10)
Inventory financing solution (C6)										2								Transport management system (C11)
Inventory financing solution (C6)										2								Customer self-service system (C12)
Blockchain solution for industry-wide supply chain visibility (C7)			7															Quick payments with the use of an external financer (C8)
Blockchain solution for industry-wide supply chain visibility (C7)							3											Own system related to all areas of company`s management (C9)
Blockchain solution for industry-wide supply chain visibility (C7)						4												Credit risk assessment of suppliers/carriers (C10)
Blockchain solution for industry-wide supply chain visibility (C7)						4												Transport management system (C11)
Blockchain solution for industry-wide supply chain visibility (C7)					5													Customer self-service system (C12)
Quick payments with the use of an external financer (C8)											3							Own system related to all areas of company`s management (C9)
Quick payments with the use of an external financer (C8)									1									Credit risk assessment of suppliers/carriers (C10)
Quick payments with the use of an external financer (C8)									1									Transport management system (C11)
Quick payments with the use of an external financer (C8)								2										Customer self-service system (C12)
Own system related to all areas of company`s management (C9)							3											Credit risk assessment of suppliers/carriers (C10)
Own system related to all areas of company`s management (C9)						4												Transport management system (C11)
Own system related to all areas of company`s management (C9)								2										Customer self-service system (C12)
Credit risk assessment of suppliers/carriers (C10)									1									Transport management system (C11)
Credit risk assessment of suppliers/carriers (C10)										2								Customer self-service system (C12)
Transport management system (C11)								2										Customer self-service system (C12)

Note: Answers of the second expert

81

Pairwise comparison matrix (third expert). Scale columns left-to-right: Extreme importance (9), 8, Very Strong (7), 6, Importance (5), 4, moderate Importance (3), 2, Importance (1), 2, moderate Importance (3), 4, Importance (5), 6, Very Strong (7), 8, Extreme importance (9). The highlighted (green) cell marks the expert's selected judgment; its value is shown below.

A	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	B
Invoice automation (C1)							**3**											Cash flow stabilization (C2)
Invoice automation (C1)									**1**									Digitization of waybills (C3)
Invoice automation (C1)									**1**									Digital expense management software (C4)
Invoice automation (C1)						**4**												Monitoring the behavior of drivers and adjust insurance (C5)
Invoice automation (C1)								**2**										Inventory financing solution (C6)
Invoice automation (C1)						**4**												Blockchain solution for industry-wide supply chain visibility (C7)
Invoice automation (C1)							**3**											Quick payments with the use of an external financer (C8)
Invoice automation (C1)								**2**										Own system related to all areas of company's management (C9)
Invoice automation (C1)						**4**												Credit risk assessment of suppliers/carriers (C10)
Invoice automation (C1)							**3**											Transport management system (C11)
Invoice automation (C1)						**4**												Customer self-service system (C12)
Cash flow stabilization (C2)											**3**							Digitization of waybills (C3)
Cash flow stabilization (C2)										**2**								Digital expense management software (C4)
Cash flow stabilization (C2)							**3**											Monitoring the behavior of drivers and adjust insurance (C5)
Cash flow stabilization (C2)								**2**										Inventory financing solution (C6)
Cash flow stabilization (C2)												**4**						Blockchain solution for industry-wide supply chain visibility (C7)
Cash flow stabilization (C2)								**2**										Quick payments with the use of an external financer (C8)
Cash flow stabilization (C2)											**3**							Own system related to all areas of company's management (C9)
Cash flow stabilization (C2)								**2**										Credit risk assessment of suppliers/carriers (C10)
Cash flow stabilization (C2)										**2**								Transport management system (C11)
Cash flow stabilization (C2)									**1**									Customer self-service system (C12)
Digitization of waybills (C3)							**3**											Digital expense management software (C4)
Digitization of waybills (C3)						**4**												Monitoring the behavior of drivers and adjust insurance (C5)
Digitization of waybills (C3)								**2**										Inventory financing solution (C6)
Digitization of waybills (C3)										**2**								Blockchain solution for industry-wide supply chain visibility (C7)
Digitization of waybills (C3)							**3**											Quick payments with the use of an external financer (C8)
Digitization of waybills (C3)								**2**										Own system related to all areas of company's management (C9)
Digitization of waybills (C3)							**3**											Credit risk assessment of suppliers/carriers (C10)
Digitization of waybills (C3)						**4**												Transport management system (C11)
Digitization of waybills (C3)						**4**												Customer self-service system (C12)
Digital expense management software (C4)								**2**										Monitoring the behavior of drivers and adjust insurance (C5)
Digital expense management software (C4)									**1**									Inventory financing solution (C6)
Digital expense management software (C4)													**5**					Blockchain solution for industry-wide supply chain visibility (C7)
Digital expense management software (C4)								**2**										Quick payments with the use of an external financer (C8)
Digital expense management software (C4)											**3**							Own system related to all areas of company's management (C9)
Digital expense management software (C4)									**1**									Credit risk assessment of suppliers/carriers (C10)
Digital expense management software (C4)										**2**								Transport management system (C11)
Digital expense management software (C4)									**1**									Customer self-service system (C12)
Monitoring the behavior of drivers and adjust insurance (C5)										**2**								Inventory financing solution (C6)
Monitoring the behavior of drivers and adjust insurance (C5)														**6**				Blockchain solution for industry-wide supply chain visibility (C7)
Monitoring the behavior of drivers and adjust insurance (C5)											**3**							Quick payments with the use of an external financer (C8)
Monitoring the behavior of drivers and adjust insurance (C5)											**3**							Own system related to all areas of company's management (C9)
Monitoring the behavior of drivers and adjust insurance (C5)										**2**								Credit risk assessment of suppliers/carriers (C10)
Monitoring the behavior of drivers and adjust insurance (C5)									**1**									Transport management system (C11)
Monitoring the behavior of drivers and adjust insurance (C5)							**3**											Customer self-service system (C12)
Inventory financing solution (C6)												**4**						Blockchain solution for industry-wide supply chain visibility (C7)
Inventory financing solution (C6)								**2**										Quick payments with the use of an external financer (C8)
Inventory financing solution (C6)													**5**					Own system related to all areas of company's management (C9)
Inventory financing solution (C6)									**1**									Credit risk assessment of suppliers/carriers (C10)
Inventory financing solution (C6)										**2**								Transport management system (C11)
Inventory financing solution (C6)								**2**										Customer self-service system (C12)
Blockchain solution for industry-wide supply chain visibility (C7)				**6**														Quick payments with the use of an external financer (C8)
Blockchain solution for industry-wide supply chain visibility (C7)									**1**									Own system related to all areas of company's management (C9)
Blockchain solution for industry-wide supply chain visibility (C7)							**3**											Credit risk assessment of suppliers/carriers (C10)
Blockchain solution for industry-wide supply chain visibility (C7)						**4**												Transport management system (C11)
Blockchain solution for industry-wide supply chain visibility (C7)					**5**													Customer self-service system (C12)
Quick payments with the use of an external financer (C8)											**3**							Own system related to all areas of company's management (C9)
Quick payments with the use of an external financer (C8)								**2**										Credit risk assessment of suppliers/carriers (C10)
Quick payments with the use of an external financer (C8)								**2**										Transport management system (C11)
Quick payments with the use of an external financer (C8)								**2**										Customer self-service system (C12)
Own system related to all areas of company's management (C9)						**4**												Credit risk assessment of suppliers/carriers (C10)
Own system related to all areas of company's management (C9)							**3**											Transport management system (C11)
Own system related to all areas of company's management (C9)						**4**												Customer self-service system (C12)
Credit risk assessment of suppliers/carriers (C10)										**2**								Transport management system (C11)
Credit risk assessment of suppliers/carriers (C10)								**2**										Customer self-service system (C12)
Transport management system (C11)							**3**											Customer self-service system (C12)

Notes: Answers of third expert

A	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	B
Invoice automation (C1)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Cash flow stabilization (C2)
Invoice automation (C1)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Digitization of waybills (C3)
Invoice automation (C1)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Digital expense management software (C4)
Invoice automation (C1)	9	8	**7**	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Invoice automation (C1)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Invoice automation (C1)	9	8	7	**6**	5	4	3	2	1	2	3	4	5	6	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Invoice automation (C1)	9	8	7	**6**	5	4	3	2	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Invoice automation (C1)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Invoice automation (C1)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Invoice automation (C1)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Invoice automation (C1)	9	8	7	**6**	5	4	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	2	3	**4**	5	6	7	8	9	Digitization of waybills (C3)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Digital expense management software (C4)
Cash flow stabilization (C2)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	2	3	4	5	**6**	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Transport management system (C11)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Digitization of waybills (C3)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Digital expense management software (C4)
Digitization of waybills (C3)	9	8	7	**6**	5	4	3	2	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Digitization of waybills (C3)	9	8	7	**6**	5	4	3	2	1	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Digitization of waybills (C3)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Digitization of waybills (C3)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Digitization of waybills (C3)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Digitization of waybills (C3)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Digitization of waybills (C3)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Digitization of waybills (C3)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Digital expense management software (C4)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	1	2	3	4	5	6	**7**	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Transport management system (C11)
Digital expense management software (C4)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Inventory financing solution (C6)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	2	3	4	5	6	**7**	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	2	3	**4**	5	6	7	8	9	Own system related to all areas of company's management (C9)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Transport management system (C11)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	1	2	3	4	5	**6**	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	1	2	3	**4**	5	6	7	8	9	Own system related to all areas of company's management (C9)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Transport management system (C11)
Inventory financing solution (C6)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	**7**	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	2	1	2	3	**4**	5	6	7	8	9	Own system related to all areas of company's management (C9)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Own system related to all areas of company's management (C9)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Own system related to all areas of company's management (C9)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Own system related to all areas of company's management (C9)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Credit risk assessment of suppliers/carriers (C10)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Transport management system (C11)
Credit risk assessment of suppliers/carriers (C10)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Customer self-service system (C12)
Transport management system (C11)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)

Notes: Answers of the fourth expert

83

A	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	B
Invoice automation (C1)	9	8	**7**	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Cash flow stabilization (C2)
Invoice automation (C1)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Digitization of waybills (C3)
Invoice automation (C1)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Digital expense management software (C4)
Invoice automation (C1)	**9**	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Invoice automation (C1)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Invoice automation (C1)	9	**8**	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Invoice automation (C1)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Invoice automation (C1)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Invoice automation (C1)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Invoice automation (C1)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Invoice automation (C1)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	2	3	**4**	5	6	7	8	9	Digitization of waybills (C3)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	2	3	4	**5**	6	7	8	9	Digital expense management software (C4)
Cash flow stabilization (C2)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	2	3	4	5	**6**	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Cash flow stabilization (C2)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Cash flow stabilization (C2)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Digitization of waybills (C3)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Digital expense management software (C4)
Digitization of waybills (C3)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Digitization of waybills (C3)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Digitization of waybills (C3)	9	8	7	6	5	4	3	2	1	2	3	**4**	5	6	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Digitization of waybills (C3)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Digitization of waybills (C3)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Digitization of waybills (C3)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Digitization of waybills (C3)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Digitization of waybills (C3)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Digital expense management software (C4)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Monitoring the behavior of drivers and adjust insurance (C5)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	1	2	3	4	**5**	6	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Digital expense management software (C4)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Transport management system (C11)
Digital expense management software (C4)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Inventory financing solution (C6)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	2	3	4	5	6	**7**	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	2	3	**4**	5	6	7	8	9	Own system related to all areas of company's management (C9)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Transport management system (C11)
Monitoring the behavior of drivers and adjust insurance (C5)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Customer self-service system (C12)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	1	2	3	4	5	**6**	7	8	9	Blockchain solution for industry-wide supply chain visibility (C7)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	1	2	**3**	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Inventory financing solution (C6)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Transport management system (C11)
Inventory financing solution (C6)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Quick payments with the use of an external financer (C8)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Own system related to all areas of company's management (C9)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Blockchain solution for industry-wide supply chain visibility (C7)	9	8	7	6	**5**	4	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	2	1	2	3	**4**	5	6	7	8	9	Own system related to all areas of company's management (C9)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	3	2	1	**2**	3	4	5	6	7	8	9	Transport management system (C11)
Quick payments with the use of an external financer (C8)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Own system related to all areas of company's management (C9)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Credit risk assessment of suppliers/carriers (C10)
Own system related to all areas of company's management (C9)	9	8	7	6	5	4	3	**2**	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Own system related to all areas of company's management (C9)	9	8	7	6	5	**4**	3	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Credit risk assessment of suppliers/carriers (C10)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Transport management system (C11)
Credit risk assessment of suppliers/carriers (C10)	9	8	7	6	5	4	**3**	2	1	2	3	4	5	6	7	8	9	Customer self-service system (C12)
Transport management system (C11)	9	8	7	6	5	4	3	2	**1**	2	3	4	5	6	7	8	9	Customer self-service system (C12)

Notes: Answers of fifth expert

84

Appendix 3. Experts` assessment of the highest priority risks

No.	Identified risk	Risk probability assessment	Risk probability level	Score
1	Synchronizing participants in the digital supply chain	This can happen during the first 3 months after the implementation of the digital solution	Medium probability	2
2	Employee resistance to digital technology adoption in logistics	This can happen during the first month after the implementation of the digital solution	High probability	3
3	The lack of the necessary number of specialists	This can happen during the first 3 months after the implementation of the digital solution	Medium probability	2
No.	Identified risk	Risk impact assessment	Risk impact level	Score
1	Synchronizing participants in the digital supply chain	Could lose from 5 000 EUR	High impact	3
2	Employee resistance to digital technology adoption in logistics	Could lose from 2 500 to 5 000 EUR	Medium impact	2
3	The lack of the necessary number of specialists	Could lose from 2 500 to 5 000 EUR	Medium impact	2

Notes: Answers of first expert

No.	Identified risk	Risk probability assessment	Risk probability level	Score
1	Synchronizing participants in the digital supply chain	This can happen during the first month after the implementation of the digital solution	High probability	3
2	Employee resistance to digital technology adoption in logistics	This can happen during the first month after the implementation of the digital solution	High probability	3
3	The lack of the necessary number of specialists	This can happen during the first 3 months after the implementation of the digital solution	Medium probability	2
No.	Identified risk	Risk impact assessment	Risk impact level	Score
1	Synchronizing participants in the digital supply chain	Could lose from 2 500 to 5 000 EUR	Medium impact	2
2	Employee resistance to digital technology adoption in logistics	Could lose up to 2 500 EUR	Low impact	1
3	The lack of the necessary number of specialists	Could lose up to 2 500 EUR	Low impact	1

Notes: Answers of the second expert

85

No.	Identified risk	Risk probability assessment	Risk probability level	Score
1	Synchronizing participants in the digital supply chain	This can happen during the first 3 months after the implementation of the digital solution	Medium probability	2
2	Employee resistance to digital technology adoption in logistics	This can happen during the first month after the implementation of the digital solution	High probability	3
3	The lack of the necessary number of specialists	This can happen during the first 6 months after the implementation of the digital solution	Low probability	1
No.	Identified risk	Risk impact assessment	Risk impact level	Score
1	Synchronizing participants in the digital supply chain	Could lose from 2 500 to 5 000 EUR	Medium impact	2
2	Employee resistance to digital technology adoption in logistics	Could lose from 2 500 to 5 000 EUR	Medium impact	2
3	The lack of the necessary number of specialists	Could lose from 2 500 to 5 000 EUR	Medium impact	2

Notes: Answers of third expert

No.	Identified risk	Risk probability assessment	Risk probability level	Score
1	Synchronizing participants in the digital supply chain	This can happen during the first month after the implementation of the digital solution	High probability	3
2	Employee resistance to digital technology adoption in logistics	This can happen during the first month after the implementation of the digital solution	High probability	3
3	The lack of the necessary number of specialists	This can happen during the first 3 months after the implementation of the digital solution	Medium probability	2
No.	Identified risk	Risk impact assessment	Risk impact level	Score
1	Synchronizing participants in the digital supply chain	Could lose up to 2 500 EUR	Low impact	1
2	Employee resistance to digital technology adoption in logistics	Could lose from 2 500 to 5 000 EUR	Medium impact	2
3	The lack of the necessary number of specialists	Could lose up to 2 500 EUR	Low impact	1

Notes: Answers of the fourth expert

No.	Identified risk	Risk probability assessment	Risk probability level	Score
1	Synchronizing participants in the digital supply chain	This can happen during the first 3 months after the implementation of the digital solution	Medium probability	2
2	Employee resistance to digital technology adoption in logistics	This can happen during the first month after the implementation of the digital solution	High probability	3
3	The lack of the necessary number of specialists	This can happen during the first 3 months after the implementation of the digital solution	Medium probability	2
No.	Identified risk	Risk impact assessment	Risk impact level	Score
1	Synchronizing participants in the digital supply chain	Could lose from 2 500 to 5 000 EUR	Medium impact	2
2	Employee resistance to digital technology adoption in logistics	Could lose from 5 000 EUR	High impact	3
3	The lack of the necessary number of specialists	Could lose up to 2 500 EUR	Low impact	1

Notes: Answers of fifth expert

Appendix 4. Certificate of participation in International Scientific Conference „Business and Management 2023"

VILNIUS TECH
Faculty of Business Management

CERTIFICATE

No. BM/23232

This is to certify that

Neda INGAUNYTĖ

has delivered a presentation

IDENTIFICATION OF NEW FINTECH SOLUTIONS IN THE
FORWARDING COMPANY

in International Scientific Conference
"BUSINESS AND MANAGEMENT 2023"
held on 11-12 May 2023 at Vilnius Gediminas Technical University,
Lithuania

Chair of Scientific Committee
Prof Dr Vida Davidavičienė

Chair of Organising Committee
Prof Dr Viktorija Skvarciany