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ALTERNATIVE FINANCE TECHNIQUE IN THE LOGISTICS SECTOR: BLOCKCHAIN

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ABSTRACT

Purpose- As a new generation financial concept "Blockchain and Cryptocurrencies", which have rapidly entered into the world recent years, have intense effects on our social norms, financial system and business models in the industry. In this research, it is aimed to examine the effects and contributions of innovative financial technologies that have developed with the intense digital transformation, which started with the concept of Logistic 4.0, through the sector. Actually innovative solutions to be developed by the fintech companies are expected to emerge in the logistics sector in the coming years. As we are experiencing the financial opportunities offered by fintech companies in the world, the logistics industry can also take new financial steps forward in our country with the help of great technological opportunities. However, logistics service providers traditionally focus on the delivery of goods and can quickly adapt to the realization of the opportunities so that Fintech's can present new techniques to their business processes. Both fintech and logistics companies can provide significant added values to the industry by bringing their forces together.

Methodology- In this study, I searched the current financing practices in the industry through a comprehensive literature review of the blockchain as an alternative way in financing options in the logistics sector.

Findings- When a logistics company agrees to work with blockchain technology, it enrolls in an intensive collaborative effort. This is because much of it involves facilitating reliable co-operation between multiple entities, including state institutions of all types, industrial organizations, regulators, partners, and even competitors public and private organizations. Collaboration platforms have been created to enable competitors to work together to research the implementation of blockchain technology, taking the very competitive financial services industry example. Although competing cooperation does not seem intuitive, economies of scale affect the value of the blockchain. When more parties agree to use a single blockchain solution, more value is generated for each participating organization. That's why several blockchain consortia appear in the logistics sector.

Conclusion- Fintech's provide logistics service providers with an opportunity to expand their service portfolio. In particular, they can increase their role in the supply chain and add value to their business. By reducing risks and costs, customers logistics service providers have real-time insight, reliable supply-chain data can provide them with commercial opportunities for new enhancements. These services can gradually change the role in the supply chain. Logistics service providers that want to make the industry strategic are trying to fully understand these markets in their decision to enter new markets. At this stage, it is important to enhance the infrastructure investments and to encourage governments to invest in transportation. According to the OECD, changes in infrastructure construction and investment decisions, including maintenance, will require investments in the industry globally from 2010 to 2030 of $220 billion per year. For roads, infrastructure needs, maintenance needs have emerged. According to the model employed, maintenance needs and infrastructure expenditure varies between 3.3 percent of GDP. Low-income countries require an additional investment of 2.5 percent of their GDP for middle-income countries and 0.76 percent for high-income countries.

Keywords: Logistics, supply chain, blockchain, fintech, smart contracts.
JEL Codes: M10, M15, M16

1. INTRODUCTION

1.1. Post-Pandemic Global Logistics Sector Overview

In Covid-19 period, ships from China that normally reach the US and European ports in 4 weeks failed to travel to Europe in 12 weeks during the full closing period of the countries. A container that was worth $2,500 was traveling to Europe for over $10,000. China has become the world's factory in the last 30 years, making it able to do one-third of global production alone. Manufacturing and supply problems in South Asian countries such as China and Taiwan have resulted in the failure of Western automobile factories to produce for months. On the other hand, the world's e-commerce volume exploded with the Pandemic. In the last 10 years, it was thought only two years that the level that was to come. For example e-commerce penetration came at %50 in China, surpassing %30 in the Europe and the United States. In Turkey, it went from 6% to 20%. The pandemic has once again demonstrated that how the strategic logistics services are important. If you can't send

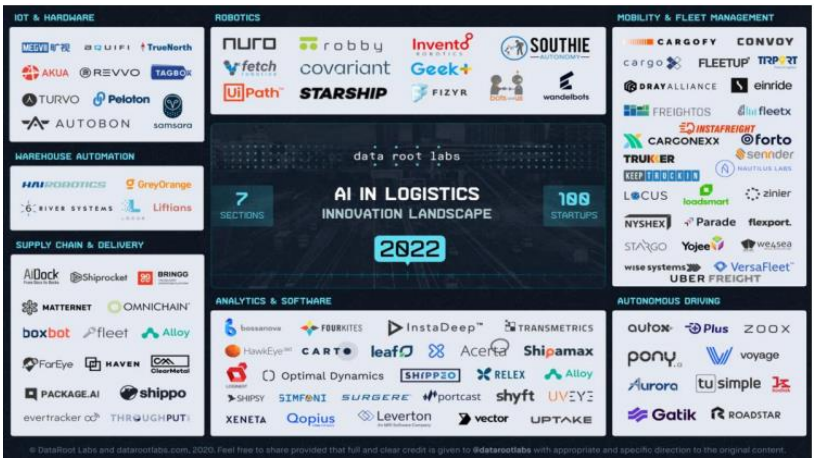
the goods to your client in time, the fact that it's not yours indeed actually dominated the world economy. And the fact that, along with the Covid-19 pandemic, a country needs to produce the essential products it needs inside, at worst, nearby, has come out of its total nudity. Production had unwittingly shifted overseas (offshore) over the past 40 years. But the pandemic created a new concept: "NearShore" (Close Production). The global logistics market size grew by 4.5% year-on-year to $5.2 trillion in 2022, according to the research results from the international market research firm called IMARC Group. The logistical ecosystem size exceeds 8 trillion dollars when indirect market components are included.

The turnover produced by the logistics sector is the lion's share of the turnover, which is 61%, transports by road. FTL (Full Truck Load) and LTL (Less than a truck load) transports stood out in this category at 35%, with micro-distribution operations, particularly at FMCG (Fast Consumption Goods), accounting for 26%. It was followed by shipping at 17%, air transport at 14%, and rail transport at 4%. Among the largest firms in the world are C.H. Robinson Group, J.B. Hunt Transport, Inc., FedEx Corporation, CEVA Logistics AG, Expeditors International of Washington, Inc., United Parcel Service, Inc., Kenco Group, XPO Logistics, Inc., Americold, Deutsche Post AG, and DSV Panalpina A/S.

Road transports remains a global leader in the logistics sector. Globally, the road remains the dominant industry in transferring the products from one point to another. On an average worldwide, 70% of freight transport is done by roads. The European Union average is about 75%. It's 70% in the United States and 60% in Britain. In Turkey, 90% of the transports is done by roads. The impact of COVID-19 on global trade and all labor has been highlighted as a major factor increasing the pressure for digital transformation in logistics. E-commerce is growing at a rapid rate beyond predictions. Not only has the pandemic accelerated growth in e-commerce, it has highlighted visibility and operational transparency among firms on the B2B side, the supply chain leading to acceleration and prioritization of innovation agendas.

Digital platforms that can streamline the logistics of spot markets with AI-enabled algorithms and mobile technologies, and intelligently match the right load and the right truck with location-based, real-time technologies have had great opportunities in the industry in recent years. Logistics technologies are available in 7 areas around the world: Mobility, Visibility and Digital Fleet Management, Embedded Logistics Technologies, Robotics, Storage Automation, Supply Chain and Intelligent Delivery Technologies, Data Analytics, and Autonomous Driving Technologies.

Figure 1: Digital Logistics Solution Platforms



1.2. Fintech Services

Fintech means financial technology as a word and incorporates many innovative innovations in the financial sector. Over the past 10 years they have signed many new financial solutions, especially in the financial literacy and education sector, retail banking, financial investments and digital currency encryption, the decentralized financial world, digital crediting and logistics sector. So the Fintech World is comprised of a wide range of different companies. Entrepreneurs in the field of Fintech's know the limitations of the current financial processes very well. They focus primarily on specific financial services to take advantage of the many opportunities that emerging technologies in this area can offer to the industries. They were founded to deliver innovative digital solutions to the financial sector, or independently to provide financial services, for their accelerated work, starting in 2010. Afterwards, Fintech's offer a variety of opportunities for services businesses in non-financial areas, and implement IT solutions, usually based on mainly intelligent data collection and processing.

As the logistics industry has continued to grow and become more complex in recent years, we may see more and more of the supply chain processes develop with the confidence in the power of blockchain technology in the coming years. While globalization has caused problems for shipping companies and retailers in the past, increased links between countries and trade, the blockchain has largely raised inefficient practices, cyber attacks, and other issues. In addition, the blockchain application provides companies with healthy data to track the movements of shipping containers, identify time-wasting steps, and plan simplified routes for the future.

By leveraging smart contracts within the business, retailers no longer need brokerages, lawyers or other third parties to complete their tasks. Thus, smart contracts help retailers and logistics companies enter binding contracts that are immediately terminated if all agreed upon conditions are not met, increasing transparency and profit, while reducing delivery time and cost errors. Logistics are very convenient to use

technology facilities, and with transparent records, reduced costs, and efficient route information, the possibilities of a distributed general ledger system are highly favorable for business efficiency.

At this point, we can examine the best worldwide practice examples from the services of a number of Fintech companies that are providing support to the business processes of the logistics industry.

Adyen (https://www.adyen.com**)**

Adyen has begun to work with payment systems at a time when service providers in the industry offer services based on system patches built on a number of outdated infrastructure. And then we see that its on the way, completely within the company, to build a financial technology platform from the ground up. Today it offers end-to-end payment capabilities, data enhancements and financial products to the world's leading businesses in a single solution. For example, if you want to travel anywhere in the world by Uber, or book a room at AirBnB in Amsterdam, your payment is made through Adyen. After all, Adyen is a Dutch Collections Payment Service Provider with 227 payments per month.

Voordegroei (https://www.voordegroei.nl**)**

Voordegroei provides loans worth at least €250,000 to small and medium-sized enterprises (SMEs) as investors seek a high return on their investments. After due consideration, the company decides whether to invest in the company that investors are interested in through the platform through the Voordegroei platform, which provides information about SMEs business model, benefits and expectations.

Slync.io (https://www.slync.io/)

Slync.io brings together Blockchain and Artificial Intelligence to provide retailers, manufacturers and suppliers with real-time information about all their local and global shipments. The platform allows movers to automate monotone workflows, anticipate bottlenecks or challenges in the logistics process, and even provide a real-time perspective on shipping activities. Slync.io is a SaaS operating platform for global carriers and logistics service providers that deliver greater productivity and process efficiency through intelligent automation systems.

Koopman Logistics (https://www.koopman.eu/en)

Koopman Logistics is an automotive transport company that uses a blockchain technology to transport cars around the world. Utilizing general ledger technology, it reduces paper supply, speeds up payment processing and makes shipping operations more secure. In April 2018, Koopman became the world's first automotive logistics company to deliver a vehicle over the blockchain by completely paperless way.

IBM (https://www.ibm.com/us-en/**)**

To give more confidence in supply chain data, IBM is providing support for implementing supply chain networks with blockchain technology. The IBM Blockchain initiative implements distributed general ledgers to define company-specific rules, create smart contracts, and improve data invariant records. As a result, organizations can provide their own information and a holistic picture of their data to certified individuals.

MuleChain (http://www.mulechain.com/)

MuleChain is a decentralized end-to-end (P2P) personal delivery network. Using blockchain-based smart contracts, movers enter into deals with the same goal. Once the parties set a price, the practice delivers the movers' belongings in personally. All interested parties have listed MCX tokens as a collateral.

dexFreight (https://www.dexfreight.io/)

The DexFreight platform includes the blockchain-assisted end-to-end (P2P) market, the first in the industry for shipping and transport. Contains everything from encrypted identity management to smart contracts and token payments, all helping to alleviate disruptions and increase transparency in the P2P supply chain market.

1.3. Transition to the World of Digital Money

Cash-Free Society - A lot of research has shown that we're accelerating towards the structure of "cash-free society." We're all going through a process where money digitizes very quickly. In Canada, known as the world's most "cash-free" country, all transactions without cash are estimated to weigh up to 60% of the total amount of money. Developed countries are following Canada, including Sweden, the United Kingdom, France and the United States. Digital coins are classified into two groups: “electronic money” (e-money) and “virtual money”. This distinction is based on whether there is government credibility behind it. While those with a state reputation are considered "electronic money", digital coins such as Bitcoin, a nation behind which is not a state, are considered "virtual money". So, e-currency is sort of a representation of money in an electronic setting. For example your $5,000 stored in a bank deposit account, or $500 in your PayPal account, is an electronic currency. Electronic coins have either nation-states and central banks or private organizations such as PayPal. The reputation of digital monies depends on those who are not defined by money, meaning that stateless digital coins, such as Bitcoin, are considered "virtual currency".

It is possible to switch from explicit virtual currency (convertible virtual currency) to virtual currency such as Dollars and Euros. They can also interact with the real economy. In other words, it is possible to buy goods and services with virtual currency that is open to the outside. Externally open virtual coins are also divided into centralized and distributed fabrics. WebMoney is a great example of a centralized version of the open virtual currency. It provides services such as keeping track of payment instruments, converting payment instruments, funding

flow, resolving disputes, and performing secure business transactions. However, the WebMoney platform has a central architecture. Records of Bitcoin transactions are kept on the Blockchain of distributed architecture.

Figure 2: Web Money Transfer System

Source: https://www.wmtransfer.com/

1.4. The Digital World

The early stages of the Internet were a brutal time for many. We've collectively failed to find ways to build value. We only exist on the ground, on the principles, in the built-in environment of a pre-digital world, enriched by the potential of what's next. We take the thought of the past, we force it into the boxes of the future, and it doesn't fit. While this may be a nightmare for established firms, brands, regulators, it has been a wonderful time for lawyers and consultants. We can call this period "the ultimate mess." We're in a digital middle age. Devastating forces, the engine of change, the acceleration of complexity, the stress of companies fighting for profit margins of the past... that's where we're in the energy. At every stage of our complex life, we don't realize it because we've fallen so much in love with the miracle of the new.

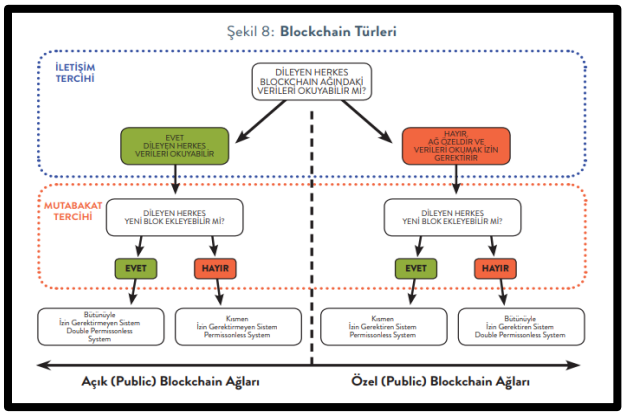
What makes the path to the future more positive, holding all of these experiences together, all of the perceived errors, is that we've been interpreting and evaluating the idea of the digital age to date, passing it through a digital lens. We took every behavior, product, or physical object and changed it in an astonishing way. We've transformed the old into the new, developing old things very rarely with new frames, and never thinking about what is possible. In fact, from a critical point of view, most of the modern world seems to have changed tremendously little. Everything we see today is a repeat of the past, a gradual improvement with additional technology. We're going to think about the technological age in this post-digital age, not the technology itself. We're going to reinvent the physical retail, because online behavior means that we expect to find what we're looking for quickly, see what goes next to what we're going to get, and never stand in line for payment.

1.5. Blockchain Practices in Finance

Blockchain was the technology of the new period—a software architectural structure, to say the least. It is becoming more and more widespread. The ultimate impact is that it brings together transaction and shopping (not physical, of course). It will either eliminate the agents altogether or cause the structure to change. Vitalik Buterin, born in 1994, was designed to be an Ethereum inventor and described as a Blockchain. "This is a magical computer that anyone can install programs and leave them to work on their own. It makes it possible for everyone to see all the existing and past situations of every program on this computer. It also carries a crypto-economically ensured warranty that programs in this chain will continue to function in a way that the Blockchain protocol fully explains."

The blockchain is essentially a database system. Saving data into blocks in a sequential fashion. There's a timestamp on each record. One block is full, the next block is built. Blocks are bound together in chains. Just as there are databases all over the world today, the same is true for Blockchains. We can think of a blockchain that would be built into each project, into each cryptocurrency, into each registration system. A blockchain is actually a registry/book-e-calculus. (general ledger) Each blockchain has its own rules. The size of its blocks, the block's information fields (such as title, password, timestamp, version number, fingerprint of each record, the protocol to which records are to be recorded, what fields to contain, what to sequence, what to do with the block's full, the conditions of the new block's production, the conditions of interconnect with blocks, the properties of the interblockchain, how the Blockchain is distributed across the grid, stored, monitored, and controlled, are the properties and rules of each blockchain. The more useful these specifications and rules are, the more purpose-built and secure the demands for use and attention in that blockchain are likely to be, in some cases, high. We no longer have to save data to central systems, but it is possible to store data using services such as cloud services or even over-the-top structures such as P2P. Cloud and P2P structures may also have databases on them. Moreover, the size of the data is not an obstacle to many other areas of distribution, because we have very high-speed communication networks.

Figure 3: Blockchain Types



Source: Usta, Ahmet. (2021), Blockchain 101, Fintech Istanbul Eğitimi

1.5.1. Blockchain Types

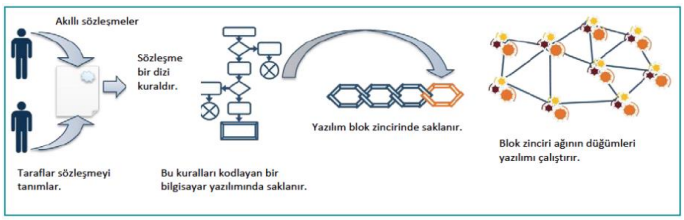
If you do not need permission to enter a Blockchain network and read the recorded data and follow the network's "reconciliation structure", again does not require permission to participate in the "reconciliation process" to add new blocks, such networks are called Blockchain Networks that do not require Full Permission. The purpose of such networks is to involve as many people as possible in the system and everyone involved in the "reconciliation process". As the number of people who are part of the network increases, the number of points that have a copy of the data chain within the network will increase and the network will become even safer every day. If you do not need permission to enter a Blockchain network and read the recorded data, but if you need permission to add new blocks and participate in the "reconciliation process" following the "reconciliation structure" of this network, such networks are called Blockchain Networks that “Do Not Require Partial Permission”. For those who access data on such networks, the data provides value, while the network itself is typically designed to serve specific purposes. They are now selected to participate in the "reconciliation process" of data records which are accessible to everyone.

Blockchain Networks are grouped into Open (Public) Blockchain Networks as they are accessible to everyone, which requires no Permissions and Partly No Permission. On the other hand, companies, organizations and public institutions may find it inconvenient to have data on Open Blockchain Networks. Yes, it's possible to encrypt data to those kinds of networks, but those passwords can be cracked or people with the keys can leak the information. If we need permission to enter a Blockchain network and read the recorded data, but then follow the "reconciliation structure" of this network and require no permission to add new blocks and participate in the "reconciliation process", such networks are called “Blockchain Networks that Require Partially Permission”. The purpose of such networks is to make the recorded data accessible only to interested parties, but to include everyone who enters into the "reconciliation process". This creates a secure data recording system between those involved in the network. We can explain this to strangers when we're playing indoors with a script that only our friends are invited to join us. Our invited friends will be able to enter the game immediately. If we need permission to enter a Blockchain network and read the recorded data and then re-allow for the addition of new blocks according to the network's "reconciliation structure" and to participate in the "reconciliation process", such networks are called Blockchain Networks that require Full Permission. Such networks are only intended to make the recorded data accessible to interested parties and to include only the selected parties in the "reconciliation process", among those authorized to access the data. This creates a multi-layer secure data recording system between those involved in the network.

1.5.2. Smart Contract on Blockchain Network

Intelligent agreements are self-executing programming codes that automatically transfer digital currencies or assets between the two parties under pre-defined terms.

Figure 4: Smart Contract



Source: IDATE DigiWorld, Blokzinciri, Ekim 2016

Smart contracts increase the complexity of blockchain-based transactions by adding a set of conditions to complete the process. These terms are defined in a computer program that serves as the contract between the two parties in a transaction and is automatically validated and enacted by the blockchain. Intelligent contracts provide alternative uses of the blockchain, especially in financial services, loans, insurance, betting, crowdfunding, recurring contracts, leases, etc. So contracts are automatically conditional. The financial transaction takes place in the event that the conditions set forth in the agreement are met. In addition to issuing intermediaries whose work is to draft and implement contracts, this service of the blockchain helps reduce insurance and collection costs on contracts and can speed up the process. Smart contracts can be enacted by modifying or adding on the first blockchain platform (for example, Bitcoin) or by using custom blockchains (especially the Ethereum project). So people who are registering data across all of the networks are using computer systems to go there. So it can run programs on these systems as well. "Smart Contracts" are applications that run on Blockchain networks (if the network has such a feature). Smart Contracts can perform specific tasks by working automatically if data within blocks written on a network ensures specific situations. Insurance of goods and accidents constitutes the largest volume within the insurance industry after life and health insurance. By the end of 2023, the estimated total size of such insurers is expected to reach approximately $1.4 trillion. An examination of the current compensation process presents challenges such as a high latency and cost associated with intermediaries, a lack of information-sharing structures and the risk of fraud and repeated transactions, all of which involve the difficulties in creating data which supports the process due to dependence on third-party data providers. The application processes can be simplified, with a new flow based on the Blockchain and Smart Contract to be created here. With intelligent devices and IoT applications, this process can be automated, eliminating the need for agents and removing the latency and cost of their delivery from the process, making integration into reliable data sources the generation of support data comprised of minimal human control, in most cases allowing smart contracts to automatically manage and complete the entire process up to the payment process.

1.5.3. Supply Chain Management

The traditional supply chain structure implemented today finds it very difficult to control, with manufacturers and consumers focusing mainly on their own internal flows as part of the silo approach, with mixed integration and information processing happening in every step along the supply chain, resulting in time, cost, and business efficiency, and a variety of problems. Together with a blockchain-based structure, each change of hand from fabrication to sale of a product can be documented by creating a permanent product history. This could significantly reduce the time lags, additional costs and human errors which hinder today's operations. Automated control and action flows can be performed during the movement of a product on a chain using smart contracts. When we evaluate (e.g., the realization of a unit-by-product transfer by Z upon arrival at stage X and passing Y control) with the Customer eye, users can be informed about the progress of the product they are receiving and can make more informed decisions about it.

1.6. DeFi Finance System

As it is known, Bitcoin is a peer-to-peer electronic cash system. DeFi, is a peer-to-peer electronic financial tool system, referring to projects that use encryption tokens and blockchains that allow everyone to publish, transfer and own financial instruments. The maturity of the Ethereum network resulted in a series of projects that gave not only the ERC20 tokens, but all sorts of financial instruments. Bitcoin emerged as an alternative to the financial system, but the lack of features (a feature in itself) made it difficult to create complex financial means. However, smart contract functionality in Ethereum has led to the relatively easy creation of complex financial instruments. While Lightning Network opens Bitcoin to micropayment usage examples, it is not realistically suitable for a variety of tools that can be created using full intelligent contract functionality. Many other networks with EOS, Cardano, Dfinity and smart contract functionality are potentially available to DeFi projects, but for now Ethereum is the market leader, mainly because it has the largest developer mentality and many ETH owners who want to put their money to work. It is important to note that open finance and decentralized finance have two different terms which at some point can converge and share similar qualities. Open finance refers to the separation of banking services, where API-supported initiatives offer extensive services in a limited geographical region. (API) is an acronym for the Application Programming Interface, a software agent that allows two applications to talk to each other. Every time you use an app like WhatsApp, send instant messages or check the weather on your phone, you use an API.

2. LITERATURE REVIEW

Research in this area is often done through data security, financial technologies, logistics solutions, and public policy. In today's logistics, the customers' first demand is flexibility. It is important, however, to facilitate taxation and other obligations within the business process. (Toppen et al., 1998) The innovative financial services developed by the Fintech companies through financial technology provide significant contributions to the logistics sector. The differences in entrepreneurship, with the help of fintechs, are a major contributor to the development of services and products. Susilo et al., 2019. In recent years, we have also seen significant contributions to the development of economic innovations. (Bernanke 2009); (Awrey, 2013); (De Haan et al., 2020); (Board, 2017); and (Board, 2017) The main factor affecting the industry buyer's demand for innovation is that buyer alternatives are showing changes. Customers' real-time computing potential and extreme expectations are challenging business. Mobility, speed, cost reduction, easy handling of offers, and financing are all common elements of demand. At the same time, technological innovation is rapidly and novel in the sector, driving up offerings and profits on a variety of business models. Industry-wide innovation is a pricing technique developed for customers using mobile pricing, mobile phones, tablets, etc. (Rahayu vd., 2014) The mobile quote process is a positive development for users. (Fontes and others, 2017)

Digital transformation represents the level of exploitation of real technology today, as in the logistics industry. The digital transformation can be as follows. In short, it is defined as the digitization of individuals initiatives and the reduction of paper use. (Patel & McCarthy, 2000) Example of virtual software solutions developed in the field of accounting. Many financial technology applications are especially used in the industry, including paperless accounting processes, best large data processing and analysis systems, process automating for business processes, systems in a modular structure that can be integrated with each other, real-time reporting, visualization business tools, and cloud

computing database infrastructure. (Kreher, 2017) (Tsing, 2016), particularly at this point, came up with the idea of chain capitalism to explain the old configuration of capitalism. There's a model that the economic parties are distributing globally. It is said to have a large number of distributed and fluctuating business models. Supply chains are mixed together in a complicated way. According to Tsing, this structure must be considered "a hardened heterogeneous political economic system". Financial capitalism has many approaches associated with the field of logistics. Supply chain capitalism relies heavily on financing because it supports buyers with capital. (Tsing, 2009) Also in logistics finance depends on earnings made during the delivery chain period. Another critical aspect is that among the activities of capital in the field of finance and logistics, monetary markets become so critical. The reason for this is that there's actually a trend in global trade to develop a security mechanism to avoid the dangers that are at stake. (Lee & LiPuma, 2004) Financial derivatives allow global employee entities to maintain their trade operations, while investors on the other side create a speculative source of revenue for institutions like hedge funds. (Lee & Lipuma, 2004), p. 67-83; (MacKenzie, 2008).

3. RESEARCH FINDINGS

3.1. Getting Started with Blockchain in Logistics

When a company understands and accepts the potential for increasing efficiency and value of blockchain technology, the next step is to construct a roadmap that is suitable for implementation. This must start from a desire to cooperate and include building blockchain knowledge and skills with a focus on creating value for all stakeholders. There are three main success factors for each blockchain initiative:

Success factor # 1: Creating a Culture of Collaboration

When a logistics company agrees to work with blockchain technology, it enrolls in an intensive collaborative effort. This is because much of it involves facilitating reliable co-operation between multiple entities, including state institutions of all types, industrial organizations, regulators, partners, and even competitors public and private organizations. Collaboration platforms have been created to enable competitors to work together to research the implementation of blockchain technology, taking the very competitive financial services industry example. Although competing cooperation does not seem intuitive, economies of scale affect the value of the blockchain. When more parties agree to use a single blockchain solution, more value is generated for each participating organization. That's why several blockchain consortia appear in the logistics sector.

Success factor # 2: Building Blockchain Knowledge and Capabilities

Knowledge and capabilities enable organizations to determine and realize the value of new operating models. Therefore, it is important to provide the time needed to successfully contribute to each blockchain project to the partner organizations and individual contributors who strengthen the tools and resources. They must be able to effectively communicate with relevant technology players, implementing partners and associations within the blockchain ecosystem.

Success factor # 3: Focus on Value and Interact with Stakeholders on Blockchain Opportunities

By participating in blockchain-based prototypes, stakeholders can prove and understand the business value of a new initiative and establish technical feasibility. It is important to establish realistic expectations and to acknowledge that blockchain technology remains in an early stage of the software maturity lifecycle. It must be implemented on a large scale yet. Recognizing the full value of this technology depends on the cooperation with the entire stakeholder ecosystem and attendees must be ready for it. When determining their promising blockchain usage, companies must examine each idea to establish their dependence on blockchain technology. The design and planning phase moves towards a prototype to prove the concept. In the proof of concept phase, stakeholders should learn all the nuances of using blockchain technology in the proposed application. In the pilot stage, stakeholders must test the application on a small scale while completing a high degree of dissemination evaluation. This pilot stage is required to include all stakeholders, so this step includes a viewpoint change from achieving success with an internal solution to multiple party engagement and testing the solution over a network. The last stage in a blockchain application involves scaling the solution and realizing the comprehensive benefits. This requires significant transformation in business processes not only between on-premises parties, but also between partners and even a large number of stakeholders, including competitors. Therefore, the success of the solution depends greatly on stakeholder acquisition and acceptance. The success of the project depends on everyone getting the job done and getting the full benefit of blockchain implementation. Stakeholder participation is probably the most critical factor in the adoption of the blockchain.

3.2. Technology & Financial Driven Business Development Recommendations

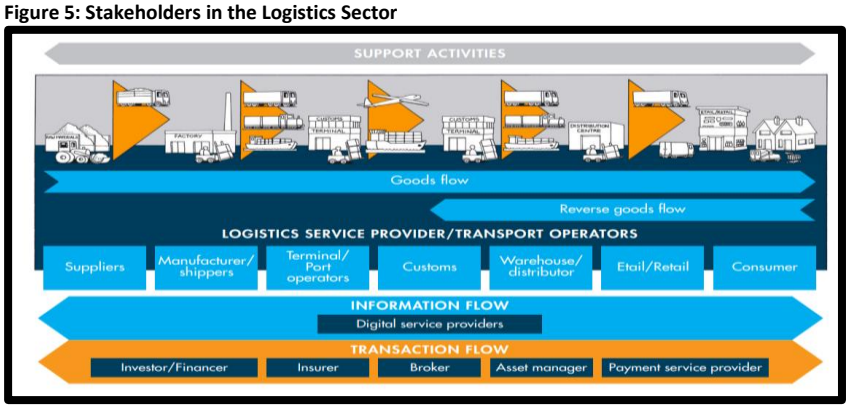
- Don't go into this world by yourself. Blockchain technology has a structure that unites many sides. Since there is no reason for you to go it alone, it has to be either to build an ecosystem or to be part of an ecosystem that exists.
- In order to understand blockchain technology from an enterprise perspective, it is necessary to examine open networks, but the best experience can be understood in a specific infrastructure. I'm not supposed to neglect that step.
- It is necessary to establish targets of where it can use blockchain technology. For these goals, it is necessary to perform a proof-of-concept (Proof of of Concept) study on the specific infrastructure.
- It's important to think about the real world of business and processes, how you can solve problems with the Blockchain.

- When using all these suggestions, it's important to start with a problem-oriented rather than a technology. If you start with a technology-focused approach, as soon as it's described in the phrase "Anything that's a hammer, thinks it's a nail," unsuitable problems can be solved by a Blockchain approach, where you can find yourself going the wrong way.

The Netherlands, as it is well known, is the world leader in logistics, generating significant business and value in this area. The other thing is the fact that the Netherlands has done very well in the information exchange and co-ordination of supply chains. Global advances are the incentive of the Netherlands to develop highly innovative solutions to make its logistics sector competitive. All of the innovation in the industry has shown that the new perspectives of the logistics giants and their processing platforms are driven by entrepreneurs. The Dutch government is heavily behind all the innovations that have traditionally been used to focus on optimizing the flows of physical goods and information. Today, transaction flows within the industry are recognized as a significant opportunity to add value to the logistics industry in developed countries.

As shown below, there are many stakeholders in the logistics sector: investors, insurers, brokers, portfolio managers, and payment service providers.

Figure 5: Stakeholders in the Logistics Sector



Source: Logistics & Fintech (2017). From Direct Benefits to Big Impacts, Whitepaper, sf.3

3.3. Fintech Opportunities in the Logistics Industry

In logistics chains, information exchange is usually done through paper documents. Manual signatures, intensive correspondence, and official stamping procedures (billing, bill of lading, accredited), and business processes are in operation. Many logistics companies still use outdated technology systems that lag behind the current situation. But today's business is rapidly unleashing new ways of doing business through innovative investments that involve high technology in a "Networking Society" mentality. Compared to other industries, logistics services (data and transactions) are not fully compatible with existing digital infrastructure (e.g. cloud software, smartphones, etc.). This is also especially true of small and medium-sized companies in Turkey. Using the financial opportunities offered by the Fintech companies around the world, the logistics sector could also take financial steps in our country, with a huge technological opportunity to move forward. However, logistical service providers have traditionally focused on the delivery of goods and can quickly adapt to the realization of the opportunities Fintech's can offer in their business processes. Both Fintech and logistics companies could bring big benefits to the industry by joining forces.

3.3.1.Fintech's Service Areas and Opportunities in Logistics

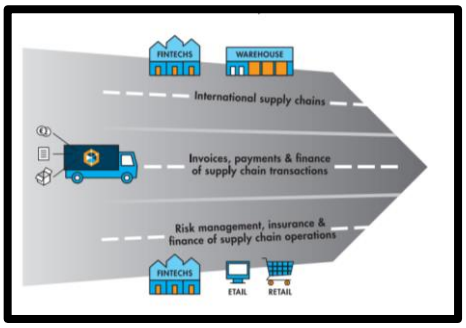
There are 3 significant potential areas for Fintech solutions;

1. Improve management, operating capital, and supply chain financing,

2. Provide financing for equipment, inventory, and real estate,

3. Facilitate international trade, cross-border movement, and trust.

Figure 6: Fintech Services and Opportunities in the Logistics



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ource: Logistics & Fintech: From Direct Benefits to Big Impacts, Whitepaper, sf.5, 2017

Many logistics companies can reduce their business capital needs by using a wide range of alternatives. Nowadays, logistics firms struggle extensively with billing processes and payment methods, under available funding options. However, by reducing their administrative challenges with the help of innovative solutions in today's financial area, they can rapidly add value to their business processes by improving insight into financial matters.

At this point, these are the first points that we can define to solve problems;

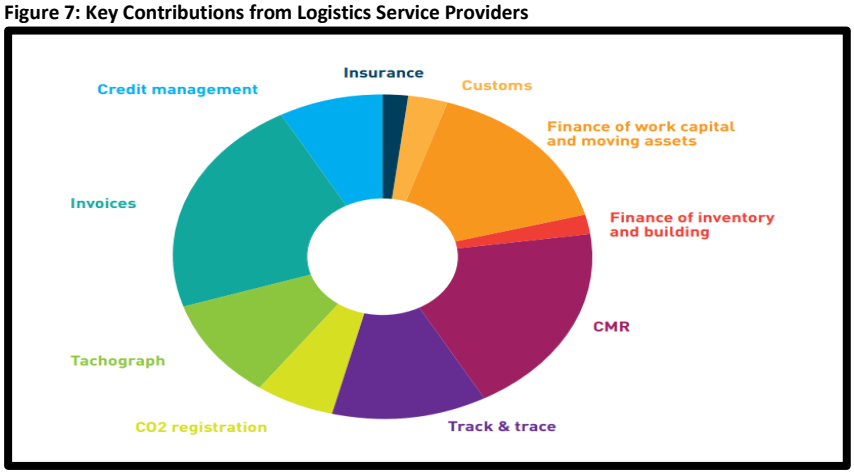
1. Securing Business Capital: Some supply chains include large loan-capable buyers. In a perspective intended to support "Supply Chain Financing (SCF)" regulations to effectively fund net working capital, logistics providers may be provided with capital and tax incentives from the public sector. In other supply chains, the capital problems of logistics companies can also be solved by meeting their needs through other solutions (e.g., reverse factoring) offered by banks and subsidiaries.

2. Optimizing Administrative Processes: A wide range of solutions are available at this point. Activities can be initiated by optimizing all processes, from purchase to payment and order to payment. Inefficient collaboration can be improved by developing a network of information about deliveries among supply chain partners. Fully automation can also be done within business processes, including approval processes, invoicing, and cross-company digital connectivity. The possibilities for timely handling of logistical business processes have been extremely accelerated in recent years. The need to 100% handle storage and full-time transport services requires a range of business solutions that are custom-tailored. The issue of effective financing or insurance is important at this stage. The business processes in the logistics sector could be assessed at financial and operational risks, based on more available local and global data on logistics assets, enabling private delivery of financial services to the customer.

3.3.2. Business Process Supports

Logistical service providers face numerous challenges in financing and managing their investments. Efficient data management is the first to attract, particularly with the provision of operational capital, effective management of administrative processes and the collection of all required operational resources.

Figure 7: Key Contributions from Logistics Service Providers



Source: Logistics & Fintech: From Direct Benefits to Big Impacts, Whitepaper, sf.8, 2017

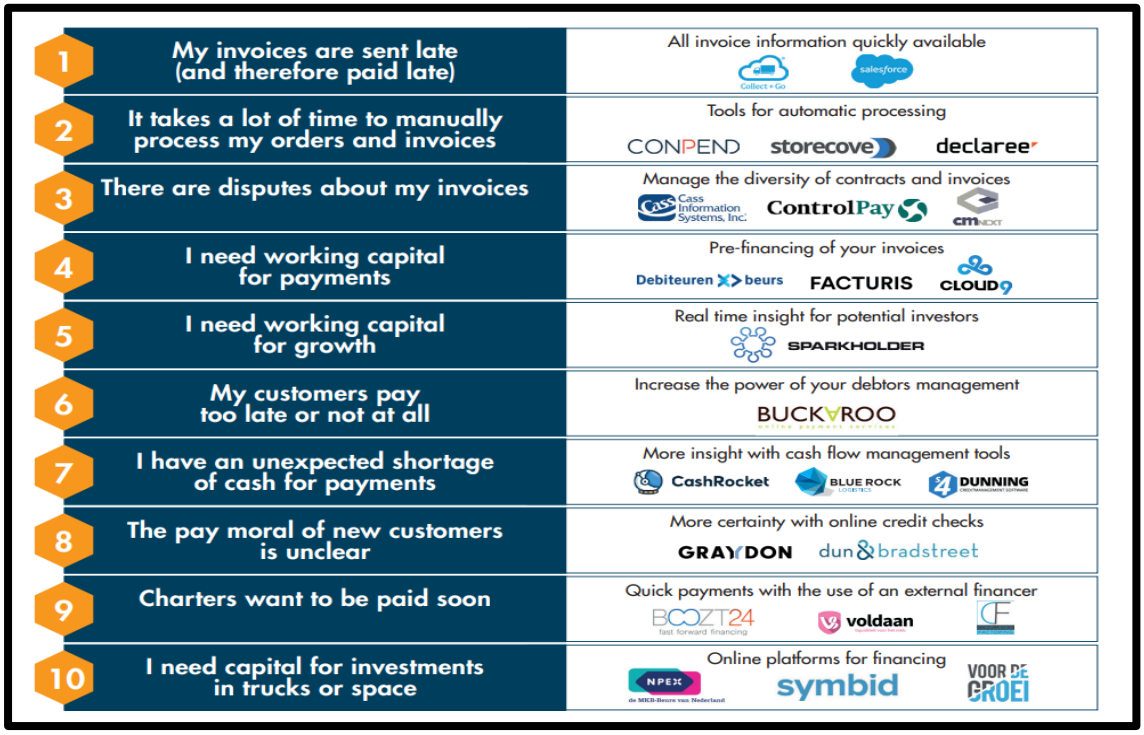
Typically, order processing, billing, and payment processes are not always smooth sailing. Cash flow management is a key challenge for logistical service providers. Logistic service providers can improve their finances by improving cash-from-order business processes. Payments

can be received on time when tracing invoices is processed correctly and sent quickly. The cost of financing of business capital can be reduced more rapidly. In addition, any required data must be collected at the best quality through an effective registration system during the process from order to payment. Stages such as logistics operations (e.g. CMR. and tacograph data collection or tracking and tracking data) and correctly calculating costs are critical. Billing or self-invoicing according to customer specifications is important for logistical service providers in the business process from order to cash. Other challenges include effective financing of material assets such as buildings, equipment and inventory. Managing the active assets of fuel consumption, services and penalties, such as tracking the process flow online, is important in a constantly changing combination of drivers and trucks and trailers.

3.3.3. Fintech Companies Contributing to the Logistics Industry

Fintech companies have a lot of solutions that improve the processing of orders and invoices. Improvements can be made in this area of cash management, as well as all payments within the business processes.

Figure 8: Ten Successful Solutions Provided in Logistics with Fintech Solutions



The adoption of such Fintech solutions has so far been very low in the logistics industry. The real challenge, however, is to raise the awareness of logistics service providers, especially small and medium-sized logistics companies. Another challenge is to resolve a potential conflict of interest in a timely manner. This problem arises with the existing financial providers for the industry. There may be risks such as not supporting some of the business financing and shifting it to other companies as they might perceive it as reducing and increasing the profit margins. However, the large financial institutions should allow small fintechs to enter the sector through SMEs. Fintech's provide logistics service providers with an opportunity to expand their service portfolio. In particular, they can increase their role in the supply chain and add value to their business. By reducing risks and costs, customers logistics service providers have real-time insight, reliable supply-chain data can provide them with commercial opportunities for new enhancements. These services can gradually change the role in the supply chain.

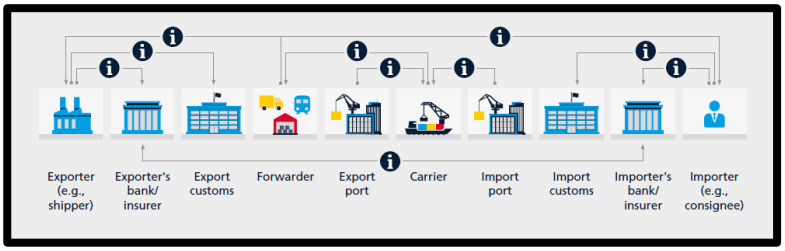
3.4. Work Excellence with Blockchain in Logistics

Achieving excellence in logistics involves working with others to optimize physical goods flow as well as complex information flow and financial transactions.

However, there are now significant trapped values, largely due to the fragmented and competitive nature of the logistics industry. For example, in the USA only, it is estimated that there are more than 500,000 individual truck companies. With so many stakeholders included in the supply chain, this often leads to low transparency, unstandardized processes, data silos and various levels of technology adoption. Many parts of the logistics value chain also depends on manual processes mandated by regulatory authorities. For example, companies often need to rely on manual data input and paper-based documentation to comply with customs clearance. All of this makes it difficult to trace the source of goods moving along the supply chain and the condition of shipments, causing friction in global trade. The blockchain can potentially help overcome the frictions in logistics and deliver significant gains in logistical process efficiency. This technology can also create a single source of truth by ensuring data transparency and access among relevant supply chain stakeholders. In addition, the confidence needed to share information among stakeholders is strengthened by the specific safety mechanisms of blockchain technology. Moreover, it

can reduce costs by reinforcing simpler, more automated, and error-free blockchain processes. In addition to adding visibility and predictability to logistics operations, it can also accelerate the physical flow of goods. Resource tracking of goods can enable a wide range of responsible and sustainable supply chains and can help combat product fraud. In addition, it offers potential for blockchain-based solutions, new logistics services, and more innovative business models.

Figure 9: Blockchain Use in Logistics



3.5: Blockchain Effects on Global Trade

Blockchain technology can help alleviate many of the disputes with global trade logistics, including supply, transport management, tracking and monitoring, customs cooperation, and trade financing. To unlock the efficiencies in maritime transport, Maersk and IBM have launched an initiative to create a global blockchain-based system for digitizing trade workflows and end-to-end delivery tracking. The system allows each stakeholder in the supply chain to view the progress of goods along the supply chain by understanding where a container has been moved. Stakeholders can also view the status of customs documents and view bills of lading and other data. Blockchain technology provides a tamper-proof repository for secure data exchange and this documentation. Blockchain technology can help alleviate many of the disputes with global trade logistics, including supply, transport management, tracking and monitoring, customs cooperation, and trade financing. To unlock the efficiencies in maritime transport, Maersk and IBM have launched an initiative to create a global blockchain-based system for digitizing trade workflows and end-to-end delivery tracking. The system allows each stakeholder in the supply chain to view the progress of goods along the supply chain by understanding where a container has been moved. Stakeholders can also view the status of customs documents and view bills of lading and other data. Blockchain technology provides a tamper-proof repository for secure data exchange and this documentation. Containers that were shipped from China to Canada were delivered to importers (buyers) without any problems. While still in the pilot phase, it will be important for the logistics industry to adopt the "Digital Bill of Lading". Considerable support in supply chains can be delivered to ensure cost reduction, error-free documentation and rapid transfer of original documents. Accenture, a renowned U.S.-based consulting firm, is also developing a blockchain-based system that focuses on modifying traditional bills of lading and issuing commercial documents, facilitating a single source of accuracy for all supply-chain stakeholders for freight inquiries. Here, a decentralized network connects all parties in the supply chain and enables direct communication, eliminating the need to pass through centralized organizations and rely on agents. The proven value of this project exceeds expectations, according to Accenture, Global Freight and Logistics Leader Adriana Diener: "Using the blockchain to modify traditional bill of lading documents to send goods will enable millions of dollars of process efficiency and operational cost reduction benefits in the supply chain for many parties within the trade ecosystem, including shippers, receivers, carriers, transporters, ports, customs agents".

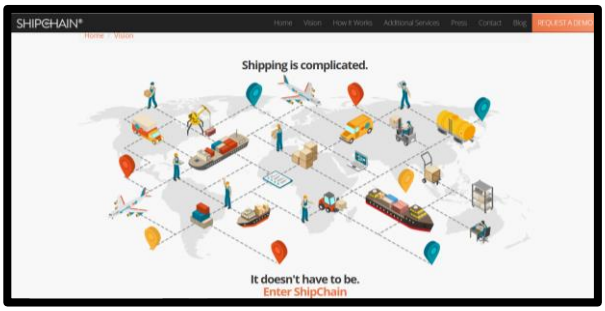
3.6. Transparency and Traceability in the Supply Chain

Many projects are still in progress, using blockchain technology to improve supply chain transparency and track provenance. These enterprises collect data on how products are produced, from where they came from, and how they are managed, and this information is stored in a blockchain-based system. This means data will become permanent and easy to share, giving supply-chain players more comprehensive monitoring and monitoring capabilities than ever before. Companies can use this information, for example, to provide evidence of the legitimacy of products in medicine shipments and evidence of authenticity for luxury goods. These initiatives also lead to consumer benefits where people can learn more about the products they purchase, for example whether a product is ethically sourced, whether it is an original product or not and whether it is protected under the right conditions.

3.7. Automation of Business Processes in Logistics with Smart Contracts

Current industry estimates indicate that 10% of all freight bills contain bad data, leading to disputes and many other process inefficiencies in the logistics industry. This problem is so pervasive that Accenture alone in the oil and energy industry expects at least 5% of annual freight spending to be reduced through improved invoice accuracy and reduction of overpayments. Blockchain has significant potential to improve efficiency and help resolve disputes in the logistics sector throughout the entire logistics and settlement process, including trade finance. As digitalized documents and real-time shipment data are embedded in blockchain-based systems, this information can be used to enable smart contracts. These agreements may automate business processes as soon as agreed conditions are met. "ShipChain" is one of the first initiatives in the logistics industry to pursue such smart contract practices. ShipChain, is an early-stage company that designs a comprehensive blockchain-based system to monitor the process of a product leaving the factory until the final delivery on the customer's door. The system is designed to cover all transport methods and has plans to include an open API architecture that can integrate with existing load management software. All relevant supply chain information is stored in an unaltered blockchain-based database that can be executed by smart contracts after conditions are met (e.g. the driver communicates successful delivery confirmation). A key aspect of automating the payment process is ShipChain's digital currency called "The Ship Tokens." Participants of the ShipChain platform buy these tokens to pay for the freight and to operate on the platform.

Figure 10: Work Excellence with Blockchain in Logistics: SHIPCHAIN



If this business process is used, then the blockchain, together with the Internet of Things (IoT) in the logistics industry, will enable smarter logistics contracts in the future. For example, at delivery, a connected pallet would automatically communicate the status of goods to the blockchain-based system, in addition to the time of approval and delivery. The system can then automatically verify the delivery, check whether the goods have been delivered under the agreed conditions (e.g. Temperature, humidity, etc.) and release correct payments to the appropriate parties, thus greatly increasing efficiency and integrity. Blockchain can also be used in the context of IoT to automate payments from machine to machine. (e.g. connected machines negotiating and executing a price based on logistics activities performed) Another example of a smart contract in the logistics industry is the digitization of letters of credit (L/C) to speed up the preparation and execution of a standard paper based letter of credit transaction, which currently tends to last from several days up to several weeks. Bank of America Merrill Lynch (BofAML), HSBC, and the Singapore Information Committee Development Authority (IDA) developed a prototype to align a paper-intensive L/C process with a blockchain. The system basically allows for sharing information on a secure blockchain-based platform between exporters, importers, and related banks. This business development enables automated execution of the process through a set of digital smart contracts for trade agreements. In the trial, each of the four parties involved in an L/C process can visualize the data in real time on a mobile tablet and see the next actions that are performed.

In a joint statement, consortium partners said the concept evidence showed the potential to facilitate manual processing of import/export documents, improve security by reducing errors, facilitate all parties through mobile interaction, and make working capital of companies more predictable. Partners now plan to implement more tests in the commercial application of the concept with selected partners, such as companies and transporters. New innovators are working in this field as well, and Libelli is a model. It is a solution that essentially acts as an escrow agent to generate an intelligent contract between any vendor and any buyer, bypassing the buyers and sellers need to have a relationship with the banks, and eliminating paperwork traditionally associated with L/C. The company aims to provide transparency to all stakeholders throughout the process, and claims the automation of this business process has reduced the length of letter of credit execution to a few minutes, at costs ten times lower than those banks are currently applying. Other functions that can be automated include outsourced transport management, normative compliance, route planning, delivery planning, fleet management, transport and links with partners.

4. RESULTS

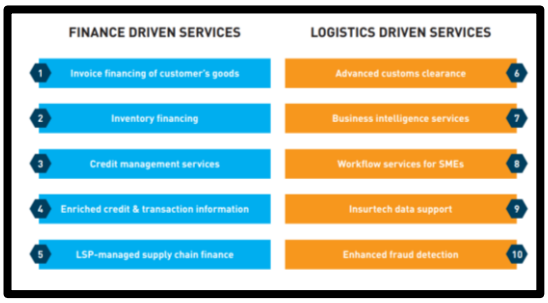
Fintech's provide logistics service providers with an opportunity to expand their service portfolio. In particular, they can increase their role in the supply chain and add value to their business. By reducing risks and costs, customers logistics service providers have real-time insight, reliable supply-chain data can provide them with commercial opportunities for new enhancements. These services can gradually change the role in the supply chain.

Consequently, the parts in charge of financing functions in logistics are as follows;

- Contracts and procurement,
- Account payments and accounting records for the provision of goods and services,
- Compensation claims,
- Records for employees or contractors assigned in case of emergency.

Logistics service providers that want to make the industry strategic are trying to fully understand these markets in their decision to enter new markets. At this stage, it is important to enhance the infrastructure investments and to encourage governments to invest in transportation. According to the OECD, changes in infrastructure construction and investment decisions, including maintenance, will require investments in the industry globally from 2010 to 2030 of $220 billion per year. For roads, infrastructure needs, maintenance needs have emerged. According to the model employed, maintenance needs and infrastructure expenditure varies between 3.3 percent of GDP. Low-income countries require an additional investment of 2.5 percent of their GDP for middle-income countries and 0.76 percent for high-income countries. Required investment maintenance ratios are higher in developed countries.

Figure 11: Expanding Portfolios of Logistics Service Providers



With a maximum score of 5, the Logistics Performance Index (LPI) evaluates countries' logistics performance according to the following criteria. (World Bank)

- Logistics infrastructure,
- Efficiency of the customs process,
- Quality and competitiveness of logistics services,
- Timely delivery,
- Easy transport organization with competitive costs,
- Traceability of shipment.

"According to the Logistics Performance Index (LPI), Turkey was ranked 34th in 2007, but fell to 27th place in 2012. Turkey ranks 47th in 2018. This decline was characterized by customs criteria and customs blockages and cost factors. Shipping criteria and the quality of logistics services have also declined in recent years.

Figure 12: Logistics Performance of Turkey (2007-2018)

Yıllar	Sıra	LPI Puanı	Gümrük	Altyapı	Uluslararası Sevkiyat	Lojistik Hizmet Kalitesi	Gönderi Takibi ve İzlenebilirlik	Zamanında Teslimat
2007	30	3.15	3.00	2.94	3.07	3.29	3.27	3.38
2010	39	3.22	2.82	3.08	3.15	3.23	3.09	3.94
2012	27	3.51	3.16	3.62	3.38	3.52	3.54	3.87
2014	30	3.50	3.23	3.53	3.18	3.64	3.77	3.68
2016	34	3.42	3.18	3.49	3.41	3.31	3.39	3.75
2018	47	3.15	2.71	3.21	3.06	3.05	3.23	3.63

Figure 12 shows that Turkey experienced a decline in rankings and all performance criteria in 2018 compared to 2016. It is accepted that the logistics industry's share in GDP is between 11-13 percent. The remaining 50 percent stems directly from the activities of logistics service providers. The remaining 50 percent consists of logistics activities carried out by the companies that trade goods. (UTIKAD)

Turkey is ranked 42nd on the 2023 ranking and its Logistics Performance Index (LPI) score is:

Figure 13: Logistics Performance of Turkey (2023)

Ülke	LPI Skoru	Gümrük Skoru	Altyapı Skoru	Uluslararası Gönderi Skoru	Lojistik Yetkinlik, Kalite Skoru	Zamanlama Skoru	Takip Skoru
Türkiye	3.4	3.0	3.4	3.4	3.5	3.6	3.5

The scores of the top-10 economies in the 2023 Logistics Performance Index by the World Bank are as follows;

Figure 14: Logistics Performance Index of the World (2023)

Ülke	LPI Skoru	Gümrük Skoru	Altyapı Skoru	Uluslararası Gönderi Skoru	Lojistik Yetkinlik, Kalite Skoru	Zamanlama Skoru	Takip Skoru
Singapur	4.3	4.2	4.6	4.0	4.4	4.3	4.4
Finlandinya	4.2	4.0	4.2	4.1	4.2	4.3	4.2
Danimarka	4.1	4.1	4.1	3.6	4.1	4.1	4.3
Almanya	4.1	3.9	4.3	3.7	4.2	4.1	4.2
Hollanda	4.1	3.9	4.2	3.7	4.2	4.0	4.2
İsviçre	4.1	4.1	4.4	3.6	4.3	4.2	4.2
Avusturya	4.0	3.7	3.9	3.8	4.0	4.3	4.2
Belçika	4.0	3.9	4.1	3.8	4.2	4.2	4.0
Kanada	4.0	4.0	4.3	3.6	4.2	4.1	4.1
Hong Kong SAR, Çin	4.0	3.8	4.0	4.0	4.0	4.1	4.2

Source: Worldbank

Finally, developments in the logistics industry and the digitalization process could also make a positive impact on Turkey's trade volume. The report published by the World Bank not only provides an indication of the current state of Turkey in logistics services, but also serves as a guide for possible improvements and developments.

Turkey may make the following moves to improve its logistics performance;

- Expediting customs procedures and reducing bureaucracy,
- Prioritizing infrastructure investments, especially sea ports, airports, and multimodal facilities,
- Transition to digital technologies, digitization of the supply chain and improvement of end-to-end processes,
- Increase incentives for environmentally friendly and sustainable logistics services, switch to transportation methods that reduce carbon emissions, and adopt energy-efficient storage solutions.

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