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THE EFFECT OF SUPPLY CHAIN TRANSPARENCY AND AGILITY ON INTENTION TO ADOPT BLOCKCHAIN AMONG SMES

Yahya Ayad Shakir SHAKIR

Master's Thesis

Supervisor

Assist. Prof. Dr. Gül Esin DELİPINAR

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The thesis titled THE EFFECT OF SUPPLY CHAIN TRANSPARENCY AND AGILITY ON INTENTION TO ADOPT BLOCKCHAIN AMONG SMES prepared by YAHYA AYAD SHAKIR SHAKIR and submitted in 24/06/2024 has been **accepted unanimously** for the degree of Master of Science in Business Administration.

Asst. Prof. Dr.Gül Esin DELİPINAR

Supervisor

Thesis Defense Committee Members:

Asst. Prof. Dr. Gül Esin DELİPINAR	Department of International Logistics Management, Altinbas University	_____
Asst. Prof. Dr. Tina Ismat Idris SHABSOUGH	Department of Business Administration, Altinbas University	_____
Asst. Prof. Dr. Mehmet GÜREL TEKELİOĞLU	Department of Engineering and Architecture, Fenerbahçe University	_____

I hereby declare that this thesis meets all format and submission requirements of a Master`s Thesis.

I at this moment declare that all information/data presented in this graduation project has been obtained in full accordance with academic rules and ethical conduct. I also declare all unoriginal materials and conclusions have been cited in the text and all references mentioned in the Reference List have been cited in the text, and vice versa as required by the abovementioned rules and conduct.

Yahya Ayad Shakir SHAKIR

Signature

DEDICATION

With deep reverence, I dedicate this master's thesis to my dear father and mother, whose pure souls have been a constant source of inspiration and strength. Additionally, I extend my dedication to my beloved family and those who share in my happiness and triumph. Furthermore, I express my heartfelt gratitude to my esteemed university professors, whose unwavering commitment and guidance have played an indispensable role in my journey toward obtaining a master's degree.

ABSTRACT

THE EFFECT OF SUPPLY CHAIN TRANSPARENCY AND AGILITY ON INTENTION TO ADOPT BLOCKCHAIN AMONG SMES

SHAKIR, Yahya

MBA, Business Administration, Altınbaş University

Supervisor: Asst. Prof. Dr. Gül Esin DELİPINAR

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The main objective of this study was to examine how supply chain agility and transparency impact the adoption of blockchain technology by small and medium-sized enterprises in Iraq. Data were collected using a questionnaire distributed to 24 small and medium-sized enterprises in the food service sector in Baghdad, Iraq. Random sampling techniques were used to collect data. Correlation and regression analysis were used to examine the relationship between the variables. The results showed a significant positive relationship between supply chain agility and transparency and the adoption of blockchain technology. In addition, a regression analysis was conducted to evaluate the impact of supply chain transparency and agility on the adoption of the blockchain system. The results showed a strong positive effect of supply chain agility and transparency on the adoption of the blockchain system.

Keywords: Business, Supply Chain Transparency, Agility, Block Chain, SMEs.

ÖZET

TEDARİK ZİNCİRİ ŞEFFAFLIĞININ VE ÇEVİKLİĞİNİN KOBİ'LERDE BLOCKZİNCİRİ KABUL ETME NİYETİ ÜZERİNDEKİ ETKİSİ

SHAKIR, Yahya

Yüksek Lisans, İşletme Ana Bilim Dalı, Altınbaş Üniversitesi

Danışman: Dr. Öğr. Üyesi Gül Esin DELİPINAR

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Bu çalışmanın temel amacı, tedarik zinciri çevikliği ve şeffaflığının Irak'taki küçük ve orta ölçekli işletmeler tarafından blockchain teknolojisinin benimsenmesini nasıl etkilediğini incelemekti. Veriler, Irak'ın Bağdat kentinde yemek hizmeti sektöründe faaliyet gösteren 24 küçük ve orta ölçekli işletmeye dağıtılan bir anket kullanılarak toplanmıştır. Veri toplamak için tesadüfi örnekleme teknikleri kullanıldı. Değişkenler arasındaki ilişkiyi incelemek için korelasyon ve regresyon analizi kullanıldı. Sonuçlar, tedarik zinciri çevikliği ve şeffaflığı ile blockchain teknolojisinin benimsenmesi arasında önemli bir pozitif ilişki olduğunu gösterdi. Ayrıca tedarik zinciri şeffaflığının ve çevikliğinin blockchain sisteminin benimsenmesine etkisini değerlendirmek için bir regresyon analizi yapıldı. Sonuçlar, tedarik zinciri çevikliği ve şeffaflığının blockchain sisteminin benimsenmesinde güçlü ve olumlu bir etkisi olduğunu gösterdi.

Anahtar Kelimeler: İşletme,Tedarik Zinciri Şeffaflığı, Çeviklik, Blok Zinciri, KOBİ'ler.

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ABBREVIATIONS

AI	:	Artificial Intelligence
ERP	:	Enterprise Resource Planning
IIoT	:	Industrial Internet of Things
IoT	:	Internet of Things
IT	:	Information Technology
RFID	:	Radio-frequency Identification
SMEs	:	Small and Medium-sized Enterprises
WEF	:	World Economic Forum

1. INTRODUCTION

1.1 BACKGROUND

In today's era, technology disruption influences the performance of businesses belonging to all segments, including the supply chains (Guangping, 2015). Businesses, to gain a competitive advantage, are opting for modern technologies in their supply chain activities. The modern supply chain, compared to the traditional supply chain, is more complex due to the low product life cycle, upsurge in consumer demand, and companies at the global level. From the retailer's perspective, they are also working on maintaining a low inventory level and practicing lean. Therefore, in the recent business environment, scheduling, production planning, and accurate demand prediction have become a challenging task (Perren, & Jennings, 2005). A paradigm shift has been experienced, and companies are now moving towards sustainable manufacturing. Traditional companies are looking for contemporary solutions to enhance their coordination and alliances with other supply chain members and to develop their performance. One of the latest technologies that have emerged in the realm of the supply chain is Blockchain (Fahn, & Zanarone, 2022).

This technology is an internet-based technology that increases the transparency and visibility of the transactions taking place between the supply chain fellows (Pilkington, 2016). It stores transactional information which can be accessed by any member. Once the shared members confirm the information, the stored data cannot be eliminated, and due to this prime feature, this technology is considered ideal for record purposes. The multiple entities are intricate in operations, and the authentication of the operations is performed via cryptography (Crosby, Pattanayak, Verma, & Kalyanaraman, 2016). The integrated ledger records such operations chronologically and shares them between the supply chain partners. Compared with accounting, this technology provides an accurate, speedy platform that can minimize trust issues among the partners (Fahn, & Zanarone, 2022) moreover; the operations performed using these technologies are much cheaper. This technology improves the transactions that are beneficial to the supply chain partners. Moreover, by adopting blockchain, around 33% of the activities can be improvised (Alkan, 2014).

The emergence of blockchain technology is timely as customers now demand transparency in the supply chain. For instance, the customers want to ensure that the fish they are purchasing are not farmed from closed waters or employ unethical netting practices (Kuo-Jui, 2016). Moreover, the customers who want to buy jewellery also want to ensure that the diamond is not taken from war-torn regions and is authentic (Gerged, et al., 2023).

Therefore, the adoption of blockchain brings drastic transformation in the transaction methods by providing transparency and unchangeable records for inspection. From the supply chain perspective, it can be explained as the extent to which the data is available to the supply chain partners or companies involved in a supply chain activity. The adoption of blockchain technology improves transparency as it creates distributed and immutable records that can be accessed by the supply chain partners (Saberi, et al., 2019)

Another factor that motivates firms to opt for blockchain practices is supply chain agility. It can be defined as the competency of the firm to cope with the unexpected transformation in consumer demand and use it as an opportunity. Blockchain technology helps the partners to share designs, documents, and information accurately, speedily, and reliably. Moreover, data and information sharing help firms forecast demand and better manage inventory. Thus, blockchain technology takes information from diversified sources continuously, processes it, and then disseminates it with the partners (Alkan, 2014).

1.2 RESEARCH PROBLEM

The studies conducted related to blockchain technology adoption focus on developed countries (Gligor, et al., 2022) and are at an earlier stage in developing countries (Pinnington, et al, 2023). The majority of the studies have been done focusing on the financial sector (Pinnington, et al, 2023), followed by the service sector and barely discussed in SMEs. The research examining blockchain adoption in SMEs is in its earlier phases. The earliest research related to blockchain was done by Chan, & Wong (2016), who explored how environmental, technological, and organizational factors influence an SME's decision to adopt blockchain technology. Tan, T. M., & Saraniemi (2023), also examined how environmental, technological, and organizational factors influence the SME's decision to adopt blockchain technology in European SMEs. Few studies examine the impact of agility, alignment, adaptability, and transparency on blockchain adoption (Baharmand, et al., 2021).

Therefore, this work restudied the nexus between supply chain agility and transparency in blockchain adoption.

1.3 SIGNIFICANCE OF RESEARCH

The outcome of this research is beneficial for the practitioners. It helps them to apprehend how the supply chain parameters influence blockchain technology. These results assist the SME firms and their supply chain managers to adopt blockchain technology. Moreover, the implications help the supply chain managers to recognize how blockchain adoption aids them in gaining a competitive advantage and improving their performance.

1.4 STRUCTURE OF RESEARCH

In the first chapter of this study, the general framework of the study was highlighted in terms of the importance, objectives, and problem of the research. In the second chapter of the study, the theoretical concepts associated with the study were highlighted, which are supply chain transparency, supply chain agility, and the supply chain blockchain system. In the third chapter, reference was made to the study methodology, the study population and sample, and the study hypotheses. In the fourth chapter, the analyses used in the study and the results reached were highlighted. In the fifth chapter, the conclusion and contribution made by the study were presented, in addition to the limitations of the study.

2. LITERATURE REVIEW

In the literature study section, the conceptual meaning, supply chain, and supply chain management are explained first. Next, the conceptual framework for the study was created by explaining the concepts of small and medium-sized companies, as well as supply chains, transparency and agility of the supply chains, and blockchain, along with explaining the relationships between these concepts.

2.1 SMALL AND MEDIUM-SIZED ENTERPRISES (SMES)

Previously, the size of the company meant that the company was wealthy and successful. However, over time it became clear that this was wrong. Although large business organizations have become more common since the Industrial Revolution, small units appear to retain their value in countries with strong economies and industries such as Great Britain and the United States. These small units also have functions that work well and can quickly influence social behavior. Size is an important criterion for economies. However, when large sizes are composed of small, semi-independent units, the size measure has a positive effect on the economic unit (Baharmand, et al., 2021).

Otherwise, it is difficult to manage large organizations that are not composed of small units. Just as there must be a democracy and small local actors who ensure the full development of democracy in order to talk about progress and development in society, there also needs to be small structures that are free in themselves and act as local actors in the Large economic organizations operate in society. Small business organizations should be preferred due to their ease of management, humanity and convenience (Gligor, et al., 2022).

Small businesses should be preferred for reasons such as large corporations aiming for unlimited profit, using resources inefficiently because they are too large, unable to adapt to change quickly, and business serving humanity, not humanity serving corporations. The process of adaptation and change carried out by small companies is shorter than the process of adaptation and change carried out by large companies. Disappearance, loss, bankruptcy, etc., of small businesses are preferred because their ability to influence the economy and create crises is very low or even impossible in such cases. In addition, it is easier for the government to collect taxes from small businesses than from large corporations (Pinnington,

et al., 2023).

In small businesses, although the business owner specializes in the company's activities and possesses the necessary knowledge and skills, he or she can succeed in running the business because he or she has control over the business. Companies must prioritize people rather than profit. However, large enterprises generally do not give due importance to people and prevent modest consumption (Pinnington, et al, 2023).

It would not be correct to talk about large-scale investments of large enterprises and their ability to produce the same product for a long time for small and medium-sized companies. This situation puts SMEs at the forefront in terms of their flexibility and the fact that economic policies favor this flexibility. Small and medium-sized enterprises are some of the most important economic mechanisms that can be used by political authorities to achieve social and economic policies. While large-scale enterprises are tools of a capitalist economy, SMEs are tools of a liberal economy because they place the human factor before capital (Perren, & Jennings, 2005).

The changing world has also led to changes in the approach to economics. The constant change in people's thoughts and behavior leads to new trends and new methods in business and loses value over time. While the free economy and the large institutions that control this economy were once preferred to the state economy, in the 1970s small and numerous institutions that could be controlled by states came to the fore instead. With globalization, large companies transcended national borders, reached larger markets, and expanded as they grew (Perren, & Jennings, 2005). Although this situation initially seemed to be in the interests of the countries, it began to worry the political authorities when the unconditional profit objectives of large companies outweighed the interests of their countries and it became difficult to control them within the country. As such large institutions began to increase their influence on countries' economic policies, the search for alternatives to these institutions accelerated (Martin, 2016).

The phenomenon of localization that emerged with globalization led to the search for alternatives for development, especially in developing countries. As a result, this alternative was “SMEs”. As large, difficult-to-control companies become a threat to the political authorities, smaller SMEs that can be kept under control and that ensure local and regional

development in a balanced manner have become attractive (Fosso Wamba, et al., 2020). In order to achieve the full development of large enterprises, SMEs must be activated in the economy. Since SMEs are seen as structures that accelerate the local development and implementation of the economic policies of political authorities in a short period of time, these institutions are increasingly receiving state support in financial, technological and educational terms. Small and medium-sized enterprises have become essential for local development and the ability to move quickly in the economy (Martin, 2016).

Reasons for choosing small businesses include the desire to prevent monopoly capital, increase the level of knowledge of entrepreneurs, and create new sectors. It is quite difficult for a large structure to withstand crises and innovations and adapt in a short period of time. For this reason, small businesses are more resilient to economic shocks than large businesses (Shen, et al., 2022). While the elements of large organizations such as capital, employees, capacity and customers are at the macro level, it becomes difficult to manage them, whereas in small and medium enterprises these elements are at the micro level and achieving dominance in such organizations is easier , than to achieve dominance in such organizations (Perren, & Jennings, 2005).

While large companies provide countries with success in the global economy, SMEs provide success in terms of the development and survival of the country's economy and solving the employment problem. In other words, large enterprises have the characteristics of global economic dynamics, while SMEs have the characteristics of local economic dynamics. A country whose national economy has failed cannot be expected to be successful in the international economy (Shen, et al., 2022). Therefore, for a successful economy, first of all, strong and efficient Small and Medium-Sized Enterprises are needed, and then large companies with the ability to operate globally are needed. Nowadays, SMEs are gradually becoming more active in international economies like large companies. This indicates that SMEs are increasing their importance in national and international economies (Short, Ketchen, Combs, & Ireland, 2010)

Large structures that gained value during the industrialization period began to give way to small and medium-sized enterprises in the transition to the information society. Since the basis of the information society is information, and humans are the ones who create and use information, the human factor has become the most important element in the production

process. Accepting the view that human beings are more valuable than anything else in society and the production process, the desire for more democracy and humane ideas has come to take precedence over capital, and societies, in particular, have begun to exclude large-scale, capitalist-oriented enterprises. The fact that the human factor comes to the fore in smaller and more modest structures and that these structures make the distribution of capital more equitable has increased the preference for these structures (Wu, & Yu, 2023).

While Small and Medium-Sized Enterprises maintained their importance as production units until the Industrial Revolution, the dominance of production shifted to large enterprises rather than small enterprises due to the increase in large-scale economies. However, despite everything, these small companies continued to exist because they had their own advantages compared to large companies. Although small businesses lost their characteristics as production units with the Industrial Revolution in developed countries, they maintained their importance as a source of production and employment in many countries (Short, et al., 2010)

During the economic crises and recession of the 1970s, the fact that mass layoffs and cessation of production in large enterprises had a significant impact on the economy, and these situations were experienced by small enterprises to an acceptable extent, revealed the importance of small enterprises. Institutions of size. Small and medium-sized enterprises that can create jobs through small supports and incentives, reactivate production, and thus end market stagnation have proven their quick and saving advantages (Kessler, et al, 2022).

Between 1945 and 1970, the focus was on large institutions. During this period, it was noted that these institutions increased the effectiveness of countries on the international scene, but caused the deterioration of the social structure and development balance within their countries. For this reason, there is a need for new regulations that increase the growth, development, and sustainability of small-scale economic organizations. The characteristics of these small-sized organizations, such as the ability to easily fill areas of activity that large-sized organizations avoid and being more open to new production processes, have increased their economic importance (Kessler, et al, 2022). Due to the large investments such as tools, equipment, machinery, and labor allocated to production in large organizations, sticking to the same production for a long period is not possible in small organizations, and the production area may change quickly.

Although small enterprises in developed countries previously appeared to be units focused on providing a balance of employment, in the current situation they have become units in which issues such as production, sales, management, and competition are attempted to be highlighted (Bodendorf, et al , 2022).

2.1.1 Definition of Small and Medium Enterprises

There is no generally accepted common idea for defining SMEs, which form the basis of the economies of all countries. SMEs can be defined as economic units with small capital, where manual labor rather than machines are at the forefront, which can make quick decisions, have low administrative expenses, and produce cheaply. SMEs do not have the same characteristics in every country due to their structures and differences in the economic structures of the countries in which they operate. Therefore, it is not possible to talk about a generally accepted definition. Each state has established definitions using various elements such as employment numbers, unique economic opportunities, number of employees, business branches, number of machines, size of capital, import and export ratios, current technological opportunities, and production methods (Bodendorf, et al., 2022).

The most developed economic, technology, development, and sectoral preferences of countries were effective in defining SMEs. In addition to the various definitions of SMEs, the factors that are used to define them also vary. Definitions and classifications, however, are generally established based on the number of employees and the amount of capital. Almost all economies view SMEs as flexible and rapidly changing structures that can be used as tools to steer the economy. Numerical and non-numeric characteristics were considered when determining the criteria for identifying SMEs. Non-numeric criteria in defining SMEs (Alkan, 2014).

a. Independent management

b. Traditional continuation of business activities
c. The company has a small share in the sector in which it operates.
d. All or most of the capital belongs to the employer.

The numerical classifications taken into consideration for the definition are; (Kuratko, 2006).

a. Current capital
b. Equivalent to fixed values

c. Company capital
d. Number of current employees
e. Total balance sheet assets
f. The size of the company's production capacity
g. Order quantity and amount
h. Energy consumption
i. Production capacity utilization rate
j. Tax amount
k. Export share in sales amount
l. The number of rotating jobs in the company
m. Annual value added
n. The total amount of energy consumed by the inverter in a given period of time
o. Raw materials consumed within a certain period of time
p. Managerial and entrepreneurial qualities are present in the same person or persons
q. The value of the company's machinery parking
r. The number and capacity of existing machines and equipment
s. Payment of advance wages within a certain period of time
t. Whether the management situation is dependent or independent of a specific person and place.
u. One or more people provide capital
v. Net capital
w. The size of its market.

Each economy develops its definition within these criteria. Although qualitative criteria are generally ignored when defining according to quantitative criteria, definitions formed by integrating qualitative and quantitative criteria have recently been adopted.

Differences in definitions of SMEs cause problems benefiting from national and international support. Different definitions also prevent effective research results from being obtained and appropriate policies developed. Establishing a common definition of small and medium-sized enterprises, defining and implementing effective policies for the benefit of small and medium-sized enterprises, which are essential tools in social and economic development, effective and efficient use of the resources created, a statistical database for use in support created for these enterprises, which is valuable and Significant in terms of

their occurrence (Bellamy, et al., 2020).

The standard definition of SMEs eliminates differences in practice caused by definitions, ensures unity in corporate practice, and makes enterprises more effective in benefiting from support.

2.1.2 The Position and İmportance of SMEs in Economies

Small and medium-sized enterprises occupy an essential position in the national economy regarding their numerical majority, industrial sector share, and contribution to the economy. The importance and contributions of SMEs to the economy and social development can be listed as follows (Chod, Trichakis, Aspegren, & Weber, 2020).

a. Stimulate the economy,
b. Increase economic and social well-being,
c. Job creation,
d. Encouraging innovations by providing flexibility to the economy,
e. Increasing the rate of regional development and reducing development disparities between regions,
f. Encouraging entrepreneurship,
g. Supply of intermediate goods,
h. Ensuring product differentiation thanks to the ability to produce products of small capacity,
i. Rapid integration with innovations.

Due to the disappearance of distances and continuous and rapid technological developments, compatible production systems have developed so that they can respond to developments simultaneously. Small and medium-sized enterprises are, by their nature, structures that have the production systems mentioned above and can flexibly adapt to social and economic differences (Xheneti & Blackburn, 2010).

SMEs are extremely valuable structures in terms of economic and social development in Turkey, as they are active and progressive elements of our country's economy, like the rest of the world. SMEs have many advantages due to their structure. Due to their small size, they have a flexible structure, and this advantage offers SMEs the opportunity to adapt more quickly to changes and overcome industry problems. It can be adapted more quickly to

customer requirements and changing needs. Compared to large companies, they produce more with limited resources and can ensure diversity in production (Chod, et al., 2020).

The added value that SMEs add to the economy and their impact on the creation of employment opportunities has reached enormous proportions. In our country, small and medium-sized enterprises are of great importance in distributing production over a large area, eliminating regional economic disparities, creating employment opportunities and creating a democratic environment in the social sphere (Xheneti & Blackburn, 2010).

Even if the globalization of markets, industries, companies and new areas of competition seems advantageous for large companies at first glance, it has also created many opportunities for small companies. However, for small companies to be successful in this competition, they must take advantage of their flexible structures and focus on markets in which large companies do not want or do not want to operate, rather than on areas in which large companies do not want to operate. Large companies carry out their activities effectively. Global competition makes the strategic position of small businesses very important and therefore developing a strategy to meet different consumer demands and needs becomes one of the most essential elements for the success of small businesses (Alkan, 2014).

For SMEs to maintain their current market shares in international competition and effectively grow international markets, they need to give importance and priority to new developments as a source of competitive advantage. Another advantage of SMEs over large companies is that they can develop and sell products and services not imitated by companies with which they compete and offer special prices to consumers (Baharmand, et al., 2021).

In economies around the world, it is well known that small and medium-sized enterprises are the fundamental economic unit, essential for creating competition in the economy and ensuring the continuity of competition. They create vitality by preventing economies from consolidating and disappearing. Moreover, since SMEs have the flexibility to adapt to changes in a short time by closely monitoring developments and innovations, they can accelerate industrialization and influence economic developments by ensuring the adoption of new innovative ideas that have an impact on a broad segment of the world. the society (Bodendorf, et al , 2022).

It can be said that SMEs prevent migration from small to large settlements by providing employment opportunities and accelerating regional development. While SMEs provide economic stability in developing countries, they can also provide more foreign currency inflows in conjunction with exports to solve the problems of opening up to foreign markets (Gerged, et al., 2023). In the European Union, SMEs are considered the first element in achieving stable and sustainable growth, as they are units that respond more easily to innovations, changes in demand, and diversification with their ability to make quick and flexible decisions, create jobs with low-cost investments, and are not affected by economic bottlenecks. In the European Union, which aims to be a leader in the global economy in terms of competition and dynamism, the contributions of small and medium-sized enterprises to the national economy and, of course, to the achievement of international economic goals are accepted by all member states (Gerged, et al., 2023).

Small and medium-sized enterprises make up 99% of all companies in the European Union. For this reason, government competition policies are effectively designed taking into account the needs of SMEs and the problems they face and various measures are taken to achieve this. Corporate practices are designed as part of the Integrated SME Program. The integrated program can be divided into three groups related to the development of small and medium-sized enterprises in the European Union and all Member States at national or regional level. These measures are aligned across EU Member States, a multi-annual program and activities implemented in parallel with other EU policies (Pinnington, et al., 2023).

2.1.3 The Main Problems Facing SMEs

With the increasing importance of small and medium enterprises, it has become necessary to fully highlight their problems to increase, develop, and advance their effectiveness in the economy. Like the definitions of SMEs, their problems vary depending on the economy in which they operate. The problems that small and medium-sized enterprises in developed economies face and try to overcome and those in developing or underdeveloped economies are completely different (Perren, & Jennings, 2005).

It is possible to divide the problems of SMEs into two main categories. In the first category, there are problems arising from the structures of SMEs. In the second category, there are

problems arising from economic and social life that develop outside the scope of work and negatively affect work. For SMEs to improve and increase their effectiveness in their field of activity, they need to deal with the problems of the first category and the problems of the second category. While it is more possible for companies to solve problems arising from their structure, the efforts of politicians who manage the economy are required to solve external problems (Pinnington, et al., 2023).

Small and medium-sized companies face many and varied problems. For this reason, more studies and scientific research should be conducted to develop policies and programs for small and medium enterprises, making these strategies and programs take into account local differences and improve existing practices in this direction (Blackburn, & Smallbone, 2008).

Small and medium-sized enterprises, due to their structure, cannot adequately benefit from banking systems, have limited infrastructure and technological opportunities, and have low capital amounts, which makes them lose their ability to compete against large companies. The research conducted to date generally focuses on certain aspects of issues related to SMEs and takes into account companies located in specific regions. For this reason, public opinion often cannot be considered when conducting evaluations, and it becomes difficult to cross-reconcile these studies. At the same time, it should not be ignored that regions have their problems (Kessler, et al, 2022).

2.1.3.1 Problem of financial resources

Perhaps the most basic and important problem facing small and medium-sized companies is the problem of creating financial resources. Since the first condition that must be met for a business to be completed is the entrepreneur and the second is capital, it not be possible to talk about a business without capital. Financial resources that ensure the existence and continuity of the business are important for businesses of all sizes. The problem of finding financial resources is considered one of the most important and important problems facing small and medium-sized companies (Mol, 2015). Inadequate government support, unprofessional financial management style in SMEs, and structural problems of financial resource providers are the main causes of resource problems in SMEs. A business owner who is inadequate in managing financial resources may fail to solve the problem because he does not have sufficient knowledge about the ways and methods of accessing external

resource providers while providing the financial resources that the business needs (Kessler, et al., 2022).

Financial support that reduces new investment costs for SMEs and increases the profitability of companies makes these underdeveloped areas where support is provided attractive to SMEs and supports economic development (Audretsch, & Keilbach, 2004). Since SMEs are the main economic instruments for regional development, the financial support provided by the state to SMEs needs to be increased and made transparent. Government financial support must be able to cover the financial resource needs of SMEs at the establishment stage and the financial resource needs at the development stage of their activities (Bellamy, et al., 2020).

There are several issues that SMEs must undertake to overcome their financial problems. The most important is to make the financial data that be used to increase the credibility of the business a realistic and reliable source of information.

2.1.3.2 Production problem

SMEs tend to be labor-intensive rather than capital-intensive enterprises, produce in workshops and to order, and have a relatively low division of labor. Since they work according to the system, they are underutilized due to low order volumes and insufficient raw materials. Therefore, there is an increase in production costs. Inadequate technology, financial problems and a lack of knowledge in the production area lead to inferior production and uneconomical use of resources. Below are the main causes of the production problem (Bellamy, et al., 2020).

a. High input costs
b. Lack of quality control
c. High labor costs
d. Lack of skilled labor
e. Not using current technological methods in production

Small and medium-sized companies, which have the advantage of flexibility in product changes compared to large companies in production, cannot take advantage of this advantage. The reason for this is that there is no team or department that carries out production selection to determine market needs, and no studies have been carried out to

determine production selection. SMEs must identify the preferred and in-demand products in the markets in which they operate and advance the company to the point where it can produce these products. While the requirements of the production phase are taken into account, the fact that the operations are carried out by the employer and not by a specialized department reduces the efficiency of this process (Chrisman, et al., 2005).

2.1.3.3 Management problem

Since SMEs are generally founded as family businesses, the manager is the owner and tries to run the company with unprofessional principles. In SMEs that do not seek for institutionalization, the main factor influencing business identity is the business owner, and the entrepreneur and manager are united in the same person. In SMEs with a traditional management structure, all management tasks are carried out by the company owner and partners. Management plans are prepared instinctively by the entrepreneur and his partners, and due attention is not paid to the formal structure (Short, et al., 2010)

In small and medium-sized companies, there is no delegation of authority, and no skilled workers are employed. The lack of professional managers is considered the biggest problem in management. Several studies have shown that the use of professional managers in SMEs has long been low, and this problem has been highlighted. The second most important problem is traditionalism in the administrative structure, while the third most important problem is the division of tasks and powers and the lack of performance evaluation. In short, to prioritize administrative issues (Short, et al., 2010)

a. The manager is unprofessional
b. Lack of sharing of powers and tasks
c. There is no performance evaluation

Although companies have different characteristics, given their size, many companies may generally face similar management problems. The Failure to meet a certain standard in production, services, and human resources, the failure to develop effective time management, the unfair standards in performance evaluation, the inability to make adequate use of information technology, and the fact that corrections are carried out by the employer and partners cause management problems (Çevik, 2018).

In order to solve management problems, the business owner must master professionalism within the capabilities of the business. In addition, politicians must take steps to provide the necessary financial and educational support to solve the managerial problems of business owner-managers (Short, et al., 2010)

After the employer accepts the management problems of SMEs, the planning and distribution of decision-making authority are ensured, and production management, human resource management, and financial management should be carried out by professional experts (Yapar, 2015).

2.1.3.4 Recruitment problem

SMEs are seen as the most effective tool in solving the employment problem, which is one of the biggest problems of economies at the regional level. Eliminating or minimizing the problem of employment and preventing many other economic and social problems caused by it is the most important goal of economies concerning employment. In combating the employment problem, effective policies should be taken to solve the problem radically rather than prevent the negative aspects of unemployment (Alkan, 2014).

To bring unemployment to an acceptable level in the economy, the causes of unemployment must first be identified. Decisions should be made about whether unemployment is caused by structural problems or the preferences of an active workforce. The social dimension of unemployment is no less important for countries than the economic dimension. The economic costs of unemployment may be compensated, but the social life costs may not. Many studies have found that there is a positive relationship between unemployment and crime rates (Fahn, & Zanarone, 2022).

2.1.3.5 Brand problem

Trademarks are names that distinguish a good from other goods and describe its characteristics. Nowadays, it is observed that preferences are made based on brand names rather than features of the product or service. When this is the case, the brand becomes indispensable to products and services. For successful marketing, branded products and services must first be created. Marketing a branded product or service is easy and creates cost advantages (Kırmızı ,2019).

In order to talk about the concept of branding in SMEs, an established market must first be formed. After the market and products become strong, efforts should be made to brand. SMEs create a stimulating effect on the economy in domestic and foreign markets in terms of market creation, which is the initial stage of branding (Yapar, 2015).

For SMEs to survive under the harsh conditions of market competition, they must accept the reality of branding and accelerate their practices in this regard. After completing the incorporation processes, SMEs face two options: institutionalization and branding. The choice to be made here is the first step of the company's future strategy and the beginning of the business roadmap. For this reason, companies must be careful when choosing between corporateization and branding. When firms are observed, firms are found to be shaped consciously or unconsciously with choices of institutionalization first, branding first, or a combination of the two (Kılıçlı, 2016).

2.1.3.6 Marketing problem

Starting a business and producing high-quality products and services in that business is not enough to achieve the goal of businesses whose primary goal is profit. The concept of marketing is encountered in the phase of converting products and services into profits. When marketing problems for SMEs are considered, it is understood to mean the problems of companies, especially changing consumer preferences, changes in response to demands, and the introduction of new products, the development of new products, or the innovation of existing products are at the forefront. In addition, the problems that SMEs face with suppliers and intermediaries can also be counted among the problems they face in the marketing phase. Another important reason for the emergence of marketing problems is the inability to innovate and develop new products due to a lack of financial resources. In summary; (Bodendorf, et al , 2022).

a. Shortcomings in developing new products
b. Excessive counterfeit products
c. Continuous and rapid change in consumer preferences.
d. Difficulties in making changes to products

Inadequate financial resources allocated to the marketing stage cause the marketing problem

in SMEs (Kırmızı ,2019).

The fundamental marketing problems are product, service, pricing, and sales efforts. Advertising and promotions have recently begun to be widely used to make marketing efforts successful (Bodendorf, et al., 2022).

The marketing phase is one of the business activities that SMEs and other companies attach great importance to. Consumer feelings, thoughts, and preferences have become extremely important to businesses today. For this reason, it is necessary to be in close contact with consumers, to produce products that meet consumers' demands and needs, and to make products accessible to consumers. Since all these phases involve activities related to marketing, marketing is defined as the process that ensures that products reach the consumer.

The marketing process has recently become a concept in which the processes that take place after products and services are provided to the customer are important (Fosso Wamba, et al., 2020).

2.1.3.7 The problem of foreign trade

When Turkey's export and import potential is examined, it is found that it imports technology-oriented products with high added value and imports products with a high labor force. Most of the export companies in the Arab world and developing countries are small and medium-sized companies that produce textiles and ready-made clothing. For SMEs to have the opportunity to compete in foreign trade, they need to reduce their costs and produce high-quality products using advanced technology. Recently, SMEs that had a cost advantage thanks to cheap labor and raw materials have lost this advantage and it has become necessary to adopt advanced technology to remain competitive. This situation has led SMEs to look for new sources of finance (Carlsson, Braunerhjelm, & Ylinenpaa ,2013).

Many countries are working intensively to increase their exports and attach importance to export-promoting activities such as tax cuts, tax exemptions, incentives for raw materials and labor, and marketing research. In Turkey, government support is available, such as research and development assistance, support for participation in international and local exhibitions, market research, job creation support, and covering expenses related to branding and patenting activities for SMEs that wish to shift to foreign markets (Khan, & Bhatnagar, 2009).

The export-related problems faced by small and medium-sized enterprises can be studied under two main headings (Dane, 2010):

a. Problems that Small and Medium-Sized Enterprises face due to the national economy. These problems are access to financial resources, insufficient information and education, bureaucratic problems, market problems, substandard support, and quotas-related problems.
b. Business-related problems of SMEs; these problems include raw materials, problems of information and data collection, problems with quality and cost of potential manpower, and production problems.

2.1.3.8 Competition problem

It is too difficult for small and medium-sized companies with national affiliations to compete with large multinational companies that dominate global markets. SMEs highly depend on factors such as labor, raw materials, and capital in the country where they operate (Fosso Wamba, et al., 2020).

For this reason, SMEs cannot be expected to have multinational characteristics in global markets. Despite this, they have to adapt to the conditions created by the environment to survive and compete. The advantages of flexibility the SMEs have in decision-making and decision-implementation create comfort in this regard. Facing a competitive market, SMEs need to define their strategies in this direction and create the necessary financial and other technical infrastructures to realize their strategies (Blackburn, & Kovalainen, 2009).

SMEs must make intense efforts to achieve their goals of competing, creating jobs, and maintaining their presence in the market. Increased competition also brings with it an increase in productivity. Due to competition, companies produce goods more efficiently to meet consumer demands while increasing production efficiency. With the creation of this competitive environment, the production of more efficient, cheaper, and diverse goods benefits the consumer and gives vitality to the economy. Companies whose main goal is to make profits must engage vigorously in the competitive environment and develop valuable activities to achieve this goal (Alkan, 2014).

Talking about the advantages of the competitive environment in the national market, every entrepreneur entering the market increases the supply in this market, reduces prices by

producing the same products of other companies, and attracts the consumer to his products by producing different products from other companies. The competitive environment creates effects that increase innovation and productivity (Perren, & Jennings, 2005). This section provides detailed information about procurement, supply chain, and supply chain management concepts.

2.2 SUPPLY CHAIN CONCEPT

2.2.1 Supply Chain Concept

Various supply chain concepts have been identified in the literature by numerous researchers and authors. Although these definitions may vary, they generally focus on similar aspects. The supply chain includes a series of activities that a product goes through from its initial stage as a raw material until it reaches the end consumer. These activities include the necessary information systems for the procurement of raw materials, production, assembly, storage, inventory management, order processing, sales and delivery, as well as the monitoring and control of all these processes (Kuo-Jui, 2016).

A supply chain represents an organization and a range of activities that span from suppliers to customers, involving the supply of raw materials, the conversion of these materials into products during the production phase, and the eventual delivery of the final product to consumers (Sert, 2018). The supply chain encompasses all activities related to a product's seamless flow and transformation from its raw material stage to its delivery to the end consumer. In a traditional supply chain, there is a flow of materials from suppliers to customers and funds from customers to suppliers.

Schmude, et al (2008) defines a supply chain as a comprehensive network comprising all facilities and distribution systems responsible for procuring raw materials, their conversion into intermediate and final products, and the subsequent delivery of the final product to the customer. This concept of a supply chain is not limited to specific industries or companies, as it can also be observed in both the production and service sectors (Schmude, et al., 2008).

Perren, & Jennings, (2005) further emphasize that the supply chain is not merely a network of intercompany relationships but rather a complex web of business and relational connections that encompasses multiple companies and organizations. It encompasses all

stages of the process, from the procurement of raw materials to the acquisition of the final product, and encompasses all activities involved in the production process (Perren, & Jennings, 2005). Effects of cost-information transparency on intertemporal price discrimination.

In line with this, Kırmızı ,(2019), explains that a supply chain encompasses all the activities, systems, and individuals involved in the journey of raw materials to deliver the finished product to the customer. This network includes suppliers, manufacturing and distribution centers, retail stores, in-process inventories, and the transportation of finished products throughout the system. The supply chain covers the entire spectrum of production and distribution, starting from the supplier stage and ending at the customer stage (Short, et al., 2010)

The supply chain definitions provided by various authors emphasize the process and its components. Kuo-Jui, (2016) identifies the key elements as suppliers, production facilities, distributors, distributors and end users who contribute the necessary raw materials for product development. The supply chain includes activities that include pre-production, production and post-production processes and are aimed at increasing production efficiency. Its main goal is to optimize purchasing, sales and demand forecasting activities through the effective use of enterprise resource planning and material requirements planning. Effective communication with all stakeholders involved in the process is crucial to meeting consumer demand at the lowest possible cost (Kuo-Jui, 2016).

2.2.2 Supply Chain Structure

All companies involved in the supply chain and their connections with each other form the structure of the supply chain. A supply chain is a structure that consists of the sequence of all facilities, activities, and organizations related to the process until the delivery of the goods or services provided. These activities can be embodied in information, materials, money, and work (Short, et al., 2010)

According to Alkan, (2014), the most critical dimensions of supply chain structure are the width and length of the supply chain; the number of facilities is determined by their location, function, operations, and capacity. The basic strategy in the supply chain is to increase service quality and keep costs at a minimum.

The following figure shows the process that operates in the overall supply chain structure. This process begins with purchasing raw materials from suppliers. In the next stage, these raw materials are converted into final products in production centers, and these final products are delivered to distribution centers. In the final stage, these products are collected at the distribution center and delivered to retailers or customers (Ayllon-Lorenzo, et al. 2019).

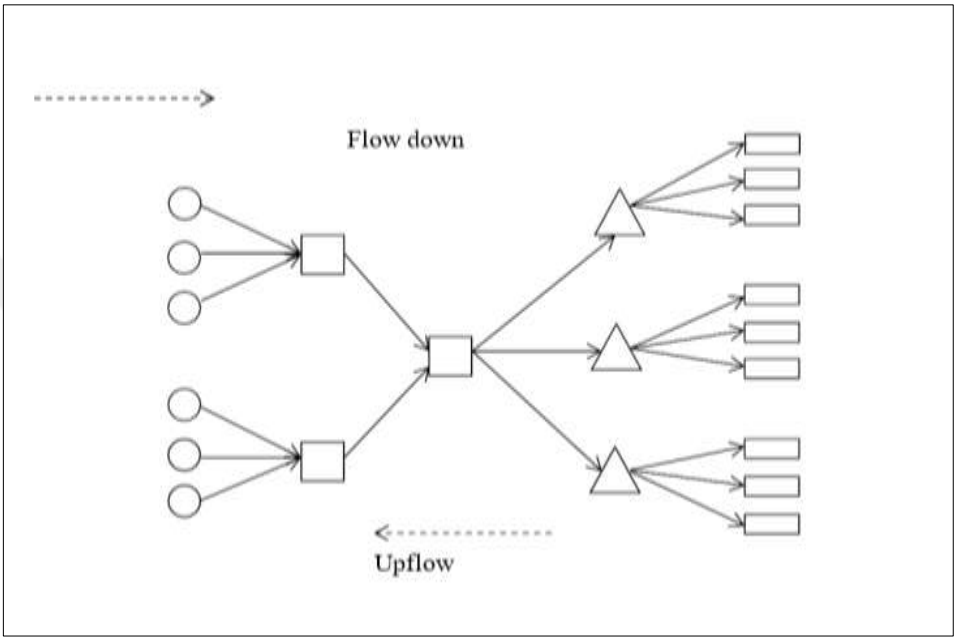

Figure 2.1 General Structure of the Supply Chain Source Ayllon-Lorenzo, et al. (2019)

2.2.3 Types of Supply Chain

Supply chains are divided into single-stage and two-stage, depending on the complexity of the companies. A single-stage supply chain includes functions such as purchasing raw materials, the flow of materials in production and distribution, information processing, decision-making, and money management.

In a multi-stage supply chain, many companies are involved in the process. Companies that use outsourcing on a large scale

According to Shen, (2022), supply chain types are divided into three. Which:

a. Direct supply chain

b. Extended supply chain

c. Downstream supply chain

The direct supply chain includes businesses, customers, and suppliers. The extended supply chain also includes elements such as supplier-supplier and customer-customer. Unlike the extended supply chain, the downstream supply chain includes third-party suppliers, end customers, downstream suppliers, and suppliers.

Not every supply chain needs to include the above components. In addition to the physical flow of materials, supply chains include information and money (Shen, 2022).

Supply chain decisions fall into two different groups: strategic and operational. Strategic decisions are made in accordance with business strategy over a lengthy period. On the other hand, operational decisions are made in an abbreviated period and focus on the company's day-to-day activities (Shen, et al., 2022).

On the other hand, Schmude, Welter, & Heumann, (2008) examined supply chain decisions under the tactical decision dimension as well as strategic and operational decisions, and they divided supply chain decisions into three different hierarchical groups. According to this, Decisions made at the strategic level of a business refer to its long-term decisions, decisions at the tactical level refer to its medium-term decisions, and decisions at the operational level refer to its short-term decisions. The common purpose of decisions at these three different levels is to ensure that the product flows efficiently in the supply chain (Schmude, Welter, & Heumann, 2008).

2.3 SUPPLY CHAIN TRANSPARENCY

Recently, supply chain transparency has become extremely important. Both companies and consumers have recognized the social and environmental consequences associated with their purchasing decisions. With easier access to information, people now demand a comprehensive view of a product's entire journey, from raw material sourcing to final consumption. This increasing demand for transparency has motivated companies to review and improve their supply chain practices striving for greater transparency and accountability (Gligor, et al., 2022).

The capacity of supply chain transparency to recognize possible dangers and weaknesses in the chain is a critical component that further underscores the significance of this concept.

Through an exhaustive mapping of the whole supply chain and a thorough comprehension of each stage involved, businesses may pinpoint potential areas for unethical behavior, damage to the environment, or violations of human rights. With this knowledge, businesses can take action to mitigate these risks and guarantee that their supply chain functions ethically and sustainably (Chrisman, et al., 2005).

Numerous organizations have adopted the practice of supply chain transparency and have experienced positive outcomes. A prime illustration of this is Patagonia, a company specializing in outdoor apparel and equipment. Patagonia discloses detailed information regarding the factories involved in producing its goods, encompassing aspects such as working conditions, environmental impact, and social endeavors (Kuo-Jui, Wu, & M.-L,2016). Patagonia has fostered a dedicated customer base by maintaining transparency in its supply chain, focusing on sustainability and ethical standards. On the other hand, Nestlé started the Cocoa Plan project to address the problem of child labor in its supply chain for cocoa. Nestlé ensures fair compensation and safe working conditions for cocoa farmers by offering training and support through this program (Wu, & Yu, 2023).

2.3.1 Tips for Achieving Supply Chain Transparency

To enhance their supply chain transparency, companies can follow several valuable tips. Firstly, conducting comprehensive audits regularly is crucial. This allows for evaluating suppliers, manufacturers, and distributors, identifying potential risks and areas for improvement. Secondly, engaging with stakeholders such as suppliers, employees, and customers is essential. Companies can resolve any issues they may have and obtain insightful knowledge about the supply chain by cooperating with them. It is important to encourage open communication and a transparent culture within the company (Çevik, 2018).

Technology utilization is also essential for supply chain transparency. Real-time tracking and monitoring of the supply chain are made possible by digital tools and platforms, which also give a comprehensive overview of each step of the procedure. This not only increases transparency but also ensures greater accountability. Lastly, it's imperative to give supplier relationships top priority. It's important to build trusted relationships with vendors and make sure they share the same commitment to being open and honest. Regular communication and collaboration on initiatives to promote responsible practices can strengthen these

relationships (Fosso Wamba, et al., 2020).

Modern business practices rely heavily on supply chain transparency. Businesses that value transparency are better able to identify possible hazards, adapt to the changing needs of their customers, and move closer to an ethical and sustainable supply chain. It is clear from case studies and real-world application that transparency boosts the financial performance of companies and fosters a more socially and environmentally conscious society (Blackburn, & Smallbone, 2007).

2.3.2 The Importance of Supply Chain Transparency

Transparency throughout the entire supply chain is crucial. Initiatives for sustainability must cover everything from the procurement of raw materials to last-mile transportation, product returns, and recycling. The development of supply chain sustainability is largely dependent on digital transformation and the rising sophistication of digital supply chain technologies. The significance of supply chain transparency and its advantages for businesses, consumers, and the ecosystem are examined in this study (Carlsson, et al.,2013).

a. Enhances corporate reputation: Building and improving a company's reputation relies heavily on transparency within its supply chain. By openly sharing information about their products' origins and production processes, companies can effectively demonstrate their unwavering commitment to ethical and sustainable practices. This transparency promotes customer trust, leading to a strengthened brand reputation and increased customer loyalty. Companies can, therefore, expect significantly increasing sales and profits (Xheneti & Blackburn, 2010).

b. Reduces potential risks: The implementation of supply chain transparency also serves as a risk mitigation strategy for companies. By actively identifying and addressing potential risks within their supply chain, such as human rights violations, environmental concerns, or disruptions in the supply of materials, companies can take proactive measures to prevent these risks from escalating into significant problems. This proactive approach helps companies avoid costly legal battles and reputational damages, safeguarding their operations and overall business performance (Cope, 2007).

c. Enhances operational efficiency: Enhanced supply chain transparency is key to boosting operational efficiency within organizations. By obtaining a clearer view of their supply chain, companies can effectively monitor product movement from suppliers to manufacturers to distributors. This increased transparency empowers them to pinpoint areas for improvement and optimize their processes accordingly. Through streamlined operations, cost reduction, and productivity enhancement, companies can elevate their overall efficiency and deliver enhanced customer satisfaction (Gerged, et al., 2023).

d. Drives innovation: Openly sharing details about the supply chain can catalyse innovation by fostering collaboration between companies, suppliers, and stakeholders. This collaborative approach encourages creativity and helps companies meet customers' changing needs to remain competitive in the industry (Zengin, 2010).

2.3.3 Sustainable Supply Chains Work

Collaboration is key to achieving sustainable supply chains. It is surprising to learn that numerous multinational corporations rely on the same raw materials and inferior suppliers. The global push for sustainability and transparency has led to remarkable progress. Nevertheless, ensuring compliance with environmentally friendly and ethical operating standards in different regions of the world has historically presented challenges. Supply chain managers can effectively address this issue by encouraging collaboration, sharing information, and reinforcing the importance of sustainability compliance in business transactions. The start of the Fashion Revolution movement in 2013 is a notable example of major fashion brands, despite being competitors, joining forces to combat unethical suppliers in their industry (Ghazal, 2016).

The 2020 Fashion Transparency Index report reveals a significant enhancement in supply chain transparency within the fashion industry, despite initial doubts. Over seven years, collaboration and data sharing among industry stakeholders have not only improved transparency but also led to mutual benefits without compromising competitiveness. This positive shift has contributed to an enhanced brand sentiment across the board (Gerged, et al., 2023).

Sustainable supply chains can optimize their operations by utilizing the most advanced technologies available. The sustainability of a supply chain poses a significant challenge due

to the intricate and widespread nature of its various components. The utilization of modern digital technologies is essential in order to uphold and synchronize the necessary level of accountability and real-time visibility required to meet ambitious sustainability objectives. An advantageous aspect of digital transformation within supply chains is that it does not need to occur all at once in order to have an impact. Incremental measures can be implemented to gradually digitize supply chain processes. Additionally, intelligent factory and digital supply chain solutions inherently gather and analyze data (Wu, & Yu, 2023).

As a result, once integrated, these interconnected technologies begin to autonomously compute their own efficiencies (Carlsson, et al.,2013).

Sustainable supply chains are established through the implementation of consistent standards. To effectively execute a strategic plan for ensuring sustainability within the supply chain, it is crucial to outline standards, objectives, and guidelines clearly. These parameters should be communicated, shared, and mutually agreed upon by all stakeholders and suppliers involved in the supply chain. Fortunately, various organizations assist companies in defining these standards and objectives, while advancements in digital technologies have simplified the process of monitoring and managing compliance. Additionally, there is a growing wealth of data and information available to showcase the importance of adhering to sustainability measurement standards. (Gerged, et al., 2023).

Sustainable supply chains operate by effectively communicating their achievements. Customers must be informed about the accomplishments of companies in achieving their sustainable supply chain objectives. Failing to share this positive news may result in the loss of the valuable reputational advantages associated with such achievements. Establishing a well-deserved reputation as an environmentally conscious company is always advantageous for the brand. Adopting eco-friendly marketing strategies can improve brand image and reputation, leading to customer loyalty and positively impacting company financial performance. However, this is just one aspect of the benefits. Companies also have the opportunity to set an example within their industry and demonstrate the tangible financial and environmental benefits of implementing sustainable supply chain initiatives. They align their brand with innovation and thought leadership in sustainability by sharing their successes and best practices. (Zengin, 2010).

2.3.4 Benefits of a Transparent Supply Chains

Companies prioritizing sustainability and transparency in their supply chains can reap various benefits across different business sectors. The digital champions who demonstrated high levels of investment and adoption of digital technologies reported a significant reduction in supply chain operating costs of around 7% due to digital transformation. Additionally, half of digital champions expressed that improving supply chain sustainability and transparency has become a top priority. By greening their supply chains, companies can effectively lower their costs (Fahn, & Zanarone, 2022).

The trend of consumer consciousness and preference towards sustainable enterprises was on the rise even prior to the global health crisis. Presently, there is a surge in public demand for businesses to uphold transparent supply chain operations and ethical business practices. This viewpoint was reiterated in a 2020 article featured in Fortune magazine, which emphasized the heightened scrutiny faced by companies amidst the COVID-19 pandemic (Fahn, & Zanarone, 2022).

The article highlighted that a company's social impact is now more critical than ever before. In challenging times, maintaining a reputation for sustainable and transparent supply chain practices can be a valuable asset for companies seeking a competitive edge (Fahn, & Zanarone, 2022).

Minimizing risk and vulnerability periodically, news emerges regarding the infiltration of defective or hazardous products into the supply chain. The repercussions of such occurrences are detrimental to those affected and pose a significant threat to the reputation and viability of the company involved. Legal expenses and reputational harm often follow after a product recall. By mandating transparency in the supply chain and integrating digital security solutions, dishonest suppliers and manufacturers are left with no room for deception. These initiatives not only shield businesses from unethical and environmentally harmful collaborators but also enable the meticulous tracking and documentation of all aspects of production, transportation, and sourcing (Özkul, & Dulupçu, 2007).

2.3.5 Tools And Techniques To Enhance Supply Chain Transparency

Digital transformation within the supply chain enables companies not only to meet but also surpass sustainability standards, all while fostering innovation and expanding their operations. Artificial Intelligence plays a crucial role in this transformation by facilitating the management and analysis of various data sets throughout the supply chain. One key advantage of AI in promoting sustainability within the supply chain is its capacity to coordinate and optimize shipping processes collaboratively. This involves monitoring the status and whereabouts of packages in real time to capitalize on opportunities for consolidating shipments or utilizing lighter logistics resources whenever feasible (Fahn, & Zanarone, 2022). On the other hand, machine learning, a subset of artificial intelligence, uses rich data to help interconnected systems and devices adapt dynamically by recognizing patterns, learning from past experiences, and automating adaptive, responsive workflows. The improvements in performance metrics resulting from this approach can result in significant reductions in waste and energy consumption for supply chain managers.

Additive manufacturing, commonly referred to as 3D printing, offers companies the advantage of maintaining virtual inventories and producing goods on demand. This innovative approach eliminates the need for overseas shipping and packaging, consequently reducing the reliance on fossil fuels and other resources. Moreover, additive manufacturing has the potential to utilize recycled plastic sourced from within the supply chain loop as a primary material for 3D production. By leveraging this sustainable practice, companies can further contribute to environmental conservation and resource efficiency (Fahn, & Zanarone, 2022).

Industrial Internet of Things (IIoT): A company's linked equipment and devices that have digital data transmission and reception capabilities and unique identifiers are integrated into an IIoT network. In a sustainable supply chain, asset intelligence may assist boost machine efficiency and automate maintenance to cut down on energy use and remove workflow redundancies (Özkul, & Dulupçu, 2007).

Blockchain technology is highly beneficial in sustainable supply chains because it can serve as a single source of truth. Using sensors makes it possible to accurately track products and materials back to their origin, thereby eliminating any uncertainties regarding their source,

quality, and handling throughout the supply chain. This level of transparency is crucial for ensuring accountability and reliability in the supply chain process (Fahn, & Zanarone, 2022).

Radio-frequency identification devices and other small sensors can be easily integrated into products and raw materials at various points along the supply chain. When all partners and suppliers adhere to the requirement of sensor attachments, a new level of transparency is achieved, particularly in previously challenging areas to monitor effectively. This enhanced visibility helps maintain integrity and trust within the supply chain (Alkan, 2014).

Cutting-edge sustainability solutions rely on modern databases and ERP systems that are capable of handling vast amounts of data and intricate processes. Integrating automated technologies and components in a sustainable supply chain depends on predictive analytics, advanced insights, and real-time information these sophisticated central business systems provide. This ensures efficient and effective management of sustainable practices throughout the supply chain (Fahn, & Zanarone, 2022).

2.4 THE AGILITY OF SUPPLY CHAIN

2.4.1 The concept of agility

Agility is essential for organizations to thrive in a constantly evolving and unpredictable business environment. It encompasses various aspects such as organizational structures, information systems, logistics processes, and, most importantly, mindsets. The concept of flexibility revolves around the ability to operate profitably in a competitive landscape characterized by ever-changing consumer opportunities. It enables businesses to adapt swiftly to rapidly shifting markets driven by consumers' evaluations of products and services.

Additionally, flexibility empowers organizations to respond promptly to fluctuations in demand, both in terms of volume and diversity. According to Balaji (2016), flexibility is defined as the capacity of an organization to flexibly, effectively, and quickly respond or adapt to market changes and capitalize on available opportunities. On the other hand, agility refers to an organization's ability to navigate unexpected challenges and survive in the face of unprecedented threats in the business environment. It involves adding value to consumers, collaborating to enhance competitiveness, managing change and uncertainty, and leveraging

the power of people and information. Agility entails being quick, active, and thinking boldly in intelligent ways. It enables organizations to effectively respond to a changing and unpredictable environment and transform changes into opportunities for growth and development. Similar to flexibility, agility also encompasses the ability to respond swiftly to changes in demand volume and diversity. In summary, flexibility and agility are crucial attributes that organizations must possess to thrive in a competitive business environment characterized by constant change and uncertainty (Guangping, 2015).

It requires being dynamic, content-oriented, focused on changes, and aggressively growing. Agility brings growth, success, profits, market share, and customers. It is not about improving efficiency, cutting costs, or avoiding competition. Resilience is about increasing profitability and market share, achieving success, and winning customers in every moment of the intense competitive environment that many companies fear (Kuo-Jui, 2016).

Agility encompasses the essential qualities needed to adapt to rapidly changing market demands quickly and flexibly. These qualities include a highly skilled and motivated workforce, advanced technology and software, and proficient management well-versed in information and communication technologies. Agility is characterized by a system that can swiftly transition between various product models with agility, rapidity, and responsiveness (Kuo-Jui, 2016).

An agile organization is capable of promptly responding to consumer needs, frequently introducing new products, and swiftly forming or dissolving strategic partnerships with its business associates. Agility involves the amalgamation of multiple companies, each possessing unique capabilities and expertise that can contribute to a shared business process. It entails effectively applying competitive factors such as speed, flexibility, innovation, quality, and profitability by integrating adaptable resources and best practices to deliver consumer-centric products and services in a volatile market landscape (Çolak, 2017).

At this stage, it is necessary to note the difference between the concepts of flexibility and agility. Flexibility means that the current arrangement of pre-defined parameters adapts to change; Agility is the rapid restructuring of a new set of parameters. Agility is an organization's ability to constantly withstand changes in a competitive environment and respond quickly to these changes. Flexibility is the ability of a business to respond to

unexpected environmental changes in the market and production processes. In other words, flexibility is the ability to respond to changes in consumer expectations and unpredictable market changes. As can be understood from the definitions, flexibility is the ability to respond to change, while agility is the ability to respond quickly (Blackburn, & Brush, 2008).

An agile business must design its organizational structure, processes, and products in a way that it can respond to changes when necessary. An organization's ability to be agile shows that it is effective, efficient, consumer-oriented, value-creating, and quality-oriented (Blackburn. & Kovalainen 2009).

Agile organization: It is a living organism that can grow, learn, and adapt to create value for consumers and take advantage of new opportunities. An agile organization is constantly exploring how to create value for consumers. For an organization to become resilient, managers must change their basic assumptions about how the world works and how companies must operate to be successful in it. Managers must organize and manage their businesses so that they can consistently implement innovations that consumers care about and are willing to pay for. Since the organization constantly interacts with consumers, sometimes changes requested by consumers can be achieved simultaneously (Chrisman, Chua, & Sharma, 2005).

Agile organizational structure is the way an organization can deal with dynamic and complex environmental factors. Flexibility enables the organization to respond to consumer needs more quickly and effectively and enter more new markets. Agility enables companies to respond quickly and effectively to any environmental changes and meet the highly changing demands of consumers.

Agility is an important tool that keeps the entire organization surviving in dynamic and competitive business environments. Agility goes beyond production and concerns the entire organization (Cope, Jack, & Rose, 2007).

2.4.2 Agile supply chain and agile supply chain management

Manufacturing companies must use rapid purchasing processes to survive in the global and competitive business world and be a step ahead of their competitors, cope with shorter product life cycles and increasingly knowledgeable consumers, meet ever-changing

consumer needs, meet changing demand, and introduce new products quickly. Products to the market, and they have to leverage the chain (Jennings, & McDougald, 2007).

Today, in global trade, agility-based organizations are beginning to replace mass production. The idea of agility involves a series of interconnected changes in marketing, production, and organization (Aldrich, 2000).

It defines and involves acquiring new management skills that transcend the boundaries of the organization. In order to deal with changing demand, the entire supply chain must be managed so that it can react quickly. While supply chain management with efficient processes is sufficient for functional products with predictable demand, market-sensitive supply chain management that focuses on speed and flexibility rather than cost is required for innovative and trendy products (Dane, ,2010). Agile supply chain management is the ability of a supply chain to quickly adapt or respond to constantly changing market demands, both in terms of size and variety and to potential and existing disruptions (Wu, & Yu, 2023).Agile supply chains can respond effectively and efficiently to rapidly changing business environments and market changes, whether typical or for the first time. Therefore, flexibility is a necessary advantage that companies can use to confront the competitive pressures they face and gain a competitive advantage. A flexible supply chain allows companies to be competitive and thus respond more quickly and effectively to market changes and other uncertainties (Alada, 2000).

An agile supply chain is defined as the strength and competitiveness that a company can use to transform market uncertainties into opportunities with rapid response (Hızır, 2014). Supply chain flexibility: It is the ability of a supply chain to quickly respond and adapt to meet the rapidly changing needs of a dynamic, competitive, and unpredictable market. In other words, supply chain flexibility is a company's ability to adapt to changes in the market through internal and external strategic changes concerning its customers and suppliers. An agile supply chain is about market sensitivity and enables companies to see true demand and be able to respond to that demand. Agile supply chain management helps adapt to future changes and ensures appropriate response to rapidly evolving market requirements and changes. Agile supply chain management focuses on the ability to understand changes in the market and quickly respond to these changes (Martin, 2016).

Supply chain resilience entails the restructuring of networks and operations to adapt to evolving consumer demands, as well as fostering collaboration between consumers and suppliers. A key component of an agile supply chain is the ability to accurately forecast demand, exhibit flexibility, and promptly respond to changes (Alada, 2000).

Moreover, it is crucial for the supply chain to be attuned to market fluctuations in order to effectively address unexpected spikes in demand. An agile supply chain necessitates robust communication across all levels, sharing of information, seamless process integration, minimized lead times, optimized safety stock levels, efficient technology and resource utilization, effective supplier relationships, and proficient material and inventory management (Aytaç, 2006).

Supply chain resilience is a strategy that focuses on adaptability, flexibility, and the ability to respond quickly and effectively to changes in the market. This depends on the speed with which these activities can be implemented, flexibility, understanding consumer needs, and ensuring consumer satisfaction. The most important thing is consumer satisfaction. Achieving consumer satisfaction depends on implementing all processes in the supply chain quickly, accurately, and effectively (Short, et al., 2010)

In this context, an intelligent supply chain is necessary for companies that produce according to consumer needs. A company's supply chain needs to be adaptable and quick to react to short product life cycles, fluctuating demand, and unpredictability in the market in order for it to produce in accordance with consumer needs. An agile supply chain ensures the rapid launch of new products and the ability to respond effectively to quantitative and temporal changes in delivery conditions in order to respond to changing consumer needs. It focuses on the ability to respond quickly to the market, introduce new products, and speed and consistency of distribution. An agile supply chain can deliver customized products to consumers by waiting until demand becomes clear (Aytaç, 2006).

An agile supply chain consists of stakeholders who can understand the needs of consumers individually through interaction with the market. An agile supply chain can adapt to future changes quickly. An agile supply chain allows companies to make rapid adjustments in their supply chains to respond to changes or adapt to internal and external uncertainties. In other words, speed is one of the key elements of agile business. Speed is the ability to complete

activities and tasks in the shortest possible time (Martin, 2016).

There is a difference between the concepts of speed and agility. While speed is meeting consumer needs in the shortest possible time, agility is the ability to respond quickly to changes in demand in terms of variety and/or volume (Aytaç, 2006).

An agile supply chain aims to be flexible in adapting and responding to rapidly changing consumer needs quickly and effectively. Flexibility is the ability of a production system to handle changes in the volume, timing, or other elements of its activities. The origins of agile lie partly in flexible production systems. Initially, flexible production systems were used to better respond to changes in product mix and volume. Nowadays, the supply chain must adapt to this situation in order to meet increasingly variable and unpredictable demand. The ability of a supply chain to be flexible is called agility it is suitable for markets and industries with short product life cycles, high product variety, unpredictable demand, low product quantities, relatively high profit margins, and product-based competition. An agile supply chain increases performance by operating at lower costs in the global supply network. To measure supply chain flexibility, responsiveness to changes in demand, consumer demands, flexibility of production processes and volume are used (Ghazal, 2016).

An agile supply chain requires independent companies to work in teams with a common goal. For a supply chain to be resilient, companies must focus on their core capabilities and activities and leverage outsourcing of all other processes (Martin, 2016).

Elements of an agile supply chain; Market sensitivity, increased delivery speed, data accuracy, new product introductions, short product development times, frequent new product introductions, centralized and collaborative planning, process integration including collaboration between buyers and suppliers to manage production and logistics, organizational integration and development capability, integration. Strategic networking aims to provide consumers with more effective service and enables companies to better structure, coordinate and maintain their relationships with their business partners, use information technologies, exchange data and information effectively, quickly and accurately, route information and delivery times To shorten. This is defined as the time between an order for a service and the delivery of that product or service, reduced production times, increased quality of service, lower costs, increased quality, reduced uncertainty,

increased trust, reduced resistance to change, close and long-term - long-term relationships with consumers and suppliers (Ghazal, 2016).

Supply chain agility refers to establishing long-term relationships between suppliers and consumers, outsourcing collaborative relationships, flexibility, increased responsiveness, increased customer satisfaction, and increased ability to identify changes in the business environment. The importance of supply chain agility can be summarized in the ability to read sales data quickly, accurately, and effectively based on consumer requests, increase flexibility, and increase competitiveness (Shen, et al., 2022).

Supply chain flexibility allows an organization to improve its daily operations, reduce costs, increase profitability, and gain a competitive advantage. Supply chain flexibility and adaptability positively affect both cost performance and operational performance. It is used to improve important supply chain outcomes such as increasing speed, shortening production times, increasing the number of new products introduced to the market, and increasing the quality of customer service. An agile supply chain is an important strategic element. It allows all companies operating on the same chain to benefit from the benefits of flexibility (Shen, et al., 2022).

An agile supply chain is a competitive advantage for all companies in this chain that strive to achieve a higher level of agility than their competitors because companies with agility skills are more prepared to deal with change and have more advanced resources (Short, et al., 2010)

An agile supply chain can combat uncertainty in the market. An agile supply chain plays an important role in increasing market share, improving customer satisfaction and ultimately achieving competitive advantage. Agile processes contribute to the formation of a highly responsive, reliable, and consistent supply chain that can take advantage of market opportunities (Hutchinson, & Qintas, 2008).

The intelligent supply chain enables companies to develop and improve customer services, which contributes to the company's competitive advantage. In order to achieve a flexible supply chain, it is necessary to shorten the product development cycle, shorten production and delivery times, increase the number of customized products produced, improve customer service, increase delivery reliability, and better meet consumer needs. AnJ agile supply chain

is about responding to consumers and is essential for businesses to gain the competitiveness that enables them to respond effectively and efficiently to operational changes (Gerged, et al 2023).

Therefore, an agile supply chain seeks to increase the speed and differentiation of customer service by focusing on consumer responsiveness. A flexible supply chain is essential to respond to changing consumer demands, including consumer demands that include a wide variety of products. Companies with a flexible supply chain can fulfill customer orders quickly, introduce new products frequently, and form strategic alliances with their partners (Hutchinson, & Qintas, 2008).

2.4.3 The Concept of Agility in the Supply Chain

Flexibility is defined as the ability of a business to deal with unexpected problems and changing market movements, as well as the ability to transform these changes into opportunities (Gerged, et al 2023).

There are three basic elements of agility. These include availability, which is defined as the ability to focus on changing customer demands, accommodation, and the ability to respond to customer requirements, and flexibility, besides the ability to meet unexpected problems. For companies to achieve resilience, they need to combine these three elements.

Supply chain agility is defined as the ability to read and meet the end customer's requirements. Agility helps deliver the right product to the customer at the right time (Ghatari, 2013). Agile has taken the supply chain concept from a company-oriented perspective and oriented it towards customer centricity (Harrison, 2008). In addition, Agility advocates that all partners from the same or different business lines in the supply chain should work in a networked system and add value to the product or service in order to increase customer satisfaction (Hutchinson, & Qintas, 2008).

An agile supply chain is the type that can continuously respond to global markets, whose demands are constantly and rapidly changing, dynamically and aggressively, with the condition of growth and profits. In these supply chains, each element of the chain must be flexible in its own business processes and adapt to each other (Gligor, et al., 2015).

Although the goods subject to the agile supply chain are mostly fashion products with a short

lifespan and high profit margin, the product range is overly broad. Capturing and sharing information is very important to maintain an agile supply chain (Steyaert, 2005). The partnerships created in agile procurement are short-term and variable, defined by agile relationships. In agile purchasing, estimates are based on consultation. In agile procurement, logistics planning is highly flexible and shaped according to demand. Initiative-taking development of logistics capabilities is essential for agile procurement (Steyaert, 2005).

Process integration, another advantage of an agile supply chain, indicates that information sharing must be supported by complete process integration for supply chain continuity. Finally, the network advantage suggests that all members should connect with each other and establish a network structure so that supply chain partners can have flexible relationships and gain competitive advantage. With these features, six important rules for ensuring flexibility in the supply chain were brought together in Steyaert 's study (2005).

a. To ensure a continuous flow of information in the chain so that members of the supply chain can quickly respond to changes between supply and demand.
b. Develop a collaborative relationship between customers and suppliers so that they can work together in the design and production processes,
c. Design products that start with common parts and processes and differ at the end of production,
d. Keep frequently used inventory cheap and not bulky,
e. Establish reliable logistics systems that can respond quickly to changing demands,
f. Form a team that knows how to implement plans

As can be seen information exchange is a particularly essential element in an agile supply chain (Kuo-Jui, 2016).

In light of the information provided by the above literature, the concept of agility is explained from different perspectives, both as a capability and as a strategy. In addition to this information, Harrison, (2008) argues that the supply chain must have the ability to be flexible in order to be successful in turbulent markets. In Carlsson, et al.'s (2013) study investigating the effects of supply chain agility on performance, the concept of agility was considered as a dynamic capability Blackburn, & Smallbone, (2007), in their research model; also include

the concept of flexibility in the dimensions of cost reduction and integration, which they express as supply chain capacity (Kuo-Jui, 2016).

2.5 SCOPE AND CONCEPTS OF BLOCKCHAIN

Cash system, which was shared in an email group in 2009 and made a disruptive and innovative impact on the financial world, also gave rise to blockchain technology, which has a revolutionary impact on many different sectors, especially in the world of technology and finance in the following years (Cope, 2007). Bitcoin is the first, most stable, and successful digital currency and remains unbreakable despite numerous digital attacks, thanks to the blockchain infrastructure it uses. Most of the cryptocurrencies called “altcoins” that are used today use blockchain technology that makes up the infrastructure of Bitcoin (Grant, & Perren, 2002).

With over 20 years of scientific research and rapid technological advancement, impressive progress has been made in cryptography and decentralized computer networks. This has given rise to blockchain technology, a disruptive innovation that radically changes how society operates Balaji (2016).

Blockchain also provides governance technology and system infrastructure to create a rule-based economy and disruptive enterprise technology. The use of Bitcoin as a tool to transfer value to Blockchain 1.0. Conducting all financial transactions using blockchain technology has been defined as Phase 2.0. The value creation phase using blockchain technology infrastructure is described in different areas as Blockchain 3.0, according to the same book. When it is evaluated based on this qualification, the stage is the end of the Blockchain 1.0 phase and the beginning of the Blockchain 2.0 phase. As the genius behind the Ethereum currency, he emphasized that blockchain technology has an important role in all business operations in the future, beyond being just a cryptocurrency (Davidsson, & Wiklund, 2001).

These applications can essentially determine transactions on digital assets according to simple or complex pre-defined rules (smart contracts). These rules are determined by people according to the desired plan (Edmondson, & McManus, 2007).

Blockchain technology is expected to provide many benefits to organizations. Some of these measures include secure transactions, preventing information leakage, reducing transaction

times, eliminating intermediaries, reducing cybercrime, and the ability to monitor transactions in real time (Davidsson, & Wiklund, 2001).

Although blockchain technology is viewed as the infrastructure for digital currencies, when looked at in detail, it is expected to have innovative impacts on big data used by many different sectors. Blockchain, machine learning/AI, multi-tenant cloud architectures, and big data engineering are just some of the innovations that have the potential to unlock markets from established players and begin the process of generating real (not fake) liquidity (Drakopoulou & anderson, 2007).

In the 2015 Future of Financial Services report published by the World Economic Forum (WEF) Balaji (2016), although the innovative structure of blockchain has advantages, it also has disadvantages; "Decentralized systems like the blockchain protocol threaten to disrupt almost every process in financial services." With the widespread use of blockchain technology, it has started to be used in many different concepts in our daily lives. While some of these concepts began to be used with blockchain technology, some already existed in the current IT world and were not widely used. Blockchain technologies mainly consist of 6 main concepts (Davidsson, 2005).

a. Decentralization: The main advantage of blockchain is that it does not need to be connected to a central node. Data is recorded, stored and updated in a distributed architecture.
b. Transparency: The data in the blockchain is completely transparent within the distributed node structure. Hence, the system has a trusted structure.
c. Open source: Most blockchain systems are open to everyone. This way, anyone is free to develop applications on it.
d. Autonomy: Thanks to consensus models and smart contracts, blockchain systems can operate independently without the need for intermediaries or human intervention.
e. Immutable: Every record cannot be changed without interfering with 51% of all nodes. This keeps the system security level at maximum.
f. Anonymity: The system has an anonymous structure by keeping data systems within itself without the need for third parties and organizations.

2.5.1 Definition and Structure of Blockchains

Blockchains are digital ledgers that enable cryptographic transaction records to be kept through a decentralized distributed architecture and operate through consensus. Blockchain technology is a system that allows transactions between people without the need for any intermediary institution (bank, insurance company, etc.). Through these digital records, people can verify transactions and store them in blocks. Blockchain has a highly sophisticated cryptographic infrastructure that is difficult to hack, allowing transactions to take place by creating transparency and trust among users.

A blockchain consists of blocks in which transaction information is recorded. The first block created for the system is called the configuration block. This block only has its own signature because there is no block before it. From now on, each block created bears the signature of the previous block. This way, the blocks remain connected to each other like a chain Balaji (2016).

Blockchain infrastructure provides a simple solution to transfer information and transaction records between peers automatically, transparently, and securely. While these recording operations are performed through blockchain technology, the data is recorded through a distributed database structure rather than one or multiple central structures (Blackburn. & Kovalainen, 2009).. In addition, It is a technology that enables applications in many different fields, such as smart contracts, public services, the Internet of Things (IoT), virtual systems that require trust, and security services (Erdem, 2019).

An operating system that is standardized and distributed for permissioned blockchains is offered by the widely researched Fabric project. It presents a new architecture that offers politically based consent, isolates transaction execution from consensus, and is comparable to replicated databases for middleware (Çolak, 2017).

2.5.2 The Process of Creating Blocks and Blockchain

Blockchain technology was designed to eliminate the need for third parties and institutions and create a trust that offers a new level of technological trust. While the system records transactions in blocks, it uses encrypted hash and date information. The block consists of two parts (Erdem, 2019).

a. A section containing transaction records.
b. The block header is required to verify the integrity and accuracy of the block data

The block header contains the following information:

i. Title block
ii. Summary of the value of the previous block
iii. The root value obtained from the summary information of the transactions in the block
iv. Time information

The blockchain architecture is based on the necessary "security" approach by keeping transaction history information in these structures called blocks so that the information cannot be changed in any way without being noticed, rather than keeping the blocks secret. This system, which is built and developed on the Bitcoin infrastructure, has worked successfully so far and has never been broken Eser, & Yıldız (2015).

2.5.2.1 Smart contracts

When buying and selling vehicles, transactions are processed via computers by notaries. When companies conclude contracts and check whether they are implemented or not, they use computers. If computers can perform all of these functions, why can't computers do this? Contracts that are intended to be used instead of classic contracts that are completely autonomous and do not require human intervention and control are called smart contracts. Smart contracts are computer protocols and are defined within the blockchain. The first proposal for smart contracts was made in 1994 by law professor, computer scientist, and cryptographer Nick Szabo. Software designed to run on the Ethereum platform is often referred to as smart contracts. A smart contract is a computerized transaction protocol that fulfills the terms of a contract (Edmondson, & McManus, 2007).

Smart contracts were implemented, and their first applications were developed by Vitalik Buterin, founder and programmer of Ethereum (Buterin, 2014). Vitalik Buterin explained the transition of smart contracts to software as follows at the Blockchain Summit. "The software runs this code and at some point, the condition automatically determines its validity and whether the asset should go to one person or go back to the other person or whether some combination requires an immediate return." (Gartner, 2001).

For a smart contract to be formed, certain features must be present. these;

a. What the contract is about
b. Digital signatures
c. Terms of the agreement
d. A platform with a blockchain infrastructure

To go through with buying and selling vehicles, it's necessary to get in touch with an agent. When registering the purchase and sale of vehicles and their exchange, notaries do not provide a money transfer service. Money transfer services require transactions to be processed through banks. This transaction requires either bringing cash or a wire transfer or bank transfer (Hjörth & Steyaert, 2004).

Buyers and sellers must connect to the blockchain network where this smart contract is located using their e-government username and password. A smart contract runs in the background to check if the car has any debts (traffic fines, MTV , inspection, traffic insurance, etc.). At the same time, it checks whether there is money in the seller's account, and if the specified financial amount is there, it carries out the sale through the notary system. (Hebert, & Link, 2006).

2.5.2.2 Blockchain Situation Analysis (SWOT)

Blockchain technology has revolutionary features, and with this technology, many innovations and conveniences are present in our daily lives. Blockchain laboratories are being set up in the world's leading universities in this field, conducting development studies and publishing articles. Blockchain, like every technology, has strengths, weaknesses, threats, and opportunities. Studying blockchain technology from this perspective reaches the following analysis results.

Strength points; Decentralized network, distributed flexibility and control, scalable database, secure encryption and modern cryptography, operational efficiency and ease of information sharing, platform for big data projects, transparent, fast and cheap, smart contracts, open source code (Hızır, 2014).

Weaknesses: Lack of regulation, customer dissatisfaction and poor user experience, difficulty testing technology, lack of smart contract programming experience, wallet and key management, poor developer experience, Blockchain image and trust issues, mature

scalability

opportunities; Secure communication between IoT devices; Low transaction fees Fast and efficient business processes Reduced fraud Reduced systemic risk; Potential to enable new business models

Threats: Legal and judicial obstacles, tax problems, negative perceptions of governments, technological problems, problems of institutional adaptation, weak management, and settlement models (Hızır, 2014).

3. METHODOLOGY

In social science research, either quantitative or qualitative analysis can be employed. For this study, a quantitative approach was utilized. The researcher randomly distributed questionnaires to the study sample and analysed the responses using correlation and regression analysis to test the study hypotheses (Creswell. & Creswell, 2017). The theoretical scope of this research focuses on the relationship between supply chain transparency and resilience and the adoption of blockchain technology. To understand the study framework, scientific literature was reviewed to describe the study variables. The collected questionnaires were then analysed using a quantitative approach.

3.1 RESEARCH QUESTIONS

This study addresses the following research questions:

a. How does supply chain agility influence blockchain technology adoption?
b. How does supply chain transparency influence blockchain technology adoption?
c. How does both supply chain agility and transparency influence blockchain technology adoption?

3.2 RESEARCH OBJECTIVES

This study aims to:

a. To examine the impact of supply chain agility on the tendency to adopt the blockchain system.
b. To examine the impact of supply chain transparency on the tendency to adopt the blockchain system.
c. To examine the impact of supply chain agility and transparency on the tendency to adopt the blockchain system.
d. To highlight the theoretical concepts related to supply chain transparency and agility.
e. To highlight the theoretical concepts related to the blockchain system and the trend towards its adoption.

3.3 HYPOTHESES DEVELOPMENT

The theory on which the conceptual model of this research is based is the resource-based theory. According to the theory, if the company wants to achieve a competitive advantage, it needs rare, valuable and non-substitutable resources. The theory was first put forward by Alada, 2000 explain the concept in the context of the resources and capabilities of companies and states that these resources are the main source of generating profits. The theory highlights the importance of autonomy, resource allocation, and imitability of exploitation in developing capabilities to gain competitive advantage (Dubey, et al., 2020). Blackburn, & Smallbone, (2008) found that the capabilities of supply chain members are neglected when companies achieve competitiveness based on internal resources. To overcome the problems of this theory, scholars consider the impact of dynamic and relational processes on resources related to the supply chain (Frynas, 2010). Therefore, to become competitive in the changing market, dynamic expansion is required. In terms of relational extension, the focus is on the association between members. Kamble, et al. (2019) found that dynamic capabilities help companies become more competitive. The invisible source of supply chain agility is transparency. Based on the resource-based theory this work analyses the association among agility, transparency and the block chain adoption.

3.3.1 Supply chain Agility and Block Chain Technology Adoption

Agility can be defined as a company's ability to respond to market transformation, effectively manage these challenges in the short term and then turn them into opportunities (Blackburn, & Brush, 2008). Carlsson, et al. (2013) stated that agility can be explained as rapid response to consumer demand, market changes and the integration of innovations using technology to improve consumer satisfaction. Schnackenberg, et al. (2021) stated that adopting agility towards technology is important to improve companies' performance. Implementing agility helps companies gain a competitive advantage and improve their business. It also encourages companies to offer lower-cost products and services and eliminate non-value-added activities. Davidsson, and Wiklund, (2001), found that supply chain agility is valuable and rare, helping companies gain market advantage through long-term integration. They also argue that agility positively promotes supply chain integration. One of the most effective technologies is blockchain due to its special features. Blockchain technology is beneficial because it promotes integration between organizations and helps companies reap the benefits

of the supply chain (Çevik, 2018). Supply chain integration helps companies improve their business processes, operational and financial performance. Based on the above discussion, the first hypothesis developed for this study is:

H1: There is a positive significant effect of supply chain agility on intention to adopt block chain.

3.3.2 Supply Chain Transparency and Block Chain Technology Adoption

Transparency can be explained as the degree to which the data is easily accessible to the parties involved and also to external viewers (Awaysheh & Klassen, 2010). Bateman, & Bonanni, (2019) argues that transparency is important in supply chain activities. Transparency helps supply chain partners track products and accuracy. Zhu et al. (2004) reported that the adoption of RFID and blockchain technologies helps companies improve their supply analytics, which in turn leads to transparency. Tan, T. M., & Saraniemi, (2023), noted that a lack of transparency hinders the adoption of a sustainable supply chain. Dubey, et al. (2020) reported that the adoption of blockchain improves transparency between stakeholders in the supply chain. Chod, et al. (2020) reported that transparency increases blockchain adoption. Shafiq, et al. (2020) reported that blockchain adoption improves transparency in nonprofit corporations. Based on the above discussion, the second hypothesis developed for this study is:

H2: There is a positive significant effect of supply chain transparency on intention to adopt block chain

*H**3**: There is a positive significant effect of both supply chain transparency and agility on intention to adopt block chain*

3.4 MODEL OF THE STUDY

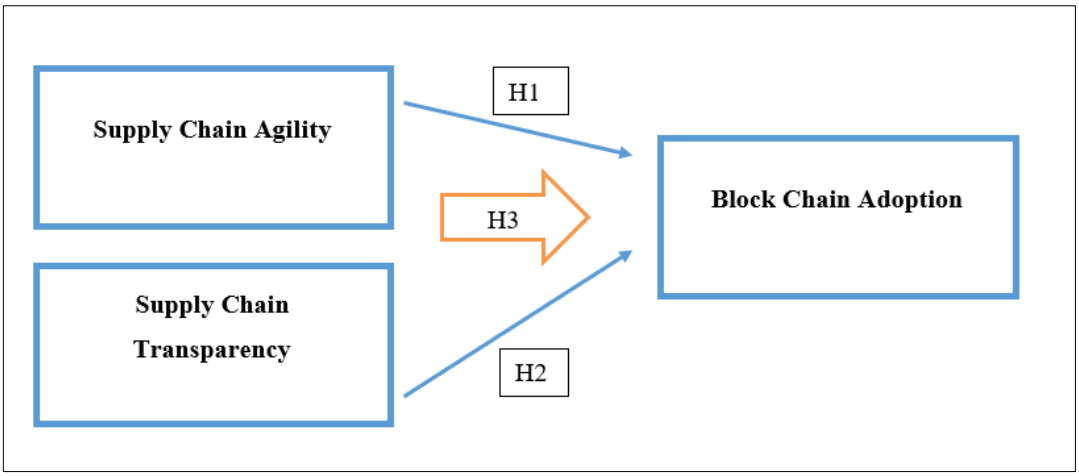

Figure 3.1: Model of the Study

3.5 DATA COLLECTION

This study used primary and secondary data. Primary data was obtained from field research in which data was collected from the respondents who are the subject of the study after selecting a random sample of respondents and distributing the questionnaire to them. Primary data is first-hand information collected directly from the field to help investigate the phenomenon. Secondary data sources emerged from published and unpublished articles, journals, periodicals and publications.

3.6 STUDY POPULATION AND SAMPLE

The study population consists of workers in 24 small and medium-sized establishments in the city of Baghdad that specialize in food services, as these establishments are among the most important establishments that provide employment opportunities and use multiple supply chains on a daily basis.

The average number of employees in the supply, procurement and administrative departments of these companies is estimated at 1,620 employees. The appropriate sample size was set at 320 participants and calculated using the following rule (Sekaran, & Bougie, 2016):

$$n = \frac{N}{1 + Ne^2}$$

Where:

N: Population size

n: sample size

e: Precision level/sampling error “level of repeatability of measurements”: 0.05 (Sekaran, & Bougie, 2016).

Substituting into the above equation shows that the sample size is 320.

n=1620/ ((1+1620*0.0025)) =320

In this study, 320 questionnaires were distributed, and after collecting the questionnaires, it was found that 10 questionnaires were not suitable for analysis due to lack of information. The researcher analyzed the data from 310 questionnaires.

3.7 SAMPLING TECHNIQUE

A sample of customers was randomly selected by distributing a questionnaire to the employees of these establishments in the purchasing, delivery and administration departments. A random sample is a sample in which all elements of the statistical population have an equal chance of being included in the sample. In other words, the probabilities of any two items in the selected sample must be equal. The chances of selecting an item from a group whose size does not exceed the sample size must be equal (Shagofah et al., 2022). The questionnaire is distributed manually so that the researcher can explain the questionnaire sections and their purpose to the respondent so that he can understand the topic of the study and answer the sections.

3.8 QUESTIONNAIRE DEVELOPMENT

The questionnaire was adopted as an important field tool to collect data from beneficiaries who are employees of small and medium-sized enterprises providing food services in the city of Baghdad.

The questionnaire for the study includes three sections:

a. The first section: presents the title of the research, its meaning and its basic concepts and emphasizes the confidentiality of the information collected from the beneficiaries.

b. The second section: Add demographic information including the gender, age, education level and income level of the sample members.

c. The third section: Contains questions about our variables. All survey questions come from a study by Iranmanesh, et al. (2023).

Supply chain agility consists of 8 questions, including supply chain agility related questions such as “Blockchain is beneficial in reducing development cycle time”. These questions were measured using a 5-Likert scale.

Supply chain transparency consists of 4 questions, including supply chain agility questions such as "Blockchain plays a critical role in improving the sharing of operational strategies, including sales and production plans, among employees within the supply chain."

Blockchain adoption consists of 3 Questions, including supply chain agility questions such as "Our company will implement blockchain technology in supply chain management in the future."

All these questions were assessed using the 5 Likert scale as follows to measure the questions of the questionnaire:

a. Strongly agree and gave it “five marks”.

b. Agreed and gave it “four marks.”

c. Neutral and gave it “three marks”.

d. Disagree and gave it “two marks”.

e. Strongly disagree and gave it “one mark.”

3.9 STATISTICAL USED METHODS

In order to fulfil the goals of the research, the researcher used Statistical Package for Social Sciences (SPSS) software to conduct data analysis, test hypotheses, and achieve the objectives outlined in the research framework. A significance level of (5%) was used, considered appropriate in the field of social sciences. Generally, a confidence level of (95%) was maintained to interpret the study results, and various statistical methods were used.

a. To assess the reliability of the questionnaire items, use the Cronbach's alpha test.

b. Testing standard deviations, arithmetic means, frequencies, and percentages.

c. testing for correlation to see if the independent variables—supply chain agility and transparency—and the dependent variable—blockchain adoption—correlate.

d. To ascertain how much the independent variable influences the dependent variable, perform a regression test.

4. RESULTS

4.1 DESCRIPTIVE TESTS (DEMOGRAPHIC CHARACTERISTICS OF THE STUDY SAMPLE)

Table 4.1: Distribution of Sample Members According to the Gender of the Respondent

	Gender		Total
	Male	Female	
N	163	147	310
%	52.6	47.4	100%

Source: Prepared by the researcher based on Excel 2013

Table 4.1 above indicates that the percentage of males in the study sample is slightly higher than the percentage of females, as the percentage of males reached 52.6%, while the percentage of females reached 47.4%. Small and medium-sized companies that provide catering services are companies that largely attract females.

Table 4.2: Distribution of Sample Members According to the Age of the Respondent

Age	N	%
From 18 to 25 years	67	21.6
25 to 35 years	88	28.4
35 to 45 years	69	22.3
45 to 55 years	68	21.9
55 to 65 years	18	5.8
Total	310	100

Source: Prepared by the researcher based on Excel 2013

Looking at the results of Table 4.2 above in terms of age, the proportion of 18-25 year olds was 21.6%, which is close to the proportion of 45-55 year olds which was 21.9%. In addition, the results of the table show that the proportion of 25 to 35 year olds is 28.4%, 35 to 45 year olds is 22.3% and 55 to 65 year olds is 5.8%. These percentages generally indicate that small and medium-sized enterprises rely heavily on young people, since the work of small and medium-sized enterprises provides their services throughout the day and therefore requires employees who can withstand long-term work pressure.

Table 4.3: Distribution of Sample Members According to the Educational Qualification of the Respondent.

Educational qualification	N	%
High school diploma	35	11.3
Technical Institute	115	37.1
University	117	37.7
Postgraduate	43	13.9
Total	310	100.0

Source: Prepared by the researcher based on Excel 2013

Data from Table 4.3 above indicate that the percentage of those who have a high school diploma among the sample is 11.3%, and those who have a technical institute certificate are 37.1%, which is close to the percentage of those who have a university degree, which reached 37.7%, and the percentage of those who have a postgraduate certificate is 13.9%. These percentages indicate the dependence of small and medium-sized companies on the scientific competencies and technical certificates necessary for work.

Table 4.4: Distribution of Sample Members According to The Respondent's Job Experience

Functional experience	N	%
From 1 to 5 years	23	7.4
From 5 to 15 years	116	37.4
From 15 to 20 years	78	25.1
20 years and over	93	30.0
Total	310	100.0

Source: Prepared by the researcher based on Excel 2013

Referring to the results of Table 4.4 regarding the respondents' work experience, the results showed that 7.4% of the sample members had work experience between one and five years, while the proportion of those with work experience was between five and 15 years. The proportion of those with A professional experience of between 15 and 20 years was around 37.4%, those with a professional experience of between 15 and 20 years was 25.1%, and those with a professional experience of more than 20 years was 30%. This percentage shows that small and medium-sized companies retain their employees, train them, and provide incentives to keep them working for them.

4.2 RELIABILITY AND FACTOR LOADING

4.2.1 Cronbach's Alpha

Cronbach's alpha coefficient analysis is used to evaluate the reliability of the study tool, which is the questionnaire, which measures the internal consistency of the items, to interpret or question the homogeneous structure of the items in the scale. Since the items in the scale with a high Cronbach's alpha coefficient are consistent with each other and consist of items that measure the same feature.

Cronbach's alpha is often used in Likert-type scales. Cronbach's alpha is expressed as follows:

Reliability is very weak, and the scale cannot be relied upon if the value of the Cronbach's alpha coefficient is between 0 and 0.40

Reliability is low if the Cronbach's alpha value is between 0.40 and 0.60.

Reliability is good if the value of the Cronbach's alpha coefficient is between 0.60 and 0.80.
Reliability is extremely high if the value of Cronbach's alpha coefficient is between 0.80 and 1

Table 4.5: Results of Cronbach’s Alpha Test.

The dimension	Alpha Cronbach's
Supply chain agility	.836
Supply chain transparency	.880
Blockchain adoption	.818
total summation	.845

Source: Prepared by the researcher based on the SPSS 22 program.

The results of the reliability analysis of the study variables show that the values of Cronbach’s alpha coefficient are more than 0.80 for all study variables, which indicates that reliability is high for all dimensions of the study. The results also show that the value of Cronbach’s alpha coefficient for all questionnaire questions is 0.845, which is a high value that indicates the tool's high reliability.

4.2.2 Factor Loading Analysis

Exploratory factor analysis is one of the most common applications among researchers because of its numerous benefits in the research field. It is concerned with developing standards, reconsidering, and verifying them, and judging the validity of their construction.

Table 4.6: Analysis of Factor Loading.

Factor's Name	Variables	Factor Loading	EEigen-value	Variance Explained	KKMO
Supply Chain Agility (AGL)	Blockchain helps reduce lead time for manufacturing processes..	.875	1.088	54.856	.674
	Blockchain is beneficial because it shortens the development cycle time.	.669			
	Blockchain helps increase the frequency of new product launches.	.735			
	Blockchain is beneficial because it increases the level of product customization.	.945			
	Blockchain helps improve delivery capability.	.765			
	Blockchain is beneficial in improving customer service.	.753			
	Blockchain helps ensure delivery reliability.	.834			
	Blockchain is beneficial in adapting to the changes in market needs.	.745			
Supply Chain Transparency	Blockchain plays a crucial role in enhancing the exchange of operational strategies, including distribution and production plans, among collaborators within the supply chain.	.845	2.745	58.375	.834
	Blockchain offers benefits by facilitating the exchange of operational data among supply chain collaborators, such as batch size, production quality, transfer efficiency, inventory levels, machine availability, and downtime information.	.965			

Table 4.6: Analysis of Factor Loading "Table Continued".

	Blockchain plays a crucial role in facilitating the exchange of planning and design data among supply chain partners, including information on planning and design effectiveness, operational efficiency, resource allocation, rework and wastage rates, and project advancement status.	.884			
	Blockchain offers numerous benefits in enabling the exchange of vital information within the supply chain ecosystem. This includes the seamless sharing of strategic data such as new orders, product demand, internal and external expertise, teachability, culture, and government regulations among partners involved in the supply chain.	.724			
Blockchain Adoption	Our company implement blockchain technology in supply chain management in the future.	.864	1.856	65.625	.845
	Our company utilize blockchain technology in supply chain management in the future.	.824			
	Our company aims to digitally revolutionize supply chain management by implementing blockchain technology.	.814			

In this study, an exploratory factor analysis was conducted to examine the validity of all 17 questions in the questionnaire and to increase the reliability of the data. The acceptable value of exploratory factor analysis is more than 50 (Creswell. & Creswell, 2017). Scaling methods: problems and applications. Sage Publications. The results showed that all exploratory factor analysis values for the study questions were more than 0.5, indicating the validity of all questions for the analysis.

A preliminary investigation was conducted to calculate eigenvalues for each variable in the data set. All variables had eigenvalues greater than one, indicating good component reliability. The Kaiser-Meyer-Olkin measure assesses sampling adequacy for analysis, with the KMO exceeding 0.5 for all five variables. Each variable accounted for more than 50% of the explained variance, as shown in the table above, confirming the suitability of the results for analysis and the utility of the data.

4.3 THE CORRELATION BETWEEN THE STUDY VARIABLES

Correlation analysis is a commonly employed statistical technique in social and physical sciences. It allows us to statistically examine the relationship between two variables. The correlation coefficient plays a crucial role in determining the direction and strength of this relationship. A positive correlation coefficient means that the variables are moving in the same direction, while a negative correlation coefficient indicates an inverse relationship. The correlation coefficient measures the strength of the relationship between variables, with values ranging from -1 to 1. A zero value indicates no correlation, while a value of 1 signifies a perfect correlation (Creswell. & Creswell, 2017).

Essentially, if the correlation coefficient between two data sets is 1, then the graphs of these variables align perfectly. Conversely, a negative correlation coefficient suggests that as one value decreases, the other value increases. Pearson's correlation test is commonly preferred for assessing correlation. However, in cases where the data set is not suitable for parametric tests, the Spearman test can be used (Noor, et al., 2022).

Table 4.7: Results of the Correlation Analysis between the Dimensions of Intellectual Capital and Financial Performance.

		Supply chain agility.	**Supply chain transparency**	**Blockchain adoption**
Supply chain agility.	Pearson Correlation	1	.768**	.773**
	Sig (2-tailed)		.000	.000
Supply chain transparency	Pearson Correlation	.768**	1	.858**
	Sig (2-tailed)	.000		.000
Blockchain adoption	Pearson Correlation	.773**	.858**	1
	Sig (2-tailed)	.000	.000	
	Sig (2-tailed)	.000	.000	.000
**. Correlation is significant at the 0.05 level (2-tailed).				

Source: Prepared by the researcher based on the SPSS 22 program

The results in the table above indicate that there is a positive correlation with statistical significance at 5% between both supply chain transparency and blockchain adoption, where

the value of the correlation coefficient reached .858**, which is the highest value, and this indicates that supply chain transparency is positively associated with blockchain adoption. On the other hand, the results indicate that there is a positive correlation with statistical significance at 5% between both supply chain agility and blockchain adoption, as the value of the Pearson correlation coefficient reached .773**, which is a good value indicating that supply chain agility has a good positive correlation with adopting blockchain in the supply chain.

4.4 REGRESSION ANALYSIS BETWEEN THE STUDY VARIABLES

In statistical models used in regression analysis, the study of cause-and-effect relationships typically involves the inclusion of two or more variables. The main focus is on assessing the extent to which these variables influence each other. When a relationship is identified, it is quantified by a mathematical function known as the regression function. Simple linear regression: The aim is to explain the change in the independent variable (X) and the dependent variable (Y), and to measure the effect of a unit change in the independent variable on the dependent variable. In multiple linear regressions, there is more than one independent variable affecting a dependent variable (Shagofah Noor, Omid, and Jawad Golzar, 2022). Multiple linear regression analysis is used to examine the impact of supply chain agility and transparency on blockchain adoption in the supply chain.

Table 4.8: Results of Regression Analysis Between Supply Chain Agility and Blockchain Adoption.

Dependent variable	**Independent variables**	**β**	**T**	**P VALUE**	**R^2**	**F**
Blockchain adoption	(constant)		4.890	.000	0.597	57.757
	Supply chain agility	.0.435	3.265	.000		

To determine the significance of the regression coefficients, a t-test with probability level was used, since it is clear from the results in Table 4.8 that the P-value, which represents the probability level corresponding to the t-test value, is less than 5% , suggesting that there is a statistically significant effect of supply chain agility on blockchain adoption.

R-squared (R^2) is a statistical measure used to determine the proportion of variance in a dependent variable that can be predicted or explained by an independent variable. The value of R2 (0.597) means that supply chain agility explains 59.7% of the variance in blockchain adoption. We also use the F-statistic to assess the significance of the estimated model as a whole. On a certain moral level. The F-test is also used in regression analysis, which allowed us to determine the explanatory power of the model as a whole, as the F-value is 57.757.

Regression coefficients, also known as slope coefficients or beta coefficients, show how much the dependent variable changes when an independent variable changes by one unit while the other variables remain constant.

If beta coefficient is positive it means that a rise in the independent variable causes a rise in the dependent variable, and vice versa for a negative beta coefficient. From the results in the table above, we find that the beta value indicates that increasing supply chain agility by one unit will lead to an increase in the tendency towards adopting Blockchain system by 0.435, holding other factors constant.According to the obtianed results in the table 4.8 the hypothesis H1 was accepted.

Table 4.9: Results Of Regression Analysis Between Supply Chain Transparency and Blockchain Adoption.

Dependent variable	**Independent variables**	**β**	**T**	**P VALUE**	**R^2**	**F**
Blockchain adoption	(constant)		2.167	.000	.0.736	34.376
	Supply chain transparency	.0.276	1.465	.000		

To determine the significance of the regression coefficients, a T-test with probability level was used, as it is clear from the results reached in Table 4.9 that the P value, which represents the probability level accompanying the T-test value, is less than 5%, which indicates that there is a statistically significant effect of the transparency of the supply chain towards adoption of blockchain.

The value of R2 (0.736) means that Supply chain agility explains 73.6% of the variance in the Blockchain adoption. We also use the F statistic to judge the significance of the estimated model as a whole. At a certain moral level. The F test is also used in regression analysis, which enabled us to know the explanatory power of the model as a whole, as the F value is equal to 34.376. From the results in the table above, we find that the beta value indicates that

increasing supply chain transparency by one unit will lead to an increase in the tendency towards adopting a blockchain system by 0.276, holding other factors constant. According to the obtained results in table 4.9. the hypothesis H2 was accepted.

Table 4.10: Results of regression analysis between supply chain agility and transparency and blockchain adoption.

Dependent variable	**Independent variables**	**β**	**T**	**P VALUE**	**R^2**	**F**
Blockchain adoption	(constant)		4.890	.000	.0.688	78.168
	Supply chain agility	.0.557	7.783	.000		
	Supply chain transparency	.0.018	5.209	.000		

To determine the significance of the regression coefficients, a T-test with probability level was used. As the results in Table 4.10 clearly show, the P value, which represents the probability level accompanying the T-test value, is less than 5%. This indicates a statistically significant effect of both agility and transparency of the supply chain on the adoption of blockchain.

The value of R2 (0.688) means that supply chain agility and transparency explain 68.8% of the variance in the adoption of Blockchain. We also use the F statistic to judge the significance of the estimated model at a certain moral level. The F test is also used in regression analysis, enabling us to know the model's explanatory power as a whole, as the F value equals 78.168. According to the obtained results in Table 4.10, hypothesis H3 was accepted. From the results in the table above, we find that the beta value indicates that increasing supply chain transparency by one unit will lead to an increase in the tendency towards adopting blockchain system by 0.018 and increasing supply chain transparency by one unit will lead to an increase in the tendency towards adopting blockchain system by 0.557 in the multiple regression holding other factors constant.

5. CONCLUSION AND IMPLICATIONS

5.1 DISCUSSION AND CONCLUSION

The study primarily aimed to examine the impact of supply chain agility and transparency on the adoption of blockchain in the supply chain for small and medium-sized enterprises in Iraq. The questionnaire was used to collect data from 24 small and medium-sized enterprises providing food services in Iraq, in the city of Baghdad. Randomization was performed and correlation analysis was used to examine the relationship between the variables. It was found that there is a strong positive relationship between supply chain agility and transparency and blockchain adoption. Regression analysis was also conducted to examine the impact of supply chain transparency and agility on blockchain system adoption. Both supply chain agility and transparency have been found to have a strong positive effect on blockchain system adoption.

The results of this study are consistent with the results of Bodendorf, Lutz, Michelberger, and Franke (2022) and the study of (Gerged, et al., 2023), which indicated that supply chain agility has a positive impact on the adoption of the blockchain system in the supply chain. In the study by Kuo-Jui, Wu, M.- (2016), all researchers examined the relationship between supply chain agility and transparency in blockchain system adoption. This study used the questionnaire method to collect data from the randomly selected sample. The study found a positive, statistically significant effect of supply chain agility on the trend of blockchain system adoption. A positive but weaker effect of supply chain transparency on blockchain system adoption was also found. In this study, the concepts of sourcing, supply chain, and supply chain management are explained in detail in the “Conceptual Basics” section. In the conceptual framework section, the concepts of blockchain adoption, supply chain transparency and supply chain agility and the relationships between these concepts are mentioned in detail. Two hypotheses were put forward regarding the relationship between the concepts.

The hypotheses formulated in the conceptual framework section were tested using survey data collected from participants. The results obtained and the hypotheses formulated were confirmed. Supply chain agility has a positive impact on blockchain adoption in the supply chain. Furthermore, supply chain transparency also impacts blockchain adoption in the

supply chain.

Among various innovative technologies, blockchain technology is a promising transformation tool. The results proved that blockchain's capability of improving supply chain transparency and flexibility significantly influences SMEs' intention to adopt this technology. Particularly in industries characterized by turbulence and unpredictable markets, the role of blockchain in improving resilience becomes even more critical. Considering the benefits of blockchain technology and its comparatively low adoption rate among small and medium-sized enterprises (SMEs), this study significantly adds to the body of knowledge by emphasizing how blockchain can motivate SMEs to embrace this ground-breaking technology.

5.2 THEORETICAL CONTRIBUTION

This study is important because it is the first to cover the concept of supply chain flexibility for SMEs in Iraq.

The study's results clearly show that increasing supply chain transparency positively affects the performance of small and medium-sized companies operating in Iraq. Additionally, supply chain transparency appears to increase blockchain adoption and resilience. This information is in line with the literature conducted so far and supports existing studies.

This study found that supply chain flexibility increases blockchain adoption and that supply chain transparency plays a variable, semi-moderating role in its impact on blockchain adoption. It is considered an important study from a theoretical perspective because it investigates the intervening effect of supply chain agility, supply chain transparency, and blockchain adoption.

In today's changing and uncertain markets, SMEs need a unique skill set to survive. SMEs with such capabilities can maintain their capabilities and improve blockchain adoption by gaining a competitive advantage (Morkunas, et al., 2019).

The literature also discusses supply chain resilience as a dimension of survival in turbulent markets. The supply chain's agility concept is based on the principle of responding to customer requests correctly in all circumstances. SMEs that adopt this principle can survive in volatile markets and stay ahead of their competitors, thus increasing their companies'

performance.

This study demonstrated how adoption of blockchain is positively impacted by supply chain agility and transparency. In order to boost blockchain adoption, managers should think about balancing supply chain flexibility with increased transparency.

5.3 PRACTICAL IMPLICATIONS

Considering the advantages of blockchain technology and the critical role of small and medium-sized enterprises (SMEs) in the economy, policymakers aim to encourage blockchain adoption among SMEs. Earlier research on the factors influencing the adoption of blockchain technology has highlighted the importance of SME managers understanding the benefits of this technology before deciding to invest in it. This study addresses key questions that SME managers may have regarding adopting blockchain technology, such as its impact on supply chain management and its importance across different industries. While existing studies have limitations in terms of theoretical foundation and empirical evidence, this study proposes a theoretically sound and empirically tested model, providing valuable insights for SME managers, policymakers, and blockchain service providers. It is widely recognized that supply chain flexibility, adaptability, and alignment are essential to maintaining competitive advantage in today's market. Therefore, SMEs face the challenge of determining how blockchain technology can enhance alignment, adaptability, and flexibility within their supply chains. Earlier research has identified trust, clarity, and information integrity as key barriers to achieving supply chain agility, adaptability, and alignment. Since transparency is a key feature of blockchain technology, it has the potential to address these barriers by increasing visibility, enhancing information integration, and enhancing trust between supply chain partners.

Furthermore, the results of this study provide urgent insights for policymakers and blockchain service providers. These insights can help it come up with instant plans and set priorities for actions that will encourage small and medium-sized businesses (SMEs) to use blockchain technology. The study highlights the significant impact of transparency and flexibility on adopting blockchain technology and points to the need for urgent awareness programs for SME managers. Furthermore, it is imperative that blockchain service providers disseminate and convey the success stories of small and medium-sized

enterprises (SMEs) that have leveraged blockchain technology.

Furthermore, the urgency and strategic importance of the government and vendors focusing on industries with high levels of market disruption when targeting SMEs for blockchain adoption cannot be overstated. This strategic focus is crucial with blockchain adoption among SMEs in its early stages. Blockchain's ability to respond quickly to unexpected market changes is a key factor in the success of SMEs in highly competitive markets, making the role of government and providers even more important.

5.4 LIMITATIONS AND DIRECTION FOR FUTURE RESEARCH

The study findings have addressed both research questions, yet various limitations can guide future research. First, due to the low rate of blockchain adoption among SMEs in Iraq, our investigation concentrated on the drivers of blockchain adoption. It would be helpful to conduct an empirical analysis of how blockchain capabilities affect supply chain competitiveness for upcoming research in developed nations. Second, the study sample was restricted to small and medium-sized enterprises, which possess distinct capabilities in resource integration, information sharing, and service provision compared to larger corporations. Subsequent research could investigate the study model among large enterprises. Third, future studies could improve results by examining the mediating effects of trust, transparency, and information integration on the relationships between transparency, adaptability, alignment, and supply chain agility.

In addition, it is crucial to consider market turbulence as an external element. To further improve the suggested model, future research could explore how organizational factors like readiness, financial resources, and employee capabilities moderate its effects. Additionally, a direct correlation between supply chain transparency and the adoption of blockchain technology suggests that alignment, adaptability, and flexibility are not the only factors contributing to this relationship. Subsequent studies could delve into the mediating effects of other factors, such as safety and performance efficiency. The evaluation of blockchain enablers in this study highlights the importance of operational transparency and the supply chain's resilience.

It is extremely important to highlight that the application of blockchain technology goes beyond centralized entities. As a fundamental element of Industry 4.0, blockchain

integration includes the participation of value network partners and their functions. This suggests that blockchain integration is not exclusively limited to small and medium-sized enterprises (SMEs). The effective integration of blockchain in SMEs depends heavily on the interest of suppliers, retailers, and end users in actively participating in blockchain-enabled commercial transactions. It is widely recognized in the academic literature that the use of digital technologies in companies should be examined in the supply chain context. Recent findings from Ghobakhloo, et al. (2023) underline that integrative technologies such as blockchain require technical knowledge of the implementing company, business partners, and customers to implement and use these technologies effectively. It would be beneficial for future studies to examine how variables such as supply chain transparency and adaptability may impact supply partners' collective decisions about blockchain adoption.

REFERENCES

Alada, A. D . (2000). Notes on the Concept of Entrepreneurship in the History of Economic Thought, Istanbul University Journal of Political Sciences Faculty, 4(2), 13–22.

Aldrich, H . (2000). Learning together: national differences in entrepreneurship research. In Sexton, D.L. & Landström, H (Eds), The Blackwell Handbook of Entrepreneurship. Oxford: Blackwell Business, 7(4), 22–36.

Alkan, M. (2014). *Examination of entrepreneurship, innovation, innovative thinking, and innovative entrepreneurship levels of entrepreneurs* (Master's thesis, Hasan Kalyoncu University).

Audretsch, D. and Keilbach, M . (2004) explored the relationship between entrepreneurship capital and economic performance in their article published in the Regional Studies journal, 8(12), 48–70.

Awaysheh, A., & Klassen, R. D. (2010). The impact of supply chain structure on the use of supplier socially responsible practices. *International Journal of Operations & Production Management, 30*(12), 1246–1268.

Ayllon-Lorenzo, P. M., Cardenas-Maciel, S. L., & Cazarez-Castro, N. R. (2019). Applying Control Theory to Optimize the Inventory Holding Costs in Supply Chains. In *Numerical and Evolutionary Optimization–NEO 2017* (pp. 127-137). Springer International Publishing.

Aytaç, Ö. (2006). Entrepreneurship: A Socio-Cultural Perspective. *Dumlupınar University Journal of Social Sciences, 15*, 139-160.

Baharmand, H., Maghsoudi, A., & Coppi, G . (2021). Examining the utilization of blockchain in humanitarian supply chains: Findings from Humanitarian Supply Blockchain pilot project. International Journal of Operations & Production Management, 41(9), 1522–1543 .

Balaji, V. V , A. (2016). A Fuzzy Modeling Approach for Designing Agile Supply Chains Using Interpretive Structural Modeling. Jordan Journal of Mechanical and Industrial Engineering, 10(1), 67-74.

Bateman, A., & Bonanni, L. (2019). What supply chain transparency really means. *Harvard Business Review*, *20*, 2–8.

Bellamy, M. A., Dhanorkar, S., & Subramanian, R . (2020). Managerial environmental innovations, supply network configuration, and environmental disclosure. Journal of Operations Management, 66(7–8), 895–932 .

Blackburn, R. A., & Smallbone, D. (2007). *From the margins to the mainstream: the development of research on small business and entrepreneurship in the UK*. Kingston Business School, Kingston University.

Blackburn, R. A., & Smallbone, D. (2008). Researching small firms and entrepreneurship in the UK: Developments and distinctiveness. *Entrepreneurship Theory and Practice*, *32*(2), 267-288.

Blackburn, R. and Brush, C.G. (Eds) (2008), Small Business and Entrepreneurship, (Vols 1-5), Sage Library in Business and Management, Sage, London.

Blackburn, R., & Kovalainen, A. (2009). Researching small firms and entrepreneurship: Past, present and future. *International Journal of Management Reviews*, *11*(2), 127-148.

Bodendorf, F., Lutz, M., Michelberger, S., & Franke, J. (2022). An empirical investigation into intelligent cost analysis in purchasing. *Supply Chain Management: An International Journal*, *27*(6), 785-808.

Buterin, V. (2014). A next-generation smart contract and decentralized application platform. *white paper*, *3*(37), 2-1.

Carlsson, B., P. Braunerhjelm, M. McKelvey, C. Olofsson, L. Persson, H., Ylinenpaa (2013). The Evolving Domain of Entrepreneurship Research, *Small Business Economics,* 913-930

Çevik, E .(2018). The Role of Innovation in the Competitiveness of SMEs, master's Thesis,2(5), 90-98.

Chan, A. T. L., & Wong, E. W .(2016). The Effects of Strategic And Manufacturing Flexibilities And Supply Chain Agility On Firm Performance In The Fashion Industry. European Journal of Operational Research, 259(2), 1-14.

Chod, J., Trichakis, N., Tsoukalas, G., Aspegren, H., & Weber, M .(2020). Assessing the financial advantages of supply chain transparency and blockchain implementation. Management Science, 66(10), 4378–4396.

Chrisman, J.J., Chua, J.H. and Sharma, P. (2005). Trends and directions in the development of a strategic management theory of the family firm, *Entrepreneurship Theory and Practice*, 29, 555–576

Çolak, İ .(2017). Innovation and Entrepreneurship in Developing Countries and Economies: A Comparison of Turkey and Argentina, master's Thesis.

Cope, J., Jack, S., & Rose, M.B .(2007). Social capital and entrepreneurship: an introduction. International Small Business Journal, 25(3), 213–219.

Creswell. J.W. and Creswell, J.D. (2017) Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. 4th Edition, Sage, Newbury Park.

Crosby, M., Pattanayak, P., Verma, S. and Kalyanaraman, V. (2016). Blockchain Technology: Beyond Bitcoin. Applied Innovation, 2, 71.

Dane E .(2010). An Examination of SMEs and SME Issues in Turkey and Italy within the Framework of Bilateral Commercial Relations, 5(1), 12-26.

Davidsson, P .(2005). Researching Entrepreneurship. New York: Springer.

Davidsson, P., & Wiklund, J .(2001). Levels of analysis in entrepreneurship research: current research practice and suggestions for the future. Entrepreneurship, Theory and Practice, 25(4), 81–99.

Drakopoulou Dodd, S., & Anderson, A .(2007). Mumpsimus and the myth of the individualistic entrepreneur. International Small Business Journal, 25(4), 341–360.

Dubey, R., Gunasekaran, A., Bryde, D. J., Dwivedi, Y. K., & Papadopoulos, T. (2020). Blockchain technology for enhancing swift-trust, collaboration and resilience

within a humanitarian supply chain setting. *International journal of Production research*, *58*(11), 3381-3398.

Edmondson, A.C., & McManus, S.E .(2007). Methodological fit in management research. Academy of Management Review, 32, 1155–1179.

Erdem, M (2019). The Impact of kosgeb-gmka-kgf on Solving the Financing Problems of SMEs: A Study in Balıkesir Province, journal of Economics, 6(1), 90–94.

Eser, & Yıldız M. L .(2015). What is the focus of entrepreneurship research in Turkey? A review of the literature, Marmara University Öneri Journal, 12(3), 25-44.

Fahn, M., & Zanarone, G. (2022). Transparency in relational con- tracts. *Strategic Management Journal*, *43*(5), 1046–1071.

Fosso Wamba, S., Queiroz, M. M., & Trinchera, L .(2020). Dynamics between blockchain adoption determinants and supply chain performance: An empirical investigation. International Journal of Production Economics, 8(2), 16-32.

Frynas, J. G. (2010). Corporate social responsibility and societal governance: Lessons from transparency in the oil and gas sec- tor. *Journal of Business Ethics*, *93*, 163–179.

Gartner, W.B .(2001). Blind assumptions in theory development: questioning the presence of an elephant in entrepreneurship. Entrepreneurship, Theory and Practice, 25(4), 27-39.

Gerged, A. M., Salem, R., & Beddewela, E .(2023). The impact of transparency on global sustainability initiatives and firm value: Evidence from Anglo-American countries. Business Strategy and the Environment, 12(4), 1–29.

Ghatari, A. R., & Gholami, M. G .(2013). Developing A Model for Agile Supply: An Empirical Study From Iranian Pharmaceutical Supply Chain. Iranian Journal of Pharmaceutical Research, 12(6), 193-205.

Ghazal Bargshady, S. M .(2016). The Impact of Information Technology on Supply Chain Agility in the Iranian Power Plant Industry. Journal of Manufacturing Technology Management, 27(3), 427-442.

Gligor, D. M., & Cavinato, L .(2015). Performance Outcomes of Supply Chain Agility: When Should You Be Agile? Journal of Production Management, 33(34), 71-82.

Gligor, D. M., Davis-Sramek, B., Tan, A., Vitale, A., Russo, I., Golgeci, I., & Wan, X .(2022). Leveraging blockchain technology for enhancing supply chain transparency: A resource orchestration approach. Journal of Business Logistics, 43(1), 140–159

Grant, P. & Perren, L .(2002). Meta-theories, paradigms, and prejudices in small business and entrepreneurial research. International Small Business Journal, 20(2), 185–212.

Guangping Wang, W. D .(2015). Firm Capabilities' Influence on External Collaboration and Performance: The Moderating Effect of Market Turbulence. Journal of Business Research, 68,(7), 1928-1936.

Harrison, A. R .(2008). Logistics Management and Strategy: Competing Through the Supply Chain, Third Edition. Essex: Prentice Hall, Financial Times, 7(1), 34-75.

Hebert, R. F. & Link, A. N .(2006). The Entrepreneur as Innovator: exploring the role of entrepreneurship in technology transfer. Journal of Technology Transfer, 6(6), 76-88.

Hızır, N. (2014). Content analysis of complaints and business responses in e-commerce opportunity websites. *International Journal of Electronic Commerce Studies*, *23*(5), 84-99.

Hjörth, D. & Steyaert, C .(2004). Narrative and Discursive Approaches in Entrepreneurship: examining different perspectives. Cheltenham: Edward Elgar, 56(1), 84-94.

Hutchinson, V. & Qintas, P .(2008). Knowledge management in SMEs: exploring the extent of their practices. International Small Business Journal, 26(2), 131–154.

Iranmanesh, M., Maroufkhani, P., Asadi, S., Ghobakhloo, M., Dwivedi, Y. K., & Tseng, M. L. (2023). Effects of supply chain transparency, alignment, adaptability, and agility on blockchain adoption in supply chain among SMEs. *Computers & industrial engineering*, *176*, 108931.

Jennings, J.E. & McDougald, M.S .(2007). Work-family interface experiences and coping strategies: implications for entrepreneurship research and practice. Academy of Management Review, 32(56), 747–760.

Kamble, S., Gunasekaran, A., & Arha, H. (2019). Understanding the blockchain technology adoption in supply chains-Indian context. *International Journal of Production Research*, *57*(7), 2009–2033. https://doi.org/10.1080/00207543.2018.1518610

Kessler, M., Arlinghaus, J. C., Rosca, E., & Zimmermann, M .(2022). Curse or blessing? Exploring risk factors of digital technologies in industrial operations. *International Journal of Production Economics* , 56(1), 84-94.

Khan, A. K., & Bhatnagar, B. B .(2009). Impact Of Agile Supply Chain Delivery Practices on Firms' Performance: Cluster Analysis And Validation. Supply Chain Management, 14(1), 41-48.

Kırmızı A. (2019). Kobilerin Temel Sorunları Ve Swot Analizi*, Yüksek Lisans Tezi*

Kuo-Jui, Wu, M.-L. T .(2016). Attaining Competitive Advantage through Supply Chain Agility in Certainty: A Unique Multi-Criteria Decision-Making Framework. International Journal of Production Economics, 6(7), 1-12.

Kuratko, (2006) pays tribute to 50 years of excellence in entrepreneurship and small business in the Journal of Small Business and Management, 12(3), 77–85.

Martin Christopher, A. H , A. (2016). Establishing the Agile Supply Chain: Challenges and Concerns. In H. R. Kulwant S. Pawar (Ed.), Developments in Logistics and Supply Chain Management (61-68). Palgrave Macmillan UK, 5 (6), 65-78.

Mol, A. P. J. (2015). Transparency and value chain sustainability. *Journal of Cleaner Production*, *107*, 154–161.

Morkunas, V. J., Paschen, J., & Boon, E. (2019). How blockchain technologies impact your business model. *Business Horizons*, *62*(3), 295-306.

Özkul, G. & Dulupçu, M. A .(2007). The Impact of Personal Development on Entrepreneurial Types: A Study in Antalya-Isparta Provinces, Çanakkale Onsekiz Mart University Journal of Entrepreneurship and Development, 2(2), 67-92.

Perren, L. & Jennings, P. L .(2005). Examination of Government Discourses on Entrepreneurship: Legitimization, Subjugation, and Power Issues. Entrepreneurship Theory and Practice, 29(2), 173-184.

Pilkington, M. (2016). Blockchain technology: principles and applications. In *Research handbook on digital transformations* (pp. 225-253). Edward Elgar Publishing.

Pinnington, B., Benstead, A., & Meehan, J .(2023). Enhancing the quality of modern slavery statements through Transparency in Supply Chains (TISC). Journal of Business Ethics, 182(5), 619–636.

Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International journal of production research*, *57*(7), 2117-2135.

Schmude, J., Welter, F., & Heumann, S .(2008) contributed to the field of entrepreneurship research with their article titled "Entrepreneurship research in Germany" published in the journal Entrepreneurship Theory and Practice, 5(3), 57-65.

Schnackenberg, A. K., Tomlinson, E., & Coen, C. (2021). The dimensional structure of transparency: A construct validation of transparency as disclosure, clarity, and accuracy in organizations. *Human Relations*, *74*(10), 1628-1660.

Sekaran, U. and Bougie, R. (2016) Research Methods for Business A Skill-Building Approach. 7th Edition, Wiley & Sons, West Sussex.

Sert, E .(2018) conducted a master's thesis titled "Kobi'ler Ve Türkiye Ekonomisindeki Yeri" which explores the role of small and medium-sized enterprises (SMEs) in the Turkish economy, 3(3), 60-65.

Shafiq, A., Ahmed, M. U., & Mahmoodi, F. (2020). Impact of sup- ply chain analytics and customer pressure for ethical conduction socially responsible practices and

performance: an exploratory study. *International Journal of Production Economics*, *225*, 107571.

Shagofah Noor, Omid & Jawad Golzar .(2022), Simple Random Sampling, Herat University ,2(5),78-83.

Shen, B., Dong, C., & Minner, S .(2022). Combating copycats in the supply chain with permissioned blockchain technology. *Production and Operations Management*, *31*(1), 138–154.

Short, J. C., Ketchen Jr, D. J., Combs, J. G., & Ireland, R. D. (2010). Research methods in entrepreneurship: Opportunities and challenges. *Organizational Research Methods*, *13*(1), 6-15.

Steyaert, C. (2005). Entrepreneurship: In between what? On the" frontier" as a discourse of entrepreneurship research. *International Journal of Entrepreneurship and Small Business*, *2*(1), 2-16.

Tan, T. M., & Saraniemi, S. (2023). Trust in blockchain-enabled ex- changes: Future directions in blockchain marketing. *Journal of the Academy of Marketing Science*, *51*, 914–939.

Wu, J., & Yu, J .(2023). Blockchain impacts platform supply chains: Transaction cost and information transparency per- spectives. *International Journal of Production Research*, *61*(11), 3703–3716.

Xheneti M. and Blackburn R. (2010). Small Business and Entrepreneurship (SBE): An Analysis of Publications and Implications for the Development of the Field

Yapar İ .(2015). Innovation in SMEs and the Importance of Innovation: A Case Study of Kayseri Province, 4(2), 28-33.

Yılmaz Kılıçlı's. (2016) master's thesis focuses on the financing and marketing problems of SMEs and provides solution suggestions based on a study conducted in Van Organized Industrial Zone, 18-30

Zengin, B . (2010). The Situation of SMEs and SME Supports in Globalization: An Application on Turkey, 6(1), 24–38.

Zhu, K. (2004). Information transparency of business-to-business electronic markets: A game-theoretic analysis. *Management Science*, *50*(5), 670–685.

APPENDIX A

QUESTIONNAIRE

Declaration

Dear Participants
This is a personal invitation to participate in research to understand the **Effect of Supply Chain Transparency and Agility on Intention to Adopt Block Chain among SMEs**. All responses will be compiled together and analysed as a group. None of the information collected will be shared with anyone outside me and my supervisor. Your participation is voluntary.
Please read the following sentences carefully and select a suitable answer.

PART A

PERSONAL DETAILS

1) Please indicate your gender:

Male ( )

Female ( )

2) Please indicate which age group you belong to.

a) 18 – 25 ( )

b) 26 – 35 ( )

c) 36 – 45 ( )

d) 46 – 55 ( )

e) 56 and more

3) What is your level of education?

a) Under High school ( )
b) High school graduate ( )
c) Bachelor's degree ( )
d) Master's degree ( )
e) Professional degree ( )
f) Doctorate degree ( )

4) What is your experience?

a) 1 – 5 years ( )

b) 5 – 10 years ( )

c) 10 – 15 years ( )

d) 15 – 20 years ( )

e) more than 20 years ( )

PART B

(Please choose as appropriate)
(Strongly Disagree=1 Disagree=2 Not sure=3 Agree =4 strongly Agree=5)

	STATEMENT	**SCALE**				
	Supply Chain Agility (AGL)	**1**	**2**	**3**	4	**5**
1	Blockchain is helpful in reducing manufacturing lead time.					
2	Blockchain is helpful in reducing the development cycle time.					
3	Blockchain is helpful in improving the frequency of introducing new products.					
4	Blockchain is helpful in increasing product customization.					
5	Blockchain is helpful in increasing delivery capabilities.					
6	Blockchain is helpful in increasing customer service.					
7	Blockchain is helpful in delivery reliability.					
8	Blockchain is helpful in adjusting to changing market needs.					
	Supply Chain Transparency					
1	Blockchain is helpful in sharing operational plans (e.g., distribution plans, production plans) regarding product design information among supply chain partners.					

2	Blockchain is helpful in sharing operations information (e.g., batch size, run quality, transfer quality, buffer stock, available machines, machine breakdown time) among supply chain partners.					
3	Blockchain is helpful in sharing planning and design information (e. g., current planning and design performance, operations perfor- mance, resource utilization, rework and scrap level, level of work progress) among supply chain partners.					
4	Blockchain is helpful in sharing strategic information (e.g., new or- ders, product demand, internal and external expertise, teachability, culture, government regulations) among supply chain partners.					
	Blockchain Adoption					
1	My firm adopt blockchain in supply chain management in the future.					
2	My firm use blockchain in supply chain management in the future.					
3	My firm intend to digitally transform supply chain management through blockchain.					