İŞLETME ARAŞTIRMALARI DERGİSİ
JOURNAL OF BUSINESS RESEARCH-TURK
2022, 14(2), 1564-1580
https://doi.org/10.20491/isarder.2022.1457

The Role of Digital Innovation in Collaboration Business Systems in the COVID-19 Pandemic Process: A Case Study

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ARTICLE INFO

Keywords:
COVID-19
Digital innovation
Collaborative business systems
Business development strategies

Received 5 April 2021
Revised 20 June 2022
Accepted 25 June 2022

Article Classification:
Research Article

ABSTRACT

Purpose – In collaboration with business systems and many other fields, digital technologies are used in companies' decision-making processes, product designs, and many areas of production of goods and services. Firms need collaborative business systems to focus on their capabilities and outsource to other businesses. This study examines managers' opinions on enterprises' collaborative business strategies and digital innovation capabilities during COVID-19.

Design/methodology/approach – The research was carried out in nine companies operating in the manufacturing sector in the Marmara Region. The ISO 44001 classification is based on the determination of the companies' collaborative business systems. Innovation capacity components were used to determine the innovation capability of the firms. The research method was designed according to the qualitative research method (case study). The research was conducted with the data collected through a semi-structured interview form with company managers. Descriptive analysis technique was used in the analysis of the data.

Findings – The analysis findings show that digital innovation effectively strengthens the business capabilities of businesses, and cooperation strategies reduce company costs and provide a competitive advantage during the COVID-19 pandemic.

Discussion – The necessity of structuring business processes with a focus on digital technology during the pandemic period has caused the organizational structures of enterprises to be flexible. This flexibility has brought along a new management and organizational structure, as well as a new leadership approach such as technology leadership. As a result, innovative information systems that meet the need for cooperation, operational capabilities of enterprises and competent human resources come to the fore in the success of cooperation processes.

1. INTRODUCTION

In the process of the COVID-19 pandemic, the way businesses produce and provide services requires differentiation. In this process, business managers feel the need to innovate in order to survive in market conditions. This requirement arises from the need to innovate in line with customer expectations and to provide businesses with advantages in providing a competitive advantage (Akgun and Cini, 2021). Industrial companies tried different methods to adapt to new conditions in the days of uncertainty caused by the COVID-19 pandemic. In this period, the importance of digital innovation capability and collaborative business systems increases for companies to adapt to the change process. In this process, businesses are making digital innovations to cope with pandemic conditions, and they see digital innovation as the most reliable means of survival. On the other hand, businesses consider it necessary to be included in business systems based on cooperation with other businesses to reduce costs (Yilmaz, 2021). Collaborative business systems require the development of the digital innovation capacities of industrial companies. Firms also need to develop cooperation strategies to reduce transaction costs.

Competence, speed, flexibility, and the desire to respond make it necessary to take advantage of innovation and collaborative business systems. Fast work, simplicity, and convenience in business processes require digital innovation (Aktas and Ulgen, 2021; Pekersen, 2020). It is essential for corporate sustainability that businesses develop innovative products to meet customer expectations and cooperate for this purpose. In addition, businesses tend to cooperate in following the developments in their own or other sectors (Langley

Suggested Citation
Tutar, H., Nam, S. (2022). The Role of Digital Innovation in Collaboration Business Systems in the COVID-19 Pandemic Process: A Case Study, *Journal of Business Research-Turk,* 14 (2), 1564-1580.

et al., 2020; Ramanathan and Gunasekaran, 2014). Firms need to cooperate to use time more efficiently, a crucial competition variable that reduces transaction costs. This research assumes that collaborative business strategies and digital innovation capabilities are essential in adapting to the pandemic.

Innovation capabilities of companies are determined according to their technological intensity, know-how, and R&D capacities. The innovation ability of any firm is directly related to its expertise in the field in which they operate. The intense competition requires companies to optimize their production processes with various innovations. Businesses also need digital innovation and collaboration to improve product or service quality and increase efficiency (Sahin, 2021). Digital innovation and cooperation provide significant advantages in reducing production costs and increasing the profitability and competitiveness of the company. Firms prefer digital innovation and collaboration to reduce production costs and increase their profitability. This situation also increases the sustainability power of enterprises (Dogru, 2021). Although essential studies have been made on innovation and collaborative business systems, there is a gap in the literature on what innovation and cooperation companies should do in the face of extraordinary developments such as pandemics. On the other hand, it has not been discussed in the literature to what extent an activity that requires time and cost, such as innovation, is possible in pandemic days when urgent solutions such as pandemics are required. It can be argued that it would be beneficial to focus on collaborative innovations when innovation becomes essential.

Companies need to innovate to adapt to change, but this alone is not enough (Reeves and Deimler, 2011). Companies need to develop technology and innovate to adapt to change, but alone is not enough. It is also essential to increase the capacity of producing know-how, performing R&D, and creativity. Every innovation activity emerges as a result of creative ideas, technical knowledge, and complex R&D processes. Especially digital innovation activities require complex technical and engineering knowledge. Innovating also requires a set of capabilities that are aligned with the firm's strategic requirements. Especially in times of extraordinary developments, such as during the pandemic, companies' ability to produce creative solutions requires a set of skills such as technical knowledge, creative talent, and innovation management, as well as sufficient technological infrastructure. As in the COVID-19 pandemic, companies' innovation capabilities are directly related to their ability to adapt to change and develop cooperation strategies. Innovation capability provides companies with a significant competitive advantage in producing critical solutions in a turbulent environment, especially during the pandemic. Innovation capabilities of companies are essential in terms of adapting to change and developing cooperation. Innovation capability provides a significant competitive advantage, especially in producing critical solutions in turbulent environments (Akgun and Cini, 2021). Considering the importance of digital innovation and cooperation strategies in coping with the extraordinary developments of the pandemic process, together with its reasons, makes this research up-to-date, functional, meaningful, and original. For this reason, discussing the importance of digital innovation and collaboration development in the pandemic process will make a significant contribution to the practice and the literature.

Firms are not self-sufficient structures, and any structure organized in an open system style must cooperate with the environment. Firms are not content with merely adapting to the environment; simultaneously, they feel the need to manage the environment according to their interests. Developing collaborative business strategies to reduce digital innovation and transaction costs is essential in successfully managing environmental change. Innovating in production and management processes and developing cooperation strategies are practical tools for the enterprise to respond to the environment's expectations. Innovation increases, especially when environmental adaptation is complex and delivery to the market is significant. In order to reduce transaction costs and provide a competitive advantage, companies need to meet the jobs that they cannot cooperate with from the external environment. The obligation of companies to purchase and access the market makes it necessary to work in coordination with other companies. This necessitates digital innovation, which provides significant advantages, especially coordination (Akgun, 2021; Ozge, 2021). It is essential to develop innovative approaches to reduce environmental uncertainty arising from pandemic conditions. In this context, the main question of the importance of cooperation and digital innovation in the COVID-19 process has been answered in the research. In addition to the main question of the research, it is aimed to answer the following sub-questions.

1- What do companies do about collaborative business systems in order to successfully manage the COVID-19 process?

2- What are the problems faced by companies regarding cooperation during the COVID-19 process?

3- What kind of digital innovations are companies making to adapt and cooperate with the COVID-19 process?

2. CONCEPTUAL FRAMEWORK

2.1. Collaborative Business Systems

Collaborative business systems are business systems in which ownership-based coordination and inter-firm links are strong. The main features of this system are cross-industry cooperation, risk-sharing among partners, trust in the specialized workforce, and standardization (Cheung et al., 2021; Olson and Kesherwani, 2021: 38). It is not very easy for businesses to design different products on their own compared to their competitors. For this, businesses now feel the need to introduce open innovation collaboration approaches. In this process, companies feel the need to see other businesses as value-creating partners. Competitors, businesses, and suppliers in different sectors have a very active role as the source of information needed for innovative digital design. In this approach, the company shows proactive behavior while integrating outside information into innovation processes. Collaborative business systems ensure that the parties benefit by sharing common knowledge, technical skills, and resources among independent companies. One of the most important elements of cooperation processes is to ensure full-time information flow between the parties. For this purpose, information and communication technologies and a just-in-time production model are used (Ramanathan and Gunasekaran, 2014). In order to standardize collaborative business systems based on digital innovation, the ISO 44001 set of standards published by the International Standards Organization (ISO) has been developed.

Collaborative business systems, in which cooperation is dominant, and sometimes the state assumes a regulatory role, increase the ability of companies to do business. This situation has gained significant importance, especially during pandemic days (Sang et al., 2021). Today, in a process where both high and low technology products' market and shelf lives are decreasing due to rapid change, the importance of doing the work based on these standards is increasing. Collaboration gains excellent importance due to the radical change experienced in sectors where digital technologies are used intensively. Since it is not easy for businesses to make different product designs on their own in a short time, they feel the need to cooperate. Therefore, today external actors are seen not only as competitors but also as value-creating partners for businesses. In order to increase their innovation capacity, businesses focus on the areas they have basic competence, and they turn to cooperation to outsource the jobs they do not have basic competence. This makes collaborative business systems mandatory.

In the days of the pandemic, it has become essential for businesses to establish a business system based on cooperation. Collaborative business systems protect the business from the destructiveness of competition and contribute to reducing risk. It is also generally accepted that cooperative behavior and cooperation between businesses have a cost-reducing effect (Olson and Kesharwani, 2021; Sang et al., 2021). There are many reasons to cooperate. Businesses need to cooperate in obtaining the knowledge and talent needed for innovative digital design from companies specializing in different fields. In this approach, businesses aim to incorporate the information they obtain from external sources into the innovation processes in the business.

For this reason, digital innovations and information technologies are becoming a tool for outsourcing. There are two reasons for this; the first is the shortening of the shelf life of the products, that is, the time pressure, and the second is the desire of the business to focus more on the area in which it has core talents or core competencies. This situation forces businesses to cooperate in the digital design process and launch products (Langley et al., 2020; Ramanathan and Gunasekaran, 2014). The gradual development of digital technologies makes it possible to produce products and services that were previously difficult to produce technically and economically, with more stakeholders, quickly and low. Particularly in the days of the pandemic, the difficulty created by the changes in the competitive conditions in the market is tried to be overcome with collaborative business systems. The supply chain consists of complex processes that many independent companies have combined around common strategic goals.

Products consisting of thousands of parts, produced in different places, combined in different places, and offered to customers in different regions make various collaborative business systems mandatory (Olson and Kesharwani, 2021; Cheung et al., 2021). Products consisting of thousands of parts produced in different geographies of the world, combined in different regions, and offered to customers in different regions make

various collaborative business systems mandatory. Collaboration is inevitable for the smooth execution of these complex supply chain processes and delivering products to customers at the most reasonable price and in the shortest time possible. Digital technologies offer essential opportunities to ensure coordination between the rings of the supply chain operating in different fields to carry out complex business processes successfully. Collaborations have many benefits, such as adding value to the product, developing technological capabilities, strengthening operational and financial capabilities, facilitating market entry, and increasing efficiencies through shared resources. For this reason, companies need to develop cooperation to reduce production costs and focus on core competencies (Langley et al., 2020; Tutar, 2015: 218). Collaboration processes commonly carried out in supply chains are collaborations with logistics service providers. In addition, companies in the supply chain; consist of raw material producers, suppliers, manufacturers, distributors, and retailers.

In recent years, information technologies, internet technologies, and alternative information-sharing platforms have made it easier for companies in the supply chain to cooperate. Digital innovation systems in the supply chain provide significant advantages in increasing collaboration performance. Companies participating in the cooperation process combine their successful businesses in specific businesses. The partnership can be more advantageous for companies than performing the relevant work alone. Thanks to the cooperation, the production costs are reduced, profitability and customer satisfaction are increased, thanks to companies with self-talent in their field carry out the works. The successful collaborations of the American retail chain Wal-Mart with its suppliers are an excellent example for other companies. Planning, demand forecasting, ordering, information, and resource sharing among supply chain elements make it necessary to establish partnerships in the cooperation processes of companies (Langley et al., 2020; Ramanathan and Gunasekaran, 2014). The desire of companies to transfer their supply chain operations to one or more companies makes cooperation mandatory.

Collaborative business systems have significant advantages as well as some drawbacks and risks. Collaborations with large companies for various advantages can damage the brand image of companies. People buy a particular product because all its parts are produced by the company that owns the brand in question. When they see the parts of many different brands in the product they buy, this causes them to have some negative opinions about the product. In addition, the number of business partners, the duration, and the form of cooperation may cause some coordination problems. Thus, it is essential to have a standard for all processes in the system so that the cooperation activities in the supply chain can be carried out smoothly. In this context, ISO 44001 standards, which determine the framework of cooperation in strategic cooperation, are essential. ISO 44001 binds companies' resource, risk, cost, and opportunity sharing to a certain standard (Dag and Kabadayi, 2020). Besides being a document focused on fulfilling contractual obligations, ISO 44001 aims to transform corporate culture into a culture of cooperation.

Firms are trying to increase their productivity by cooperating in business planning assistance, capitalization plans, marketing materials, feasibility and market studies, market development, and technical assistance. ISO 44001 wants to standardize the activities of companies that cooperate on the following issues: Relationship management, fulfillment of contracts, conflict resolution, producing, managing, and terminating projects, and developing mutual understanding between cooperating companies. In addition, it is known that collaborative approaches provide a wide variety of benefits that increase competition and performance. For example, better cost management, improved time management, resource utilization, risk management, and increased business value and innovation delivery (Dag and Kabadayi, 2020). In order to gather the ISO collaborative management system standards under the same headings, an application called "high-level structure" has been implemented. With this structure, the management system standards published by ISO are grouped under ten main headings (Marques et al., 2016). The main headings and subheadings of the ISO 44001 collaborative business relationship management standard are determined as follows:

1-Scope (specific to the applied discipline). 2-Referenced standards (specific to the applied discipline). 3-Terms and definitions (specific to the applied discipline). 4-Context of the organization (understanding the organization and its content, understanding the needs and expectations of interested parties, determining the scope of the collaborative business relationship management system, determining the management system processes, creating value). 5- Leadership (leadership and commitment, policy, roles, responsibilities, and authorities). 6-Planning (activities for risks and opportunities, objectives of the collaborative business relationship management system, planning to achieve them, defining collaborative business relationships, and

setting priorities). 7- Support (resources, skills, and attitudes, awareness, communication, documented information). 8- Operations (operational awareness, knowledge, internal evaluation, partner selection, working together, creating value, and ending strategic partnership). 9- Performance evaluation (monitoring, measurement, analysis and evaluation, internal audit, management review). 10- Improvement (non-conformity and corrective action, continuous improvement).

2.2. Digital Innovation

The first thing that comes to mind regarding digitalization is that the work done in the physical environment is done with the help of intelligent technologies. The concept of digitalization is innovative business systems based on changing or even transforming existing business processes (Duygu, 2020; Akin, 2020). With the contribution of digitalization, video meetings and conferences, digital banking, cloud technology, and online shopping have become a part of daily life. Digitalization has accelerated innovations and has begun to be implemented as digital innovations (Ayanoglu, 2020; Butler and Rivera, 2020). The concept of "digital innovation" emerged with digitalization. The use of digital technologies in the innovation process is called "digital innovation." For companies, digitalization is a necessity applied more frequently with the impact of the COVID-19 epidemic. Digitization uses digital technologies to change a business model and provide new revenue and value-creating opportunities. Innovation is the introduction and application of new ideas, processes, products, and services. For an organization to be innovative, it must have the ability to apply them to business processes and creative ideas. Innovation is the primary tool of competition for many companies, especially in technology and knowledge-based industries.

The innovation process can often be understood as a complex activity in which new knowledge is applied for business ends. Innovation is viewed as one of the most important sources of sustainable competitive advantage. Firms engage in product, process, radical, incremental, technological, managerial, market attraction, technology push, and competence enhancement. Collaborative business systems are one of these types of innovation. Innovation is an essential competence for companies to provide and maintain competitive advantage and implement strategy (Castro et al., 2013; Hogan et al., 2011). Through innovative activities to create added value for the firm or its stakeholders, innovation capability, implicitly and explicitly, creates added value. Defines it as the ability to process knowledge, skills, and resources. Innovation capability is a firm's particular assets and core competencies. Innovation ability is essential for companies to provide and maintain a competitive advantage. Firms innovate to increase their market share and reach different customers in various ways, such as business models, products, services, and processes.

In the Covid-19 period, when uncertainty prevailed, they considered it necessary to turn to organic structures as an open system to organizations. Organic structuring, the delegation of authority instead of central government gains importance, and communication and access increase. This situation necessitates digital innovations based on information and communication technologies. The obligation of employees to do their work in an electronic environment during pandemic days necessitated digital innovation (Hıdıroglu, 2020; Alpago, 2020) Thanks to digital innovation, employees benefit from digital technologies to a great extent in holding online meetings with multiple participants in a virtual environment and especially performing service works. Digital innovation can only be possible with digital processes and technologies, the infrastructure being digital and appropriate, and the experience of digital experience. Digital innovation contributes to responding quickly to changes and reducing costs and risks. Thanks to digitalization and digital technologies, new product trials can be done easily and quickly (Caligiuri et al., 2020; Carnevalea and Hatak, 2020)

Digital technologies bring two fundamental innovations to the business ecosystem. The first of these is that it is possible to manage the processes in the ecosystem effectively and efficiently thanks to digitalization. This way, it causes significant changes in the value chain, from product design to differences in service delivery, marketing, and sales processes. The second innovation establishes new integrated organizational structures that cooperate by creating new platform structures between the upper and lower ecosystems. These features also allow businesses to work effectively on innovative product and service concepts. In this way, businesses have the opportunity to do business with new business models and collaborative business systems (Duan et al., 2020). Digital technologies, innovation capacity, and collaborative business strategies play a crucial role in the corporate sustainability of businesses, especially during the pandemic process. For example, web pages that were previously established for the promotional purpose of the business are becoming an essential

marketing-sales channel today. In this case, digital innovations are necessary for internal activities and the successful implementation of collaborative business models outside the enterprise (Akin, 2020; Ayanoglu, 2020). However, the use of digital technologies in business processes and the digitalization of business are not enough. It is also necessary to innovate for new business models.

According to the Oslo Manual published jointly by OECD and Eurostat, innovation is implementing a new or significantly improved product, good or service, process, or new marketing method. Innovation is transforming creative ideas into value-creating outputs. This process consists of two basic steps. The first step is to develop new and creative ideas, and the second step is to transform the new and creative ideas into products, methods, or services that create added value (Hıdıroglu, 2020). Innovation is significant in enterprises' product, process, or cooperation models, perceiving them as new and concretizing them with information technologies.

For this reason, it is not possible to think of innovation independently of digitalization and digital innovation today. Digital innovation transforms traditional services or products into communicable forms through digital technologies or harmonizes the production process. Digital innovations are essential in successfully managing these structures and processes (Caligiuri et al., 2020; Isci, 2021: 45; Kaushik and Guleria, 2020). Digital innovation capability plays an essential role in increasing the speed of adaptation to extraordinary developments such as pandemics. Digital innovation requires digital technologies to change a business model and provide an opportunity to create new value.

Digital business requires using digital technologies and technical knowledge in business processes. Digitalization transforms the business world, especially when close distance work is inconvenient, such as the pandemic, and digital skills are now essential for corporate sustainability. Digitalizing business and digital models require collaborative business strategies in this process (Caligiuri et al., 2020; Carnevalea and Hatak, 2020). Collaborative business systems require both business models and appropriate new organizational structures and models. This is a post-industrial transformation process. In this process, works; On-call work, job sharing, part-time work, in short, are atypical work styles. In this process, different "digital workspaces" emerge outside of organizational structures. This also means that the workforce works with atypical working methods. For this, various mobile devices and digital tools that make work mobile are used. The digitization of a business also leads to digital commerce and new collaboration systems (Hıdıroglu, 2020). Digital transformation is a situation that needs to be addressed at the level of the physical infrastructure of the organization, information technologies, intellectual capital, know-how ability, human resources, and even organizational culture. Therefore, digitization should be considered together with the dimensions of digital technology, digital maturity, and digital culture.

There are some features of applications that have the nature of digital innovation. These; having a digital database that holds all the information, the ability to analyze the data, and the analysis findings are suitable to meet customers' needs or target audiences. In addition, it should have an infrastructure suitable for collecting data in the implementation process, and it should be capable of supporting strategic decisions. More radical changes than digital innovations require digital transformations in some cases. Digital transformation; covers web 2.0 and web 3.0, broadband internet, cloud computing, big data, artificial intelligence, internet of things, augmented reality and use of 3D printers, new business strategies, new business models, operational processes, innovative products and processes, and new marketing techniques (Carnevalea and Hatak, 2020). Digital transformation is a customer-oriented business strategy and aims to eliminate employees' creativity and interaction limits. Virtual workspaces such as "digital workplace" and "digital work portal" are emerging with digital transformation. This means that both the work and the concept of the workplace have changed radically.

During the Covid-19 process, digital changes in businesses have been of great importance for businesses to continue their existence (Caputo et al., 2021). With digitalization, it has been possible for businesses to develop new business models such as a collaboration business system using digital technologies, create new sources of income and benefit from value opportunities. In order to prevent the spread of Covid-19, it was possible to restrict people's gatherings and maintain private and business life even during quarantine days (Barnes, 2020). Thanks to digital technologies, remote working has been encouraged, and digital technologies have been used primarily in information-intensive jobs during the pandemic. Digital tools that encourage remote work have

been widely used during the Covid-19 pandemic (Davison, 2020; Carnevalea and Hatak, 2020). During the long quarantine days, business owners have discovered digital ways of working for their companies' continuity, profitability, and effectiveness by going beyond their usual routines. In this context, businesses have functionally used digital innovations as tools for professional life to adapt to the new normal. In the early stages of digitalization, the digital technology-oriented configuration of businesses' processes has transformed businesses into more flexible and organic structures (Almeida et al., 2020).

Another dimension of the digitalization of working life is "artificial intelligence" and "robotics." The increasing use of "artificial intelligence" with Industry 4.0 and robots in employment instead of human resources brings many discussions. The replacement of human power by robots is not a new situation. For example, ATM (Automated Teller Machine) in the banking industry and robotic arms used instead of human muscle power in the automotive industry have been used for a long time. In this process, artificial intelligence, instead of the human brain, functions in intelligent factories, banking, the health sector, and many other areas that emerged with digital transformation and Industry 4.0. They use analog and digital applications together with mechanical and automatic processes. Technologies that can decide independently, depend on algorithms, and are supported by software require new business models (Acosta, 2020: 262; Oge and Cetin, 2020: 31). Digitalization causes the emergence of new jobs and occupations in the industry and new employment areas.

While previous technological developments were limited sectoral size, digital technologies have a transformative effect on all sectors. Companies now effectively benefit from digital technology in their decision processes, production processes, and product designs, providing high-quality service against cost risks. This gives companies a competitive advantage over their competitors. With the impact of this driving force, digital technologies lead to radical changes in all industries (Carnevalea and Hatak, 2020). Information, which forms the basis of the innovation process, is now a critical production factor in determining the competitive process. Developments in digital technology make it easier to access the data and information needed for innovation and provide significant savings in the time and cost required to process information. Processing millions of data with supercomputers in a short time and at low costs or producing a new product with a 3D printer at low costs as soon as the CAD data is finished provides a tremendous competitive advantage for companies.

3. MATERIAL AND METHOD

3.1. Research Design

The research aimed to determine the role of companies' collaborative business systems and digital innovation capabilities in coping with the conditions of the Covid-19 pandemic. For this purpose, a qualitative case study was conducted with the managers of 9 industrial companies operating in the Marmara region of Turkey. The reason for choosing the case study design, one of the qualitative research designs, is that it is convenient to examine current situations based on people's opinions and in-depth knowledge of the subject. Another reason for choosing the case study design is that it is suitable for evaluating current situations from personal perspectives. In addition, the case study design was preferred because it is more convenient to reveal the essence of the researched subject and reflect the event as it is (Ozdemir, 2010; Tutar and Erdem, 2020; Hancock and Algozzine, 2006). Studies conducted with case studies reveal the factors that affect the phenomenon hidden in the examined situation. The case study design was not preferred in this study because the situation is up-to-date, there is no researcher's control over the situation, and the investigated phenomenon is not manipulated (Yin, 2014; Merriam and Tisdell, 2015).

3.2. Participants and Sampling

In qualitative research, a sample is created to provide limited but qualified and deep information for the research. For this purpose, the criterion sampling technique, one of the purposeful sampling techniques, was used to determine the people interviewed in the research since it is suitable for answering the research questions. In criterion sampling, data is collected by consulting people who have deep knowledge of the subject. In this study, interviews were conducted with the senior managers of the researched companies to answer better the research questions (Tutar and Erdem, 2020; Tarhan, 2015). In the research, attention was paid to the sample's companies operating in the Marmara Region, the industrial region of Turkey, and having experience in collaboration business systems and digital innovation.

Table 1. Indicators for sampling

Participants	Industry	Experience (years)	Education level	Position
P1	Plastic Product	13	Bachelor's Degree	CEO
P2	Automotive	14	Associate Degree	General Manager
P3	White Goods	5	Bachelor's Degree	Manager
P4	Rubber	6	Associate Degree	General Manager
P5	Food products	6	Bachelor's Degree	Production manager
P6	Prefabricated industrial products	23	Bachelor's Degree	General manager
P7	Ready-mixed concrete	18	Bachelor's Degree	General manager
P8	Information technology	6	Bachelor's Degree	CEO
P9	Aluminum products	11	Bachelor's Degree	General manager

3.3. Data Collection Instrument

The research data were collected with the permission of the ethics committee, which was given with the decision numbered "05" of the meeting numbered 24, dated 10.06.2021, of the Presidency of the Ethics Committee of Social and Human Sciences of Sakarya University. Ten questions were asked in the semi-structured interview form in the research, six based on the ISO 44001 standard, and four based on the digital innovation criteria. The interview form was used as a guide to not deviate from the purpose of the research. During the interview process, an effort was made to understand the subject in depth by drilling. Creswell (1998) states that a sample size of 10 or less would be sufficient in qualitative research, depending on the research topic. The sample of this research is limited to 9 companies.

3.4. Data Collection and Analysis

In qualitative research, data collected through interviews are taken from a biased sample and analyzed in depth. The data of this research consists of the interview notes collected from the participants. In the analysis of the data, descriptive analysis and content analysis techniques were used together. In the descriptive analysis process, a four-stage process was first followed: creating a framework for the analysis, processing the data according to the thematic framework, defining the findings, and interpreting the findings. In the analysis, a categorical analysis strategy depending on the content of the material was used. In the process of processing the data, first of all, all the interviews were read one by one, notes were taken and the data were deciphered. In this way, a pre-coding and temporary coding was done. During the coding phase of the data, a coding strategy made within a general framework was applied according to the concepts extracted from the data (Yildirim and Simsek, 2018). It is aimed to reveal the original situation that will come out of the research context by allowing the directing of the text (Tutar and Erdem, 2020). No software was used in coding and the coding process was done manually. In order for all codes to be clearly and clearly understandable by both the researcher and others, a coding key including the main and sub-codes was created (Creswell, 2014). For each new code added to the coding key during the coding process of the documents, the previously coded documents were re-read and subjected to second and third coding. Thus, the risk of data loss was reduced and researcher bias was eliminated by re-coding the interviews.

Themes were determined to reveal the relationship and common aspects between the codes. The data collected through the thematic coding process were categorized through codes (Yildirim and Simsek, 2018). Emerging themes enabled the research process to be shaped in a more factual framework and to establish relationships between codes. For example, the prominent codes (process management, customer demands, price advantage, information flow, competitive advantage) in the evaluation of the importance of cooperation and the difficulties encountered in cooperation are included in the theme of the advantages of cooperation. The whole data set was carefully examined in order for the data under the themes to form a meaningful whole (internal consistency) and for all themes to explain the data obtained in the research in a meaningful way (external consistency). Thus, the representation ability of the data set according to the themes was evaluated. At this

stage, another researcher experienced in qualitative data analysis was consulted to confirm whether the themes adequately reflected the data set.

Then, interpretations were made based on the research findings (Creswell, 2014; Marshall and Rossman, 2006). The views of the participants were tabulated by calculating how often they were repeated under each descriptive statement and sub-theme. In addition, direct participant statements that fully reflect the participant's views are included.

4. RESULTS

4.1. Opinions of company managers on the advantages and problem areas of cooperation

The findings obtained from analyzing the participants' company managers' views on cooperation systems during the Covid-19 process were gathered under the main theme of "advantages of cooperation." "What do you think is the importance of cooperation in the pandemic process?" "What are the challenges companies face in supply chain collaborations?" The questions "What are the internal and external factors that may affect the supply chain cooperation processes?" were asked. The descriptive expressions reflecting the views of the participants and the frequency of common opinions of the participants, the codes created according to the descriptive expressions, sub-themes, and themes are shown in Table 2.

Table 2. Opinions of the participants on the advantages and problem areas of cooperation

Descriptive expressions	***f***	***Codes***	***Sub-theme***	***Main theme***
- Non-disruption of production processes.	*6*	*Cooperation*	*Advantages of cooperation*	***Advantages and problem areas of cooperation***
-Meeting customer demands on time.	*2*	*Process management*		
-Collaborations provide a price advantage.	*3*	*Customer demands*		
We are increasing the speed and quality of cooperation.	*4*	*Price advantage*		
-The importance of information flow in the supply chain.	*7*	*Information flow*		
-Collaborations provide a competitive advantage.	*2*	*competitive advantage*		
-Suppliers are not meticulous about time.	*9*			
- Failure to ship the product on time.	*5*	*Time management*	*Collaboration management issues*	
- Failure to comply with standards.	*3*	*Product standard*		
- Difficulty communicating with suppliers.	*7*	*Communication problems*		
- Failure to deliver on time.	*2*	*currency fluctuation*		
- Problems due to currency fluctuations.	*6*			
-Sudden plan changes of cooperation companies.	*5*			
-Sudden price fluctuations.	*6*	*price change*	*Financial and HRM issues*	
-Momentary price fluctuations in raw material prices.	*8*	*price fluctuation*		
- Lack of competent and sufficient personnel.	*2*	*competency issues*		
	5			

When Table 2 is examined, the participants' opinions are gathered under the main theme of "advantages of cooperation and problem areas." From the analysis of the descriptive statements, the participant's views were gathered under three sub-themes: "advantages of cooperation," "collaboration management problems," and "financial and HRM problems in cooperation." The highlights of the participants' views are given below, with the participants' own words:

For our company, the cooperation of the supply processes is essential not to disrupt the production processes and meet the customer's demands on time and with the expected quality.

The problems we encounter in cooperation are usually that the suppliers are not meticulous about time management. In addition, not complying with the quality criteria and not delivering the products following the contract are significant problems.

In terms of our working principles, the cooperation process in procurement is essential for the continuity and stability of the business. It is always a priority to cooperate with the companies with which quality products and trust are established and ensure continuity.

From the participants' statements, it is understood that all the chain links must be at a certain quality level for the supply chain to function effectively in cooperation business systems. Otherwise, as Nietzsche put it, "the strength of a chain is as strong as its weakest link." A weak link in the supply chain can lead to various problems, from raw materials to product delivery and services. All companies included in the cooperation must work at a certain standard and competence level to prevent this. Another problem identified in this central theme is generally related to time management. From the participants' statements, companies need to have time management awareness and skills in cooperation. In addition, determining the iron standards according to the awareness of total quality management is another critical issue. Another critical problem in collaboration business systems is that communication problems and digital technologies are essential. Another fundamental problem gathered under this theme is price fluctuations due to exchange rate fluctuations. The participants' statements that this situation causes the company to experience various customers' faces are understood from the participants' statements.

4.2. Findings regarding the problems faced by the participants regarding cooperation in the COVID-19 process

To the participants; the questions "Is a common information management system used in cooperation in the supply chain," "How do you determine the cooperation partners in the supply chain?", "What are the main problems you encounter in cooperation in the supply chain?" were asked. The descriptive statements' frequency of their participation in these statements is shown in Table 3 as codes, sub-themes, and main themes.

Table 3. Opinions of the participants regarding the problems they encountered in cooperation in the COVID-19 process

Descriptive expressions	***f***	***Codes***	***Sub-theme***	***Main theme***
Extensive use of the customer portal.	*3*	*Customer portal*	*Collaborative digital technology use.*	***Digital technologies and collaboration issues***
Utilizing MIS in planning, implementing, and controlling	*2*	*MIS*		
Keeping information confidentiality at the forefront	*1*	*Information privacy*		
Utilizing product tracking systems.	*4*	*product tracking system*		
Evaluation of collaboration performance.	*3*	*Performance appraisal*	*Performance appraisal system*	
Performing supplier tracking in a digital environment.	*1*	*Supplier tracking*		
Identifying areas for improvement.	*1*	*customer feedback*		
Evaluation of customer feedback.	*4*	*Firm performance*		
Researching the history of companies	*1*			
Checking company references	*2*			
Examination of concrete performances of companies	*3*			
The problem of supplying raw materials and auxiliary materials.	*2*	*Raw material supply*	*Supply, delivery, and retention problem*	
Failure of suppliers to comply with the criteria.	*3*	*Company criteria*		
Partners' non-compliance with cooperation standards.	*2*	*Collaboration standards*		
We are experiencing various quality problems.	*4*	*quality issues*		
We are experiencing retention problems in the market.	*2*	*hold on the market*		
Timely delivery of orders.	*3*	*delivery problem*		
	5			

When Table 3 is examined, it is seen that the participants' views are gathered under the central theme of cooperation, digital technologies, and cooperation problems. From the analysis of descriptive expressions, participant views; It is grouped under three sub-themes: "use of digital technology," "performance evaluation system," "provision, delivery, and retention problem." The prominent opinions of the participants are given below in their own words:

In our company, the main customer portal is open to all suppliers. Suppliers can check all information such as the current status of orders, technical drawings and revisions, quality performance, and shipment performance of their companies through this portal.

Business tracking systems and management information systems are partially used in our company. Company confidentiality is at the forefront. The products to be supplied are not allowed to be shared except for technical drawings and material information. In terms of logistics tracking, we have an information management system used jointly with the supplier company.

In our company, supplier performance is evaluated every month at both the deadline and the quality level. The suppliers' compliance with the deadlines, the ability to ship the desired amount of material, the conformity of the goods to the standard, and other quality documents are scored.

In addition to monthly and annual performance evaluation methods, feedback from customers and suppliers is also applied in our company.

From the participants' statements, it is understood that the customer portal facilitates the follow-up and management of the works in the effective management of the companies' cooperation in the COVID-19 process. In addition, it is understood that the participants actively benefit from management information systems for the effective management of cooperation. It is understood from the participants' statements that computer-aided systems established to provide information support to management decisions and ensure that managers can access the correct information at the right time and through the proper channels are of great importance in terms of cooperation systems. Participants stated that they actively use the management information system to obtain, evaluate and analyze the necessary information. Judging by the participants' statements, it is understood that they give importance to information confidentiality and the use of information systems. It is understood that they use product tracking systems and information systems in the effective management of cooperation. It is understood that it is imperative to establish a connection between all the supply chain links. In the management of cooperation, digital innovation is made, especially in tracking and management systems. It is seen that there are specific criteria for performance evaluation among the collaborating companies, and importance is given to customer feedback. In addition, it is an important issue to emphasize the necessity of complying with the quality standards of the production and service quality of the cooperated companies and emphasizing the importance of the successful execution of the cooperation.

4. 3. The participants' opinions on the necessity of digital innovation in the cooperation process in the COVID-19 period

What are the participants doing to monitor innovative technologies and develop new technologies? What innovations are being made ineffective production planning, quality systems development, and reduction of production costs? What is being done about preparing and implementing strategic plans and the effective management of human resources? Questions were asked about what is being done in your company to improve customer relations, increase bargaining power and make executable contracts. The frequency of participant opinions, codes generated from participant opinions, sub-themes, and the main theme are presented in Table 4.

Table 4. Opinions of the participants on the necessity of digital innovation in the cooperation process in the COVID-19 period

Descriptive expressions	***f***	***Codes***	***Sub-theme***	***Main theme***
Development of innovative technologies by the R&D unit.	6	*Innovative Technology*	*Innovative product design*	***Digital innovation in collaboration systems***
Following new technologies by the R&D departments of the companies.	4	*New Technology*		
Closely following fairs and other organizations by the R&D department of the companies.	3	*Technology Transfer*		
Transfer of new technologies to the company.	5	*New Product Design*		
Computer programs support and new product design.	7			
Use of Risk and Process Oriented Integrated Management System, Quality Management System (QMS), Information Security Management System (ISMS), Quality Documents Management System (QDMS) for the effective management of works in cooperation.	2 5 3 4 3	*Smart Systems Product Logistics Production Planning*	*Use of intelligent systems in*	

Production of products with high quality and low cost with logistics. *Production planning made by the R&D department. Use of the recommendation evaluation system to improve quality systems.* *Use of zero stock system for cost reduction.* *Using artificial intelligence technologies in the production process.* *Accurate demand and sales forecasting with market research* *Collaborating with a specialist company to improve quality.*	*4* *7*	*Suggestion* *Evaluation* *Zero Stock* *Artificial Intelligence* *Market Research* *Cooperation*	*business processes*
Implementation of the strategic plan under ISO 9001. *We are establishing cooperation with companies specialized in different fields.* *Following innovations for sustainability.* *Obtaining consultancy services for norms and procedures.* *Use of ISO standards in business standards.*	*4* *7* *8* *2* *3*	*Strategic Plan* *Cooperation* *Sustainability* *Consultancy* *ISO Standard*	*Ensuring sustainability through cooperation.*
Collaboration to focus on core competencies. *Determination of cooperation goals with strategic planning.* *Customer-oriented production.* *Ensuring competitive advantage with quality products, services, and speed.*	*7* *3* *5* *3*	*Self-Talent* *Customer-Oriented Production* *Competitive Advantage*	*Competitive advantage.*

When Table 4 is examined, it is seen that the opinions of the participants on the necessity of digital innovation in adaptation and cooperation to the COVID-19 process are gathered under the main theme of digital innovation in cooperation systems. From the analysis of descriptive expressions, participant views; It is grouped under four sub-themes: "innovative product design," "use of smart systems in business processes," "ensuring sustainability through cooperation," "gaining competitive advantage." The opinions of the participants are given below in their descriptive expressions:

We develop innovative technologies with our R&D unit established within our company. This unit, which has been strengthened with investments in recent years, continues to work on innovative technologies that can be applied in processes such as production-quality planning, etc., and investments to be made following its current strategic plan.

We invest in digital information management programs (ERP) and similar technologies in our company. Artificial intelligence technologies play an active role in the company's production process. In this way, production costs decrease, and product quality increases.

We have made significant use of digital technologies such as web 3.0 technologies, broadband internet, cloud computing, big data opportunities, artificial intelligence, the internet of things, and augmented reality during the pandemic. We also developed new business systems and new business models based on collaboration. We used them in operational processes.

The companies that we will cooperate with are contacted, and a cooperation agreement is reached. In line with expert advice, technical staff and equipment are supplemented, and this institution's documents and authorization certificates are used. In order to ensure continuity, innovations are followed, and the continuity of the procedures is ensured.

All kinds of technological developments, equipment tracks, quality certificates, and realized projects are continuously communicated to our customers to improve and maintain customer relations in our company. At the same time, efforts are made to deliver the products within the specified time. In this way, the trust relationship with our customers ensures the continuity of the business.

According to the analysis findings, it is understood that there is a strong relationship between the participants' views on the necessity of digital innovation in adapting to the COVID-19 process and in cooperation, using innovative technology, and effectively managing collaboration systems. Innovative technologies facilitate the management of complex business processes. For this purpose, it has been determined that companies use Risk and Process Oriented Integrated Management System, Quality Management System (QMS), Information Security Management System (ISMS), Quality Documents Management System (QDMS) for effective

management of the business in cooperation. Although companies prefer to design new products, it is understood that they transfer technology if they cannot develop technology in order to manage the cooperation successfully. While intelligent systems facilitate the management of complex business processes, on the other hand, they can provide a competitive advantage by reducing production costs due to their contribution to speed and quality. The use of intelligent systems in collaboration systems also makes joint production planning possible.

With the help of stock control systems, one of the intelligent systems, working with zero stock and just-in-time production is possible. With the suggestion evaluation systems, the feedback received from the customer is evaluated in the production of new innovative products to be produced later. In addition, the data and information infrastructure provided by management information systems and decision support systems are used to make more accurate strategic plans. While the corporate sustainability of information age organizations requires the use of external resources through cooperation, on the other hand, it is necessary to use intelligent systems in the management of all these complex processes and to go digital innovation in this process. The use of 44001 business tracking systems determined by ISO in the effective management of collaboration systems makes it possible to conduct business at a certain quality level. From the participants' statements, it is understood that the companies find it necessary to cooperate to focus on the area where they have their skills. It is understood from the participants' statements that this is especially necessary for customer-oriented production, competitive advantage, and corporate sustainability.

5. DISCUSSION AND CONCLUSION

In this research, in which the importance of digital innovation in collaboration business systems during the Covid-19 pandemic process is questioned, what companies do about collaborative business systems in order to manage the COVID-19 process more successfully in the research sample, what are the problems that companies face in cooperation in this process, and what are the problems that companies face about COVID-19. It has been tried to determine what kind of digital innovations they have developed to adapt to the process. It is understood from the research findings that the participants cooperate for sustainability by providing a competitive advantage, reducing the production cost, and providing high profitability. In this process, it is understood that companies both benefit from digital innovation to manage complex business processes and develop innovative digital products. Participants stated that digital innovation is essential for the efficient management of cooperation. Otherwise, it is impossible to meet customer demands fully and on time. It is understood that it is strategically essential to determine the cooperation partners in the supply chain. It is essential to cooperate with the candidate companies suitable for the characteristics of the cooperation during the determination of the partners in the cooperations. Thus, it is understood that it is essential to pay attention to the fact that the companies participating in the cooperation are the most suitable. It can be argued that leaving the unsuccessful cooperation is as important as identifying the partners in the cooperation processes.

*Theoretical implications***.** When the literature on the subject is examined, it is understood that the research significantly overlaps with what the company managers did during the pandemic days. According to the research findings of some researchers in Turkey, the necessity of employees to do their work in an electronic environment during pandemic days has made it necessary to benefit from digital innovation (Hidiroglu, 2020; Alpago, 2020). Thanks to digital innovation, employees have chosen to hold online meetings with multiple participants and see their service jobs from there. Digital innovation requires the infrastructure to be the digital and digital experience. In addition, it has been determined by some researchers that digital innovation is necessary to respond quickly to changes and contribute to reducing costs and risk (Caligiuri et al., 2020; Carnevalea and Hatak, 2020). During the pandemic process, digital technologies were used, especially in information-intensive jobs. During the Covid-19 pandemic, digital working tools that enable remote work were widely used (Davison, 2020).

Thanks to digital innovations, businesses have used it functionally by adapting business life to the new normal. In addition, in this process, it was determined that the digital technology-oriented configuration of the processes of the enterprises caused the organizational structures of the enterprises to turn into more flexible and organic structures (Almeida et al., 2020;). It is understood that all these developments require a new understanding of leadership, such as a new organizational structure, a new management approach, and technology leadership during the pandemic days. This process requires a new competence such as digital

literacy in employees. Otherwise, it can be argued that it will not be easy to benefit from digital transformation, blockchain, the internet of things, and artificial intelligence applications. With digitalization, enterprises' communication, production, and organizational structures are changing, and it is impossible to manage this change with traditional methods. Many processes and even products and services of businesses are becoming digital (Correani et al., 2020). In the face of this digitalization, what will be done is disseminating a new understanding of digital management and digital leadership.

It is understood that the companies participating in the research are experienced in cooperation within the scope of operational awareness, and they need innovative technologies to be successful in the systematic and periodic execution of these activities. In addition, it was determined in the research that the cooperation development processes remained weak due to the uncertainty caused by the pandemic. In addition, it has been understood that they do not have enough awareness to create common value in the supply chain. It has been determined that insufficient personnel working at the lower levels to manage the researched enterprises' cooperation processes. As a solution to this, the participants stated that it is essential for the cooperating companies to develop their competencies. Participants stated that they benefited significantly from information management systems, especially in cooperation and coordination among the cooperating companies. They stated that harmonizing companies' information systems or standard information management systems in cooperation processes are essential for operational success. It is understood that innovative information systems, which will meet cooperation needs, are essential in successfully managing cooperation processes. However, it is essential to ensure harmony between the information systems among the cooperating companies in the supply chain. This finding also overlaps with other research findings in the literature (Langley et al., 2020; Lee and Berente, 2012). Accordingly, it can be argued that the findings obtained from the analysis of the data ensured the realization of the purpose of the research to examine the opinions of the managers on the collaborative business strategies and digital innovation capabilities of the enterprises in the COVID-19 process.

*Practical implications***.** As a result, in order for the cooperation systems to be carried out healthily, the companies participating in the cooperation should develop innovative technologies, and the technology produced by other companies should be transferred to the company. In the research, it has been understood that the operational ability following the cooperation conditions is also essential in the successful execution of the cooperation. It can be argued that it is necessary to plan production, improve quality standards, and reduce production costs for this. One of the other essential issues in cooperation systems is demonstrating a management capability following the principles of cooperation. Thus, it is necessary to develop appropriate norms and procedures to plan strategy, have competent human resources, and cooperate functionally. Another result of the research is the determination of the transaction capability among the cooperating companies. Here, customer relations, bargaining power of companies, compliance with the contract that determines the principles of cooperation between companies, and sufficient technological intensity and innovation ability are required (Zawislak et al., 2012).

Today, the conditions of competition in the markets have changed, and the strategic competition between companies has moved between supply chains. For this reason, companies need to manage their supply chains effectively in order to achieve strategic success. Collaboration is used today as a preferred business method in supply chain management, minimizing the total supply chain costs and ensuring maximum customer satisfaction by carrying out the organizations from the raw material producer to the end consumer without any problems. In addition to the positive aspects, cooperation processes bring many risk factors for supply chains (Langley et al., 2020; Ramanathan and Gunasekaran, 2014). In order to minimize these risk factors, a set of standards known as ISO ISO 44001 has been created. With the ISO 44001 standard, the company should support the cooperation processes of different dimensions between its suppliers, customers, partners, and departments with digital innovations to maximize cooperation in the supply chain. In addition, it is an important issue to create an organizational culture based on cooperation in cooperation processes. Among the companies forming the cooperation, the supply chain consists of complex operational processes that many independent companies have combined around common strategic goals. Therefore, it is understood from the participants' statements that it is essential to develop standard criteria for performance measurement in cooperation processes in the supply chain. As a result, it is now understood that it is necessary to see competitors as business partners and cooperate.

Limitations and suggestions for future research. This research is qualitative research with a limited number of participants. In the research, only the managers' opinions were consulted within the purpose and scope of the research. Researching employees' views on digital innovation and collaborative business systems will better understand the subject. In addition, it is a qualitative case study in terms of research method, and its results are not suitable for generalization. In order to generalize the research findings, it should be supported by quantitative and mixed studies and factual data. Future research is recommended to be applied with both qualitative and quantitative research methods.

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Appendix

Interview questions

1- What do you think is the importance of cooperation in the supply chain?

2- What are the difficulties faced by companies in supply chain collaborations?

3- What are the internal and external factors that may affect the supply chain cooperation processes?

4- Are joint information management and other intelligent systems used in cooperation in the supply chain?

5- Do you use a systematic method to measure the performance of collaborations in the supply chain?

6- How do you determine the cooperation partners in the supply chain? Do you have a method for this?

7- What do you do to monitor innovative technologies and develop new technologies?

8- What do you do about effective production planning, developing quality systems, reducing production costs?

9- What do you do about preparing and implementing strategic plans, effective human resources management, and implementing norms and procedures?

10- What is being done in your company to improve customer relations, increase bargaining power and make executable contracts?