İSTANBUL UNIVERSITY PRESS

Acta Infologica,
ACIN 2025, 9 (2): 419–463

https://doi.org/10.26650/acin.1647989
Submitted: 27.02.2025
Revision Requested: 22.06.2025
Last Revision Received: 19.07.2025
Accepted: 11.09.2025
Published Online 28.10.2025

Acta Infologica

Research Article

Open Access

A Multidisciplinary Overview of "Business Intelligence Systems" Concept and Maturity Criteria: A Study in the Logistics and Transportation Sector

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Abstract The aim of this study is to reveal the concept of business intelligence and the extent of business intelligence systems and to determine the maturity of business intelligence systems. So, an intensive literature review was conducted and the maturity criteria of business intelligence systems were determined. It has been seen that all information systems with strategic importance within the organization's thinking mechanism can be called a business intelligence system. Moreover, it has been concluded that business intelligence systems maturity can be evaluated by the success factors of information systems (IS Success), the strategic aligned between IT and the organizations (IT Strategic Alignment), and the contribution of these two factors to organizational intelligence. According to these criteria; transportation and logistics organizations in Turkey were reached. Because transportation and logistics organizations use information systems intensively in organizational mechanisms. As a result; it has been understood that information systems, which are sufficient in terms of information system infrastructure, can contribute to corporate intelligence factors, especially leadership practices and organizational positive thinking, and thus it can provide business intelligence support to organizations. Also, it has been understood that the strategic alignment between IT and the organizations is important for business intelligence support to organizations. In addition, it has been determined that the versatile strategic alignment between IT and the organizations will make the business intelligence support to be obtained from information systems more strategically distinct. This work; it is extremely important in terms of its contribution to the literature and suggestions for future studies.

Keywords Business Intelligence · Business Intelligence Systems · Business Intelligence Maturity · IT-Strategic Alignment · Logistics · Transportation.

Citation: Yıldız, İ. & Yavuz, U. (2025). A multidisciplinary overview of "Business Intelligence Systems" concept and maturity criteria: A study in the logistics and transportation sector. *Acta Infologica*, *9*(2), 419-463. https://doi.org/10.26650/acin.1647989

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Introduction

With the value of data, business intelligence systems have become important for all sectors (Dadkhah, 2019). This importance is evaluated according to the role these systems play in the decision-making processes of organizations (Vugec, 2020). The correct responses of organizations to environmental factors because of their decisions are the main gains that determine this value (Chen & Siau, 2020; Kitsios & Kapetaneas, 2022). Because “business intelligence” represents a paradigm that centers information systems (IS) in organizational solution mechanisms (Ain et al., 2019). In other words, "business intelligence systems", which refers to the information systems at the center of the business intelligence paradigm, operate on the basis of making valuable contributions to the decision-making process, being a pioneer in competition, and being an important asset of the organizations in cooperation with its stakeholders (Hamidinava et al., 2021; Sergi et al., 2021). From this perspective, the weight of the elements of information systems in organizational mechanisms and the extent to which they fit into the "business intelligence" paradigm should be evaluated (Gestaldi et al., 2018).

The maturity of business intelligence systems (BIS) in transportation and logistics organizations should be evaluated, as these organizations require a strong focus on information system infrastructure, which is a fundamental component of their operations (Francois, 2020; Tang & Abosedra, 2019; Yavaş & Özkan-Özen, 2020). In addition, transportation and logistics companies should incorporate information systems into their business processes because the sector is characterized by high uncertainty and decision-makers need information system support throughout the decision-making process (Koliadenko et al., 2020; Pennetti et al., 2020). Therefore, adopting a holistic approach when implementing any management system in transportation and logistics organizations is of great importance (Bashmakov et al., 2021).

It is also important to make evaluations and recommendations for this sector in accordance with the maturity criteria of BIS, given that transportation and logistics are highly critical sectors in terms of economic development. Some scholars argue that national economies and organizational development would not be possible without logistics activities (Meidutė-Kavaliauskienė et al., 2014). This argument is also applicable to Turkey. As stated in the Logistics Sector Report (2020) by the International Association of Forwarding and Logistics Service Providers (UTIKAD) the largest share of public investments in Turkey over the five years leading up to 2020 was allocated to the transportation and communication sector, which includes transportation and logistics. Furthermore, the 11th Development Plan of the Presidency of the Republic of Türkiye (2019–2023) emphasizes the importance of logistics infrastructure. Therefore, studies that prioritize the transportation and logistics sectors, as well as policies shaped by the findings of this research, are of great strategic significance (Beysenbaev & Dus, 2020). Therefore, this study is important to evaluate the information systems used in the transportation and logistics sector in accordance with the maturity level of BIS, as the findings and results obtained from this study have the potential to guide strategies concerning institutions operating within the transportation and logistics sector.

This study began with a comprehensive literature review based on various perspectives. As part of this step, the international literature was examined and assessments from well-known and branded companies were analyzed. Through this process, the information systems features associated with the concept of business intelligence were identified. A general business intelligence framework was also developed. This helped to clarify the critical components and dimensions of such systems.

In the second stage, the research focused on transportation and logistics companies registered with the Chamber of Commerce of Istanbul, Turkey. These organizations were selected and evaluated as the primary

sample group. This study contributes to the literature through its use of a substantial sample size and provides valuable insights for future research.

Moreover, this study addresses a gap in the existing literature by examining the underexplored relationship between BIS and organizational performance in developing countries (Bhatiasevi & Naglis, 2020). Notably, numerous business intelligence maturity models have been proposed in the literature. However, these models frequently fail to offer valid criteria applicable to all industries. They also lack a comprehensive perspective and a strong theoretical foundation (Brooks et al., 2013; Chuah & Wong, 2014).

Literature Review

The term ‘business intelligence’ and the meaning of ‘business intelligence systems’ in the literature were addressed in this section, along with their various components. The maturity criteria for the business intelligence systems were also introduced based on the principles highlighted by the elements of business intelligence systems.

Business Intelligence Systems

Business intelligence refers to an organizational competency that enables stakeholders to make informed decisions by supporting data analysis and evaluation (Chee et al., 2009; Dyk & Conradie, 2007; Niu et al., 2021; Wieder & Ossimitz, 2015). According to IBM, Gartner, Microsoft, Qlik, Tableau, Tibco, and Oracle business intelligence—when considered in a broader sense—encompasses applications, tools, and technologies used for data processing, as well as the organizational mechanisms that support these processes (e.g., performance analysis, benchmarking, measurement, assessment, reporting, monitoring, and analytics). Furthermore, business intelligence is recognized as an organizational framework that facilitates participation in decision-making processes.

However, BIS refers to information systems that are compatible with users and play a supporting role in screening the organizational environment, executing performance analysis and evaluation, and thus making the right decisions by using various methodologies and techniques, especially data warehousing and statistical analysis for data analysis and assessment. In other words, BIS are the information systems that provide strategic support to organizations through yielding solutions based on data and information (Ain et al., 2019; Antoniadis et al., 2015, p. 300; Arnott et al., 2017, p. 58; Baransel & Baransel, 2012, p. 470; Brichni et al., 2017, p. 97; Chen & Lin, 2020; Luhn, 1958; Nino et al., 2020; Romero et al., 2021; Thietar & Vivas, 1958; Torres et al., 2021; Vajirakachorn & Chongwatpol, 2017, p. 76; Vuksic et al., 2017, p. 1355; Vaclav et al., 2021). The concept expressed as Business and Analytics (BI&A) in the literature also denotes the techniques, technologies, systems, processes, methodologies, and practices that are compulsory for analyzing and presenting critical data, which enable organizations to better perceive their internal powers and market dynamics, and thus, make the right decisions. However, the BI&A indicates the efforts of organizations in integrating applications that might provide a competitive advantage to the organization and developing the existing applications in this direction (Bozic & Dimovski, 2019; Corte-Real et al., 2014; Moreno et al., 2020; Rikhardsson & Yigitbasioğlu, 2018; Torres & Sidorava 2019). In this respect, BIS can be defined as "information systems that provide information that may have strategic value from data stacks, and that exist as an indispensable strategic element in the decision-making process and the thinking mechanism of the organizations”.

Components of BIS

The primary purposes of business intelligence systems are data analysis and pattern visualization. For this purpose, accessing data repositories and data warehouses, performing data analysis, storing data and information, having reporting and visualization tools (dashboards), and having reliable systems required for distribution to users with reporting and visualization tools are the crucial elements of the technical infrastructure of business intelligence systems (Liang & Liu, 2018; Lopes & Boscarioli, 2021; Magoma et al., 2021; Muntean et al., 2021; Zelenka & Podaras, 2021). Business intelligence systems are also anticipated to function in the evaluation and decision-making processes of organizations (Ain et al., 2019).

Data Analysis and Presentation Tools

Business intelligence systems use data warehouses, data mining techniques, and ETL, OLTP, and OLAP tools. The primary tools for mining activities in data warehouses are the ETL (Extraction, Transformation, and Loading) and OLTP (Online Transaction Processing); additionally, the OLAP programs are used for multidimensional queries (Bidgoli, 2014; Bimonte et al., 2020; Chen et al., 2012; Chung et al., 2002; Maheshvari, 2015; Patil & Gangadhar, 2016; Vuksic et al. 2017). In this context, the accuracy, contemporaneity, and completeness of the information acquired; the adequacy, reliability, and agility of the system infrastructure; the competence of the service providers in this area or the sufficiency of the organizational personnel; and the fun and user-friendly system interface will all be significant aspects in the strategic contribution of the data analysis process to competitiveness, predictability, organizational efficiency, effectiveness, and transformation (Chan & Lau, 2018; Diop et al., 2019; Miskon & Ahmad, 2021; Subramanian & Wang, 2019; Sun et al., 2018). Khan et al. (2012) also stated that data warehouses with such featured-system infrastructure contribute to organizational agility and staff motivation.

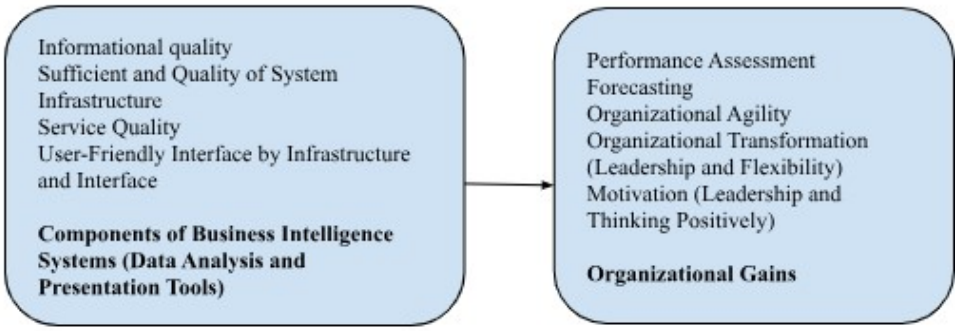
Dashboards are critical business intelligence system components. They are graphics-based and user-friendly interfaces that support organizational assessment by presenting relevant data on a single screen to facilitate more accurate decision-making. Dashboards also enable interactive communication and enhance business analytics by participating in critical processes. Moreover, they provide valuable patterns and facilitate deeper analysis. These features may also assist organizations in initializing business intelligence processes (Bourbonnais & Morency, 2018; Nadj et al., 2020; Vilarinho et al., 2018, p. 15).

Recent conditions entail information systems that will provide business intelligence support to organizations using modern and modern technologies (Gottfried et al., 2021; Magoma et al., 2021). BIS also benefits from infrastructures such as cloud computing, big data, machine learning, artificial intelligence (AI), and augmented reality (AR) technologies. Consequently, business intelligence systems function as structures that may contain intelligent algorithms that support real-time analysis through various optimization techniques. Modern technology-based business intelligence solutions are designed to sustain performance analysis, insight development, and decision-making processes. To accomplish this, it is critical to conduct multidimensional inquiries and deploy visualization equipment compatible with users (Francia et al., 2019; Francia et al., 2020; Khaddam et al., 2021; Li et al., 2021; Lopes et al., 2021; Nakhal A. et al., 2021; Pustokhina et al., 2021; Schawade, 2021; Sharma et al., 2021). The concept of "intelligence +" refers to changes and transformations that may occur in organizational processes and industrial structures (Chen & Lin, 2020). Figure 1. illustrates the technical components of BIS and organizational accomplishments implied by these components.

Criteria 1: The maturity criteria for business intelligence systems are having a high-quality information system infrastructure (quality information, system infrastructure, service quality, and user compliance) and taking a significant role in organizational mechanisms Additionally, this technically required competence should generate positive effects on organizational actions and internal dynamics.

Figure 1

The technical components of business intelligence systems and organizational gains.



Role in the Decision-Making Process

Making a strategic contribution to the decision-making process is another task expected from BIS (Petrini & Pozzebon, 2009). Wieder and Ossimitz (2015) stated that business intelligence systems, which are not decision-makers and do not take decisions by themselves, may sustain decision-making processes with the high-quality information they generate. In addition, BIS can play a role in the decision-making process by contributing to making predictions with the current techniques (such as machine learning and deep learning) (Sharma, Nazir, & Ernstsen, 2019). Interacting with its users is essential at this point (Nadj et al., 2020). In this context, assessing the input contributed to the analytical processes of the organization (business analytics) is especially significant (Acito & Khatri, 2014; Phillips-Wren et al., 2021; Troilo et al., 2016; Vidgen et al., 2017). Business analytics is the process of transforming data in a way that can aid in the decision-making process and is a sign of organizations' mental maturity (Grossman, 2018; Holsapple et al., 2014).

It should be kept in mind that decision-making is a process explicitly under the influence of the decision-maker's personality traits explicitly. The manner in which the decision-maker perceives the surroundings, approaches the decision process with proactive behavior, and takes an active role in the decision process are all critical for the success of the decision-making process. It should be noted that the cultural aspects and goals of the organization, the decision will be made and executed, will be effective in the decision-making process (Grzesik, 2019; Remenova & Jankelova, 2019; Siebert et al., 2020). The decision-maker should also receive behavioral assistance for the successful decision-making process. For this to be successful, the decision-makers should have a full grasp of the decision's subject matter, access to reliable information, perceive the decision alternatives as an operation of creativity, have clear and evaluable decision criteria, make reasonable and logical assessments, and consider the decision worthy of implementation for the organizational resources, goals, and values. To accomplish this, the decision-maker must possess the capacity for freethinking and be in a healthy and sound psychological state (Gambetti & Giusberti, 2019; Lee et al., 2003; Shen et al., 2017; Siebert et al., 2021; Webb et al., 2020).

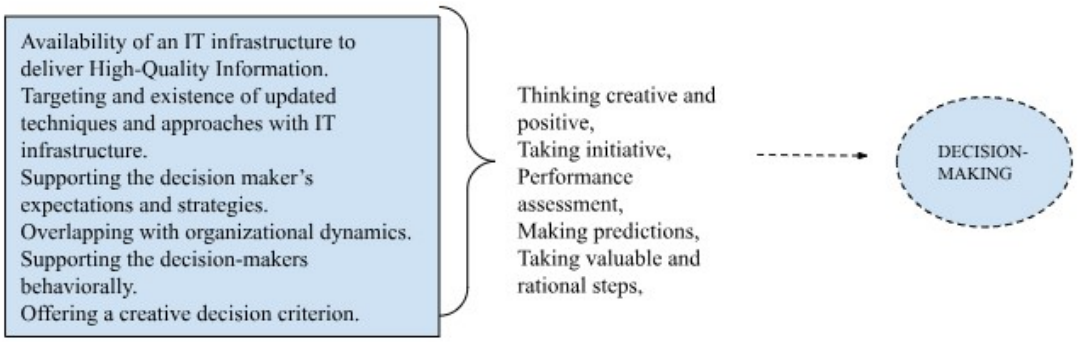
Decision-making is a process of choosing among alternatives and requires mental health in a complex environment. Considering that there are decisions depurated from individual weaknesses and orientations,

that they are unstructured as rational decisions where performance indicators matter, and that there are also decisions to be taken with limited rationality and intuition, it appears that in addition to the presentation of up-to-date and accurate information delivered in real-time, responsibilities, performance expectations, level of knowledge and past experiences, norms, and values, level of access to resources, communication channels, and feedback mechanism of the decision-makers within the organization are also highly effective components in the decision-making process. It is also crucial for the decision-making process to contemplate from multiple perspectives, maintain options open to creativity, focus on a value-creating process, and have the decision-makers be willing to take the initiative and operate a strategy they feel logical (Abubakar et al., 2019; De Winnaar & Scholtz, 2020; Siebert et al., 2021; Sousa & Rocha, 2021;-). Figure 2 illustrates the dynamics that the business intelligence systems will apply while sustaining the decision-making process.

Criteria 2: It is a significant maturity criterion for BIS to be a critical component of the effective infrastructure and positive thinking mechanism of organizations and almost a "hitman " in the actions to be taken by the organization.

Figure 2

Business intelligence systems for decision-making.



Maturity Criteria of Business Intelligence Systems

Figures 1.1 and 1.2 illustrate the primary components of BIS and highlight the following maturity criteria. The existence of successful information systems, ensuring the harmony of information system infrastructure and related strategies between business strategies and dynamics, and contributing to business intelligence (i.e. to the organization’s thinking mechanism) may all be regarded as the maturity criteria of business intelligence systems.

Information Systems Success

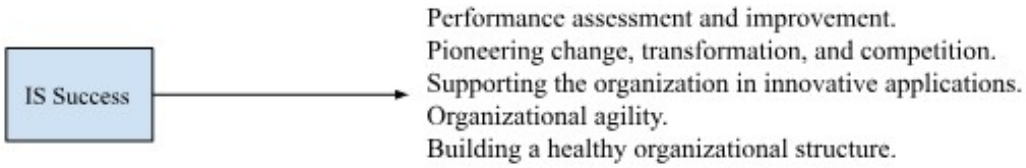
Accordingly, it is necessary to analyze the “IS success model” developed by DeLone and McLean (1992). This model comprises system quality, service quality, information quality, system using and using intention, individual impact, and organizational impact (net benefit). System quality refers to the current, efficient, reliable, and accessible features of the information systems infrastructure. Service quality denotes the caliber of the human resources and service providers in charge of the information system setup and maintenance. Information systems should meet certain requirements, including relevancy, logicality, currentness, comprehensiveness, usability, and significance, to be considered high-quality. System use and use intention express the frequency and propensity of using information systems in simple or compulsory transactions, from critical decision making to basic-level analyses. However, the individual and organizational impact (net

benefit) dimensions describe the impact of information systems on user behavior and the input provided to organizational performance, decision-making processes, increasing productivity, lowering costs, and gaining market share (Balaban et al., 2013; Naveed et al., 2021; Petter & Fruhling, 2011; Wang & Liao, 2008; Wu & Wang, 2006).

Business intelligence systems with a successful information system infrastructure may have a substantial impact on monitoring and improving organizations' performance and make them ready for future informatics-based changes and transformations. Successful information systems enable organizations to be flexible in their internal operations and open to innovative applications. Factors of flexibility and innovation in domestic and international policies may facilitate organizations' agility and competitive leadership. Information systems that satisfy users and organizations may also contribute to the development of healthy psychology and the dissemination of positive emotions and opinions (Dai et al., 2007; Dahiya & Mathew, 2017; Jeyaraj, 2020; Li & Wang, 2021). Figure 3 illustrates business intelligence factors to which successful information systems will contribute.

Figure 3

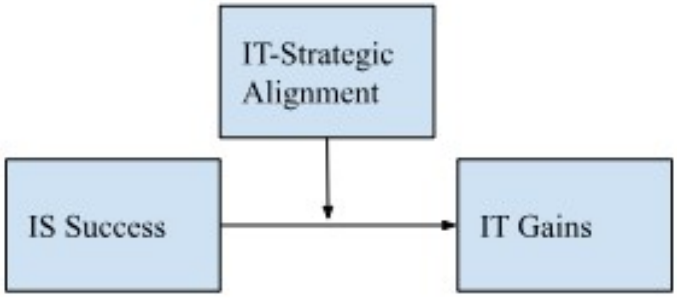
Contributions of Information System Success to Organizational Intelligence.



Strategic Alignment

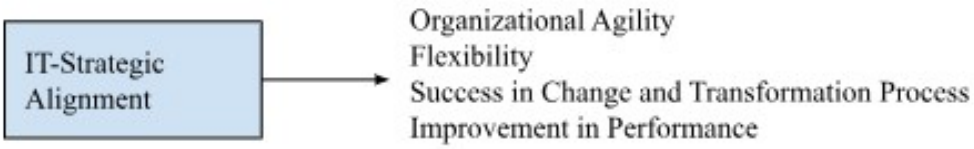
As illustrated in Figure 1.2, business intelligence systems should align with the core principles of the organization and the decision-maker. In other words, organizational dynamics should not exclude BIS from supporting the anticipated decision input (Shao, 2019; Wong et al., 2012). Xiang et al. (2013) reported that synergies should be established with business strategies for information systems to compete at their utmost capacity. Such harmony is essential because it will reveal how much the organization's information technology (IT) architecture has contributed. Chatterjee et al. (2020) underlined that the specifications making information systems successful could not provide satisfactory and significant support to organizations alone; as a result, organizations should have their own strategies for these systems. For instance, Mouhib et al. (2020) proposed a model that demonstrates the maturity criteria in big-data-related operations. According to this model, the attributes of data sources and data themselves, the quality of IT infrastructure, the accuracy of the methods employed, the support of organizational culture, human resources, and business strategies in approaching big data were listed as the factors bringing success in big data. Sfaxi and Aissa (2020) also reported that having data-based business strategies and organizational culture, valuing information in their norms and values, and hiring the appropriate personnel are key factors in the success of big data applications. Figure 4. Illustrates the compliance of information systems with business strategies and its role in the gains it will provide on information system success.

Figure 4
The Role of Strategic Alignment on IT Gains



The model proposed by Henderson and Venkatraman (1993) gains significance at this point. Chan et al. (1998) stated that the "strategic alignment" model developed by Henderson and Venkatraman (1993) was remarkable in assessing the compliance between organizational factors and information systems. This model demonstrates the reciprocal and cross-directional harmony among organizational dynamics, top management policies, organizational culture, norms and values, and IT-related dynamics of other employees (Henderson & Venkatraman, 1999: 476). This harmony is considered to make the organization agile in external processes and flexible in internal processes. Additionally, organizations' effectiveness in the transition and transformation process greatly depends on this harmony (Kawtar et al., 2019; Njanka et al., 2021). Organizations could improve their performance with compliance between organizational dynamics and information system dynamics (Wang & Rusu, 2018). It is possible to argue that such harmony may also help the assimilation of information systems. However, IS assimilation refers to the dissemination of IS in business processes, highlighting the strategic significance of IS and taking their place in intellectual mechanisms (Shao, 2019). The term 'synergy' indicated here also means the convergence of social, technical, and psychological aspects on common ground. Gaining a competitive advantage, making transactions cheaper and faster, increasing profitability, and the subsequent innovation in business processes can be facilitated in this regard (Haag & Cummings, 2015). Figure 5. illustrates the contribution of this alignment to organizational intelligence.

Figure 5
Contributions of strategic alignment to organizational intelligence



Organizational Intelligence

Analysis of the aforementioned figures (Figures 1, 2, 3, 4, and 5). Reveals that the maturity of BIS can be assessed according to the contribution of other factors (IS success and strategic alignment) to organizational intelligence. Because organizational intelligence is an organizational competency that can be evaluated based on assessing and improving performance, having all members be conscious of and focused on their performance with healthy psychology in the organization, assigning knowledge and learning the appropriate consideration, analyzing and interpreting the organizational climate, and taking the necessary actions toward organizational processes and strategies (Neyişci & Erçetin, 2020; Thannhuber et al., 2017).

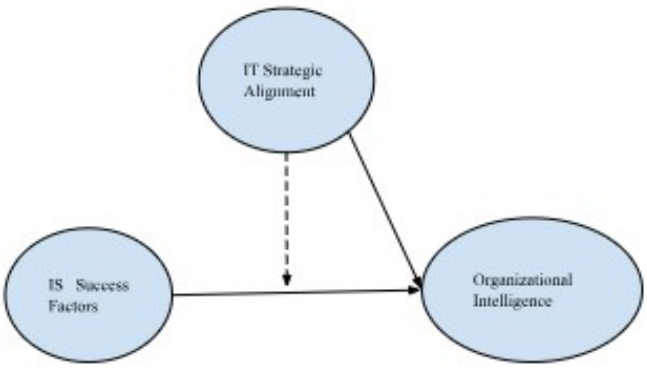
Albrecht (2003) listed organizational intelligence traits. Accordingly, intelligent organizations have strategic roadmaps and engage in the desired leadership practices, and the members of the organization practice the following: they share a sense of common fate and are committed to working together to achieve goals, and even have the willingness to go beyond what is expected of them, they have an appetite for change and transformation, they may set up their business processes, organizational policies, and objectives in a way that supports employees, they ensure the dissemination of technical knowledge and intellectual assets within the organization and consider learning as a cultural value, and they evaluate performance and stir sensitively in the organization with leadership practices to increase the performance further.

Business intelligence systems can contribute to organizational intelligence through their successful information infrastructure and the strategic harmony generated. With a general approach, seeking digitalization and integrating it into business processes is typically a sign of organizational intelligence (Li et al., 2021). Once business intelligence systems are recognized as an organizational value, information will help to build trust in performance evaluation, organizational functioning, and policies and generate a favorable environment in the organization. In addition, employees and managers should be aware of the IT processes and policies, especially digital transformation, and adopt these processes, policies, and IT strategies in organizations. This could strengthen the hand of managers in leadership practices and encourage employees to express their creativity. Because leadership requires keeping up with innovations (Dent, 2016; Wang et al., 2021; Hahn et al., 2015; Koohang et al., 2020; Murphy & Reeves, 2020; Paliszkiewicz, 2019; Pare et al., 2020; Porfirio et al., 2021; Randolph et al., 2020; Rutkauskas & Stasytyte, 2013).

It may be easier to make predictions using business intelligence systems, such as statistical analyses and data mining. In particular, business intelligence systems, which are also used by AI, where machine learning algorithms are run and interactive dashboards are utilized, may provide users with the opportunity to conduct in-depth analysis and thus enable the formulation of predictions (Khaddam et al., 2021; Lopes et al., 2021; Nadj et al., 2020; Ngo et al., 2020). The literature has reported that all of these could be an accomplishment of harmony between the technical infrastructure of BIS and organization dynamics (Chan et al., 1998; Kawtar et al., 2019; Kearns & Sabherwal, 2007; Njanka et al., 2021). The IT infrastructure of business intelligence systems, associated with policies and practices, and the harmony that all these establish with each other and also with organizational dynamics are critical for organizational agility and flexibility in internal processes (Deng et al., 2021; Halpern et al., 2021; Kawtar et al., 2019; Martinez-Caro et al., 2020; Melian-Alzola et al., 2020; Ridwandono & Subriadi, 2019; Tallon et al., 2019;). Figure 6. illustrates the research model.

Figure 6

The maturity criteria of business intelligence systems and their relationships.



Methodology

Data

The research population consisted of 5046 organizations registered as of 2020 in the Istanbul Chamber of Commerce's occupational group no. 24’ category under the “transportation and logistics” list. Important Turkish logistics organizations are located in Istanbul. In addition, Istanbul is an important center of international logistics activities, both economically and geographically (Özdemir, 2010). Organizations in the limited liability company status were selected for the study while considering that the IT infrastructure of the participating organizations should be at a certain level to perform the research properly. The sample size required for the research had to be at least 357 with a 95% confidence interval and a 5% margin of error. The following formula was employed for this purpose (Alkan et al., 2020):

$$n = \frac{NPQZ^2}{(N-1)d^2 + PQZ^2}$$

Where:

n = required sample size

N = total population size;

P = estimated proportion of the population (often set as 0.5 for maximum variability)

Q=1−P

Z = Z-score corresponding to the desired confidence level (e.g., 1.96 for 95%)

d = margin of error (precision level)

Service was procured from a private-sector research company to acquire the sampling number calculated by this method; accordingly, 360 individuals were chosen for the study sample. A simple random sampling approach—one of the probabilistic sampling techniques—was adopted for the research design. The simple random sampling method allows all units in the population to have an equal probability of being selected for the sampling process (Potas & Akçil Ok; 2020). The data collection and statistical analysis process of this study was completed between April 17, 2020, and September 16, 2020. Additionally, the document stating that the conduct of the research is not against ethical rules has been approved by Atatürk University Social and Human Sciences Ethics Committee with the number “E-77040475-000-2100195865.”

Data Collection Tools

The “IS success model” developed by DeLone and McLean (2003) was employed to assess the current success of the participants’ information systems. Additionally, the harmony (IT strategic alignment) between the IT-organization dynamics in the participants’ own organizations was evaluated using the scale introduced by Gerow, Thatcher, and Grover (2014) in their study entitled “Six types of IT-business strategic alignment: an investigation of the constructs and their measurement”. The study’s first author was contacted via email to obtain permission to adapt it into Turkish. Furthermore, the following steps were adapted to convert English scales into Turkish and align them with the research population: translation, linguistic validity, the pilot scheme, construct validity, and dependability (reliability) (Erkuş, 2012). However, the “Multidimensional Business Intelligence Scale” was used to classify organizational intelligence levels. Erçetin (2001, 2004) initially developed this scale and then adapted it into several studies. This study used the version of this scale that was valid for commercial organizations (Erçetin et al., 2007; 2013; Potas et al., 2010).

Independent and Dependent Variables

Figure 6 shows that IS Success Factors and IT-Strategic Alignment Factors denote independent variables. Factors related to organizational intelligence are dependent variables. The following are the IS success factors (DeLone & McLean, 2003):

- System Quality: This refers to the state of the infrastructure for information systems as it relates to being updated, efficient, reliable, and accessible.
- Service quality: It describes the competence of the human resources and service providers responsible for the information system infrastructure and operation.
- Information Quality: It denotes the criteria that information systems must meet to ensure that information is relevant, intelligible, updated, holistic, practical, and significant.
- System Using–Using Intention: It expresses the frequency and tendency of users to engage in simple or compulsory transactions.
- User Satisfaction: This refers to the contentment of users with information systems.
- Individual Impact: It implies the ability of information systems to impact user behavior.
- Organizational Impact: It refers to the input of information systems to organizational performance indicators (e.g., decision-making process operation, increasing productivity, lowering costs, and gaining market share).

The IT-Strategic Alignment factors corresponding to the other independent variables in the study are as follows (Gerow et al., 2014):

- Alignment of Business Strategies with IT Strategies (Intellectual Alignment): IT-related strategies (technology scope, systemic competencies, I/T governance) affect business strategies (business scope, distinctive competencies, business governance). Additionally, business strategies influence information technology (IT) strategies, indicating a high level of harmony based on mutual interaction. This factor was encoded as Alg1 in the analyses performed.
- Alignment of Organizational Infrastructure with IT Infrastructure (Operational Alignment): This indicates the mutual compatibility at the operational level between the organizational infrastructure dynamics (processes, skills, and administrative infrastructure) existing in internal processes and IT infrastructure-related elements (architectures, processes, and skills). This factor was encoded as Alg2 in the analyses performed.
- Alignment of Business Strategies with IT Infrastructure (Cross Domain): It specifies the mutual compatibility between the dynamics of business strategies (business scope, distinctive competencies, business governance, etc.) and IT infrastructure-related elements (architectures, processes, skills). This factor was encoded as Alg3 in the analyses performed.
- Alignment of Organizational Infrastructure with IT Strategies (Cross Domain): This refers to the mutual compatibility between the elements of organizational infrastructure and the dynamics of IT-related strategies. This factor was encoded as Alg4 in the analyses performed.
- Alignment of IT Strategies with IT Infrastructure (IT Alignment): It expresses the mutual compatibility between IT Strategies and IT Infrastructure dynamics. This factor was encoded as Alg5 in the analyses performed.

- Alignment of Business Strategies and Organizational Infrastructure (Intra Alignment): This refers to the mutual compatibility between business strategies and organizational infrastructure dynamics. This factor was encoded as Alg6 in the analyses performed.

The dimensions of the organizational intelligence factor are the dependent variable in the study (Albrecht, 2003; Erçetin, 2001; Neyişci & Erçetin, 2020):

- Performance: This factor indicates that intelligent organizations have roadmaps for assessing and improving performance to move things forward.
- Forecasting: This factor states that intelligent organizations may accurately interpret what has been happening around them and develop premonitions about future events.
- Leadership: This factor expresses leadership practices such as the capacity of intelligent organizations to inspire, guide, and communicate with their employees.
- Quick Response: This factor refers to intelligent organizations' capacity to respond promptly to changes in their surroundings.
- Imagination: This factor indicates that intelligent organizations have healthy and optimistic employees and creative thinking mechanisms.
- Flexibility: This factor refers to the ability of intelligent organizations to adapt their organizational structures and current practices in order to achieve their objectives.

In addition to these factors, participants' ages, genders, educational statuses, organizational age, the international activity of the organization, the size of the organization, and the logistics mode were also recognized as control variables in the study.

Construct Validity and Reliability

The research validity and reliability were analyzed by separating sub-samples from the defined sample set. In this context, observation groups of 224 participants were allocated for the validity and reliability analyses of the information systems success scale, strategic alignment scale, and organizational intelligence scale, respectively. Jackson (2001) and De Winter, Dodou and Wieringa (2009) revealed that a sample size of at least 200 participants was sufficient for factor analysis. Therefore, the above numbers were deemed adequate for factor analysis. Confirmatory Factor Analysis (CFA) and model fit The LISREL 8.80 package program was employed for this objective. According to the CFA outcomes, the fit values confirmed the research model. Table 1 shows the fit values. Appendix A illustrates the CFA path diagrams. As a result, the analyses performed for construct validity indicated that the factors used largely sustained their existing configurations (only user satisfaction and individual impact factors, which are among IS success factors, were used as a single factor in the study).

Table 1

CFA Fit Index Values

Goodness of Fit	CFA Fit Values for IS Success Scale	CFA Fit Values for the Strategic Alignment Scale	Organizational Intelligence Scale CFA Fit Values
P	0.000 (Acceptable)	0.000 (Acceptable)	0.000 (Acceptable)
x^2 / s	1159.90/541 = 2.14 (Acceptable)	1275.83/647 = 1.97 (Perfect)	1111.98/575 = 1.94 (Acceptable)
RMSEA	0.073 (Acceptable)	0.070 (Acceptable)	0.065 (Acceptable)
SRMR	0.066 (Perfect)	0.080 (Acceptable)	0.060 (Acceptable)

Goodness of Fit	CFA Fit Values for IS Success Scale	CFA Fit Values for the Strategic Alignment Scale	Organizational Intelligence Scale CFA Fit Values
CFI	0.97 (Perfect)	0.96 (Perfect)	0.045 (Perfect)
NFI	0.94 (Perfect)	0.92 (Acceptable)	0.94 (Perfect)
NNFI	0.96 (Perfect)	0.96 (Perfect)	0.90 (Acceptable)
IFI	0.97 (Perfect)	0.96 (Perfect)	0.94 (Perfect)
RFI	0.93 (Acceptable)	0.92 (Acceptable)	0.94 (Perfect)
PGFI	0.66 (Acceptable)	0.65 (Acceptable)	0.82 (Acceptable)

Cronbach's alpha coefficients were calculated to identify the data reliability level. First, the Cronbach alpha (α) reliability coefficient value was computed as 0.95 for the entire IS success factor. The values for system quality, information quality, service quality, system usage, user satisfaction-individual impact, and organizational effect were 0.92, 0.89, 0.83, 0.82, 0.88, and 0.84, respectively. These data proved that the reliability level is satisfactory. The total item correlation values for each factor varied between 0.517 and 0.724. The Cronbach alpha (α) reliability coefficient value for the entire IT-Strategic Alignment factor was computed as 0.93. These values were 0.92, 0.93, 0.85, 0.91, 0.95, and 0.94 for Alg1, Alg2, Alg3, Alg4, Alg5, and Alg6, respectively. The total item correlation values of this scale ranged from 0.307 to 0.704. Finally, the Cronbach alpha (α) reliability coefficient was 0.93 for the entire organizational intelligence factor. These values were 0.84, 0.79, 0.83, 0.81, and 0.78 for performance, flexibility, leadership, quick response, and imagination, respectively. However, the total item correlation values of this scale were between 0.42 and 0.88. All these reliability coefficient values were satisfactory (Erkuş, 2012; Fraenkel et al., 2012; Hu & Bentler, 1999; Hooper et al., 2008; Kline, 2011; Tabachnick & Fidell, 2013).

Normal Distribution Analysis (NDA)

Testing the normal distribution was required to undertake the regression analyses deemed necessary for making assessments within the research model framework. This result required the computation of the values for skewness and kurtosis. Variable data were commonly regarded as having a normal distribution when their skewness and kurtosis coefficients were between +2 and −2 (George & Mallery, 2010). Table 2. Data sets for skewness and kurtosis coefficients corresponding to these variables. Accordingly, the kurtosis data from the predicting-forecasting variable, one of the organizational intelligence dimensions, was significantly higher than the applicable limit. Thus, the proximity of the mean, mode, and median values for this variable was calculated and identified to be approximately the same (Mean = 2.04, Mode = 1.80, and Median = 1.80). The proximity or equality of the mean, mode, and median values were an indicator of normal distribution (Nadarajah, 2005).

Table 2

Skewness and kurtosis values of the dependent and independent variables.

Variables	S.	K.	Variables	Skewness	Kurtosis	Variables	Skewness	Kurtosis
Age	0.463	−0.944	Information Quality	−0.185	−0.623	Alg4	−0.711	0.196
Gender	1.092	−0.811	Service Quality	−0.223	−0.734	Alg5	−0.152	−0.094
Education	−0.002	0.234	System Usage	−0.719	−0.400	Alg6	0.320	0.982
Activity Year	−0.420	−1.431	User Satisfaction-Individual Impact	−0.779	−0.315	Performance	−0.577	0.396

Variables	S.	K.	Variables	Skewness	Kurtosis	Variables	Skewness	Kurtosis
Internationalization	−0.056	−2.000	Organizational Effect	−0.480	−0.531	Forecasting	1.919	4.177
Organization Size	−0.463	−0.926	Alg1	−0.358	0.050	Leadership	−0.853	0.361
Logistic Mode	0.859	−0.928	Alg2	−0.311	−0.762	Quick Response	1.132	2.00
System Quality	−0.574	−0.206	Alg3	−0.254	0.049	Imagination	−0.703	−0.021
						Flexibility	−0.455	0.261

Results

Linear Regression Analysis

The correlations indicated by the research model were subjected to multiple linear regression analysis with moderator variables. To do this, the VIF values of the factors were originally examined, and no obstacle was determined to perform these analyses (Alpar, 2018). Table 3 shows the VIF values.

Table 3

VIF Values of Variables

Variables	S.	K.	Variables	Skewness	Kurtosis	Variables	Skewness
Kurtosis							
Age	0.463	−0.944	Information Quality	−0.185	−0.623	Alg4	−0.711
0.196	Gender	1.092	−0.811	Service Quality	−0.223	−0.734	Alg5
−0.152	−0.094	Education	−0.002	0.234	System Usage	−0.719	−0.400
Alg6	0.320	0.982	Activity Year	−0.420	−1.431	User Satisfaction-Individual Impact	−0.779
−0.315	Performance	−0.577	0.396	Internationalization	−0.056	−2.000	Organizational Effect
−0.480	−0.531	Forecasting	1.919	4.177	Organization Size	−0.463	−0.926
Alg1	−0.358	0.050	Leadership	−0.853	0.361	Logistic Mode	0.859
−0.928	Alg2	−0.311	−0.762	Quick Response	1.132	2.00	System Quality
−0.574	−0.206	Alg3	−0.254	0.049	Imagination	−0.703	−0.021
						Flexibility	−0.455
0.261							

Effect of Information Systems Success Factors on Factors of Organizational Intelligence

Based on the multiple linear regression analysis, the information quality provided by the information systems employed by Turkish logistics organizations appeared to have the potential to significantly affect performance evaluation, one of the organizational intelligence factors (R^2=0.10; p<.05). In addition, it was determined that the variables including system quality and information quality, user satisfaction-individual impact, and organizational effect were likely to have a statistically significant impact on leadership practices in Turkish logistics organizations (p<.05; R^2=0.314). Such analysis results indicated that information quality

and user satisfaction—individual impact factors and variables such as age, educational level, and logistics mode—may have a significant impact on the capacity of Turkish logistics organizations to develop imagination, creative thinking, and optimism about the future (p<.05; R^2=12.4). Furthermore, user satisfaction and individual impact factors were found to have a statistically significant impact on the flexibility of Turkish logistics organizations. It should also be noted that organizational size might adversely affect the flexibility factor (p<.05; R^2=0.088). The information systems of Turkish logistics organizations have not yet been sufficiently developed to generate a statistically significant impact on the factors of forecasting and quick response (p>.05). These indicators are included in Appendix B.

Impact of strategic alignment factors on organizational intelligence factors

The alignments between organizational infrastructure and IT strategies (Alg4), IT infrastructure and IT strategies (Alg5), and business strategies and organizational infrastructure (Alg6) had the potential to be statistically significant in accessing the performance evaluation capacity of the logistics organizations (p<.05); R^2=0.147). Additionally, the alignments between organizational infrastructure and IT infrastructure (Alg2), business strategies and IT infrastructure (Alg3), and business strategies and organizational infrastructure (Alg6) might draw significant conclusions (p<.05; R^2=13,3) about the organization-IT relationship, which enables the organizations to make forecasts. Nevertheless, the alignment between organizational infrastructure and IT infrastructure (Alg2) might impact negatively (B=-0.159). All other factors, except for the alignment factor between business strategies and IT infrastructure (Alg3), clearly support leadership practices in Turkish logistics organizations (p<.05; R^2=41.8). However, the manager's age impact negatively (B=-0.083). The alignments between business strategies and IT strategies (Alg1), organizational infrastructure and IT infrastructure (Alg2), and business strategies and organizational infrastructure (Alg6) are statistically significant in terms of accelerating the responses of organizations (p<.05; R^2=10,5). At this juncture, the alignment between organizational infrastructure and IT infrastructure (Alg2) might also have a significantly negative effect (B=-0.10). For Turkish logistics organizations to operate in a positive mindset, while the alignments between the organizational infrastructure and IT infrastructure (Alg2) and the organizational infrastructure and IT strategies (Alg4) contributed positively, the alignments between IT strategies and IT alignment (Alg5) and business strategies and organizational infrastructure (Alg6) factors are likely to have the potential to impact negatively (p<.05; R^2=42.8). However, to gain flexibility in Turkish logistics organizations, the alignments between business strategies and IT strategies (Alg1), organizational infrastructure and IT infrastructure (Alg2), and business strategies and organizational infrastructure (Alg6) all played statistically significant roles (p<0,05; R^2=20,9). These indicators are included in Appendix C.

Moderator Role of Strategic Alignment Factor in Information System Success's Contribution to Organizational Intelligence Level

The indicators of the multiple hierarchical regression analysis with moderator variables demonstrated that the strategic alignment factors alone could not sufficiently moderate the effects of the information systems success factors on organizational intelligence. It was also found that it might mitigate any potential positive effect. Statistically significant indicators of this analysis are presented in Appendix D. The conclusions are as follows:

1. Only the alignment between organizational infrastructure factors and IT strategies (Alg4) is likely to have a moderating effect that may weaken the potential impact of information quality on performance.

2. Only the alignment between the organizational infrastructure factors and the IT infrastructure (Alg2) induces a moderator effect that undermines the positive effect of the system quality variable on the leadership.
3. Only the alignment between the organizational infrastructure factors and IT strategies (Alg4) appears to have a moderator effect, weakening the positive impact of the system quality variable on the leadership variable.

Discussion and Conclusion

The findings of this study are significant for the logistics sector, which constitutes the research population, particularly given that BIS are defined as an enterprise concept centered around information systems —where data and information are considered the primary criteria in decision-making processes and where the information systems infrastructure is aligned with organizational dynamics. For instance, the UTIKAD Logistics Sector Report (2023) defines the concept of digital logistics as a contemporary approach that, through the use of information systems, aims to enhance performance, foster positive relationships with customers, and facilitate collaboration and integration. Furthermore, the report highlights the importance of adapting to modern technologies, such as AI and the Internet of Things (IoT), for businesses operating in the transportation and logistics sectors. In this context, the results of this study are particularly valuable in offering guidance to enterprises within the transportation and logistics industry.

Information systems are important for organizations. This importance of information systems is reinforced by the strategic role it plays in the decision-making process. At this point, it is important to determine the criteria of business intelligence systems that express information systems with vital value for organizations. In this context, the findings point to the following argument:

Information Quality is the Most Active Factor on Organizational Intelligence: The findings of this study demonstrated that Turkish logistics organizations capable of accessing high-quality information might assess their own performance, that their managers using high-quality information systems were capable of being powerful in leadership practices, and that organizations using systems with high-quality information might develop more optimistic and healthy perspectives. These findings concur with those of the relevant literature (Kassim et al., 2012; Koohang et al., 2020; Lin et al., 2009; Silva et al., 2020).

Managers of Turkish Logistics Organizations are Unable to Evaluate the Dynamics of Information Systems Holistically: Managers of Turkish Logistics Organizations were aware of how information quality provided by information systems affects organizational intelligence; however, according to the analysis results, they failed to identify other potential influences of the factors such as system quality, service quality, system usage, user satisfaction, individual impact, and organizational effect on organizational intelligence. Thus, these managers seemed far from holistically considering the information systems. In TUBISAD's Turkey Digital Transformation Index – 2020 report, there were many complaints, including a lack of knowledge and awareness level on digital transformation, particularly among Turkish organizations with SME structures, a failure to integrate traditional business practices with IT systems, and a comprehension to use IT technology dominantly for social media activities at the individual level.

Leadership is an Organizational Intelligence Factor that is Nurtured the Most by the Information Systems Success and the Strategic Alignment Level of these Systems: The study findings indicated that the factors of the information systems success utilized in Turkish logistics organizations (system quality, information quality, system usage, user satisfaction- individual impact, and organizational effect) might strengthen the

hand of managers in leadership practices. However, assessing strategic alignment in a routine and ineffective manner reduced the contribution of information systems success to leadership practices. Gilbert (2020) stated that high-quality organizational investments might improve leadership practices. Particularly during the COVID-19 pandemic, it is typical for digitalization to gain significance and applicability in this field to support leadership practices. According to Kalish and Luria (2021), leadership should be assessed based on the current circumstances.

Business Intelligence Systems with High-Quality Information System Infrastructure are Necessary for a Healthy Organizational Climate: The results of this study revealed that maintaining information systems with high-quality information, integrating those systems with users, and ensuring user satisfaction are critical issues for organizations to operate in a positive mindset. This conclusion concurred with the studies in the literature highlighting the factors affecting the organizational climate (Lugo, 2016; Türkmenoğlu, 2019). In addition, the effect of the COVID-19 pandemic should not be ignored at this point. McKinsey's (2021) report suggested that employees who experienced the pandemic would adopt an independent and flexible working style extensively and prefer to acquire digital skills individually. He added that success on this issue might foster positive thoughts within the organization.

Information System Infrastructure is not Alone Sufficient for Forecasting and Organizational Agility: The information systems used in Turkish logistics organizations do not satisfactorily provide support for forecasting and reacting quickly to changes in their environment. Ridwandono and Subriadi (2019) cited several studies referring to organizational systems that could sufficiently contribute to organizational agility. However, Magoma et al. (2021) and Li et al. (2021) underlined the need for modern technologies in BIS. Therefore, they asserted that the business intelligence support provided by the information systems operating in a traditional setting fails to significantly contribute to forecasting. Thus, the importance of raising awareness regarding AI and data analytics in the transportation and logistics sector is emphasized. In this way, businesses in the sector can be encouraged to develop and implement policies oriented toward contemporary technologies—ranging from the selection of information systems to their use and management within the organization.

This study is important because it indicates that information systems should be considered an organizational value. In addition, this study should be considered a valuable study as it provides logistics organizations with evaluations about the strategic management of information systems. Thus, the following considerations can be made:

The Maturity of Business Intelligence Systems Requires a "Wisely" Approach to Information Systems: This study's findings indicate that approaching information systems as ordinary technical devices will hinder their contribution. In this context, Dalal and Pauleen (2018) stated that practicing information systems would be wise. Therefore, these results proved the significance of the approaches providing technical specification assessments in the background together with the outputs of information systems within the cultural framework and facilitating socio-psychological evaluations of information systems in addition to their daily use (Abubakre et al., 2020).

For the Maturity of Business Intelligence Systems, Information Systems Should Be Adopted as a Strategic "Shared Value" Throughout the Organization: The study findings proved that initiatives such as adopting information systems dynamics throughout the organization, raising awareness in the entire organization about the process and operation of information systems, and ensuring the harmony of senior management and other organization dynamics with information systems further clarified the gains attained from the

factors of the information systems success. Consequently, business and IT managers' efforts to reject the status quo mindset and ensure that other employees pay the necessary attention to the information system infrastructure are essential for the maturity of business intelligence systems. At this point, the experimental applications of information systems, reverse mentoring techniques, and organizational events run by IT managers and departments within the organization are of great significance (Chamakiotis et al., 2021; Doz, 2020; Jain & Ranjan, 2020; Kim et al., 2019; Lehr et al., 2017; Peter & Jarratt, 2015; Ridwandono & Subriadi, 2019; Venkitachalam & Willmott, 2017; Wang et al., 2021).

A Multi-Perspective View is Necessary for the Maturity of Business Intelligence Systems: The study results and further assessments proved that raising the level of information system literacy for organizational management is crucial. Leadership training should include information system literacy and IT management concepts. However, Söllner, Hoffmann, and Leimeister (2016) emphasized the essence of guiding leader-type individuals in the field regarding their affinity for IT and the significance of gaining IT-related experience. Universities are urged to launch graduate and philosophical degree programs in this area, with quotas allocated for the private sector in particular. Furthermore, computer science and technology programs should prioritize individual communication and personal development issues, especially in Management Information Systems departments. Emphasis should be placed on product and service developers for information systems and on improving the artistic aspects of students studying these subjects. Not to be overlooked is the intertwining of art and technology. Stolterman (1999) proposed that information systems could be viewed as an '(art)work.' As a result, generalizing agile software development methodology and making organizations aware of this issue are necessary.

This study offers the following suggestions for future work:

a. This limitation may give an idea that studies similar to this study can be conducted in other sectors. In addition, this study was conducted by applying regression analysis. This is also a limitation. Because regression analysis does not reveal a cause-effect relationship but presents the said effect within the framework of probabilities. This limitation appears to suggest that future studies can be conducted to reveal cause-effect relationships.

b. Interdisciplinary studies can be conducted to enhance the recognition of information systems at both organizational and individual levels, regardless of the sector. Technical issues in the background, especially regarding information system operation, can be conveyed in a language that everyone can understand. The contact that the Management Information Systems department will establish with other relevant departments will be valuable. Joint projects to be carried out in collaboration with international trade and logistics departments and programs will be important.

c. It would be appropriate to add items related to IS infrastructure to leadership education. Focus group studies can be conducted on this subject. In addition, it is suggestive for studies on leadership that having knowledge of IS management issues, from bringing information systems to the organization and functioning within the organization, can be one of the leadership characteristics. Training programs designed for the transportation and logistics sector should address information systems and organizational dynamics as an integrated whole, emphasizing their mutual interaction.

d. Reconsidering the model of information systems success is one of the future suggestions of this study. In the current "IS success model," it is not mentioned that IS provides benefits for topics such as leadership, corporate psychology, and corporate climate. This deficiency indicates that the information system success model can be enriched. Jewer and Compeau (2022) also stated that many factors, including

organizational factors, can make information systems successful or unsuccessful, and reported that studies re-evaluating the indicators that make information systems successful are lacking in the literature.

Limitation of the Study
Limitation of the Study

Ethics Committee Approval
Ethics committee approval was received for this study from the ethics committee of Atatürk University (Date: 28.07.2021, Number: 157).

Informed Consent
Written informed consent was obtained from all participants who participated in this study.

Peer Review
Externally peer-reviewed.

Author Contributions
Conception/Design of Study- İ.Y., U.Y.; Data Acquisition- İ.Y.; Data Analysis/Interpretation- İ.Y., U.Y.; Drafting Manuscript- İ.Y.; Critical Revision of Manuscript- İ.Y., U.Y.; Final Approval and Accountability- İ.Y., U.Y.

Acknowledgment
This study is derived from my doctoral dissertation conducted under the supervision of Prof. Dr. Uğur Yavuz, to whom I express my sincere gratitude for his valuable guidance and support. I also thank Prof. Dr. Şefika Şule Erçetin (Hacettepe University) and Prof. Dr. Fehim Bakirci (Atatürk University) for their kind assistance during the data collection process.

Conflict of Interest
The authors have no conflict of interest to declare.

Grant Support
The authors declared that this study has received no financial support.

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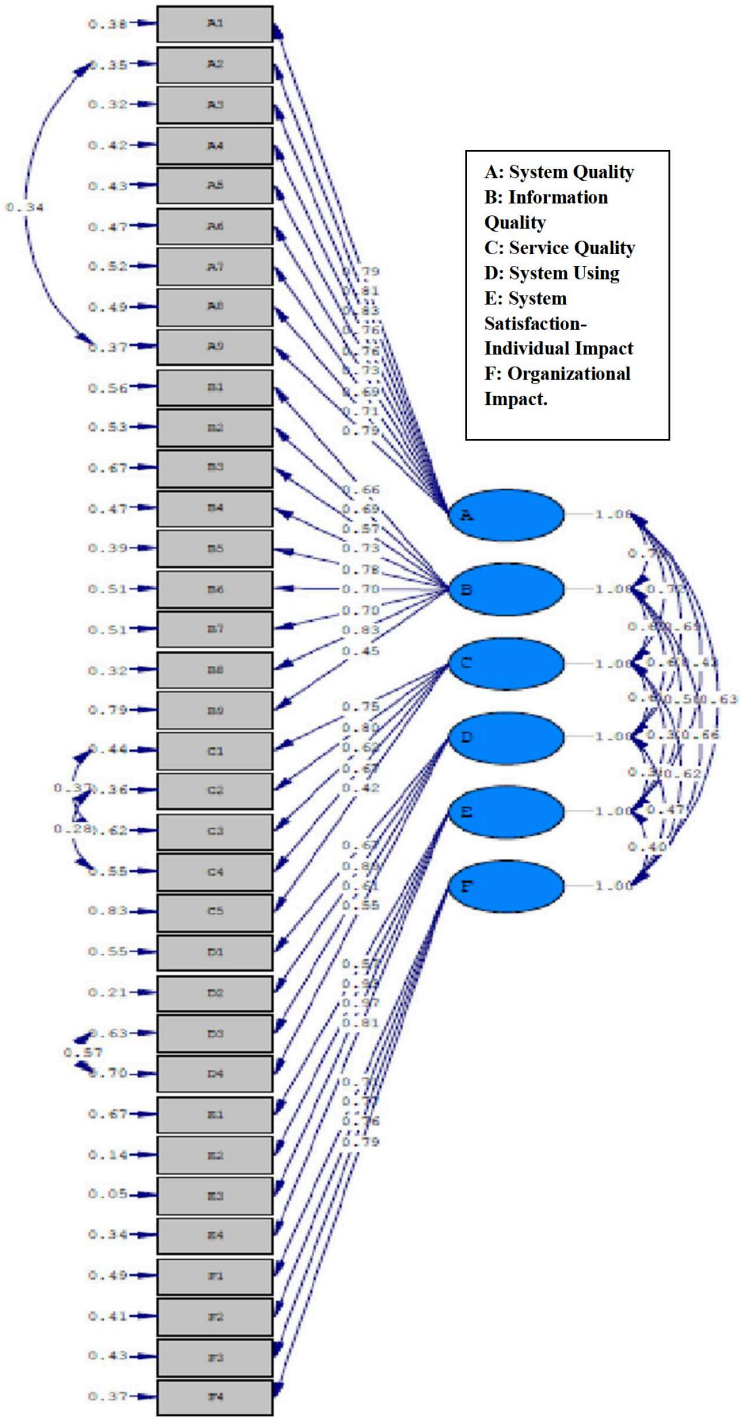
Appendix

Appendix A. CFA (Confirmatory Factor Analysis) Path Diagrams.

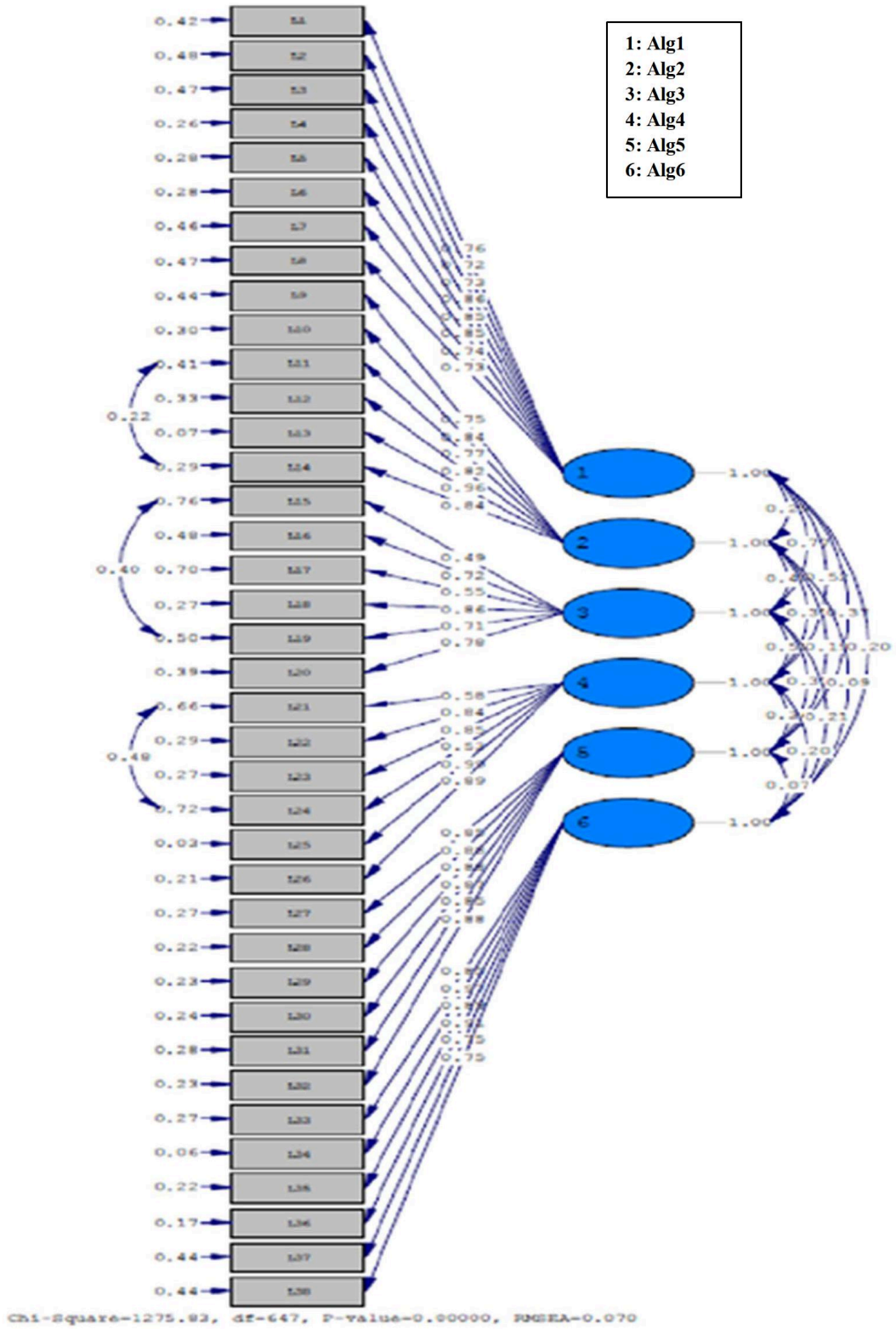
Appendix 1

The Path Diagram for Information Systems Success Scale.



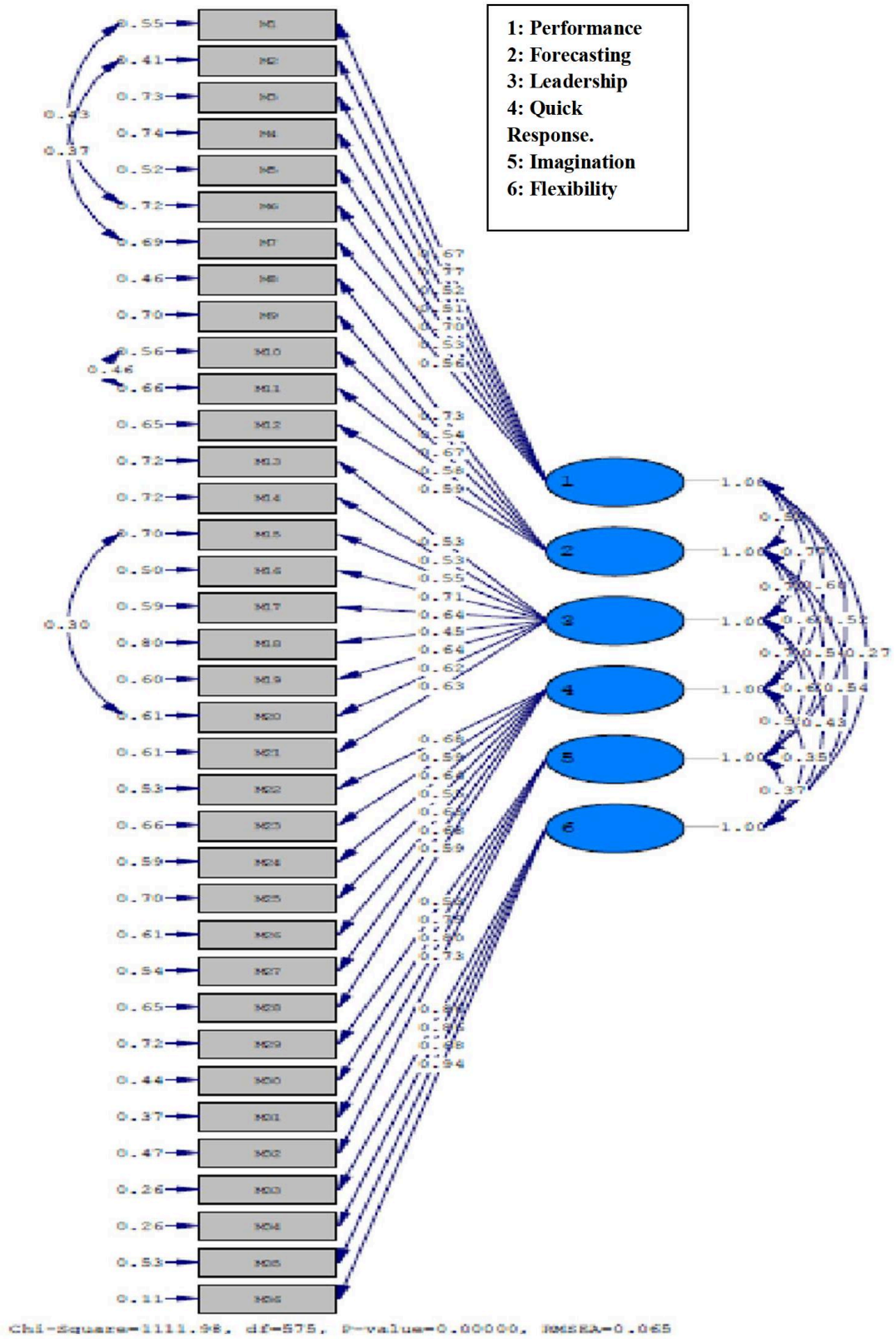
Appendix 2

The Path Diagram for the Strategic Compliance Scale



Appendix 3

The Path Diagram for the Organizational Intelligence Scale



Appendix B. Regression analysis findings on the effect of information systems success on organizational intelligence.

[1: Constant; 2: Age; 3: Gender; 4: Education; 5: Activity Year; 6: Internationalization; 7: Organization Size 8: Logistics Mode, 9: System Quality; 10: Information Quality; 11: Service Quality; 12: System Usage; 13: System Using- Individual Impact; 14: Organizational Impact]

Appendix 4

Regression analysis findings on the effect of information systems success on performance.

Dependent V.	I.V.	B	S.H	β	t	p	F	Model (p)	R	Adjusted R^2
Performance.	1	1,769	0,565		3,13	,002**	2,931	000**	9,315	0,1
	2	0,037	0,053	0,045	0,692	0,489				
	3	−0,169	0,119	−0,089	−1,42	0,157				
	4	−0,122	0,089	−0,081	−1,367	0,172				
	5	0,049	0,041	0,071	1,19	0,235				
	6	−0,154	0,106	−0,092	−1,459	0,145				
	7	0,085	0,075	0,072	1,131	0,259				
	8	0,059	0,071	0,057	0,831	0,407				
	9	−0,053	0,098	−0,037	−0,539	0,509				
	10	0,31	0,099	0,198	3,126	0002**				
	11	0,087	0,078	0,075	1,117	0,265				
	12	−0,116	0,1	−0,108	−1,163	0,246				
	13	0,115	0,119	0,107	0,971	0,332				
	14	0,117	0,085	0,111	1,377	0,169				

**: p<0,01; *: p<0,05.

Appendix 5

Regression analysis findings on the effect of information systems success on forecasting.

Dependent V.	I.V.	B	S.H	β	*t*	p	F	Model (p)	R	Adjusted R^2
Forecasting.	1	2,021	0,391		5,168	0	1,096	0,361	0,199	0,003
	2	0,019	0,037	0,036	0,532	0,595				
	3	−0,013	0,082	−0,01	−0,162	0,872				
	4	−0,009	0,062	−0,009	−0,144	0,885				
	5	−0,041	0,028	−0,088	−1,437	0,152				
	6	0,009	0,073	0,008	0,124	0,901				
	7	−0,002	0,052	−0,002	−0,036	0,971				
	8	−0,025	0,049	−0,037	−0,518	0,605				
	9	0,079	0,068	0,084	1,173	0,242				
	10	−0,04	0,069	−0,038	−0,581	0,562				
	11	−0,016	0,054	−0,021	−0,306	0,76				
	12	0,144	0,069	0,199	2,076	0,039				
	13	−0,014	0,082	−0,02	−0,175	0,862				
	14	−0,113	0,059	−0,16	−1,916	0,056				

**: p<0,01; *: p<0,05.

Appendix 6

Regression analysis findings on the effect of information systems success on leadership.

Dependent V.	I.V.	B	S.H	β	*t*	p	F	Model (p)	R	Adjusted R^2
Leadership	1	0,511	0,494		1,034	0,302	13,668	0,000**	0,582	0,314
	2	0,024	0,046	0,028	0,511	0,61				
	3	−0,036	0,104	−0,019	−0,351	0,726				
	4	0,016	0,078	0,01	0,202	0,84				
	5	−0,042	0,036	−0,061	−1,189	0,235				
	6	−0,081	0,092	−0,047	−0,874	0,383				
	7	−0,041	0,066	−0,034	−0,627	0,531				
	8	−0,022	0,062	−0,021	−0,356	0,722				
	9	0,261	0,086	0,181	3,046	0,002**				
	10	0,268	0,087	0,168	3,097	0,002**				
	11	−0,12	0,068	−0,102	−1,765	0,078				
	12	−0,034	0,087	−0,031	−0,392	0,695				
	13	0,303	0,104	0,274	2,917	0,004**				
	14	0,218	0,074	0,203	2,929	0,004**				

**: p<0,01; *: p<0,05.

Appendix 7

Regression analysis findings on the effect of information systems success on quick response.

Dependent V.	I.V.	B	S.H	β	*t*	p	F	Model (p)	R	Adjusted R^2
Quick R.	1	1,91	0,308		6,202	0,000**	1,238	0,25	0,211	0,009
	2	0,009	0,029	0,021	0,309	0,757				
	3	−0,039	0,065	−0,039	−0,609	0,543				
	4	0,018	0,049	0,023	0,372	0,71				
	5	−0,018	0,022	−0,05	−0,81	0,418				
	6	−0,048	0,058	−0,054	−0,829	0,408				
	7	0,057	0,041	0,092	1,401	0,162				
	8	0,01	0,039	0,019	0,27	0,787				
	9	−0,056	0,053	−0,074	−1,04	0,299				
	10	0,068	0,054	0,082	1,252	0,211				
	11	−0,011	0,042	−0,017	−0,249	0,803				
	12	0,152	0,054	0,267	2,797	0,005**				
	13	−0,085	0,065	−0,149	−1,318	0,188				
	14	−0,006	0,046	−0,01	−0,124	0,901				

**: p<0,01; *: p<0,05.

Appendix 8

Regression analysis findings on the effect of information systems success on imagination.

Dependent V.	I.V.	B	S.H	β	*t*	p	F	Model (p)	R	Adjusted R^2
Imagination	1	0,97	0,679		1,428	0,154	4,921	0,000**	0,395	0,124
	2	0,138	0,064	0,136	2,174	0,030*				
	3	−0,235	0,143	−0,099	−1,644	0,101				
	4	0,211	0,107	0,113	1,971	0,050*				
	5	0,058	0,049	0,068	1,186	0,237				
	6	−0,036	0,127	−0,017	−0,286	0,775				
	7	−0,121	0,09	−0,083	−1,341	0,181				
	8	−0,237	0,085	−0,184	−2,778	0,006*				
	9	0,152	0,118	0,086	1,289	0,198				
	10	0,427	0,119	0,22	3,579	0,000**				
	11	−0,121	0,093	−0,085	−1,3	0,194				
	12	−0,175	0,12	−0,131	−1,454	0,147				
	13	0,3	0,143	0,223	2,102	0,036*				
	14	0,063	0,102	0,048	0,617	0,538				

**: p<0,01; *: p<0,05.

Appendix 9

Regression analysis findings on the effect of information systems success on flexibility.

Dependent V.	I.V.	B	S.H	β	*t*	p	F	Model (p)	R	Adjusted R^2
Flexibility	1	2,653	0,513		5,167	,000**	3,658	0,000**	0,348	0,088
	2	0,029	0,048	0,038	0,601	0,548				
	3	−0,142	0,108	−0,081	−1,316	0,189				
	4	0,004	0,081	0,003	0,047	0,962				
	5	−0,046	0,037	−0,073	−1,234	0,218				
	6	0,082	0,096	0,053	0,855	0,393				
	7	−0,138	0,068	−0,127	−2,015	0,045*				
	8	−0,081	0,064	−0,085	−1,252	0,211				
	9	−0,075	0,089	−0,057	−0,839	0,402				
	10	0,166	0,09	0,116	1,846	0,066				
	11	−0,129	0,07	−0,122	−1,83	0,068				
	12	0,086	0,091	0,087	0,949	0,343				
	13	0,327	0,108	0,328	3,029	0,003**				
	14	−0,12	0,077	−0,124	−1,553	0,121				

**: p<0,01; *: p<0,05.

Appendix C.

Regression analysis findings on the effect of IT-strategic alignment on organizational intelligence.

[1: Constant; 2: Age; 3: Gender; 4: Education; 5: Activity Year; 6: Internationalization; 7: Organization Size 8: Logistics Mode].

Appendix 10

Regression analysis findings on the effect of IT-strategic alignment on performance.

Dependent V.	I.V.	B	S.H	β	*t*	p	F	Model (p)	R	Adjusted R^2
Performance	1	1,827	0,501		3,646	,000**	5,775	0,000**	0,422	0,147
	2	−0,049	0,05	−0,06	−0,98	0,328				
	3	−0,131	0,116	−0,069	−1,137	0,256				
	4	−0,125	0,085	−0,083	−1,476	0,141				
	5	0,044	0,039	0,064	1,126	0,261				
	6	−0,131	0,101	−0,079	−1,301	0,194				
	7	0,109	0,073	0,092	1,501	0,134				
	8	0,108	0,068	0,104	1,597	0,111				
	Alg1	0,115	0,072	0,086	1,595	0,112				
	Alg2	−0,08	0,079	−0,079	−1,012	0,312				
	Alg3	0,057	0,136	0,038	0,421	0,674				
	Alg4	0,358	0,068	0,345	5,273	0,000**				
	Alg5	0,219	0,076	0,176	2,895	0,004**				
	Alg6	−0,159	0,078	−0,126	−2,039	0,042*				

**: p<0,01; *: p<0,05.

Appendix 11

Regression analysis findings on the effect of IT-strategic alignment on forecasting.

Dependent V.	I.V.	B	S.H	β	t	p	F	Model (p)	R	Adjusted R^2
Forecasting.	1	1,195	0,339		3,528	,000**	5,254	0,000**	0,406	0,133
	2	0,012	0,034	0,022	0,363	0,717				
	3	−0,053	0,078	−0,041	−0,677	0,499				
	4	0,019	0,057	0,019	0,34	0,734				
	5	−0,031	0,026	−0,067	−1,166	0,245				
	6	0,038	0,068	0,034	0,561	0,575				
	7	−0,012	0,049	−0,015	−0,248	0,804				
	8	−0,027	0,046	−0,039	−0,599	0,55				
	Alg1	0,057	0,049	0,063	1,171	0,242				
	Alg2	−0,159	0,053	−0,233	−2,982	0,003**				
	Alg3	0,184	0,092	0,181	1,991	0,047*				
	Alg4	0,017	0,046	0,024	0,371	0,711				
	Alg5	−0,01	0,051	−0,012	−0,196	0,845				
	Alg6	0,291	0,053	0,345	5,534	0,000**				

**: p<0,01; *: p<0,05.

Appendix 12

Regression analysis findings on the effect of IT-strategic alignment on leadership.

Dependent V.	I.V.	B	S.H	β	*t*	p	F	Model (p)	R	Adjusted R^2
Leadership	1	0,778	0,423		1,841	0,067	20,837	,000**	0,663	0,418
	2	−0,083	0,042	−0,099	−1,966	0,050*				
	3	0,112	0,097	0,058	1,153	0,25				
	4	−0,009	0,071	−0,006	−0,125	0,9				
	5	−0,012	0,033	−0,018	−0,375	0,708				
	6	−0,043	0,085	−0,025	−0,503	0,616				
	7	0,009	0,061	0,007	0,142	0,887				
	8	0,061	0,057	0,058	1,068	0,286				
	Alg1	0,286	0,061	0,209	4,702	0,000**				
	Alg2	0,5	0,067	0,48	7,497	0,000**				
	Alg3	0,069	0,115	0,045	0,602	0,548				
	Alg4	0,204	0,057	0,193	3,567	0,000**				
	Alg5	0,151	0,064	0,119	2,365	0,019*				
	Alg6	−0,377	0,066	−0,293	−5,739	0,000**				

**: p<0,01; *: p<0,05.

Appendix 13

Regression analysis findings on the effect of IT-strategic alignment on imagination.

Dependent V.	I.V.	B	S.H	β	*t*	p	F	Model (p)	R	Adjusted R^2
Quick R.	1	1,487	0,272		5,471	0,000**	4,247	0,000**	0,371	0,105
	2	−0,004	0,027	−0,008	−0,133	0,895				
	3	−0,06	0,063	−0,06	−0,963	0,336				
	4	0,03	0,046	0,038	0,651	0,516				
	5	−0,018	0,021	−0,049	−0,834	0,405				
	6	−0,024	0,055	−0,027	−0,431	0,667				
	7	0,041	0,039	0,065	1,035	0,302				
	8	0,018	0,037	0,032	0,479	0,632				
	Alg1	0,095	0,039	0,133	2,42	0,016*				
	Alg2	−0,1	0,043	−0,185	−2,331	0,020*				
	Alg3	0,133	0,074	0,166	1,796	0,073				
	Alg4	−0,004	0,037	−0,007	−0,104	0,917				
	Alg5	−0,044	0,041	−0,067	−1,073	0,284				
	Alg6	0,194	0,042	0,291	4,589	0,000**				

**: p<0,01; *: p<0,05.

Appendix 14

Regression analysis findings on the effect of IT-strategic alignment on imagination.

Dependent V.	I.V.	B	S.H	β	*t*	p	F	Model (p)	R	Adjusted R^2
Imagination	1	1,465	0,51		2,873	0,004**	21,684	0,000**	0,670	0,428
	2	0,061	0,051	0,06	1,189	0,235				
	3	−0,106	0,118	−0,045	−0,903	0,367				
	4	0,107	0,086	0,057	1,237	0,217				
	5	0,089	0,04	0,105	2,253	0,025*				
	6	−0,091	0,103	−0,044	−0,889	0,374				
	7	0,005	0,074	0,003	0,064	0,949				
	8	−0,123	0,069	−0,096	−1,789	0,074				
	Alg1	0,02	0,073	0,012	0,274	0,784				
	Alg2	0,801	0,08	0,632	9,958	0,000**				
	Alg3	0,015	0,139	0,008	0,11	0,912				
	Alg4	0,274	0,069	0,213	3,976	0,000**				
	Alg5	−0,303	0,077	−0,196	−3,945	0,000**				
	Alg6	−0,375	0,079	−0,24	−4,735	0,000**				

**: p<0,01; *: p<0,05.

Appendix 15

Regression analysis findings on the effect of IT-strategic alignment on flexibility.

Dependent V.	I.V.	B	S.H	β	t	p	F	Model (p)	R	Adjusted R^2
Flexibility	1	1,476	0,444		3,324	0,001**	8,298	0,000**	0,488	0,209
	2	0,001	0,044	0,001	0,019	0,985				
	3	−0,073	0,102	−0,042	−0,718	0,473				
	4	0,027	0,075	0,019	0,356	0,722				
	5	−0,023	0,034	−0,036	−0,664	0,507				
	6	0,058	0,089	0,038	0,648	0,518				
	7	−0,086	0,064	−0,079	−1,33	0,184				
	8	−0,046	0,06	−0,049	−0,777	0,438				
	Alg1	0,145	0,064	0,117	2,267	0,024*				
	Alg2	0,299	0,07	0,319	4,271	0,00**				
	Alg3	−0,171	0,121	−0,122	−1,414	0,158				
	Alg4	0,09	0,06	0,095	1,503	0,134				
	Alg5	0,127	0,067	0,111	1,904	0,058				
	Alg6	0,14	0,069	0,12	2,022	0,044*				

**: p<0,01; *: p<0,05

Appendix D.

Statistically significant findings of moderator variability multiple regression analysis. [SysUse: System Using, UserSat-IndImpact: User Satisfaction-Individual Impact, OrgImp: Organizational Impact].

Appendix 16

	Variables	Model 1 (β)	Model 2 (β)	Model 3 (β)
1. Step	Age	0,045		0,008
	Gender	-0,089	-0,011	0,002
	Education	-0,081	-0,077	-0,084
	Organization age	0,071	-0,074	-0,051
	Internationalization	-0,092	0,082	0,071
	Organization size	0,072	-0,102	-0,125*
	Logistics mode	0,057	0,106	0,072
	System Q.	-0,037	0,085	0,055
	Info. Q.	**0,198****	0-,058	-0,021
	Service Q.	0,075	**0, 169****	**0,190****
	System Using	-0,108	0,083	0,035
	UserSat.-IndImpact	0,107	-0,047	-0,149
	Organizational Impact	0,111	0,039	0,136
			0,059	0,07
2. Step	Alg4 (Moderator)		**0,307****	**0,261****
3. Step	System Q.*SU4			-0,104
	Information Q*SU4			0,132**
	Service Q.*SU4			0,154*
	SysUse*SU4			0,121
	UserSat-IndIm*SU4			-0,136
	OrgImp*SU4			-0,045
	R2	0,099	0,182	0,214
	Adjusted R2	0,065	0,149	0,167
	ΔR	0,099**	0,083**	0,032*
	F	2,931**	5,478 **	4,610**

**: p<0,01; *: p<0,05

Table D.2. Statistically significant findings of moderator variability multiple regression analysis applied for the leadership variable.

Appendix 17

(a). Findings for the moderator variable Alg2.

	Variables	Model 1 (β)	Model 2 (β)	Model 3 (β)
1. Step	Age	0,028	−0,017	−0,011
	Gender	−0,019	0,007	0,017
	Education	0,01	−0,026	−0,029
	Organization age	−0,061	−0,021	−0,016
	Internationalization	−0,047	−0,064	−0,056
	Organization size	−0,034	0,029	0,022
	Logistics mode	−0,021	0,031	0,038
	System Q.	**0,181****	**0,149****	**0,121***
	Info. Q.	0,168**	0,049	0,039
	Service Q.	−0,102	−0,078	−0,113*
	System Using	−0,031	−0,01	0,041
	UserSat.-IndImpact	0,274**	0,201*	0,307**
	Organizational Impact	0,203**	0,175**	0,03
2. Step	Alg2(Moderator)		**0,423****	**0,412****
3. Step	System Q.*SU2			−0,109*
	Information Q*SU2			0,058
	Service Q.*SU2			0,039
	SysUse*SU2			−0,048
	UserSat-IndIm*SU2			−0,290**
	OrgImp*SU2			0,270**
	R2	0,339	0,478	0,514
	Adjusted R2	0,314	0,457	0,486
	ΔR	0,339**	0,139**	0,036**
	F	13,668**	22,610**	17,943**

**: p<0,01; *: p<0,05.

Appendix 18

Findings for the moderator variable Alg4.

	Variables	Model 1 (β)	Model 2 (β)	Model 3 (β)
1. Step	Age	0,028	−0,027	−0,035
	Gender	−0,019	−0,007	−0,009
	Education	0,01	0,018	0,019
	Organization age	−0,061	−0,05	−0,024
	Internationalization	−0,047	−0,057	−0,057
	Organization size	−0,034	0	−0,005
	Logistics mode	−0,021	0,008	−0,006
	System Q.	**0,181****	**0,161****	**0,157****
	Info. Q.	0,168**	0,139**	0,160**
	Service Q.	−0,102	−0,094	−0,106
	System Using	−0,031	0,029	0,051
	UserSat.-IndImpact	0,274**	0,207*	0,228*
	Organizational Impact	0,203**	0,150*	0,103
2. Step	Alg4(Moderator)		**0,306****	**0,298****
3. Step	System Q.*SU4			**0,149****
	Information Q*SU4			−0,013
	Service Q.*SU4			0,023
	SysUse*SU4			−0,089
	UserSat-IndIm*SU4			−0,042
	OrgImp*SU4			−0,01
	R2	0,339	0,421	0,446
	Adjusted R2	0,314	0,398	0,413
	ΔR	0,339**	0,082**	0,025*
	F	13,668**	17,954**	13,646**

**: p<0,01; *: p<0,05.