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A Research On Digital Transformation Awareness: An Examination of Enterprises Operating in BIST 100

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Abstract Because of rapid changes in technology, the rules of competition are changing; thus, paradigm shifts are occurring, and global competitive players are undergoing rapid change. The digital transformation phenomenon is seen as a transformation movement and a revolutionary process. Digital transformation is one of the most fundamental elements that reveal the existence of paradigm shifts and new platforms. In this context, digital transformation is seen as an application applied by those who want to become global players or participate in global competitions. The study was conducted on the BIST 100 enterprises, which pioneered the vision of the Turkish economy. The annual reports of Borsa Istanbul 100 companies between 2018 and 2022 constitute the sample of the study. This study was conducted to measure the digital transformation awareness of the BIST 100 enterprises. The method of the study is content analysis technique, one of the qualitative analysis method, on the annual reports of the BIST 100 enterprises between 2018 and 2022. The analysis of the study was carried out in the Maxqda24 program. The tendency of the BIST 100 enterprises towards digital transformation has increased between 2018 and 2022.

Keywords Digital Transformation · BIST 100 enterprises · Strategic Management · Competition · Content Analysis.

Jel Codes M1, M15, M19

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A Research On Digital Transformation Awareness: An Examination of Enterprises Operating in BIST 100

With the implementation of digital transformation, all sectors and many disciplines around the world are experiencing radical change (McAffe & Brynnjolfsson, 2017). With digital transformation, businesses gain the ability to act independently from time and space by utilising smart applications, systems, products, and factories (Shamim et al., 2016; Zawadzki & Żywicki, 2016). With this gain, businesses gain new value and opportunities to be at the forefront of the competitive race (Westerman et al., 2015). The phenomenon of digital transformation overturns all the rules of the game with paradigm shifts, and businesses are thus forced to compete in unfamiliar areas (Lu, 2017; Götz & Jankowska, 2017). As a matter of fact, it is not possible for businesses that cannot keep up with paradigmatic change to survive (Calp & Doğan, 2019). Therefore, it is necessary to incorporate digital transformation opportunities into businesses (Gruia et al., 2020).

Because of the literature review, the lack of distinction between digitalisation/digital technology/digital transformation phenomena has drawn attention. In addition to conceptual disagreements, digital transformation is not fully understood. Because of scientific research, different perspectives on digital transformation emerge. While one part views the digital transformation phenomenon as a transformation and revolutionary dimension, the other part expresses it as a new ERP study. This study aims to analyse semantic confusion and measure the awareness of digital transformation through the annual reports of 100 Borsa Istanbul companies operating in Turkey. Borsa 100 enterprises shed light on the vision of Turkey's economy. In other words, Turkey's leading businesses are listed among the BIST 100 and are among the businesses that use high levels of technology. Therefore, this research is initiated with the question of what is the awareness of the digital transformation phenomenon in Turkey. First, concepts/codings were revealed through a literature review. Then, activity reports from the last 5 years are compiled. The method of the research is qualitative research method. The study was conducted using content analysis and findings are obtained using Maxqda24 programme.

Conceptual Framework

In the literature on digital transformation and digitalisation, definitions are often used interchangeably and cause confusion of meaning. When digital transformation is expressed, digital technology and digitalisation have the same meaning and are described as similar concepts. However, the concepts of digitalisation and digital transformation have different meanings. Digitalisation is the automation of processes using information technology tools (Horvath and Szabo, 2019; Ismail et al., 2017). Digital transformation is defined as the use of digital technologies and data to create new and more revenue, improve business positively, and change or transform business processes (Verina & Titko, 2019). Digitalisation essentially means taking analogue information and encoding it into zeros and ones so that computers can store, process and transmit such information (Lozic, 2019). Digital transformations are more advanced than digitalisation and are categorised at the next level associated with the term 'digitisation'. It is well known that digital transformation is not a new concept, but it has its roots in digitalisation (Henriette et al., 2015). Digital transformation, like digitalisation, has its roots in analogue and digital variants but is expressed as a more comprehensive transformation than digitalisation (Veldhoven & Vanthienen, 2022). Digital transformation is the digitalisation of all work within a business, the interconnectedness of all departments and the creation of value for customers by offering new products. (McGrath & Maiye, 2010; Vial, 2019).

There is no common approach to the question of what digital transformation is. Although some researchers consider digital transformation as a radical and evolutionary process that is necessary, another side is accepted as a new ERP study (Wang et al., 2016; Morakanyane et al., 2017). In general terms, digital transformation makes human, machine, and technology components dynamic and continuous by creating new opportunities and values in both technical and social fields using digital technologies (Teichert, 2019). Digital transformation changes expectations and the usual situation in economic life thanks to digital technologies. It focuses on data rather than physical products in the economy and creates new business models, new working conditions, and new employee status (Schwab, 2020). The industrial world is becoming digitalised and digital transformation is becoming necessary to meet the needs and expectations of people rather than being a technological opportunity (Kraus et al., 2022). To examine the definitions of digital transformation in the literature;

Table 1

Digital Transformation of Definitions

Authors	Digital Transformation of Definitions
Liu et al. 2011	Digital technologies affect enterprises' business execution processes.
Westerman et al., 2011	In digital transformation, businesses increase business efficiency and effectiveness by using the latest technology.
PWC, 2013	To achieve positive improvements in society and the economy by using new and modern technologies.
Piccinini et al., 2015	It is characterised by the use of new digital technologies to deliver business improvements. All economic sectors form a common network.
Bondar et al., 2017	Technological inventions that obtain data with human-machine interaction, establish connections with machine-device sensor applications, and provide associations over virtual networks
Hoffman and Rüsch, 2017	Using digital technologies allows integration across geographical borders by creating changes in the functions of products.
Sebastian, et al. 2017	Thanks to digital transformation, it is defined as the steps taken to progress faster, moving towards better and becoming more efficient.
Klein, 2019	The application of new technologies involves creating a network of all value-adding actors.
Schallmo et al. (2019)	This process aims to improve an asset by triggering significant changes through combinations of information, communication, and connectivity technologies.
Vial, 2019	Digital transformation is to become more efficient with the automation of all processes and to become interconnected with the digitalisation of all jobs.
Rof et al. (2020)	Creating value by using digital technologies.

Digital technologies affect daily work, ways of working, communication and consumer behaviour (Aral et al., 2013). Digital technologies do even more and meet personalised needs by connecting the virtual world with the real world. As a result, businesses experience the differentiation of rapidly changing demands (Henfridsson et al. 2014; Piccinini et al., 2015). New opportunities and values arise for businesses, society, and the economy following digital transformation. Thus, more innovative and modern technological advances have been achieved (Sanders et al., 2016). Businesses that benefit from the opportunities offered by digitalisation make great gains in determining the reasons for their existence and the place they dream of in the future (Shamim et al., 2016). Digital transformations easily reach the opportunities that businesses desire by offering opportunities to be faster, more efficient, and more effective (Lezzi et al., 2018).

Digital transformation has positive effects on businesses. These are; digital profitability, revenue increase, customer satisfaction, increased efficiency, convenience, faster speed, and the same high-quality technical standard, increased business agility, increased employee productivity, and a competitive advantage (Ezeokoli et al. 2016). Digital transformation creates new attitudes in leadership understanding, cultural situations, and ways of thinking about enterprises. With new technology, new working methods emerge, and the necessity of change is emphasised with the willingness to accept continuous change (Kane et al., 2015). According to the information obtained because of the research, businesses make progress at the point of working with higher performance and efficiency after implementing digital transformation (Mubarek et al., 2019). Businesses that implement digital transformation adapt to change faster, meet customer expectations more appropriately, and are better positioned to compete (Zaki, 2019). In order to survive and grow in the digital world, it is crucial for businesses to adopt and implement digital transformation (Joel et al., 2024). Digital transformation enables challenges between technology and management, new managerial problems and new tools that change the way in which businesses operate (Bresciani et al., 2018). Thanks to digital transformation, businesses gain new value by getting the chance to cooperate with customers and suppliers (Aithal, 2023). Digital transformation applications achieve innovative products and services by using Industry 4.0 technologies (Chandrasekaran et al., 2019). Digital transformation facilitates professionalisation and provides more guarantees through fully or partially automated processes; it also offers opportunities for greater business intelligence and customer-centric approaches (Rof et al., 2020). Digital transformation enables businesses to experience radical and disruptive developments in their operations (Demirel et al., 2018; Hoffman & Rüsch, 2017).

Research Method

The importance, purpose, sample, and method of the research are analysed under this heading.

Purpose of the Research

This study was carried out in order to evaluate the digital transformation phenomenon, which has caused significant transformations on a global scale, at the scale of Turkey. This study investigates the digital transformation phenomenon through the annual reports of 100 companies operating in Borsa, Istanbul.

Sample of the Study

The annual reports of the BIST 100 enterprises, which shape the future of the Turkish economy and endeavour to create a vision, constitute the sample of the study. The annual reports provide information about the vision to be carried out by the enterprises. BIST enterprises with complete annual reports for the last 5 years (2018-2019-2020-2021-2022) constitute the sample.

Method of the Research

The research was conducted using the qualitative research method. The content analysis method technique was used among qualitative research methods. The research starts with the formation of codings after a literature review of digital transformation. The five-year (2018-2022) annual reports of the BIST 100 enterprises were analysed through the 30 codings obtained. The literature support for the codings obtained because of the literature review is presented below:

With the emergence ofIndustry 4.0 application and smart factory concepts bring about radical transformations in the functioning of industries and are used together with digital transformation concepts (Dal

Mas et al., 2022). Digital transformation occurs with the use of information and communication technologies by creating new capabilities thanks todigital technologies (Kraus et al., 2021). Digital transformation is also referred to as the latest, disruptive, advanced, high, and modern technology in the literature (Rojko, 2017; Mubarek et al., 2019; Schwab, 2020). Digital transformation occurs with the integration of digital technologies such acloud computing, big data analytics, artificial intelligence, cyber security, simulation, horizontal-vertical integration, cyber physical systems, three-dimensional printers, augmented reality, and the Internet of things (Ivančić et al., 2019; Kotler et al., 2019). Digital transformation is a process in which new processes emerge with the power of advanced technologies, and innovations are characterised by smart systems and smart businesses (OECD, 2018). Thanks robotic processes, work within an organisation becomes faster and more efficient and is seen as the paradigm of digital transformation (Frank et al., 2019). With the advent of the Internet of Things, machine-device-sensor interaction occurs and human-machine interaction and human-robot interaction emerge (Lu, 2017). Virtualisation is seen as an important output of digitalisation and is included as the last coding (Görçün, 2017).

Table 2 presents a tabular representation of the literature support of thirty codings is presented:

Table 2

Codings and literature Support

Encodings	Literatur Support	Encodings	Literatur Support
Smart Apps	(Shamim et al., 2016)	**Virtual Reality**	(Tiwari and Khan, 2020)
Digital Technology	(Brynjolfsson and McAfee, 2015)	**Augmented Reality**	(Ivančić et al., 2019)
Cloud	(Frank et al., 2019)	**Three-dimensional Printers**	(Machado,2020)
Robot	(Tiwari and Khan, 2020)	**Big Data**	(McAfee and Brynjolfsson, 2018)
Robotic Processes	(Pereira and Romero, 2017)	**Industry 4.0 Application**	(Rojko,2017; Dal Mas et al., 2022)
Cyber Security	(Kagerman et al., 2013)	**Artificial Intelligence**	(Davenport, 2018)
Modern Technology	(Schwab, 2020)	**Digital Transformation**	(Westerman et al., 2015)
Latest Technology	(Schwab, 2020)	**Digitalisation**	(Verina and Titko, 2019)
Simulation	(Roblek et al., 2016)	**Virtualisation**	(Görçün, 2017)
Cyberphysical Systems	(Saldivar et al., 2015)	**Intelligent Systems**	(Sanders et al, 2016)
Internet of Things	(Lu, 2017)	**Smart production applications**	(Lin et., 2018)
Human Robot Communication	(Lee and Lee, 2015)	**Smart Factory**	(Dal Mas et al., 2022)
Human-Machine Interaction	(Schwab and Davis, 2019)	**Smart Business**	(Shamim et al.,2016)
Disruptive Technology	(Schwab, 2020)	**Advanced Technology**	(Tiwari and Khan, 2020)
High Technology	(Mubarek et al., 2019)	**Reality**	(Ivančić et al., 2019)
Advanced Technology	(Mubarek et al., 2019)	**Virtual Reality**	(Machado,2020)

Findings and Discussion

The research analysed 30 codings on digital transformation in the 2018-2019-2020-2021-2022 annual reports of the BIST 100 companies. While analysing the study, Maxqda24 Analytics Pro programme was used. The findings of the analysis are presented below. The findings of the 2018 annual report content analysis are presented in Table 3:

Table 3

Content Analysis in Annual Reports (Year2018)

	Frequency	Percentage
Digital Transformation	252	15,50
Digitalisation	238	14,64
Robotics Applications	146	8,98
Industry 4.0 Application	129	7,93
Smart Apps	118	7,26
Cyber Security	103	6,33
Cloud Computing	78	4,80
Artificial Intelligence	76	4,67
Simulation	56	3,44
High Technology	55	3,38

Table 3 presents the 10 most frequently emphasised codings in the 2018 content analysis. According to the table, the most frequently repeated codes were digital transformation (252), digitalisation (238), and robotic applications (146). When the 2018 annual reports are analysed, it is concluded that Industry 4.0 applications and smart applications are the second most frequently repeated codings. Cybersecurity, artificial intelligence, and cloud computing coding are also frequently emphasised in the annual reports of the BIST 100 companies. The findings of the 2019 annual report content analysis are presented in Table 4:

Table 4

Content Analysis in Annual Reports (Year 2019)

	Frequency	Percentage
Smart Apps	278	16
Digitalisation	259	14,9
Digital Transformation	258	14,84
Robotics Applications	173	9,95
Cyber Security	142	8,17
Artificial Intelligence	91	5,24
Industry 4.0 Application	66	3,8
Simulation	60	3,45
Advanced Technology	57	3,28
Virtualisation	49	2,82

Table 4 presents the most frequently emphasised codings in the content analysis of the BIST 100 enterprises in 2019. *Smart applications* (278) are the most emphasised coding. This was followed by *digitalisation* (259). In the third place is *digital transformation* (258). *Robotic applications* (173), *cyber security* (142), *simulation* (60), and *artificial intelligence* (91) codings are emphasised more frequently than in 2018, and their awareness is increasing further. Unlike 2018, *advanced technology (57)* and *virtualisation (49)* codings were emphasised more frequently. The findings of the content analysis of the 2020 annual reports are presented in Table 5:

Table 5

Content Analysis in Annual Reports (Year 2020)

	Frequency	Percentage
Smart Apps	531	19,8
Digitalisation	458	17,08
Digital Transformation	365	13,61
Cyber Security	240	8,95
Robot Applications	230	8,58
Cloud Computing	145	5,41
Artificial Intelligence	100	3,73
Big Data	91	3,39
Industry 4.0 Application	89	3,32
Simulation	63	2,35

In Table 5, the coding with the highest increase was *smart applications* (531). This is a significant increase compared to the other two years. It was followed by *digitalisation* (458) and digital transformation (365). The most important feature that draws attention is that the frequencies of the first ten codings in the table are on the rise and the momentum of *artificial intelligence, cybersecuritysecurity and robotic applications* is on the rise. Another noteworthy point is that *big data (91)* coding was included for the first time. When we look at the 2020 annual reports of the BIST 100 enterprises, it is understood from both the number of frequencies and the percentage rates that there has been an increase in the total number of frequencies. The findings obtained because of the content analysis of 2021 annual reports are presented in Table 6:

Table 6

Content Analysis in Annual Reports (Year 2021)

	Frequency	Percentage
Digitalization	608	21,41
Digital Transformation	459	16,16
Artificial Intelligence	287	10,11
Robot Applications	282	9,93
Augmented Reality	230	8,1
Cyber Security	222	7,82
Cloud Computing	144	5,07
Advanced Technology	79	2,78
Big Data	73	2,57
Industry 4.0 Application	67	2,36

Table 6 presents the results of the content analysis of the annual reports of the BIST 100 companies for 2021. The most emphasised codings are shown in the table. *Digitalisation* ranks first with 608 codings. *Virtual reality* coding (230), which was not encountered in 2018-2019 and 2020, was encountered for the first time in this year. The frequencies of*digital transformation, artificial intelligence, robotic applications, and cybersecurity* coding are on the rise. The findings of the 2022 annual report content analysis are presented in Table 7:

Table 7

Content Analysis in Annual Reports (Year 2022)

	Frequency	Percentage
Digitalisation	834	22,5
Smart Apps	557	15,03
Digital Transformation	460	12,41
Artificial Intelligence	302	8,15
Robotics Applications	272	7,34
Cyber Security	256	6,91
Virtualisation	225	6,07
Cloud Computing	177	4,78
Simulation	101	2,73
Digital Technology	80	2,16
High Technology	60	1,62

Table 7 presents the results of the content analysis of the annual reports of the BIST 100 companies for 2022. Because of the content analysis, the most emphasised coding terms are given in the table. The most emphasised coding was digitalisation coding with 834. Smart application coding ranks second. Because of the 2022 content analysis, digital technology coding was found to be among the most emphasised codings.

The content analysis findings of the annual reports for 2018-2019-2020-2021-2022 are presented. Because of these findings, it was deemed appropriate to make a comparison based on the total frequency. The question of whether there has been an increase in the total frequency of the BIST 100 enterprises from 2018 to 2022 is answered. In Figure 1, the total frequency of five years is evaluated:

Figure 1

Comparison Between Years

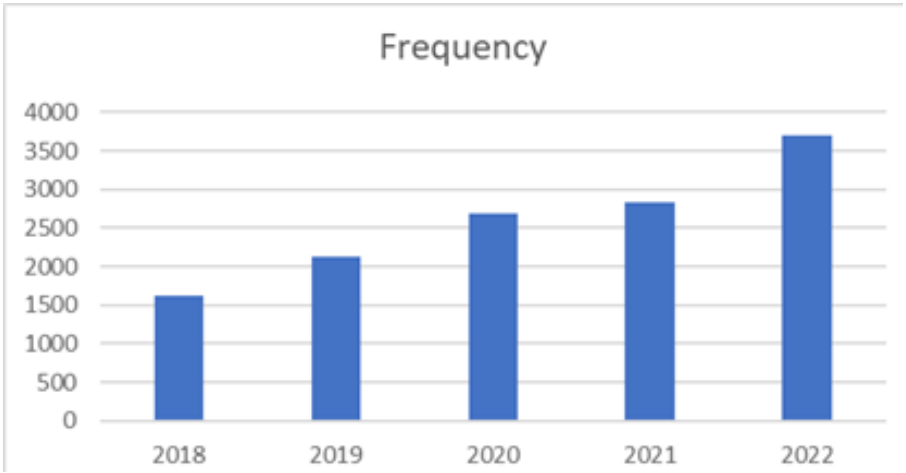
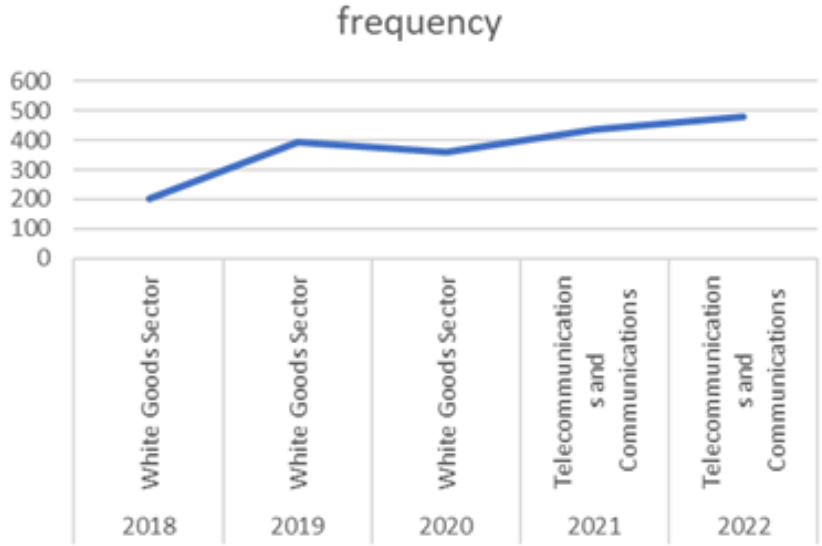


Figure 1 shows how often digital transformation codings are expressed in total in BIST 100 enterprises. In 2018, the total frequency of digital transformation codings of BIST 100 enterprises is 1626. In 2019, the total frequency of digital transformation codings of BIST 100 enterprises is 2130. In 2020, the total frequency of digital transformation coding of BIST 100 enterprises is 2682, in 2021, the frequency value of digital transformation coding of BIST 100 enterprises is 2840, and in 2022, the total frequency value of digital

transformation coding of BIST 100 enterprises is 3706. From 2018 to 2022, there is a vertical increase in total frequency.The frequency distribution of BIST 100 enterprises on digital transformation and digitalisation on sectoral basis between 2018-2022 is shown in Figure 2:

Figure 2

Sectors with the Most İntensive Coding



In Figure 2, an analysis was made on how often digital transformation codings were expressed in the 2018 annual reports of the BIST 100 enterprises. According to the result of this analysis, it was concluded that the sector in which digital transformation codings were expressed the most was the white goods sector. This is because it has the highest frequency value of 204 . An analysis was made to determine how often digital transformation codings were expressed in the 2019 annual reports of BIST 100 enterprises. According to the result of this analysis, enterprises in the white goods sector were the most common, and the frequency value for 2019 was determined as 392. There was a significant increase in the frequency value compared to the previous year. An analysis was made to determine how often digital transformation codings were expressed in the 2020 annual reports of BIST 100 enterprises. According to the result of this analysis, enterprises in the white goods sector were the most common, and the frequency value for 2020 was determined as 362. An analysis was made to determine how often digital transformation codifications were mentioned in the annual reports of the BIST 100 enterprises in 2021. According to the result of this analysis, enterprises in the telecommunications and communication sector were the most common, and the frequency value was determined as 435. An analysis was made to determine how often digital transformation codings were mentioned in the annual reports of the BIST 100 enterprises in 2022. According to the result of this analysis, enterprises in the telecommunications and communication sector were the most common, and the frequency value was determined as 477.

Conclusıons and Recommendations

In the Third Wave, he discusses the revolutionary changes that societies have undergone: agricultural, industrial, and information societies. He states that there is a transition from agricultural society to industrial society and from industrial society to information society. In an information society, with increasingly strong information, the idea that more data provides more return is emphasised. The acceleration of tech-

nology and communication, which are among the important achievements of the last period, the increase in the amount of information and the possibility of producing value with more information have gained momentum with digital transformation applications. With the emergence of Industry 4.0 technologies—one of the important applications of the last period—the phenomenon of digital transformation emerges. Digital transformation contributes to enterprises' survival, competitiveness, and efficient activities. Rogers (2017) stated in his study that the rules of the game have changed in the competition race and that the way to keep up with this change is through digital transformation. Using digital transformation inventions in business activities is an essential strategy that provides many advantages when applied. Digital transformation awareness was measured by the BIST 100 enterprises that contribute to Turkey's economy and business vision. This study analyzes the five-year annual reports of the BIST 100 companies between 2018 and 2022.

Because of the findings obtained, one of the important outputs that attracted attention in 2018 is the information that there are studies on the digital transformation phenomenon in Turkey. Smart applications, Industry 4.0 applications, cyber security, cloud computing, and artificial intelligence coding are frequently expressed. Another output obtained in 2018 is its evaluation as a high technology. Because of the 2019 content analysis, coding for cyber security, simulation, artificial intelligence, and robotic applications codings are emphasised more frequently than in 2018. At the same time, advanced technology coding has emerged through virtualisation in 2019. Because of the 2020 content analysis, smart applications coding received the highest frequency, and big data coding received a high frequency for the first time as a result of this analysis. The most frequently emphasised codings are considered to be those with more awareness. Because of 2021 content analysis, digitalisation coding has the highest frequency percentage. Digital transformation and artificial intelligence coding are also frequently emphasised. Finally, when the content analysis results of 2022 are examined, the coding of digitalisation is the most emphasised. In this year, digital technology is being intensively emphasised for the first time. When the results of the analysis are evaluated from a general perspective, the coding of digitalisation is expressed intensively within five years. Subsequently, digital transformation coding is among the most frequently emphasised types of coding.

Considering the awareness of digital transformation, artificial intelligence, robotic coding, and cybersecurity technological inventions are intensely expressed. In this case, it is possible to highlight the awareness of the digital transformation phenomenon in Turkey. It is understood that there is a tendency towards artificial intelligence, robotic applications, and cybersecurity technological inventions in Turkey, and necessary training and studies on these technological inventions are important for the future.

The total frequency was obtained from the frequency values received by the codings determined via digital transformation. In terms of the results obtained, there was an increase in the frequency of digital transformation coding in the 100 Borsa Istanbul enterprises from 2018 to 2022. The concepts of digital transformation are being increasingly expressed in annual reports. Regarding the sectoral distribution, the digital transformation tendency is higher in the white good and telecommunications-communications sectors. The results of the analyses show that the telecommunications and communications sector has been on the rise in recent periods.

Finally, a study on the concepts of digital transformation through annual reports was conducted. This study is important in terms of filling the gap in the literature. The limitation of this study is that all enterprises in Turkey cannot be included in the sample. The study can be supported by a quantitative study and an in-depth exploration can be conducted by interviewing the managers of the BIST 100 enterprises.

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