https://doi.org/10.59139/ps.2024.01.2
Received: 31.08.2024, revised: 13.12.2024, accepted: 22.12.2024
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Index of Digital Transformation: measuring the digital maturity of companies listed on the Warsaw Stock Exchange

Dominika Bosek-Rak,[a] Daniel Kaszyński[b]

Abstract. The ability to perform an efficient digital transformation is one of the key capabilities which assures company competitiveness in turbulent times. The ongoing discussion on how to measure digital maturity was the inspiration behind the main aim of the research described in the article, i.e. to construct a digital maturity model called the Index of Digital Transformation (IDT). It is built on four pillars: Strategy, Financing, Technology and Organisation. The final assessment of the model is based on a survey of 205 executives, representing companies listed on the Warsaw Stock Exchange, who were asked to provide information on their companies' performance before, during and after the COVID-19 pandemic. Statistical methods were used to calculate and validate the IDT. A significant increase in digital maturity over this period was reported in all four pillars. Moreover, the research showed that both the type of the industry and the size of the company matter. B2C industries seem to have been under greater digitalisation pressure in the pandemic period. Larger companies (which belong to WIG20, WIG40 and WIG80) were more digitally mature than the rest, and those belonging to WIG40 demonstrated the highest increase in digital maturity in the analysed period. The IDT allows a better understanding of the dynamics of digital transformation in turbulent times and provides a framework for the measurement of digital maturity.

Keywords: digitalisation, digital transformation, Warsaw Stock Exchange, digital maturity model, Index of Digital Transformation (IDT).
JEL: O33, M15

1. Introduction

Digital transformation (defined by Reddy and Reinartz (2017) as 'the use of computer and internet technology for a more efficient and effective economic value creation process') is one of the megatrends that shape the business today and impact all aspects of management. The implementation of sophisticated technologies provides a competitive advantage and is often

[a] SGH Warsaw School of Economics, Department of Management Theory, Poland, ul. Madalińskiego 6/8, 02-513 Warsaw, e-mail: dbosek@sgh.waw.pl, ORCID: https://orcid.org/0000-0002-0831-0439.
[b] SGH Warsaw School of Economics, Institute of Econometrics, ul. Madalińskiego 6/8, 02-513 Warsaw, Poland, ORCID: https://orcid.org/0000-0002-0865-0732.

essential to survive in a dynamic, constantly changing business environment. This phenomenon has been well-understood since the 1990s; however, the rise of mobile technology which started around 2010 has offered unprecedented technological opportunities (Schallmo & Williams, 2018). Since then, cloud computing, machine learning and blockchain have been widely implemented. At present, Artificial Intelligence (AI) is the technology expected to have a profound impact on the global economy. Bughin et al. (2018) estimated that the use of AI should boost global GDP by 1.2% annually by 2030. The International Monetary Fund (2024) predicts that 40% of jobs will be affected by GenAI. Other technologies like cloud computing, the Internet of Things, machine learning, blockchain and mobile phones also have an influence on how businesses are run.

Looking at international comparisons, Poland ranks very low compared to other European Union countries in terms of digitalisation. According to the Digital Economy and Society Index (2024) published annually by the European Commission, in 2023, only Bulgaria, Romania, and Greece ranked lower than Poland. The Digital Enterprise pillar, which measures the percentage of companies with successful technology implementation, seems to be Poland's especially weak point.

The objective of this study is to propose a framework for understanding the digital maturity of companies listed on the Warsaw Stock Exchange (WSE), to show the change of this maturity over time and to identify its basic differentiators. Therefore, the following research questions have been formulated:

- How to measure companies' digital maturity in a comprehensive way?
- What was the level of digital maturity of the companies listed on the WSE before, during and after the COVID-19 pandemic?
- Which industries experienced the greatest increase in digital maturity between 2018 and 2023?
- Did larger companies tend to be more digitally mature than their smaller counterparts?

The article thus aims to contribute to the discussion on measuring digital maturity. The results of the analysis are also expected to provide empirical evidence on the digital transformation journey of companies listed on the WSE during the time around the COVID-19 pandemic. As per a recent overview by Thordsen and Bick (2023), the literature on the subject describes numerous attempts that have been made to measure digital maturity and the many controversies that emerged around this topic. Therefore, we decided to develop our own approach to assess companies' digital maturity based on numerous questions asked in an

executive survey conducted among board members and digital transformation leaders of listed companies. This approach made it possible to collect the details on digital transformation directly from companies, as typically such information is not publicly available.

The paper is structured in the following way: Section 2 presents the theoretical considerations and a literature review and proposes an original digital maturity model. Section 3 shows the results of the empirical study conducted among 205 companies listed on the WSE, focusing on their digital maturity and its differentiators. The Conclusions part describes the implications, limitations and a further research agenda.

2. Theoretical background and literature review

2.1. Digital maturity and competitive advantage

One of the key objectives of every company is to generate profit, which can be done through the continuous building of sustainable competitive advantage on the market (Porter, 1985). Strategic management theories provide explanations and guidance on how it can be done efficiently, either by means of market positioning (Porter, 1985) or through the company's own resources (Barney, 1991). There are also approaches that combine the two, which seems to be optimal in times of high uncertainty and rapid change. Under the dynamic capabilities approach (Teece et al., 1997), the most successful companies are able to combine timely responsiveness, a rapid and flexible product and services innovation, together with the management-related ability to effectively coordinate and deploy internal competences and external opportunities. 'Dynamic' relates to the ability to renew competences, especially technological ones, to meet the requirements of the constantly changing environment, while 'capabilities' refer to managerial skills to adapt, integrate and reconfigure organisational skills and resources. Therefore, implementing new technologies and running digital transformation programmes is perceived as a path to remaining competitive in a rapidly changing business environment (Ferreira et al., 2019; Warner & Wäger, 2019) and improving business performance (Eremina et al., 2019). Thus, digital maturity seems to be a good indicator of the market position of a company, its competitive advantage and its potential for future success. Especially during the COVID-19 pandemic crises, digital maturity was perceived as a basis to staying resilient (Viana et al., 2023), and the maturity of digital strategy in particular assured this resilience (Forliano et al., 2023). For example, in 2020, the most digitalised companies in each industry

noted a smaller decrease in productivity (by 20%) than that of entities digitalised to a lesser extent (IMF, 2024). Moreover, the COVID-19 pandemic boosted digital transformation, as managers (even the most reluctant ones) were forced to accelerate the implementation of remote work and paperless operations (Amankwah-Amoah et al., 2021). Thus, we may assume that companies in Poland also achieved a significant increase in digital maturity during this period.

2.2. Measuring digital maturity

The first objective of this research is to propose a comprehensive tool to measure enterprise digital maturity. The assessment of a firm's digital maturity is perceived as a critical step in achieving a higher degree of organisational performance (Bititci et al., 2015). Digital maturity models are typically built to guide firms through digital transformation and are defined as 'normative reference frameworks that organizations apply to determine their present state of digital maturity and thus of their digital transformation across its various building blocks and levels' (Williams et al., 2019). According to Ochoa-Urrego & Peña's (2020) systematic literature analysis, the average digital maturity model comprises of the following dimensions: Technology, Digital Culture, Operational Processes and Digital Strategy. The aim of these models is to identify companies which are digitally mature, i.e. in 'A state of constant anticipation and adaptation to an ever-changing environment. Particularly the ability to critically reflect on and monitor business performance, together with a willingness to evolve permanently' (Thordsen & Bick, 2023). The key controversies around digital maturity models involve a poor theoretical base and limited empirical evidence associated with insufficient documentation on the development of the maturity models in general (de Bruin et al., 2005), as well as a lack of academic validity and rigor (Teichert, 2019).

Inspired by these theoretical considerations, our proposed digital maturity model is based on four pillars: Strategy, Financing, Technology and Organisation. These pillars derive from the capacities of dynamic capabilities, introduced by Teece (2014): sensing, seizing and transforming. Strategy is an essential dynamic capability in the context of digital maturity. It makes it possible to sense which digital technologies are able to best address client needs and develop more suitable products and services, as well as preparing a relevant formal digital strategy document (Yeow et al., 2018). Financing is the pillar that embodies the seizing capability. In order to implement a strategy, the company must mobilise its resources, including the financial ones. Investing in digital projects enables the organisation to seize the

opportunities that were identified in the sensing phase. The last two pillars (Technology and Organisation) can be classified as a transforming capacity. Digitally mature companies which aim at staying competitive strive for a constant reconfiguration of their resources through the implementation of the most recent technologies, both core and niche ones, across functions. As improving the digital maturity of the workforce is considered the key dynamic capability (Warner & Wäger, 2019), remote work possibilities and remote communication with the stakeholders are viewed as proxies to assess the ability of the organisation to adapt quickly to the new digital reality.

Figure 1. Digital maturity model

Strategy	Financing	Technology	Organisation
•Digital strategy document; •Using advanced technologies to understand client needs and improve products and services.	•Financing for digital project in front- and back-office.	•Implementation of core and niche technologies.	•Technical possibility to work remotely for back-office function; •Remote work policy in place; •Remote contact with stakeholders.

Source: authors' work.

Being inspired by the digital maturity models described in the literature (Thordsen & Bick, 2023) and rooted in the dynamic capabilities approach, this model allows a precise measurement of companies' digital maturity, as the components of the pillars are well-defined (see Figure 1).

2.3. Company size and industry as determinants of digital maturity

All companies operate in a unique environment and have a unique set of resources at their disposal, so their digital 'journey' must be adjusted to these conditions. Considering the dynamic capabilities approach, an industry can be perceived as an external, but specific for all players, market condition (Strønen et al., 2017), under which all industry players compete. The size of the company can be viewed as one of the factors which determines its internal ability to react to change (Jeng & Pak, 2016). Thus, theoretically, these two variables could differentiate companies' digital maturity.

Horváth & Szabó (2019) noticed that smaller companies typically focus on a single niche market and are less flexible, whereas big ones experience higher pressure from their competitors and shareholders. Their management teams carefully monitor the opportunities that digital technologies create. They have enough capabilities to react relatively quickly. Digital transformation needs sufficient funding, as sustainable successful digital initiatives require scale (Kane et al., 2017). Therefore, the larger the size of the company, the higher the level of digital maturity. On the other hand, excessive resources can cause larger companies to focus less on efficiency. Although smaller companies' responsiveness is hindered by restrained financial capability (Mittal et al., 2018), some believe that it is these restraints that might force a company to be more innovative (Katila & Shane, 2005). Due to the variety of research results, it is worth analysing if there are significant differences in digital maturity of big and small companies listed on the WSE.

The assumption that the industry matters while assessing digital maturity is based on the belief that companies can be clustered into industries which constitute a relatively similar and specific competitive environment for them. Therefore, all companies which belong to a given industry operate under similar conditions and circumstances in terms of digitalisation, and face similar barriers (Senna et al., 2023). Since all participants operating in an industry face the same disruptive change which is an external driver of digital transformation (Verhoef et al., 2021), intense competition within the industry helps them to stay competitive, especially if they are efficient in their digital transformation efforts (Bergek et al., 2013). During the COVID-19 pandemic, all companies were forced to digitalise; however, industries where face-to-face contact is essential were forced to accelerate their digital transformation leading to a significant increase in digital maturity (Fletcher & Griffiths, 2020). Therefore, it is reasonable to check whether there are any significant differences between industries in terms of their level of digital maturity, and which industries experienced the largest increase in digital maturity.

2.4. Digital maturity of companies in Poland

As digital transformation is essential to Polish listed companies (Klimczak et al., 2022), there are several publications on digital transformation and digital maturity. The digital maturity of Polish companies is carefully watched, mainly by consulting companies which publish their assessments on a regular basis (e.g. KPMG Business Digital Transformation Monitor, EY Digital Transformation). They often focus on all types of companies, though, including private ones. Kowal et al. (2024) analysed the level of digitalisation of Polish companies in the context

of the COVID-19 pandemic; however, they based their assessment on secondary research, i.e. three existing industry reports. Chądrzyński et al. (2021) also described the digitalisation of Polish enterprises on an aggregate level based on widely-available information on Internet access, websites and specialists.

The size and industry determinants of digital transformation in Poland were only partially evaluated in the literature. The main focus there is on small and medium-sized enterprises (SMEs) (Mieszajkina & Myśliwiecka, 2022) and microenterprises (Pawełoszek et al, 2023), and emphasize the lack of scale and high costs as key barriers to digitalisation. Although some industries have been assessed, e.g. development services (Winnicka-Wejs, 2022) or the industrial sector (Grzyb, 2019), there is no comprehensive industry comparative study available.

In short, very limited academic research on this topic preceded our primary research conducted among companies listed on the WSE; the research results in this area allows better understanding of the dynamics of their digital transformation and digital maturity.

3. Empirical specification and data

3.1. Sample and data

The analysis is based on an executive survey of 205 companies listed on the WSE. The survey was conducted in the form of a questionnaire. The questions were related to the implemented technologies, the assumed priorities in the digital transformation, the use of technologies to understand clients' needs and enhance products and services, the digital strategy, the budget for digital initiatives and remote work, and communication with stakeholders. Answers provided by the companies regarded three observation periods: before (2018–19), during (2020–21) and after (2022–23) the COVID-19 pandemic. The final IDT is calculated at company level and can be further aggregated into industry level.

The survey respondents were mostly top executives who declared themselves to be well-informed and participating in the company's digital transformation. The survey was conducted through a Computer-Assisted Web Interview (CAWI). Despite the respondents' potential subjectivity, we believe that due to the high number of respondents and the extensive coverage of the total population (~25%), the factual description of the digital maturity of the companies listed on WSE could be identified.

3.2. Methodology

The IDT is a metric calculated as a simple average of the obtained results relating to the four pillars described in the previous section: Strategy, Financing, Technology and Organisation. Its formula is as follows:

$$DI_i = \frac{\mathrm{STR}_i + \mathrm{FIN}_i + \mathrm{TECH}_i + \mathrm{ORG}_i}{4},$$

where:

DI_i is the value of the IDT for the i-th company,

STR_i is the digital strategy of the i-th company,

FIN_i is the spending on digitalisation,

TECH_i is the technology used in the i-th company,

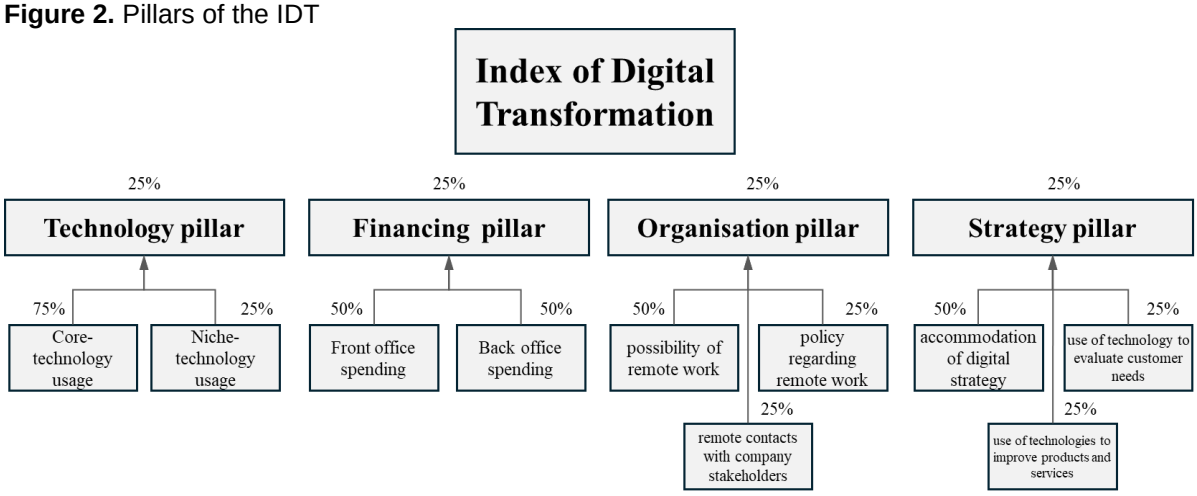
ORG_i is the the organisational part of the digitalisation of the i-th company.

The simple average was chosen to reflect the equal importance of each pillar. The resultant value representing the advancement of each of the pillars (weighted average of particular pillars) is based on the answers provided to the composed set of questions allowing the evaluation of the pillar-based maturity. Below, we present a scope of questions that were used within a particular pillar. Each pillar consists of two or three categories which are weighted according to their importance to create a comprehensive and substantial picture of the digital maturity of each company:

- Technology comprises two sets of questions (weights in the brackets): core-technology usage (75%) and niche-technology usage (25%);
- Financing consists of questions related to spending on digitalising the front office (50%) and the back office (50%);
- Organisation covers a broader set of questions that are linked to the possibility of remote work (50%), remote work policy (25%) and remote contacts with company stakeholders (25%);
- Strategy refers to questions concerning the accommodation of digital strategy (50%), the use of technology to evaluate the needs of the customers (25%), and the use of technology to improve products and services (25%).

The range of the answers to each question was set to 0 and 1, where 0 referred to the lowest advancement in the particular field and 1 to the highest. For each company, the value of every pillar was calculated as the weighted average of the answers. The high-level calculation methodology is presented in Figure 2.

Figure 2. Pillars of the IDT



Source: authors' work.

As digital transformation is very dynamic, the scale has not been proposed; due to dynamic changes in the technological landscape of the available solutions/tools, we recommend comparing the dynamics of the digital maturity index rather than evaluating particular companies' digital maturity level alone.

Each of the pillars combines several questions (binary or the Likert scale), i.e.:

- Technology – 13 questions;
- Financing – 2 questions;
- Organisation – 13 questions;
- Strategy – 27 questions.

The basic descriptive statistics of the research sample (companies) has been presented in Table 1.

Table 1. Descriptive statistics of the research sample

Pillar		2018-19	2020-21	2022-23
	number	205	205	205
Technology	min	0.00	0.00	0.00
	max	0.87	0.89	0.97
	mean	0.19	0.31	0.44
Financing	min	0.00	0.00	0.00
	max	1.00	1.00	1.00

	mean	0.18	0.37	0.52
Organisation	min	0.08	0.23	0.25
	max	0.96	1.00	1.00
	mean	0.50	0.61	0.69
Strategy	min	0.00	0.02	0.19
	max	1.00	1.00	1.00
	mean	0.65	0.76	0.84
Digital Index	min	0.08	0.15	0.20
	max	0.88	0.97	0.99
	mean	0.38	0.51	0.62

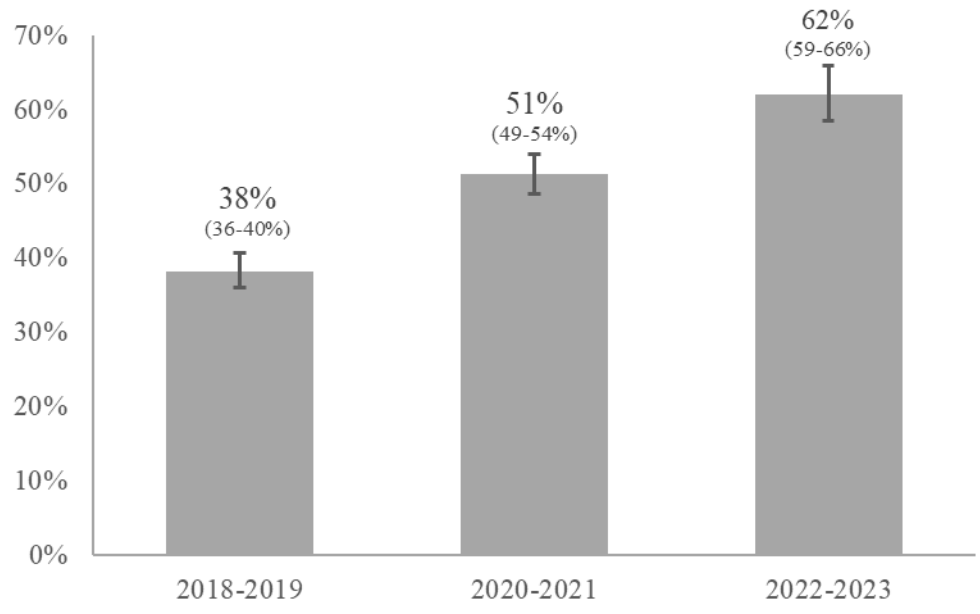
Source: authors' work.

3.3. Results

The IDT described above has been calculated for each of the 205 surveyed companies listed on the WSE. All of the calculations were performed on cloud (GCP) using Python 3.6 (in particular the *numpy*, *pandas* and *scipy* libraries).

The average IDT was growing over the analysed periods. The average values of the IDT are presented in Figure 3.

Figure 3. IDT: yearly aggregates



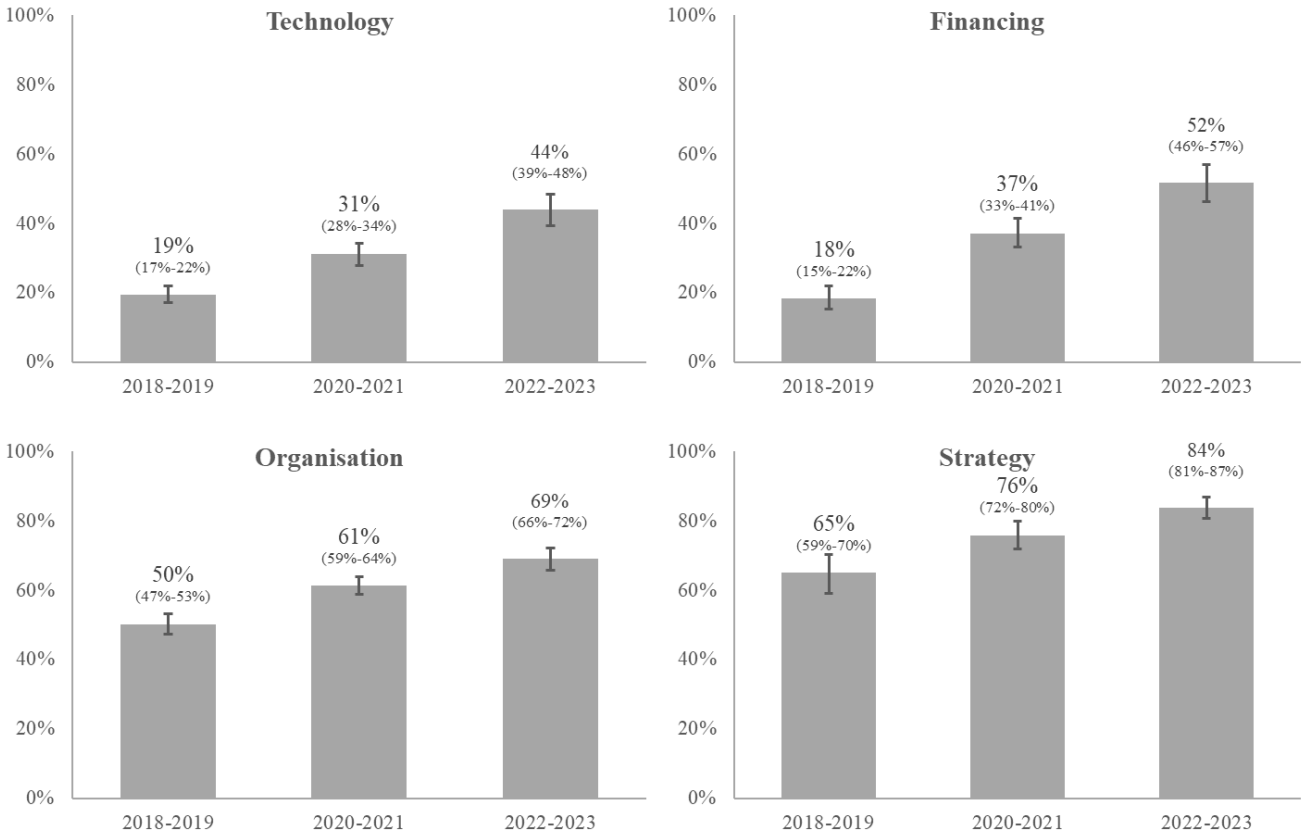
Source: authors' work.

Note that the grey bar presents the average within a particular observation period, while the black whiskers represent a 99% confidence interval of the IDT (calculated using bootstrapping; see Efron (1992)). Due to the IDT being non-normally distributed in every period (H0 rejection at 1% statistical significance of the Shapiro-Wilk test), the differences in the IDT were tested

using the Friedman test for all of the periods, i.e. in 2018–2019, 2020–2021 and 2022–2023; the periods consist of statistically different distributions of the IDT (Friedman test statistic = 314.52, H0 rejected at 0.1%).

In terms of the pillars, Figure 4 presents the time dynamic of the average aggregates; the Financing pillar was the one with the most dynamically increasing value over the 2018–2023 period. Companies, on average, scored almost 3 times more in the Financing pillar after the COVID-19 pandemic than in the pre-pandemic period. The pandemic was the time when implementing technology was necessary to stay competitive and to survive on the market, hence the significant increase in the Technology pillar; moreover, these implementations required funding which was relatively easy to obtain due to low interest rates and government support programmes (Dębkowska et al, 2021). The least dynamically increasing pillar was related to Strategy, which may have been related to the high base in the period before the COVID-19 pandemic.

Figure 4. IDT pillars: yearly aggregates



Source: authors' work.

Note that the grey bar presents the average value of a pillar within a particular observation period; the black whiskers represent a 99% confidence interval of the IDT (calculated using bootstrapping).

As an additional layer of the analysis, the correlation between the pillars forming the IDT for the sample under study has been calculated and presented in the Table 2.

Table 2. Pearson correlation coefficient between the pillars forming the IDT

2018-19	Technology	Financing	Organisation	Strategy
Technology	1.00			
Financing	0.44	1.00		
Organisation	0.34	0.21	1.00	
Strategy	0.10	0.18	0.24	1.00

2020-21	Technology	Financing	Organisation	Strategy
Technology	1.00			
Financing	0.64	1.00		
Organisation	0.57	0.37	1.00	
Strategy	0.49	0.41	0.37	1.00

2022-23	Technology	Financing	Organisation	Strategy
Technology	1.00			
Financing	0.78	1.00		
Organisation	0.73	0.67	1.00	
Strategy	0.70	0.56	0.59	1.00

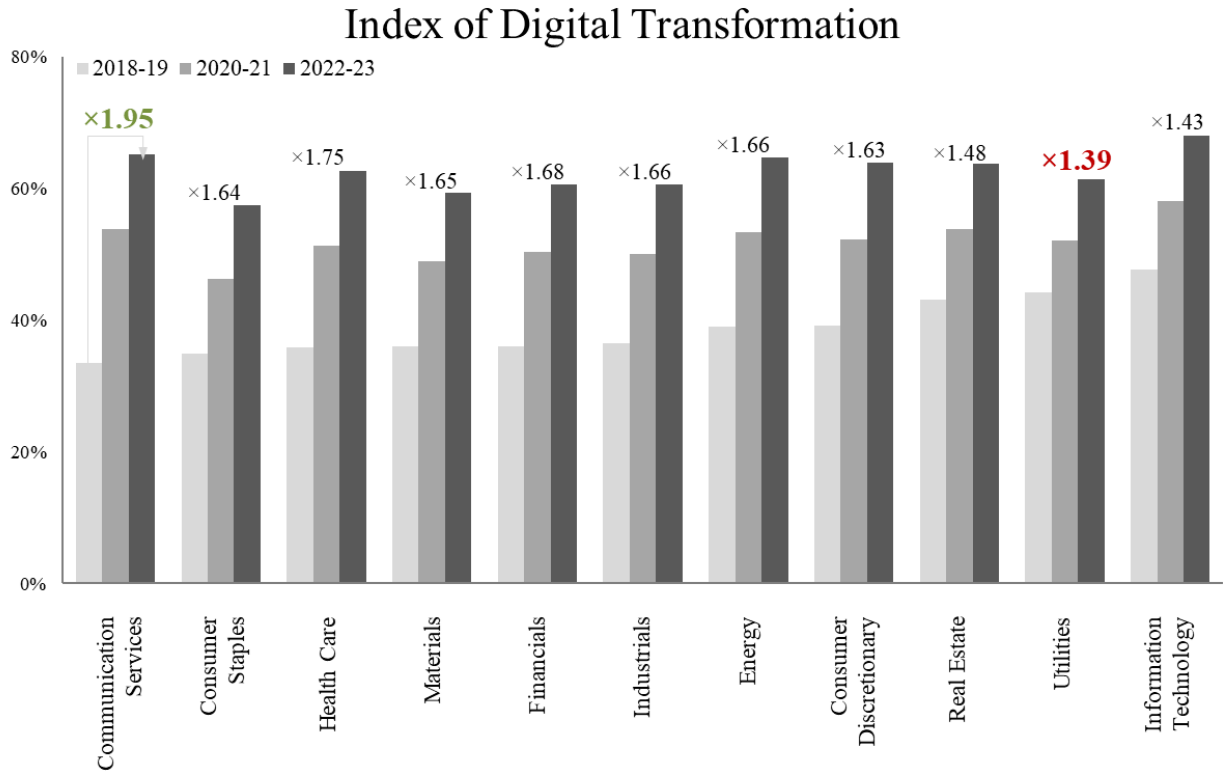
Source: authors' work.

The upward trend is visible both at the aggregate level and across all the examined sectors of the economy. An interesting phenomenon is the implied sequence of changes occurring within companies (based on the presented aggregates), which is in line with the typical strategic management process focusing firstly on creating a strategy and only then implementing it through proper resource allocation (Sinnaiah et al., 2023). In this case, a digital strategy is developed first and action is taken to establish digital channels of communication with the stakeholders (customers, employees, suppliers), and only then do financial expenditures on digitalisation projects increase and the implementation of advanced modern technologies occurs. Introducing and developing digital channels seems easy to accomplish. Thus, it can be defined as a digitalisation phase, as compared to the implementation of advanced technologies, e.g. artificial intelligence, which is a rather more expensive and sophisticated digital transformation phase (Verhoef et al., 2021). This indicates that companies are likely to make

decisions regarding digital transformation projects thoughtfully, analysing their potential costs and benefits before proceeding to their implementation.

However, the situation varies between industries. The most advanced in terms of the level of digital maturity are the IT (with an average value of the index of 68% in 2022–2023) and Communication Services sectors (65%) (see Table 3). The least advanced, on the other hand, are Consumer Staples (mainly the food industry) (57%) and Materials (59%).

Figure 5. IDT: yearly aggregates within sectors



Source: authors' work.

Table 3. IDT: results per industry

	Communication Services	Consumer Discretionary	Consumer Staples	Energy	Financials	Healthcare	Industrials	Information Technology	Materials	Real Estate	Utilities
2018-19	0.33	0.39	0.35	0.39	0.36	0.36	0.37	0.48	0.36	0.43	0.44
2020-21	0.54	0.52	0.46	0.53	0.50	0.51	0.50	0.58	0.49	0.54	0.52
2022-23	0.65	0.64	0.57	0.65	0.61	0.63	0.61	0.68	0.59	0.64	0.61

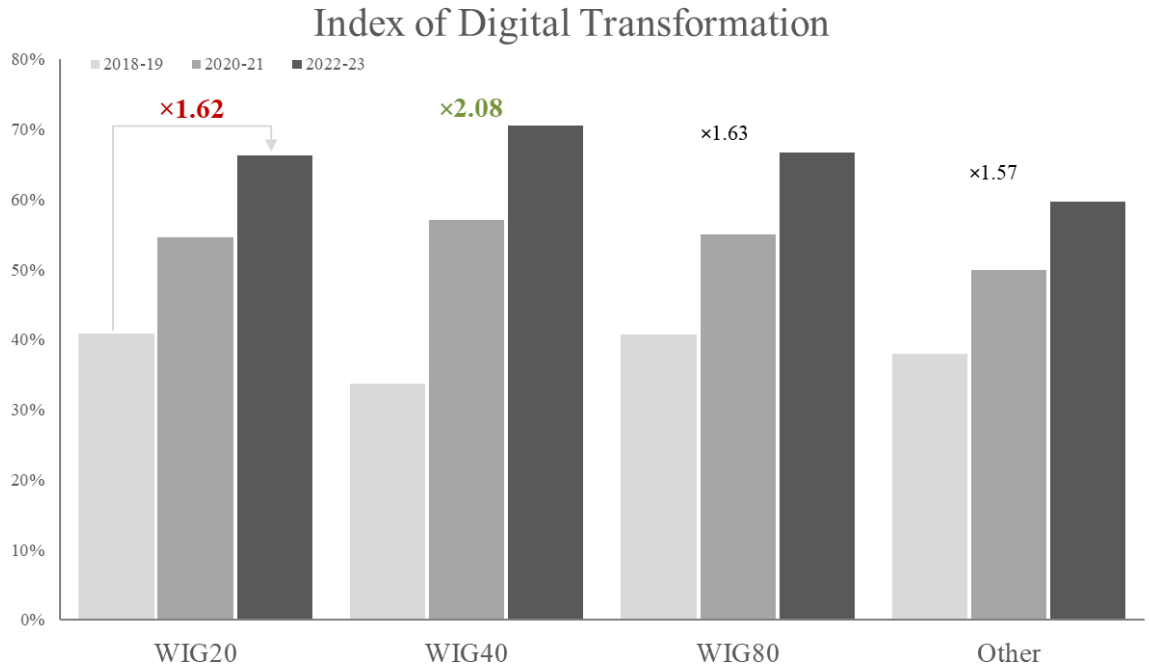
Source: authors' work.

The top three industries with the most dynamic increase were (see Figure 5): Communication Services, Healthcare and Financials. These are industries with a high exposure to retail customers (B2C) and during the pandemic, they were under greater pressure to digitalise.

As the sample was representative in terms of the size and industry (see the Table in the Appendix), an analysis was conducted based on the stock exchange index which the company belongs to. Interestingly, medium-sized companies (WIG40) at that time reached the index's

highest level (see Figure 6.). The largest companies (WIG20), despite having an initially high level of digital maturity, showed a low growth rate in this area. In contrast, the smallest companies (other) at that time had the lowest level of digital maturity and a low growth rate of this indicator over time. This shows that medium-sized companies are large enough to leverage advanced technological solutions without encountering competency barriers and small enough to avoid organisational challenges during their implementation (see Figure 6.).

Figure 6. IDT: yearly aggregates within stock exchange indices



Source: authors' work.

4. Results and interpretation

The digital maturity model, which consists of four pillars: Strategy, Financing, Technology and Organisation, was designed on the basis of the dynamic capabilities approach, allowing the measurement and assessment of the digital maturity of the companies listed on the WSE. As expected, these companies sped up their digitalisation during the COVID-19 pandemic. The increase in digital maturity between the pre-pandemic and post-pandemic era amounted to 24 p.p., i.e. from 38% to 62%.

Our results show that digital maturity, on average, increased across the studied companies during this period, which is in line with the findings of Kowal et al. (2024) and Chądrzyński et al. (2021) regarding Polish companies during the pandemic. Moreover, the size of the company matters when it comes to digital maturity. Companies which belong to WIG40 are the most

digitalised, which is only partially consistent with the expectations. What is surprising is that the largest companies which have greater economies of scale are not the most digitalised, as Horváth & Szabó (2019) suggested. This can be explained by their excessive bureaucracy and the resulting operational challenges (Meyer et al., 2011). Medium-sized companies seem to be large enough to have economies of scale and at the same time they are small enough to have operational agility (Radicic & Petković, 2023). The low digital maturity observed among the smallest companies was expected – it is in line with the previous research (Mieszajkina & Myśliwiecka, 2022).

Digital maturity and its dynamics vary across different sectors of the economy (Bergek et al., 2013; Verhoef et al., 2021). Industries with a high exposure to consumers were under greater pressure to digitalise during the pandemic (Fletcher & Griffiths, 2020). This is also visible in our results, as industries with a focus on services for retail consumers have reported higher acceleration and a higher absolute level of digital maturity. On the other hand, industries focusing on business clients and manufacturing remained on a relatively lower level of digital maturity.

5. Conclusions

Being a key dynamic capability in the era of digital transformation, the ability to implement new technologies and be digitally mature is crucial for every company to remain competitive.

As companies operate in a very dynamic environment and face constant technological change, they struggle to benchmark themselves against their competition. The proposed Index of Digital Transformation is expected to be a useful framework to measure digital maturity and understand market position for every company in every industry.

The presented framework can be considered as an important contribution to the ongoing discussion on how to measure digital maturity in an efficient way. It can be used and further developed by scientists as the rapid technological change continues. Since our digital maturity model is deeply rooted in the theoretical frameworks of strategic management, it is universal and can be used even if technological trends evolve quickly and unexpectedly.

The example of companies listed on the WSE showed that digital transformation accelerated during the COVID-19 pandemic. This is again an indirect proof that this extraordinary situation brought significant breakthrough for the society, economy and business.

Then, both the size of the company and the industry in which it operates proved significant differentiators, so these two factors should be considered by business entities while planning potential future initiatives aiming to enhance digital maturity and by all other market participants (e.g. policy makers, investors) to better understand the dynamics of digital transformation.

However, our research on the digital maturity of Polish companies faced some limitations.

The focus was on Poland and only on listed companies, so the results cannot be easily generalised. The research is based on executive surveys which may not be fully objective and may not show all aspects of the digitalisation of a company.

Another potential bias in this study is the fact that the survey respondents answered the questions regarding three different points in time at once. This could lead to the 'present conditions perspective' and make the trend more upward, as all companies made some progress in digitalisation over the pandemic period due to rapid technological change and specific market conditions.

Further research into digital maturity should focus not only on the size of companies and industry they operate in, but also on organisational culture which is an important differentiator as well (Horváth & Szabó, 2019). Since the analysis concerns only companies listed on the WSE and was inspired by the research done by Meyer et al. (2011), it would be interesting to find out how the digital transformation process went in the subsidiaries of transnational corporations which operate in Poland, as well as in small and medium-sized enterprises, and what degree of digital maturity they achieved. To make the study more comprehensive, the next iteration of the IDT might involve the categorisation of the companies into clusters, as proposed e.g. by Estensoro et al. (2022). Additionally, a deeper analysis of the sequence of the digital maturity improvement and the motivations behind the decision would be valuable and worth investigating in future research studies.

Acknowledgments

This research study was conducted in the framework of project numbered BPI/PST/2021/1 /00069/U/00001 financed by Polish National Agency for Academic Exchange under the Strategic Partnerships programme.

The authors would like to thank Maria Aluchna, PhD, MSc, ProfTit, and Bogumił Kamiński, PhD, MSc, ProfTit, for their guidance and invaluable support.

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Appendix

Table. Structure of the sample

Industry	WIG20	WIG40	WIG80	Other	Total
Communication Services				10	10
Consumer Discretionary	2	2	4	16	24
Consumer Staples		1	1	11	13
Energy	1	1	1	1	4
Financials	2	1	3	10	16
Healthcare		2	4	9	15
Industrials		2	12	40	54
Information Technology		2	4	15	21
Materials	3	1	7	18	28
Real Estate		1	3	9	13
Utilities	2	1	1	2	6
Total	10	14	40	141	205

Source: authors' work.