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The Impact of Disclosing Digitalization Information on Corporate Financial Performance

Elena Fedorova ✉
Doctor of Economics, Professor, Department of Corporate Finance and Corporate Governance, Financial University, Professor, Bauman Moscow State Technical University, Moscow, Russia,
ecolena@mail.ru, ORCID

Pavel Drogovoz
Doctor of Economics, Professor, Vice-Rector for Science and Digital Development, Head of the Department of Business Informatics, Bauman Moscow State Technical University, Moscow, Russia,
drogovoz@gmail.com, ORCID

Alexander Nevredinov
graduate student, Bauman Moscow State Technical University, Moscow, Russia,
a.r.nevredinov@gmail.com, ORCID

Abstract

The purpose of the present study is to assess the relationship between digitalization disclosure indicators and market capitalization in the Russian market, including during the COVID-19 pandemic. The research methodology includes text analysis to evaluate various components of digital transformation (business model transformation, process transformation, domain transformation, organization transformation) and digitalization. The model was assessed using panel regression and machine learning methods. The empirical basis of the study included financial indicators of 70 Russian companies and annual reports for 2017–2021. The main results are: 1) wider disclosure of information about digitalization in the annual reports of Russian companies increased company market capitalization; 2) the transformation of processes and organizations was highly significant for Russian companies; 3) the COVID-19 pandemic accelerated digitalization and led to a partial catch-up in the level of digitalization among less advanced companies. The results of this study can be used by investors and company management to develop more competent and comprehensive digital policies.

Keywords: companies, digitalization, digital transformation, investment attractiveness, signaling theory, text analysis, random forest

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Introduction

Digitalization has grown into a global phenomenon that impacts the operations of companies across various business sectors. With the implementation of digital technologies and the upgrading of business models, increasing attention is being paid to the disclosure of information on digitalization efforts. Such disclosure provides information about initiatives, strategies, and processes related to the implementation of digital technologies in company reports intended for investors and other stakeholders [1]. Many well-known consulting companies analyze the influence of digital transformation on financial performance. For example, research by McKinsey & Company has revealed that companies implementing digital transformation have the potential to boost their profits by up to 26%[1].

In the Russian domestic market, companies recognize that digitalization is crucial for gaining a competitive advantage, enhancing operating performance, and improving customer service [2; 3]. However, the influence of digitalization disclosure on the financial performance of Russian companies remains an understudied area of research. Additionally, Russia is an emerging market, and the importance of disclosing such information may differ significantly from other markets where similar research has been conducted [4–6]. This makes the topic of our study particularly relevant. Therefore, our research purpose is to evaluate the relationship between the indicators of digitalization disclosure and market capitalization in the Russian market, including during the COVID-19 pandemic.

Several theoretical studies have explored the surge in digital activity during lockdowns and restrictions, including the period of the recent coronavirus pandemic [7–9]. However, no such studies have been conducted for the Russian market. Our study compares the impact of digitalization disclosure before and after the COVID-19 pandemic, a period during which many companies transitioned to remote work and implemented new digital tools. Additionally, this paper contributes to corporate finance theories related to digital transformation within the framework of signaling theory [10]. It applies textual analysis methods using dictionaries to obtain digitalization disclosure indices. Variable significance is calculated using panel regression and random forest models, which represent a nonlinear machine learning approach.

Literature Review

Theoretical Concepts

Digitalization has become an important driver of change across various industries. Companies' declarations about achievements in high technology and digitalization processes demonstrate their development prospects and strategies, thereby reducing uncertainty. Signaling theory helps alleviate information asymmetry between a company and its primary stakeholders, such as investors and customers [10]. Essentially, the company acts as a "signaler," while third parties – such as banks, competitors, and customers – serve as "receivers." A company can send positive signals to third parties by sharing information about new products, improved business practices, or more efficient operating processes [11]. This establishes an effective relationship between economic operators and provides insight into the company's current operations and long-term prospects.

Digitalization is a fundamental stage of corporate development, involving the implementation of various digital technologies in business processes. Today, some companies go further by reorganizing their business processes, which also leads to digital transformation. This major trend extends beyond the mere digitalization of specific processes. Companies undertaking digital transformation are often perceived by investors as promising and forward-looking. These companies can demonstrate their financial soundness by allocating resources to upgrade their operations. By signaling innovations and digital transformation to investors, these companies enhance the likelihood of expanding their market share and increasing future profits [12].

Research Hypotheses

In view of the matters considered above, we raise the following research questions: How does digitalization disclosure influence corporate financial performance in Russia? Additionally, which components of digital transformation have the greatest impact, especially during the COVID-19 pandemic?

The primary motivations for companies undertaking digital transformation include enhancing operating performance, improving service quality, and reducing expenditures. Companies leveraging digital technologies often exhibit significant potential for development, characterized by their ability to expand in existing markets and enter new ones. Management in these companies is equipped to make better and more informed decisions, utilizing scientific advancements, patents, novel technologies, and the expertise of market leaders [13].

Such companies are strongly committed to strategic management, which enhances the attainability of long-term goals. Innovations in artificial intelligence and automation can have a substantial impact on corporate financial performance. Some authors assert that digital technologies can boost productivity, create new business models, and disrupt traditional markets, thereby influencing income growth, profitability, and shareholder value [14].

Moreover, several papers have explored the relationship between a company's digitalization disclosure and its financial performance. Some of them focused on sustainable development methods that can enhance corporate financial performance, particularly for digital companies [5]. Advanced technology-enabled enterprises that dis-

[1] McKinsey&Company. (2018). Digital transformation: Improving the odds of success. URL: https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/digital-transformation-improving-the-odds-of-success

close information about their digital resources often serve as catalysts for innovation-driven development within the national economy. Similar results were found by E.R. Baiburina and E.G. Grebtsova [15], who examined the impact of a company's intellectual capital on its value.

This suggests that digital transformation does impact corporate market capitalization, which leads to our first hypothesis:

H1: *A company's digitalization has a positive effect on its market capitalization.*

Business process transformation is essential to fully capitalize on the benefits of digital transformation. Therefore, companies must evaluate the specific opportunities presented by digital technologies to determine their ideal digital transformation strategy. Digital transformation extends beyond mere digitalization by establishing a data-driven organization, leveraging digital platforms and creating new revenue streams through data-driven services[2].

Many companies, comprising over half of the empirical base, dedicate separate chapters in their annual reports to information about their digital transformation efforts. However, annual reports aren't the sole source of information. For instance, D. Libaers et al. [16] employ web page parsing to analyze the business models of small, highly innovative US companies. Some authors also examine innovations and digitalization through the lens of business model disclosure in annual reports [16; 17].

Digital transformation makes a key contribution to the strategic growth of businesses by implementing and integrating advanced technologies. It involves process automation, innovative product development, operation optimization, and the enhancement of digital user interactions. This continuous process allows businesses to implement changes incrementally and evolve consistently over time.

While transitioning business processes online presents opportunities for efficiency enhancements, it also introduces challenges. According to the McKinsey Global Institute, digital transformation encompasses four essential components[3]:

1) Business model transformation.
2) Process transformation.
3) Domain transformation.
4) Organization transformation.

Business model transformation involves reinterpreting and changing fundamental business strategies, models, and operations. Process transformation aims at re-engineering and optimizing current business processes to fully leverage the potential of digital technologies. Domain transformation moves business operations to the cloud. Lastly, Organization transformation focuses on evolving the organization's culture, structure, and opportunities to foster a digital mindset.

Currently, Russia lags behind digital transformation leaders like the USA, China, South Korea, and Germany, but it is rapidly accelerating its development [18]. Each transformation brings significant changes to organizations. Therefore, when investors evaluate the prospects of digital transformations, they can potentially assess both positive and negative consequences while considering uncertainties. For instance, the outcomes of organizational transformation are typically more uncertain compared to those of production process transformation. As a result, different types of transformation may influence investors' evaluations of organizational transformation in varying ways.

H2: *Individual components of digital transformation and digitalization influence the market capitalization of Russian companies in different ways.*

The COVID-19 pandemic significantly accelerated the use of digital platforms worldwide [8]. This ongoing crisis has also provided an opportunity to expedite the digital transformation of financial intermediation, compelling companies and organizations to adapt and potentially overhaul their business models [7]. However, while the pandemic prompted swift digital transformations among many companies, it also brought forth numerous challenges. According to research by V. Klein and J. Todesco [9], medium-sized businesses faced heightened vulnerability due to insufficient financial resources and expertise.

During the COVID-19 pandemic, process and organization transformation, pivotal components of digital transformation, assumed heightened significance. Digital technologies facilitate transformative changes, prompting shifts in economic paradigms. As a consequence of the pandemic, many organizations swiftly adapted to remote work and established corresponding organizational structures, necessitating substantial efforts to transform processes [19]. The conversion of workplaces also gained greater importance post-COVID-19, with increased discussions on the continued utilization of established processes and digital tools. Investors and managers recognized the profound importance of digital transformation and its promising prospects.

H3: *The influence of individual components of digital transformation and digitalization grew during the COVID-19 crisis.*

Data and Research Methodology

Description of the Research Sample

Our study sources data from several official channels, including annual reports, sustainable development reports accessed from corporate websites, and databases such as Smart-Lab[4] and the National Register of Corporate Non-Financial Reporting[5].

[2] The 4 Tiers of Digital Transformation. URL: https://hbr.org/2021/09/the-4-tiers-of-digital-transformation

[3] The 4 Main Areas of Digital Transformation. URL: https://gocardless.com/en-us/guides/posts/what-are-the-4-main-areas-of-digital-transformation/

[4] URL: https://smart-lab.ru

[5] URL: https://rspp.ru/sustainable_development/registr/

To check our hypotheses, we constructed a sample comprising 70 Russian companies selected from the list of the country's 300 largest firms based on market capitalization, covering data from 2017 to 2021. The following criteria guided the compilation of our research dataset:

- Inclusion of public companies listed on the Moscow Exchange.
- Exclusion of financial sector companies from the dataset.
- Selection of companies listed among the top 300 by market capitalization.
- Availability of data from reliable sources.

Textual Analysis

Annual reports serve as crucial sources of non-financial information about companies, essential for external stakeholders such as investors, creditors, and customers [20]. To establish a digitalization disclosure index, the bag-of-words text analysis method is employed. This approach has proven effective in quantifying the coverage of various information disclosures within texts. Specific dictionaries are tailored for assessing characteristics like social and values-based orientations [21], risk level disclosures [22], and digital orientations reflecting innovation and digital transformation strategies [23].

The bag-of-words method is versatile, allowing for the determination of topic coverage levels within texts. This flexibility facilitates the analysis of how the obtained index correlates with other operational characteristics of organizations. Moreover, this method is adept at handling large volumes of information and is frequently utilized to investigate the impacts of various non-numerical factors on organizations.

A dictionary for textual analysis can be developed through the expert analysis of a thematic corpus of texts or compiled from existing dictionaries relevant to the research topic. Currently, there are no specific Russian dictionaries dedicated to digital transformation. Therefore, for this study, a dictionary was compiled based on existing dictionaries focused on digitalization and digital transformation [24–26]. Table 1 outlines the key characteristics of these dictionaries.

Table 1. Characteristics of employed dictionaries

Dictionary source	Total number of words	Digitalization sections
L. Guo, L. Xu, 2021 [24]	53	Seed word, macro policy, paradigm characteristics, influencing scope, technology or equipment
X. Teng et al., 2022 [25]	21	Paradigm characteristics, influencing scope, infrastructure
E. Fedorova et al., 2021 [26]	66	Product innovation, process innovation, marketing innovation, organizational innovation

After analyzing English-language lexicons from research dedicated to related topics and studying annual reports collected from Russian companies, the final lexicon was compiled for this study.

Although the primary focus of this paper is on digital transformation, digitalization is also a crucial accompanying process. It indicates the overall extent to which a company has adopted digital technologies, which are essential for enabling digital transformation. Therefore, we have included a vocabulary related to digitalization, consisting of 196 words divided into five topics: digitalization (41 words), business transformation (50 words), process transformation (35 words), domain transformation (38 words), and organization transformation (27 words).

It's notable that non-technological components of digital transformation, such as organizational aspects, are described with a smaller number of words compared to technological components. This disparity may stem from the strong association between digital transformation and technological advancements, leading to a greater emphasis on describing technological aspects in annual reports. The vocabulary used in this research is detailed in Table 2.

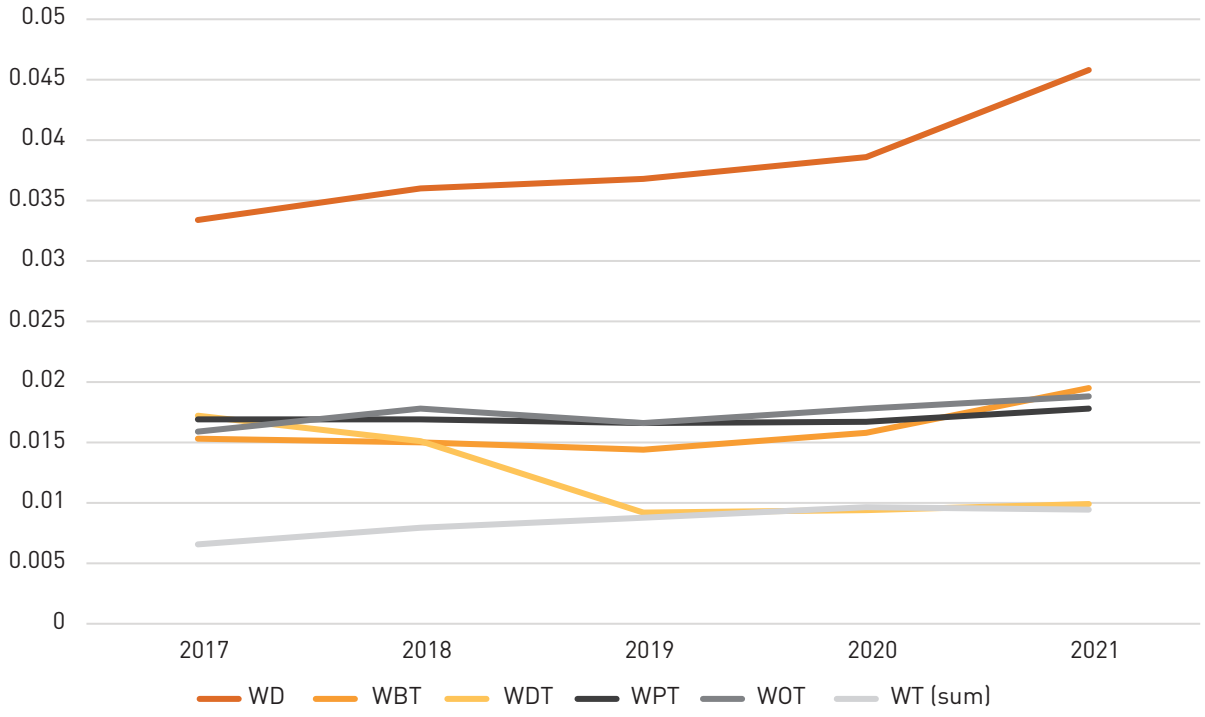
Table 2. Dictionary compiled for this study

Dictionary section (acronym)	Words
Digitalization (WD)	digitalization, technology, digital portal, digital platform, digital business, big data, digital object identifier, account, digital ecosystem, digital channels, services, digital services, user, digital business areas, internet of things, data analytics, data, web, virtual office, digital solutions, optimization, recording, digital devices, data protection

Dictionary section (acronym)	Words
Business transformation (WBT)	business model, ecosystem, digital ecosystem, business transformation, digital, digital economy, digital business, automation, digital business area, automatic control, informatization, informatization management, virtual office, informatized management, informatized application, digitalization, networking, integration, intelligence, virtualization, internet of energy, smart energy, smart city, smart service, smart transport, intelligent transport, e-government, smart medicine, smart community, smart terminal, smart home
Domain transformation (WDT)	internet of things, artificial intelligence, cloud computing, big data, cloud services, internet, 3D printing, mobile internet, biometrics, cloud technologies, data center, data analysis, data mining, interacting, pattern recognition, neuronic network, mass data, data storage, cloud platform, virtual reality, robots, industrial robots, CNC machines, CNC systems, sensors
Process transformation (WPT)	new process, new method, new technology, new equipment, high-technology equipment, improved manufacturing, improved delivery, supply chain, automation, digitalization, robot automation, standardization, manufacturing technology, R&D, waste recycling, asset replacement, lean manufacturing, quality control
Organizational transformation (WOT)	organizational changes, reorganization, workplace arrangement, restructuring, business practice, business transformation, business architecture, business functions, business process reengineering, staff development, design thinking, cooperation, remote work, coworking, import phaseout

Source: compiled by the authors on the basis of existing studies [24–26] and annual reports of studied companies.

Figure 1. Dynamics of indices according to the reports of Russian companies



To calculate the total index for digital transformation components (WT), we aggregate the evaluations from the four parts of the index. For textual analysis, we collected 357 reports spanning from 2017 to 2021, which include ESG (Environmental, Social, and Governance) and sustainable development reports. Subsequently, we conducted text normalization, involving tokenization, removal of stop words, and lemmatization. Differences in word forms were disregarded in the textual analysis. The text indices are computed using the following formula:

$$WD_{it} = \frac{CWD_{it}}{CW_{it}},$$

where WD_{it} is the share of the words related to digitalization, and CWD_{it} is the number of words from the dictionary found in corporate annual report with the total number of words CW_{it}.

The results are presented in Figure 1, which illustrates the dynamics of the indices of digitalization disclosure and digital transformation in annual reports, ESG reports, and sustainable development reports from 2017 to 2021.

It can be observed that the proportion of words related to digitalization and digital transformation components increased, especially during COVID-19 (2020–2021). This may be attributed to the fact that companies had to adapt to the challenges brought about by the pandemic crisis in the context of technological progress.

Model

Based on the analysis of various papers [27–31], we selected a set of variables comprising the following indicators: market capitalization (MCAP), company age (CA), current liquidity (CL), financial leverage (FL), net profit margin (NPM), return on equity (ROE), gross average revenue (GAR), capital expenditures (CAPEX), and asset turnover (ATO).

Panel regression with fixed effects was used to evaluate the model. The disclosure of digitalization components related to process and organization transformation has a greater influence on corporate market capitalization compared to business process and domain transformation, especially during the COVID-19 pandemic. For the periods before and after the pandemic, the same formulas as for H1–H2 were used, but the sample was divided into the periods 2017–2019 and 2020–2021.

Results and Discussion

Descriptive Statistics

Table 3 presents the descriptive statistics of the control variables used in the research, along with the digitalization disclosure variables. These variables assess the share of words related to the digital activities of Russian companies.

Table 3. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
MCAP	581.7	914.12	70.7	4815.7
Financial indicators				
CL	4.03	1.64	2.03	9.58
FL	5	2.67	0.9	8.67
NPM	2.67	1.8	0	10
ROE	28	19.39	7	11
GAR	321.81	116.58	7.95	750.78
CAPEX	802.8	956.67	7.84	1934.78
ATO	2.49	0.27	0.49	2.81
CA	37	35	3	176
Digitalization and digital transformation indices				
WD	0.00406	0.00392	0	0.03129
WBT	0.00156	0.00182	0	0.01207
WDT	0.00518	0.00342	0	0.02675
WPT	0.00073	0.00049	0	0.00390
WOT	0.00073	0.00050	0	0.00391
WT	0.00847	0.00855	0	0.04471

As Table 3 shows, the average digitalization index significantly exceeds the digital transformation indices. This is due to the necessity of digitalization processes for successful digital transformation. The terms related to digitalization are widespread and frequently used in reports. Meanwhile, process transformation and organization transformation indices exhibit the highest average values among all digital transformation components, whereas terms related to business transformation are used less frequently. This difference may be attributed to the specific nature of these terms, which are less commonly employed.

Panel Regression Results

To verify hypotheses H1 and H2, we examined the impact of digitalization disclosure and digital transformation indicators on corporate market capitalization. The results are presented in Table 4.

Table 4. Impact of digital transformation disclosure indicators on the market capitalization of Russian companies (2017–2021)

Variables	(1) *WD MCAP*	(2) *WBT MCAP*	(3) *WDT MCAP*	(4) *WPT MCAP*	(5) *WOT MCAP*	(6) *WT MCAP*
CA	0.51806*** (0.1107)	0.51718*** (0.1122)	0.4928*** (0.11047)	0.4741*** (0.11031)	0.5044*** (0.11144)	0.5044*** (0.11144)
CL	0.0029 (0.0046)	0.00291 (0.00462)	0.00340 (0.00461)	0.00391 (0.0045)	0.003194 (0.00462)	0.00319 (0.00462)
NPM	–0.0022 (0.0043)	–0.00196 (0.00432)	–0.00237 (0.00431)	–0.00233 (0.0042)	–0.002198 (0.00431)	–0.00219 (0.00431)
ROE	–0.02853 (0.070362)	–0.027236 (0.07045)	–0.028706 (0.07054)	–0.0252066 (0.070)	–0.026224 (0.0705)	–0.026224 (0.0705)
FL	–0.00728 (0.00451)	–0.006916 (0.00452)	–0.00732* (0.00453)	–0.0073602 (0.0044)	–0.007084* (0.00452)	–0.007084* (0.00452)
GAR	0.01055** (0.0041)	0.0107*** (0.0041)	0.0107*** (0.0041)	0.01061** (0.0041)	0.01069*** (0.0041)	0.01069*** (0.0041)
CAPEX	–0.00385 (0.00459)	–0.00403 (0.0046)	–0.00392 (0.00459)	–0.00398 (0.00457)	–0.00393 (0.0046)	–0.00393 (0.0046)
ATO	0.0127*** (0.00401)	0.0128*** (0.00401)	0.0128*** (0.00401)	0.01255*** (0.0039)	0.0127*** (0.00401)	0.01276*** (0.00401)
Digitalization disclosure index						
WD	0.0587*** (0.00803)					
WBT		–0.00593 (0.00813)				
WDT			0.00559 (0.00815)			
WPT				0.0088* (0.0048)		
WOT					–0.00137 (0.00647)	
WT						–0.00137 (0.00647)
Model parameters						
R-square	0.285	0.283	0.283	0.290	0.290	0.282

Notes: p-values in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.

First, we should point out that WD (digitalization index) has a direct impact and the variable is significant at the 1% level. Therefore, hypothesis H1 regarding the influence of a company's digitalization disclosure on its capitalization is confirmed. The conclusion of a positive impact of digitalization aligns with existing studies [1], which indicate that in recent years, digitalization has gained popularity among Russian companies due to its potential for breakthrough productivity growth and economic efficiency. Many Russian companies are pursuing digitalization initiatives, and the national strategic program "Digital Economy of the Russian Federation" has been launched to promote the implementation of digital technologies and platforms.

Models (2)–(5) check whether various components of digital transformation exert different impacts on the financial performance of Russian companies (hypothesis H2). Among the components considered, process transformation disclosure is the only one that is significant at the 10% level and has a positive effect on market capitalization. This finding confirms hypothesis H2, indicating that one aspect of digital transformation is particularly important. The total index in model (6) is also of low significance over the entire period. It can be assumed that the market and investors are more interested in the process of digital transformation because it involves not only the modernization of strategy but also qualitative improvements in the approach to digitalization.

Then, to test hypothesis H3, we divided the dataset into two parts: the period in Russia before the COVID-19 pandemic (2017–2019) and the period during and after the pandemic (2020–2021). The results are presented in Tables 5 and 6.

Models (7)–(12) examined the impact of digitalization disclosure and digital transformation components for Russian companies before COVID-19. All indices were found to be insignificant. This insignificance may be attributed to the fact that, while digital transformation has been relevant for Russian companies in the past decade, it was not as impactful before the pandemic. The levels of digitalization and digital transformation were less significant across all levels of company and customer interaction during that period.

Table 5. Impact of digital transformation disclosure indicators on the market capitalization of Russian companies before COVID-19 (2017–2019)

Variables	(7) *WD* *MCAP*	(8) *WBT* *MCAP*	(9) *WDT* *MCAP*	(10) *WPT* *MCAP*	(11) *WOT* *MCAP*	(12) *WT* *MCAP*
CA	0.002957 (0.0498)	0.000407 (0.0499)	–0.001806 (0.0474)	0.00651 (0.0480)	0.00092 (0.04913)	0.000923 (0.0491)
CL	–0.00089 (0.0018)	–9.023e-04 (0.00187)	–0.00083 (0.00186)	–0.00098 (0.0018)	–0.00090 (0.0018)	–0.000907 (0.0018)
NPM	0.000102 (0.0016)	1.207e-04 (0.0016)	0.000145 (0.0016)	0.000181 (0.0016)	0.000116 (0.0016)	0.000116 (0.0016)
ROE	0.0979** (0.0444)	0.0970** (0.0442)	0.0950** (0.0447)	0.1001** (0.0443)	0.0974** (0.0446)	0.09744** (0.0446)
FL	–0.0036* (0.00195)	0.0036* (0.00196)	–0.0036* (0.00196)	–0.0035* (0.0019)	–0.0036* (0.00195)	–0.0036* (0.001958)
GAR	–0.006*** (0.00167)	–0.0060*** (0.00165)	–0.0059*** (0.00166)	–0.0060*** (0.0016)	–0.0060*** (0.00166)	–0.00603*** (0.00166)
CAPEX	–0.0058*** (0.00178)	0.0058*** (0.00178)	–0.0058*** (0.00178)	–0.0057*** (0.0017)	–0.0058*** (0.00178)	–0.00586*** (0.00178)
ATO	0.0108*** (0.00249)	0.0107*** (0.00294)	0.0107*** (0.00248)	0.0110*** (0.0025)	0.01082*** (0.0024)	0.01082*** (0.00249)
Digitalization disclosure index						
WD	–0,00049 (0.0027)					
WBT		–8.014e-05 (0.0032)				
WDT			0.00094 (0.0033)			

Variables	(7) WD MCAP	(8) WBT MCAP	(9) WDT MCAP	(10) WPT MCAP	(11) WOT MCAP	(12) WT MCAP
WPT				–0.0013 (0.0021)		
WOT					–0.0002 (0.0031)	
WT						–0.000202 (0.00312)
Model parameters						
R-square	0.4343	0.434	0.434	0.435	0.435	0.434

Note: p-values in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.

Models (13)–(18) from Table 6 examine the significance of digital transformation disclosure after the onset of the COVID-19 pandemic in Russia. Models (16)–(17) clearly demonstrate that process and organization transformation disclosure is significant at the 5% level, positively impacting corporate market capitalization during the pandemic. Consequently, H3 is fully confirmed, indicating that the significance of digitalization increased sharply during and after the pandemic.

Table 6. Impact of digital transformation disclosure indicators on the market capitalization of Russian companies during the COVID-19 period (2020–2021)

Variables	(13) WD MCAP	(14) WBT MCAP	(15) WDT MCAP	(16) WPT MCAP	(17) WOT MCAP	(18) WT MCAP
CA	5.7624*** (0.9226)	5.59526*** (0.9154)	6.1296*** (0.9303)	5.6523*** (0.8714)	5.8821*** (0.926)	5.8821*** (0.9260)
CL	–0.00250 (0.0085)	–0.00208 (0.0084)	–0.006654 (0.0087)	–0.00630 (0.00816)	–0.00410 (0.0086)	–0.0041 (0.00868)
NPM	–0.005769 (0.00823)	–0.00484 (0.008)	–0.00888 (0.00821)	–0.00684 (0.0077)	–0.00714 (0.00826)	–0.00714 (0.0082)
ROE	0.6295*** (0.2165)	0.5967*** (0.2144)	0.7141*** (0.2186)	0.6891*** (0.2054)	0.6590*** (0.2183)	0.65905*** (0.2183)
FL	–0.00362 (0.00864)	–0.00156 (0.00862)	–0.00567 (0.00860)	–0.0036 (0.0081)	–0.0040 (0.0086)	–0.00402 (0.00864)
GAR	0.0359*** (0.0078)	0.0357*** (0.0076)	0.0369*** (0.0075)	0.03713*** (0.0073)	0.03701*** (0.0077)	0.03701*** (0.0077)
CAPEX	5.435e-05 (0.009)	0.00059 (0.0088)	–0.00211 (0.0089)	–0.00087 (0.0084)	–0.00099 (0.009)	–0.00099 (0.009)
ATO	0.0461*** (0.0099)	0.0475*** (0.0097)	0.0471*** (0.0097)	0.0448*** (0.0093)	0.0464*** (0.0098)	0.0464*** (0.0098)
Digitalization disclosure index						
WD	–0.00651 (0.0154)					
WBT		–0.03193 (0.022)				
WDT			0.02628 (0.0174)			
WPT				0.02434** (0.009)		

Variables	(13) WD MCAP	(14) WBT MCAP	(15) WDT MCAP	(16) WPT MCAP	(17) WOT MCAP	(18) WT MCAP
WOT					0.0254** (0.0095)	
WT						0.01048 (0.0157)
Model parameters						
R-square	0.726	0.735	0.73	0.755	0.728	0.723

Note: p-values in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1.

We expected to obtain equally unambiguous results because the crisis triggered by the pandemic made companies realize the urgent importance of implementing digital technologies. In Russia, the digitalization strategy had been promoted at the national level even before the pandemic, with people, businesses, and governments increasingly applying breakthrough technologies [32]. However, before the pandemic, company digitalization disclosure did not play such an important role and had no significant effect on corporate financial performance.

In fact, the significance of disclosing components of corporate digitalization, such as process and organization transformation, can be attributed to the pandemic's role in redirecting innovation towards new technologies that support video conferencing, remote work, and online learning—technologies that are likely to spread even more widely in the future [32]. Additionally, some studies [33] suggest that the pandemic acted as a catalyst, making the implementation of digital transformation in Russian companies urgent. Before the pandemic, remote work was technically impossible in many Russian companies or not allowed officially. However, the pandemic forced the digitalization of numerous companies [34].

Results of the Random Forest Algorithm

Random forest regression is a supervised learning algorithm that combines ensemble learning methods with a decision tree structure. The predictions or classifications provided by the algorithm are often more reliable than those from many other models [35]. Its nonlinear nature allows it to detect more subtle influences of variables on an indicator. Additionally, it enables the inclusion of all available indices in the same model. Although the nonlinear character of the method makes it impossible to definitively determine the influence area of explanatory variables on the dependent variable (since it may vary depending on the value level), it allows for the assessment of the overall significance of changes in indicator values on the dependent variable. This makes it possible to evaluate the significance of text variables, even if their influence is complex and nonlinear.

Figure 2 shows that the digitalization disclosure indicator ranks seventh in significance. It follows indicators such as asset turnover, return on equity, and capital expenditures. Among other sensitive variables, it is outperformed by both process transformation and organization transformation.

Figure 2. Random forest analysis for hypotheses H1 and H2

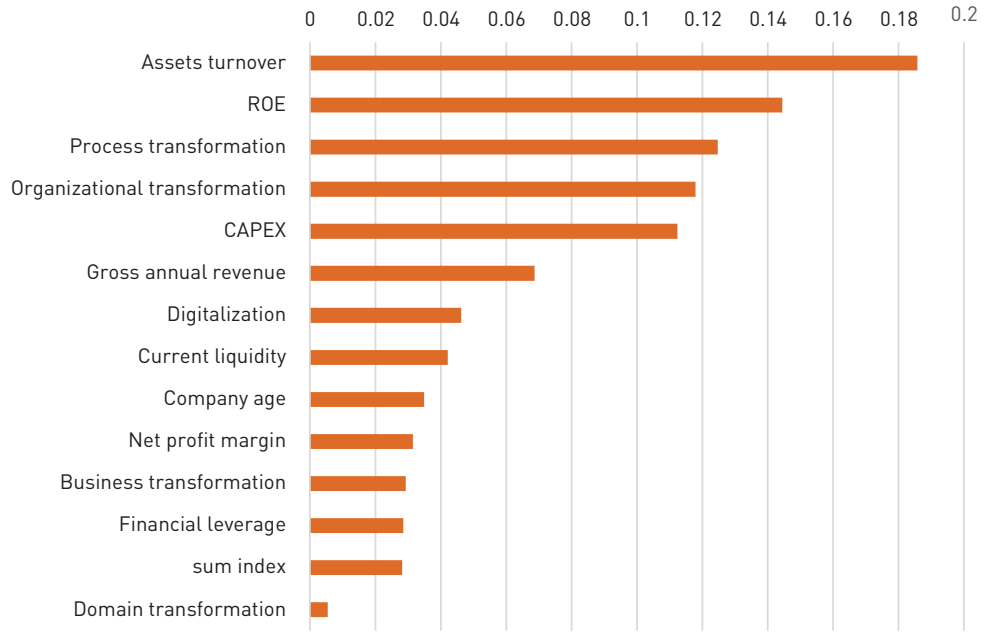
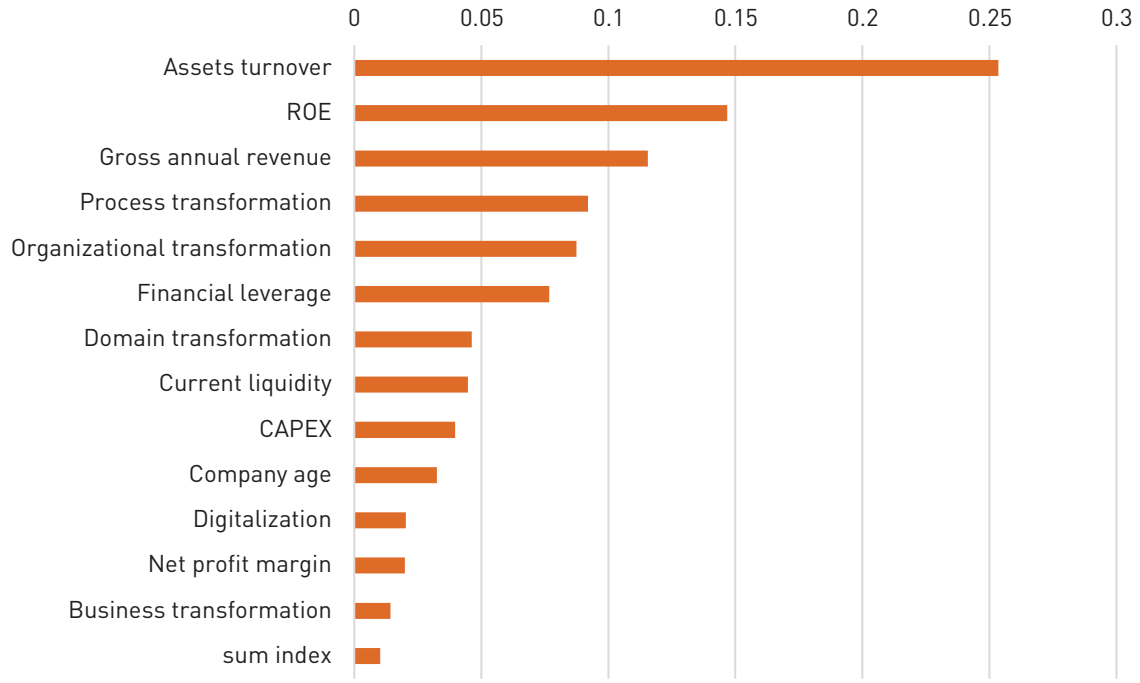


Figure 3. Random forest analysis for H3 hypothesis (during COVID, 2020–2021)



These variables are highly significant. Thus, the results for H1 and H2 are in line with previous research: return on equity has a strong effect on corporate market capitalization [27], while asset turnover [28], CAPEX [29], as well as process and organization transformation disclosure, exert a slightly smaller or equal impact [28]. At the same time, the significance of domain transformation is minimal, and different components exert their impact in varying ways, which explains the decline in significance of the total index. The results of machine learning methods corroborate the regression analysis findings and even extend them, showing that alongside digitalization and process transformation, organizational transformation also proves significant.

Figure 3, in turn, shows that process and organization transformation occupy the fourth and fifth positions on the list, respectively, after asset turnover, return on equity, and gross annual revenue, following the onset of the COVID-19 pandemic in Russia (2020–2021).

Nevertheless, the significance of these components far outweighs that of business transformation and numerous other indicators during COVID-19. Domain transformation, in particular, emerged as highly significant; its importance increased substantially after the pandemic began in Russia. In contrast, the significance of business transformation remains low. These findings are consistent with previous research [36] and are supported by the results of the random forest analysis, confirming hypothesis H3 once more.

Conclusion Based on Modeling Results

Summing up, we present a visual demonstration of all validated hypotheses in Table 7.

Table 7. Summary: Hypothesis Testing

Hypothesis		Result
H1	A company's digitalization has a positive effect on its market capitalization	(+) confirmed
H2	Individual components of digital transformation and digitalization influence market capitalization of Russian companies in different ways	(+) confirmed
H3	The influence of individual components of digital transformation and digitalization components grew during the COVID-19 crisis	(+) confirmed

The confirmation of H1 and H2 correlates with similar papers, suggesting that the disclosed information about company digitalization positively impacts corporate market capitalization. Studies such as [6; 37] indicate that digitalization disclosure influences the cost of capital, stock market valuation, and market-based valuation across various sectors. Such studies underscore the significance of digital technology disclosure as non-financial information crucial to market assessments, highlighting that higher levels of disclosure are directly associated with enhanced stock market valuation [4].

Thus, hypothesis H1 was confirmed through regression analysis and random forest techniques: broader digitalization disclosure in the annual reports of Russian companies correlates with increased corporate market capitalization. This finding aligns with signaling theory, which posits that companies communicate digitalization efforts to signal positive impacts on their value. These results are in line with previous research [38].

The verification of H2 using both methods demonstrates that process transformation disclosure significantly influences financial performance, whereas business transformation shows minimal significance, indicating distinct impacts. Disclosing even individual digital transformation components reduces information asymmetry and facilitates effective communication with stakeholders regarding the company's current operations and long-term strategy. This observation supports the applicability of signaling theory in this context as well.

The results of verifying H3 are consistent with studies confirming that the COVID-19 pandemic accelerated digitalization, prompting less advanced companies to partially catch up with digitalization levels [36]. The changes introduced during the pandemic continue to impact corporate long-term development strategies. Many companies have accelerated digitalization in customer interactions, supply chains, and internal operations and processes. Additionally, there has been an observed increase in the significance of domain transformation during the pandemic. However, components related to process and organizational updates remain the most significant. This finding aligns with similar studies [34].

Conclusion

Currently, digitalization is gaining significant importance in modern business as technological advancements continue to shape companies' operational methods. In today's business environment, transparency and openness are crucial for maintaining a reputable image. Consequently, the disclosure of non-financial information, particularly related to digitalization, has become increasingly important as more companies worldwide, including those in Russia, publish non-financial reports.

This study demonstrates that disclosing information about digitalization and digital transformation has a positive impact on corporate capitalization, with this effect becoming more pronounced after the onset of the pandemic. Stakeholders now place greater reliance on non-financial factors when evaluating the financial and market performance of companies.

The practical relevance of this paper encompasses several key aspects. Firstly, understanding the significance of disclosing non-financial information in reports and thereby enhancing business transparency can inspire businesses to further develop in this realm, potentially attracting more investment and new customers. Secondly, top managers can leverage the findings of this research to formulate a more intelligent and comprehensive digital strategy. Such a strategy has the potential to yield benefits both in terms of reputation and financial performance.

There are several limitations in the present study that also suggest potential avenues for future research. Firstly, conducting a more extensive study with a larger sample of companies, segmented by industry, could provide insights into the consistency of results and the significance of information disclosure across various sectors, drawing parallels with practices in other countries.

Secondly, future studies could consider expanding the list of digital transformation components and employing more sophisticated dictionary processing techniques to develop a more reliable index.

Finally, comparative analyses involving samples of companies from multiple countries could investigate potential differences in the impact of disclosing non-financial information, particularly between Russian practices and those in European contexts.

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