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Digital Transformation of Museums with a case study of the Russian Approach

Supervisor

Prof. Andrea Baldin

Graduand

Dariya Nizhnichenko

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Table of content:

Introduction.	3
1.Theoretical Foundations of Digital transformation (DT) and digitalization.	6
1.1 Digital Transformation (definition, history, Industry 4.0).	6
1.2 Digital Transformation Strategy. Digitalization and DT impact.	13
1.3 Frameworks and roadmaps of Digital transformation.	26
1.4 Digital transformation and digitalization of museums.	37
1.5 Museums’ Digital strategies.	45
1.6 Conclusion to the chapter.	49
2. Digital transformation in Russia and in Russian culture in particular.	50
2.1 An overview with a focus on government programs and legal framework.	50
2.2 Government initiative and regulatory framework in Russian culture and its digital transformation.	60
Government initiatives and regulatory framework in cultural sector.	60
The 'Smart City' Concept: Moscow.	69
Conclusion to the section.	72
3. Digital transformation and digitalization of museums in Russia.	74
3.1 General overview from different angles.	74
History of digitalization in Russian museums.	74
International Communities.	80
The necessity of digital transformation and digitization in museums.	82
Technologies used by Russian museums for visitor engagement.	84
Digitization, State catalog.	88
Portal Culture.RF.	91
Automated information system (AIS). System “KAMIS”.	94
Training of museum staff. Competencies.	99
3.2 Digital transformation and digitalization of the Pushkin State Museum of Fine Arts.	106
General information about the museum.	106
Interaction with government initiatives’ framework.	108
Strategy 2013-2020 and the museum's digital ecosystem.	110
Strategy from 2021.	112
Digital technologies used by the museum.	115
Conclusion to the section.	118
Conclusion.	120

Bibliography.	122
Books	122
Articles, conferences, interviews.....	122
Sites	133

Introduction.

In an age of rapid technological advancement, the phenomenon of digital transformation and digitalization has become pervasive across all economic sectors globally, revolutionizing traditional practices by introducing innovation on an unprecedented scale. This Thesis investigates the critical intersection of digital transformation in the cultural sphere, specifically examining its impact and implementation in Russian museums, supporting the research with the case study of the Pushkin State Museum of Fine Arts. The motivation for this study is driven by the increasing importance of integrating digital technologies to preserve, present, and enhance cultural heritage in line with contemporary societal expectations and global trends. It is noteworthy that this research emphasizes the need for a comprehensive approach to digital transformation, rather than merely adopting individual technologies.

The topic “Digital Transformation of Museums with a case study of the Russian Approach” possesses significant academic, scientific, and general relevance in the contemporary digital era. This Thesis is inherently interdisciplinary, intersecting disciplines such as museology and IT, appealing to a wide academic audience interested in the technological reshaping of cultural institutions.

The study seeks to answer the following research questions:

1. What are the distinctive features of digitalization and digital transformation within the museum sector?
2. How is digital transformation implemented in the Russian cultural sector, particularly in museums, and what are the challenges at both the governmental level and within the museums themselves?
3. How does the case study of the Pushkin State Museum of Fine Arts exemplify the process and impact of digital transformation in the Russian museum sector?

This Thesis is academically significant as it addresses a crucial gap in the literature on digital transformation within the cultural sector, advocating for a holistic approach. By providing empirical insights into the complex interplay between technological advancements and their strategic applications in museums, this study contributes to the theoretical framework. Examining this issue through the specific context of Russia, the research not only potentially influences cultural, economic, and IT sector professionals to explore solutions to challenges but also offers valuable perspectives for international researchers. Through the analysis of a

particular country's practices, it facilitates idea exchange and the development of strategies to preemptively address potential challenges, serving as a valuable resource for scholars globally.

Analyzing the digitalization and digital transformation practices of a specific museum, the Pushkin State Museum of Fine Arts, and reviewing its strategic approach in this area, aids in understanding how museums in Russia and abroad can successfully navigate digitalization challenges to remain relevant and accessible in a future dominated by digital technologies.

The Thesis is structured into three parts: Theoretical Framework, a Case Study of the Russian Approach focusing on government frameworks, and a Case Study of the Digital Transformation and Digitalization of Russian Culture, with a focus on museums.

Chapter 1 is segmented into six sections, laying the theoretical groundwork for digital transformation within both global and local contexts. Section 1.1 delves into the general understanding of digital transformation, clarifying the term amid the diverse interpretations and confusions present in scholarly literature. Sections 1.2 and 1.3 discuss digital transformation strategy, its necessity, and examples of strategies developed by leading global companies. Subsequently, sections 1.4 and 1.5 explore digital transformation within the museum sector, attempting to dissect how these processes manifest in museums, the strategies employed or not employed by museums, and the reasons behind these choices. Finally, section 1.6 provides a brief conclusion to the theoretical chapter.

Transitioning to Chapter 2, we examine the situation in Russia. Section 2.1 presents an overview of the Russian government's approaches to the adoption and development of digital technologies across the nation. Section 2.2 focuses on state initiatives and the regulatory framework within the cultural sphere. This concentrated attention on governmental programs is due to the State's role as the primary driver of these digital initiatives.

Chapter 3 delves into the peculiarities of Russia's digital landscape within the cultural and museum sectors from various perspectives. Section 3.1 offers a historical overview of the digitalization of the Russian museum sector, followed by discussions on international collaboration in this field, deemed essential for development in the digital era. It further includes a study on the necessity of integrating such technologies in Russian museums. Subsequently, the section explores the technologies museums employ as part of digitalization to interact with visitors, facilitate internal communication, and engage with the government. The concluding part of this section describes a crucial element of digital transformations—human capital and its competencies.

The final section, 3.2, presents an in-depth thematic study of the Pushkin State Museum of Fine Arts. The analysis not only reflects the museum's digital strategy and technological

applications but also considers them within the broader context of Russia's digital cultural landscape.

The methodology of the Thesis employs a dual approach, combining theoretical research with a practical case study. The theoretical component encompasses a comprehensive review of scientific literature, articles, books, and existing research on digital transformation and digitalization, including in the cultural and museum sectors. This foundation allows for an understanding of the global context and theoretical frameworks underpinning digital initiatives in museums.

The practical component characterizes the study of the Russian digital context and a specific museum's examination. This research relies on analyzing secondary sources, such as official documents, programs, reports, presentations, and other publicly available information, rather than collecting primary data through surveys or interviews.

By integrating these methodologies, the Thesis offers a holistic view of digital transformation in museums, highlighting both theoretical foundations and the practical implementation of digital strategies in the specific Russian context. This blend of theoretical knowledge and practical analysis facilitates a nuanced understanding of the issues and opportunities associated with museum digital transformation.

In conclusion, this research contributes to the understanding of digital transformation in the museum sector, suggesting implications for policy, practice, and future studies. It underscores the necessity for museums to adapt to digital imperatives not merely as a response to contemporary challenges but as a proactive approach to redefining their role and value in a society interconnected by digital technologies.

1.Theoretical Foundations of Digital transformation (DT) and digitalization.

1.1 Digital Transformation (definition, history, Industry 4.0).

In the contemporary context, the terms "digitalization" and "digital transformation" are widely used, akin to the pervasive use of terms such as "sustainability," which is not always clearly understood. Do we really comprehend the meanings of the terms we employ, and do we understand their peculiarities? Let's attempt to grasp the overall concepts of "digitalization" and "digital transformation," their origins, and their implications for companies on a global scale.

Currently, experts interpret the terms "digitalization" and "digital transformation" (DT) in various ways due to the multitude of perspectives on their content and roles within organizations.

To delve into the essence of these terms, let's start by examining the etymology of the word "digital" in both English and Russian, since we are going to apply these terms also in a context of Russia in the next practical chapter. According to the dictionary (Vocabulary.com, n.d.)¹, the Latin word "digitus" means "finger or toe." By adding the suffix "-al," meaning "being like," the adjective "digital," or "fingerlike," is derived. The word began to refer to numerals around 1938, becoming vital in the context of computers. The connection between fingers and numbers is evident, as the earliest mathematical "calculators" were likely fingers and toes. Digital recording emerged in 1960, challenging analog and soon becoming the broadcasting standard for clearer signals. Therefore, while "digital" originally referred to something manipulable by fingers, it also became associated with electronic signals using binary code to transmit information.

The Cyrillic word "цифровой" [tsifrovoy] ("digital") (adj.) is derived from the word "цифра" [tsifra] ("number"), which, in turn, traces its roots to the Latin "cifra" and the Arabic صفر [ṣifr], meaning zero (Wiktionary.org, n.d.)². In contemporary Russian, the word "цифра" [tsifra] is used to denote "number," establishing a connection between both concepts in the considered languages. Thus, it implies a system utilizing numbers to convey information.

¹ Vocabulary.com. (n.d.). Digital. In *Vocabulary.com Dictionary*. Retrieved from <https://www.vocabulary.com/dictionary/digital>

² Ru.wiktionary.org. (n.d.) *Digitalization*. Retrieved from <https://ru.wiktionary.org/wiki/%D1%86%D0%B8%D1%84%D1%80%D0%BE%D0%B2%D0%B8%D0%B7%D0%B0%D1%86%D0%B8%D1%8F>

Based on the literature review, initially, these terms were confined to the realms of mathematics and computer science, denoting a numeral system. Over time, their significance expanded to encompass technologies related to the processing and transmission of digital information.

Moving on to the definitions of these terms, Daniel E. O'Leary (Liew, O'Leary, Perdana, & Wang, 2022), a professor at the University of Southern California, references the Gartner glossary (n.d.)³, providing basic definitions of key concepts in digital transformation. O'Leary (Liew et al., 2022) mentions a "digital initiative" as the process of introducing a digital project to a firm. Subsequently, digitization, digitalization, and digital transformation are often considered interchangeable, but they represent three distinct technological concepts with varying consequences for a company:

1. 'Digitization' refers to the process of transitioning from analog to digital form (Gartner glossary, n.d.). The utilization of this technology has streamlined analog processes, rendering them more efficient. Kihara Kimachia (2023) describes three stages of digitization:
 - Sampling and quantization – analog signals are captured and transformed into numerical representations;
 - Signal Manipulation – actions performed on the obtained digital format;
 - Storage and transformation – data storage on physical disks, cloud storage, and data transmission through various digital channels.
2. 'Digitalization' involves employing digital technologies to alter a business model, offering new revenue streams and value-producing opportunities. It is the process of transitioning to a digital business (Gartner glossary, n.d.). In simpler terms, it entails automating tasks previously executed manually. Kimachia (2023) identifies three advantages of digitalization:
 - Everyday efficiency;
 - Business benefits, such as optimization and increased efficiency of business processes;
 - Information transmission.
3. 'Digital (business) transformation' is the process of leveraging digital technologies and supporting capabilities to establish a robust new digital business model (Gartner

³ Gartner glossary. (n.d.). *Information technology Glossary*. Retrieved from <https://www.gartner.com/en/information-technology/glossary?glossaryletter=D>

glossary, n.d.). This process focuses on transforming the entire organization and goes beyond simple digitization or process automation. Kimachia (2023) describes three multifaceted components constituting digital transformation:

- Comprehensive strategy – optimizing organizational operations and value propositions for customers, a process requiring changes in culture, structure, processes, and management;
- Customer expectations – in the modern world, we are becoming accustomed to digital solutions, expecting them from companies, e.g., the ability to place online orders. Without these, customers may turn to other companies.
- Tech drivers (big data, artificial intelligence, etc.) create opportunities for organizations to enhance themselves and their value propositions.

Although Gartner glossary (n.d.) uses the term "digital business transformation," we opt for the more inclusive term "digital transformation." This is because not only businesses undergo this transformation, but also governments, non-profit organizations, and so forth.

Based on this information, O'Leary (Liew et al., 2022) conceptualizes a hierarchy of digitization terms (Fig. 1). This hierarchy begins with simpler and easily implementable actions (digitization) and progresses to more complex and challenging ones (digital transformation). Advancing through this hierarchy implies that the completion of a lower level is a prerequisite for completing the next level. Therefore, in general, digitization is necessary for each stage of digitalization and digital transformation, while digitalization is required for digital transformation.

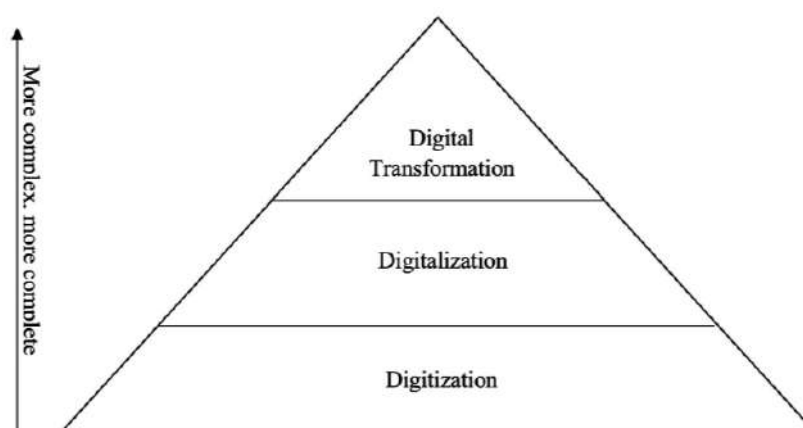


Figure 1. *Digital Transformation Hierarchy*. (Liew et al., 2022, p.180)

Undoubtedly, the scope, level of impact, and specific end goals of these processes vary because, firstly, in terms of impact, one technology involves changes only at the task level (digitization), while the other represents a strategic shift (digital transformation). Secondly, in

terms of goals, we are also moving from, figuratively speaking, the specific to the general, as digitization aims to enhance data accessibility, digitalization targets operational efficiency, and digital transformation focuses on complete organizational transformation.

For a comprehensive understanding, let's also explore the definitions of the two terms that interest us the most (digitalization and digital transformation) from several other sources:

1. MIT Sloan Management Review (Mit Sloan Management Review, n.d.)⁴:
 - Digitalization: "The integration of digital technologies into everyday life by the digitization of everything that can be digitized."
 - Digital Transformation: "The use of technology to radically improve performance or reach of enterprises."
2. Harvard Business Review (Leinwand & Mani, 2021):
 - Digitalization: "The process of using digital technologies to create new — or modify existing — business processes, culture, and customer experiences to meet changing business and market requirements."
 - Digital Transformation: "Radical rethinking of how an organization uses technology, people, and processes to fundamentally change business performance."
3. World Economic Forum (Di Battista et al., 2023):
 - Digitalization: "The adoption or increase in use of digital or computer technology by an organization, industry, country, or individual."
 - Digital Transformation: "The integration of digital technologies into all areas of a business, resulting in fundamental changes to how businesses operate and how they deliver value to customers."

In academic literature, as highlighted by Riva (2020), it is emphasized that digitalization inevitably brings about changes in the human mindset. Researchers propose approaches to define global digitalization and digital transformation (DT) based on the impact of these phenomena. One such approach is paradigmatic, as presented in the studies by Bedov, Kozhevnikova, and Ermolenko (2018). Accordingly, Babkin (2017) discusses Bedov and others research, stating that they define digitalization as a paradigm shift in thinking, actions,

⁴ Retrieved from

https://sloanreview.mit.edu/subscribe/?utm_source=googleads&utm_medium=adv&utm_campaign=MITSMR%20-%20Brand%20-%20Domestic%20-%20Phrase&gad_source=1&gclid=CjwKCAiA04arBhAkEiwAuNOslmMWNgtFlpuJfPGP5RaZgfCbU53FmSoiD7JqFqUJAK98TYaXxLDDRoC9XkQAvD_BwE&offer_id=AdvStd&tpcc=AdvStdSub

and communication, considering technology as a tool rather than a goal. This perspective on digitalization sees the transformation of human consciousness achieved through computer programs, elevating digitalization and DT to a new level associated with mental changes in society. Bedov (2018) reports that researchers like Gorlova, Zorina, and Kryukova associate these mental changes with the global transformation of culture as a whole, characterizing it as a globalist approach. The authors also link digitalization processes to a megatrend defined as a global tendency that transforms a specific sphere of public life and has a sustainable impact on all aspects of social practice (Bedov, 2018).

Understanding the definitions, let's briefly explore the history of the use of these terms. Pinpointing the exact origin can be challenging. Undoubtedly, the term "digitalization" (if not to take into account "digitization") appeared first; upon analyzing scholarly literature, it can be said that one of the earliest mentions of this term was in Nicolas Negroponte's book (1996). Although the term itself may not be the main focus, Negroponte (1996) discusses the broader consequences of transitioning from analog to digital technologies, including the transformation of various industries. Subsequently, for instance, it was used by Miklós Szanyi (1998) in his academic paper. This paper reflects an early academic exploration of the impact of digital technologies on open economies.

Examples demonstrate that discussions around digitalization have been ongoing since the late 20th century, with increasing attention being given to its economic, organizational, and industrial implications.

Determining the precise origin of the term "digital transformation" can also be challenging, as it evolved over time and is often used in various contexts by different authors and practitioners. Nevertheless, one of its early mentions in academic and industry literature can be traced back to the 2011 report by Capgemini Consulting (Westerman et al., 2011). The report discusses the transformative impact of digital technologies on business and outlines a roadmap for organizations to navigate these changes. This report, along with others from consulting firms, played a role in popularizing the concept of digital transformation. Another early example can be considered the article by Michael Fitzgerald et al. (2014), where the strategic significance of digital technologies for business is discussed. Although the specific term "digital transformation" may not be used literally, the article lays the groundwork for this concept and emphasizes the necessity of organizations strategically adopting digital technologies.

It is important to note that, even though the term "digital transformation" is not explicitly mentioned in these sources, they discuss concepts and ideas that laid the foundation

for its widespread adoption. This term became increasingly prevalent in the mid-2010s as organizations faced with the strategic challenges posed by digital technologies.

It is also crucial to understand that the concepts under consideration are part of a more global process, namely, digital transformation is inherently linked to the Fourth Industrial Revolution, also known as Industry 4.0 (Alcácer and Cruz-Machado, 2019; Weking et al., 2020). This revolution centers around interconnectivity, automation, machine learning, and real-time data (Fig. 2). The intelligent integration of machines and processes through information and communication technologies is reshaping the ways businesses are conducted and organizations are managed – in simpler terms, this is digital transformation. The digitalization of business processes and the digital strategies of Industry 4.0 connect advanced methods and breakthrough technologies in the production of goods and services with business management, facilitating global communication and collaboration across industries (Feliciano-Cestero et al., 2023).

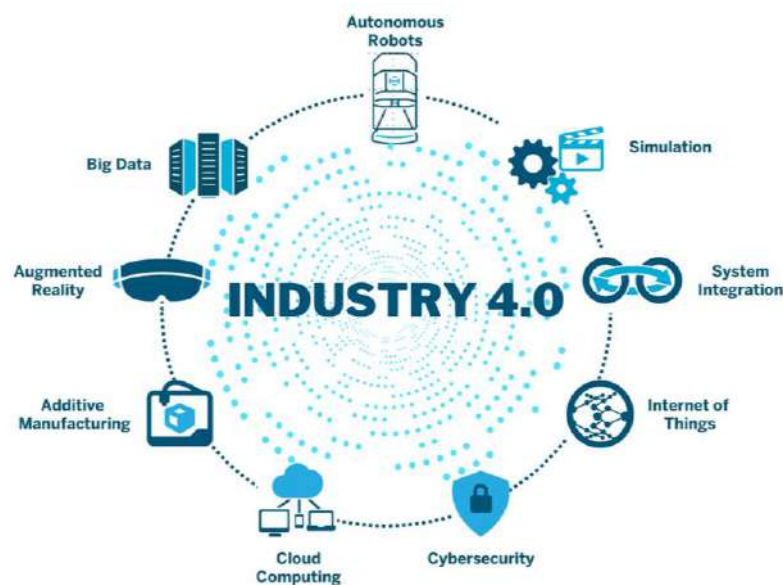


Figure 2. *Components of Industry 4.0.* (Meloeny, 2022)

Indeed, according to Vladimir Opredelev's lecture on Digital innovations in the museum sphere (2022), we are currently in the phase of a gradual transition from Industry 4.0 to Industry 5.0 (Figure 3), distinguished by an abundance of these cyber-physical systems and a significant number of artificial intelligence systems that fundamentally alter the interaction among conventional systems. Furthermore, Industry 5.0 emphasizes the importance of human involvement and collaborative efforts between humans and robots (Kaplan, 2021).

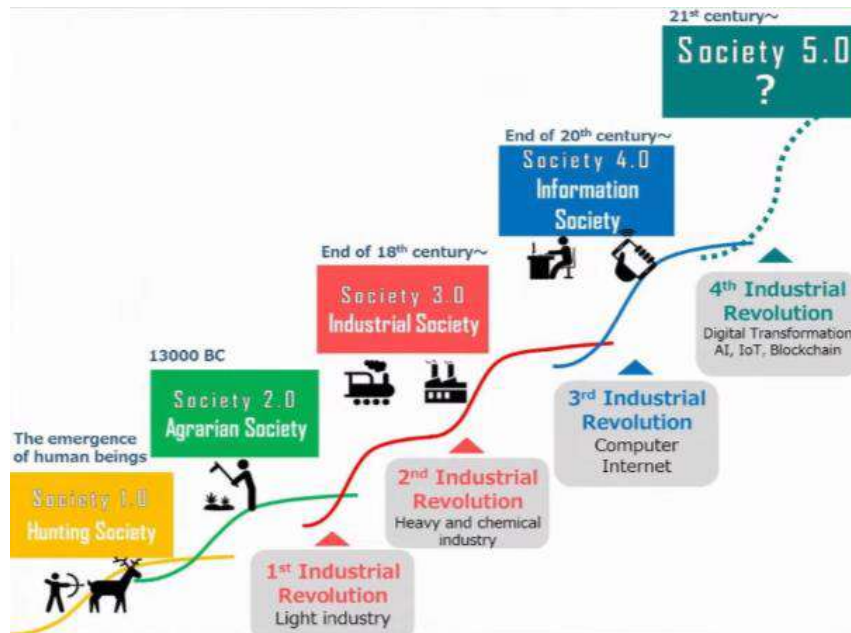


Figure 3. *Transition of technological revolutions.* (Opredelenov, 2022)

However, Industry 5.0 undoubtedly complements and expands the capabilities of Industry 4.0. Its purpose is to enhance this digital transformation through more meaningful and efficient collaboration between humans and machines and systems within their digital ecosystem. The partnership between humans and smart machines combines the precision and speed of industrial automation with the creativity, innovation, and critical thinking skills of humans ("Industry 5.0: adding human potential to Industry 4.0," n.d.).

1.2 Digital Transformation Strategy. Digitalization and DT impact.

According to Kiryushin and his colleagues (Kiryushin et al., 2020), digital transformation extends beyond the simple integration of new technologies into the corporate environment, as is often mistakenly perceived. It involves profound changes in the organizational structure aimed not only at quickly adapting to new conditions but also at setting its own trends. This encompasses the development of innovative business models, the cultivation of a digital culture within the organization, the reorganization of its structure and culture, personnel management strategies, and the encouragement of innovative development through the transformation of traditional work methods. Additionally, digital transformation implies the personal transformation of company employees, who acquire new skills demanded in the digital environment.

As also noted by O'Leary and Perdana (Liew et al., 2022), digital transformation goes beyond the simple implementation of information technology applications; it represents a strategic approach. Successful digital transformation requires an effective ecosystem in which enterprises and government institutions interact, utilizing data and digital technologies. Organizations must systematically develop the digital skills of their personnel and carefully plan, select, and implement digital technologies. On the other hand, the government should create a conducive environment to accelerate digital transformation by providing financial support, tax incentives, consulting services, educational programs, and other relevant measures.

The global nature of changes in organizational functioning induced by digital transformation necessitates the creation of a document to control the processes of digital transformation (DT) (Kiryushin et al., 2020). Depending on the strategic goals of the company, the scope, content, and level of detail of the strategy may vary. The DT strategy can be a concise document containing general formulations of planned changes, as well as a detailed multipage plan describing the sequence of implementing specific initiatives. In the former case, it is necessary to allow for the refinement of the action plan, as the lack of clear steps will hinder the coordination of transformative processes affecting various aspects of the organization's activities. It is important to note that the content of the strategy will depend on the ultimate recipient. Brief documents, emphasizing the business effects of DT, are primarily intended for the top management of the company, while detailed plans for changes in information technology are used by IT department staff. It is also worth noting that the digital transformation strategy should be built based on the business strategy or, in its absence, on the

business goals of the organization, as DT is considered a tool for achieving the company's objectives rather than an end in itself. The tasks of the digital transformation strategy can encompass various aspects, such as (Kiryushin et al., 2020):

- Increased profitability through technology implementation;
- Development of marketing and production potential;
- Transition to data-driven management, improvement of decision-making processes;
- Formation of a new corporate culture and development of digital competencies;
- Entry into new markets;
- Strengthening security and more.

Regarding the duration of the strategy, for instance, Davis (2019) suggests that it is determined by the organization itself, and generally, researchers converge on a 5-year timeframe. On one hand, it is essential during the strategy development to understand which technologies will be relevant at the time of implementation. Some argue, as noted also by Davis (2019) that the implementation of digital technologies should be planned only a year ahead, as the IT world changes too rapidly. However, they overlook that, on the other hand, digital transformation (DT) requires a fundamental change in the organization's functioning. Planning within a 1-year timeframe is more suitable for the digitalization process. Yet, at the core of DT lies the principle of adaptability, as highlighted by Gruman (2016). Successful operation in the modern world requires companies to adapt to new opportunities and incorporate this into their strategy. To prevent the digital transformation strategy from becoming outdated, a mechanism for making changes to it should be developed, such as through meetings of a special working group.

Although the content of the DT strategy may vary from one organization to another, it, like any other strategy, typically consists of three main parts:

1. The current state or "AS IS";
2. The model to be achieved or "TO BE";
3. The program of activities to achieve the "TO BE" state.

Shah (2019, published; 2023, updated) has outlined a potential common further itemization of the Digital Transformation (DT) strategy for an organization:

1. Business Assessment - Evaluation of the current state of the organization, encompassing both technical infrastructure and business processes, strategic goals, as well as available resources for potential growth.

2. Research your industry and competitors - Conducting an analysis of the market and competitive environment to understand the digital solutions applied in the specific industry. This also involves identifying technologies that can be borrowed from related fields and determining the advantages brought by different technologies.
3. Prioritize digital initiatives - Formulating goals and prioritizing them. It is evident that all strategy activities need to be implemented sequentially within a defined timeframe. It is recommended to start with small projects that, despite their modest costs, vividly demonstrate the viability and impact of digital solutions to management and employees.
4. Create a delivery plan - Developing a program of activities. It may include a roadmap for each digital initiative, a list of required resources, and criteria for evaluating results.
5. Create a budget plan, which will be based on available financial resources. It is crucial to anticipate possible delays and provide a contingency budgeting plan, as insufficient elaboration of the budget plan often leads to the failure of digital transformation.
6. Create a resource plan. This pertains to human capital. It is extremely important to assemble a team with the necessary skills and mindset.

Mikhailov (2020), an expert in IT strategies and digital business transformation, proposes the following structure for a digital transformation strategy (Fig. 4):

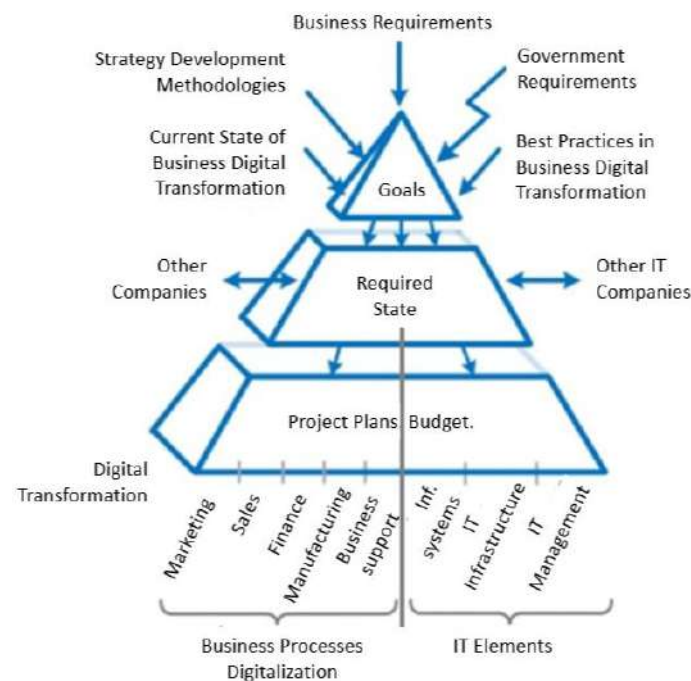


Figure 4. *Structure of a digital business transformation strategy.* (Mikhailov, 2020)

[translated by Author, 2023]

Mikhailov (2020) suggests that the strategy for digital business transformation may vary. It is necessary to consider both typical approaches to developing IT strategies and approaches to business strategy development. This implies adding digital transformation of business processes and considering new IT technologies to the IT strategy. When starting from business strategies, it is essential to include digital transformation of business processes and key IT elements (as the implementation of new IT technologies is assumed, and they need to be integrated with existing information systems, IT infrastructure, and IT management).

Other important points that may be included in the digital transformation strategy involve the management of digital transformation, i.e., the creation and description of the principles of operation of special guiding groups responsible for implementing the strategy (Ministry of Digital Development, n.d.)⁵. It also includes the description of digital transformation risks, their assessment, and measures for prevention and minimization, as well as the description of barriers and actions to overcome them (Kiryushin et al., 2020). According to Jabil (2017), the most common barriers faced by companies include employee resistance to new technologies, a low level of digital skills within the organization and among leadership, and budget constraints.

A crucial role in the overall digital transformation of the organization and in the development of the digital transformation strategy also plays The Chief Digital Officer (CDO) or Chief Digital Transformation Officer (CDTO). Both abbreviations refer to the same position in the organization; however, CDTO is more commonly used in Russian practice to avoid confusion with the Chief Data Officer, which shares the same abbreviation (Kiryushin et al., 2020).

In the report "State as a Platform: People and Technologies," edited by Shklyaruk (2019), in describing the role and responsibilities of the Chief Digital Transformation Officer (CDTO), referred to this position as the "conductor of a unified digital development policy." The CDTO is tasked with managing a cohesive digital development policy within a specific entity (be it a governmental body, organization, business, or social structure):

- Manages the implementation of digital transformation projects and coordinates digital initiatives;
- Selects goals and directions, develops sequential steps in the desired direction;

⁵ Ministry of Digital Development, Communications and Mass Media of the Russian Federation. (n.d.). Methodological recommendations on the digital transformation of state corporations and companies with state participation. Retrieved from https://digital.gov.ru/uploaded/files/mr-po-tst-gk_w0Xb9xh.pdf

- Coordinates budgetary aspects and oversees the implementation of the transformation, managing all implementation projects;
- Engages with external stakeholders;
- Inspires the team.

According to Zetlin and Olavsrud (2022), a Chief Digital Officer (CDO) is a leader who combines business acumen with digital expertise to help organizations drive digital transformation through an enterprise-wide digital vision and strategy. The CDO strategically transforms a company's technological future in a way that many Chief Information Officers (CIOs) may not have the bandwidth to do.

In the textbook "4CDTO" by Kiryushin et al. (2020), it is described that McKinsey experts clearly designated the Chief Digital Transformation Officer as the "Transformer in Chief" back in 2015. The primary task of the CDTO is to ensure business growth and/or enhance organizational efficiency through digital transformation. Evgeny Borisov, within "4CDTO" textbook (Kiryushin et al., 2020), has developed a framework that provides a general overview of the tasks of CDTO/CDO (Fig. 5).



Figure 5. An example of framework of tasks of CDTO/CDO, version by Evgeny Borisov. (Kiryushin et al., 2020) [translated by Author, 2023]

This framework encompasses tools for implementing changes across eight directions (blocks): employees, clients, processes, partner ecosystem, products, business models, IT infrastructure, and technologies. Tasks within these blocks involve the development and implementation of the organization's strategy in the field of digital transformation, transitioning

to data-driven company and production-technological processes management, fostering a new organizational culture, designing new business models, imparting new skills, and implementing novel approaches to work, among other aspects.

Undoubtedly, digital transformation and its strategy are considered not only within the framework of a particular organization but as a global process. What contribution does Digital Transformation (DT) make to the development of both society as a whole and individual organizations in particular?

Digital transformation, including digitalization processes, leads to significant changes in various aspects of human life and activities. Technologies not only drive the development of new industries but also play a crucial role in addressing social issues such as population aging, social inequality, environmental concerns, and climate change. Progress in science and technology contributes to the formation of a "smart" society based on new values, such as a focus on human needs, flexibility, and creativity. As a result of digital transformation, substantial changes occur in the labor market, healthcare system, education, and spatial development (Abdrahmanova et al., 2019).

Digital services and a contemporary approach to shaping "smart" spaces significantly enhance the quality of life by providing more comfortable conditions. A "smart" space constitutes an environment where interaction between people and technological systems occurs openly and coordinately within intellectual ecosystems. Examples of such spaces include "smart" cities, digital homes, innovative workplaces, and factories. Currently, we are entering a period of active implementation of reliable "smart" spaces, where technologies become an integral part of everyday life in various spheres—work, service, social interaction, and civic engagement (Gartner, 2018a). Progress in digital spaces brings about changes in traditional principles of territoriality, geographically oriented communities, and sovereignty. Policies based on geographical principles, such as rules of origin or specific markets, require revision to adapt to real processes of value creation and distribution (OECD, 2019).

O'Leary et al. (Liew et al., 2022) present an example of shaping digital transformation (DT) through the creation of a corresponding ecosystem, its strategy, and process hierarchy, illustrated in Figure 1 earlier, in the context of Singapore. To ensure a systematic course of digital transformation, the Singapore government developed and published the Smart Nation Digital Government Initiative (2018) and the Smart Nation and Digital Government Office (2018). This plan includes a strategic vision, key elements of digital transformation, and criteria for the success of digital initiatives. In other words, effective digital transformation requires public commitment, leadership, and a consistent strategy. This statement aligns with the

understanding of digital transformation strategy presented earlier and is consistent with the views of Verhoef et al. (2021), who suggest that digital transformation requires strategic imperatives such as digital resources, organizational structure, growth strategy, as well as metrics and goals. For their realization, companies must express dedication to researching and managing their digital resources. Additionally, they must possess flexibility and adaptability to meet growing competitiveness, industry complexity, and compliance with regulations. At the same time, companies must be able to measure the impact of digital technology implementation for more precise navigation in the digital transformation process. At a broader level, the Singapore government complements this strategic imperative by creating an ecosystem conducive to digital transformation.

Regarding digital transformation in Singapore's economy, three components have been formulated to create a supportive ecosystem for digital transformation: Accelerate, Compete, and Transform (Smart Nation and Digital Government Office, 2018). These three components correspond to the hierarchy of digital transformation (see Figure 1):

1. "Accelerate" reflects efforts in digitalization and digital transformation. The Singapore government assists enterprises in enhancing productivity, efficiency, and creating new revenue streams through digital technologies. For example, the government has provided several grants to accelerate digitalization in SMEs and offers tax incentives for SMEs innovating with digital technologies (Perdana et al., 2022).
2. "Compete" involves integrating various digital initiatives within industries with state infrastructure to develop new integrated ecosystems that meet customer needs. The "Compete" component aims to facilitate the digital transformation of Singaporean enterprises by fostering innovation, development, and enhancing global competitiveness. For instance, the Singapore government developed a virtual crowdsourcing platform called the "Open Innovation Platform." Each month, the platform presents potential innovations, digitalization opportunities, and real business challenges, matching them with innovators or problem solvers.
3. "Transform" has been formulated to support the strategic plan for preserving the digital industry as an economic engine and continuing the process of digitalization. To implement this plan, the government created "Accreditation@SGD" to accredit promising Singaporean technology companies, providing them legitimacy and access to government institutions and major corporations. Figure 6 demonstrates how the driving forces, hierarchy, and strategic imperatives of digital transformation contribute to the creation of a digital transformation ecosystem.

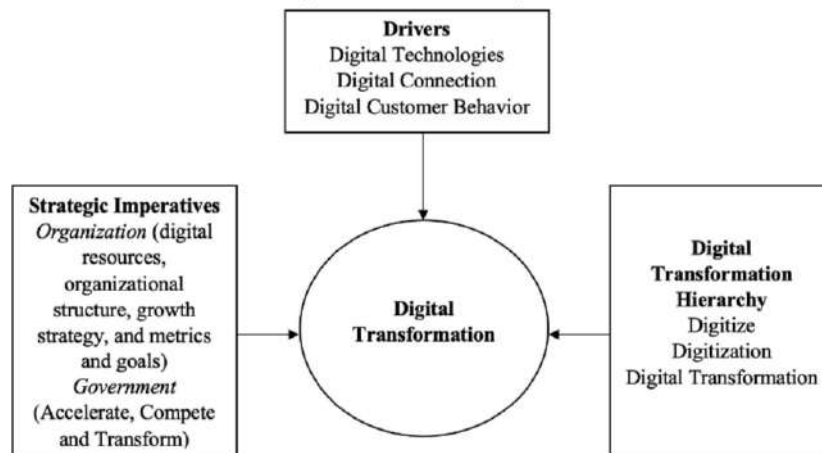


Figure 6. *Digital Transformation Ecosystem*. (Liew et al., 2022)

What specific advantages can a well-constructed digital transformation ecosystem bring to a company overall and digitalization as a distinct component of DT? The paradigm of sustainable digital transformation should yield both internal and external benefits for companies (Kim, 2015). It should contribute to enhancing ecological, economic, human, and social responsibility through business practices. Sustainable processes based on information and communication technologies (ICT) can assist companies in developing solutions that effectively alter their strategies for reduction, reuse, and recycling, thereby ensuring profit protection and business cost management (Hervé et al., 2021). Additionally, companies can leverage ICT for innovations in business processes, ensuring the sustainability of the entire organization and improving the quality of work life for their employees (Rupeika-Apoga et al., 2022, as cited in Martínez-Peláez et al., 2023).

As per their investigation of scholarly sources, Gao et al. (2023) emphasize that the impact of digitalization technologies, such as big data, intelligent manufacturing, artificial intelligence, and the Internet of Things, on the operational efficiency of companies has been extensively explored in the literature. Researchers converge on the notion that these technologies confer several advantages to firms, enhancing their efficiency across various dimensions. For instance, Maroufkhani et al. (2019, as cited in Gao et al., 2023) contend that big data enables companies to leverage business analytics for gaining a competitive edge in the market. Furthermore, Mithas et al. (2011, as cited in Gao et al., 2023) demonstrate that IT capabilities assist companies in developing customer, process, and performance management capabilities, contributing to enhanced operational efficiency. Khayer et al. (2020, as cited in Gao et al., 2023) suggest that cloud computing provides companies with a platform for accessing networks, servers, applications, and services, thereby improving the core

competencies of the firm and boosting its efficiency. Moreover, Wamba et al. (2017, as cited in Gao et al., 2023) assert that artificial intelligence encompasses a broad spectrum of technologies, including machine translation, chatbots, and self-learning algorithms, which benefit firms by enhancing their financial, marketing, and administrative functions. Martín-Peña et al. (2019, as cited in Gao et al., 2023) discovered that enhancing synergy between service-oriented and digital approaches can elevate business efficiency.

Furthermore, the utilization of digital technologies has the potential to overcome limitations associated with regional cultural peculiarities, language barriers, and national differences, opening new perspectives for traditional companies. In the context of internal control, digitalization can disrupt "information barriers" within the organization. All business units can exchange and utilize data through digital platforms, thereby enhancing overall efficiency. Moreover, digitalization can assist enterprises in developing robust strategic plans to adapt to changing market conditions (Gao et al., 2023).

Let us delve further into the impact of digital technologies involved in digital transformation (DT) on the competitiveness of an organization. As highlighted in the study by Gao et al. (2023), digitalization exerts a profound influence on the external transaction costs of companies with diverse consequences. Primarily, digitalization can alleviate costs associated with information asymmetry. According to Haferkorn (2017) and Li et al. (2023), the use of digital technologies provides companies with access to more transparent and comprehensive market information, thereby facilitating the development of effective and sophisticated strategies. Advanced tools, such as big data-based sentiment indices and forecasting systems using artificial intelligence, can assist companies in creating a multi-level strategic framework and an efficient operations management model.

Secondly, digitalization contributes to enhancing transaction efficiency by providing companies with more data for analysis. Technologies such as artificial intelligence, blockchain, cloud computing, and big data enable companies to implement user-centric product competition strategies (Truant et al., 2021). And thirdly, digital technologies help companies overcome traditional constraints, such as regional culture, language barriers, and cross-country differences. By overcoming physical limitations, digital technologies enable companies to create more value for users in various temporal and spatial frameworks. Therefore, it can be concluded that DT and digitalization enhance the operational efficiency of an organization by reducing external transaction costs (Gao et al., 2023).

What occurs at the internal level? The implementation of digital technologies, such as artificial intelligence, big data, 5G, and cloud computing, opens up opportunities for companies

to transition to intelligent manufacturing and supply chain management, leading to reduced costs for internal control. Firstly, digital technologies can disrupt "information silos" within the firm, reducing communication distances between different departments, thereby lowering costs associated with internal communication. Secondly, the adoption of digitalization provides the opportunity to reduce labor costs by automating processes of data collection, matching, and analysis, freeing employees from these tasks. This technological progress also enables companies to address issues related to hierarchical redundancy that may arise during expansion. Finally, digitalization allows organizations to develop and adjust sound strategic plans in accordance with market conditions. As a result, the operational efficiency of the organization is enhanced (Gao et al., 2023).

Let us also consider some aspects of the effectiveness of Digital Transformation (DT) itself, rather than digitalization as its specific element. The relevance of DT for organizations is supported by the examination of various academic sources providing insights into the issues and potential of digital technologies. Here are several aspects that may serve as a basis for justifying the relevance of digital transformation:

1. **Enhancing competitiveness:** For instance, Westerman et al. (2014) describe how the effective use of digital technologies contributes to increased competitiveness by helping organizations create unique digital capabilities and rethink their business models.
2. **Improving business process efficiency:** Davenport (2013) discusses how digital transformation using information technologies can significantly enhance business processes by focusing on their reengineering. The author explores how innovations in processes can lead to substantial improvements in operational efficiency and long-term organizational success.
3. **Transforming customer experience:** Supporting this assertion, Brynjolfsson et al. (2014) emphasize how digital transformation contributes to improving customer experience through personalization and innovative interaction methods.
4. **Flexibility and adaptability to changes:** For example, Matt et al. (2015) in their work "Digital Transformation Strategies" examine how organizations can use digital transformation to achieve flexibility and adaptability to changes in the business environment.
5. **Innovative business models:** Teece's study (2010) underscores how digital transformation stimulates the creation of innovative business models, which can be critically important for the long-term survival of organizations.

Additionally, Bonnet and Priyank (2011), Vice President and Senior Consultant at the consulting firm Capgemini Consulting, identified key benefits of digital transformation (DT) (Fig. 7). It is noted that DT should not serve as an end in itself, as, like any other form of transformation, it should be guided by clear objectives and benefits.

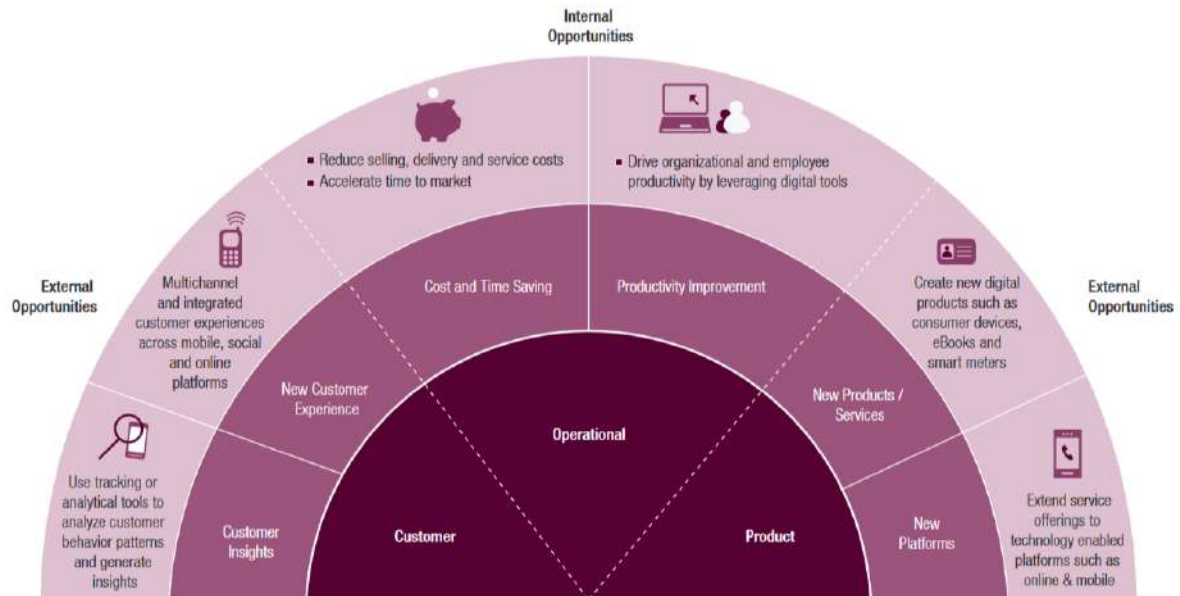


Figure 7. *Key benefits of Digital Transformation.* (Bonnet & Priyank, 2011)

Once a clear roadmap/framework is defined, digital transformation can assist organizations in addressing their most critical priorities and achieving both internal and external advantages in areas such as innovation, customer service quality, and efficiency.

As we can see, the processes under study have many advantages, and it is likely that as technology evolves, more positive aspects of digitization and digital transformation will emerge. However, there is always another side to the coin. What are the drawbacks of initiatives related to digitization and digital transformation (DT)? Although these processes are crucial for modernizing operations and improving service quality, they are associated with a number of problems and disadvantages. For instance, Levi Olmstead (2022) asserts that 70% of all digital transformation programs fail due to employee resistance and lack of support from management.

In the modern era, the primary challenge is the exponential growth in the volume, quality, and diversity of connections between organizations, citizens, and socio-economic systems. This growth leads to a rapid increase in transactions and data volumes, resulting in more complex and synchronized integration of various entities, the consequences of which are

not yet fully understood. Therefore, here are a few key negative aspects associated with these processes, according to Levi Olmstead (2022) and Digital Directions (n.d.):

1. **Complexity and Fragmentation:** Digital transformation can lead to a more complex and fragmented IT environment. As organizations adopt various new technologies, they may face difficulties in integrating these systems seamlessly, leading to data fragmentation and operational inefficiencies. However, this also offers an opportunity to streamline and centralize systems, reducing complexity over time.
2. **Lack of Standardization:** The absence of industry-wide standards for digital transformation means businesses may struggle to compare and select the best solutions. This lack of standardization fosters a more creative and flexible approach but requires careful planning to ensure compatibility and efficiency.
3. **High Costs:** The financial investment required for digital transformation can be significant, encompassing new hardware, software, and training. While initial costs may be high, adopting a phased approach can help organizations manage expenses and potentially uncover ways to reduce overall operational costs.
4. **Risk of Failure:** With the high stakes of digital transformation, there's always a risk of failure, which can result in financial losses. Strategic planning, flexibility, and incremental changes can mitigate these risks.
5. **Disruption to Employees:** Digital transformation can disrupt existing workflows and require employees to adapt to new technologies and processes. This can affect morale and productivity if not managed with clear communication and training.
6. **Security Concerns:** Moving data to digital platforms increases the risk of cyberattacks and data breaches. Strong cybersecurity measures and employee training are essential to protect sensitive information.
7. **Cultural Challenges:** Transforming from legacy systems to digital processes often requires a cultural shift within the organization. Achieving buy-in from all levels of staff and fostering a culture open to change are critical for success.
8. **Skill Gaps:** A shortage of IT professionals with the necessary skills for digital transformation can hinder progress. Outsourcing or investing in training can help bridge this gap.
9. **Evolving Customer Needs:** The dynamic nature of customer expectations requires organizations to remain agile and adaptable, continuously updating their digital offerings to meet changing demands.

These challenges underscore the importance of strategic planning, skilled workforce development, and a culture of continuous learning and adaptation in the digital transformation journey. While the path to digitalization involves navigating through these disadvantages, with thoughtful approaches, organizations can turn these challenges into opportunities for growth and innovation.

1.3 Frameworks and roadmaps of Digital transformation.

In the dynamic environment of the contemporary era, the necessity for organizations to navigate the complexities of digital transformation has led to the emergence of numerous influential structures and models. This section provides a brief overview of eight widely applied and discussed frameworks and roadmaps for digital transformation from consulting firms and research groups in academic literature. Organizations embarking on digital transformation often face questions about where to start, which direction to take, and how to address the challenges and opportunities presented by the digital era. These frameworks and roadmaps assist in structuring the digital transformation process and highlight the most crucial aspects that require attention.

1. McKinsey roadmap for digital transformation (Fig. 8) (Catlin et al., 2017).

McKinsey, one of the largest and most authoritative global consulting firms, has identified ten guiding principles of Digital Transformation (DT) and divided them into three stages.

1. The first stage, "Defining Value," is crucial to steer DT in the right direction. McKinsey asserts that any transformation is prone to failure without support from leadership. Therefore, the first principle in this stage is "Secure Management Commitment." The second principle, "Set Clear and Ambitious Targets," emphasizing specific and tangible metrics, is necessary for signaling the scale of potential digital technologies, preventing regression in times of difficulty, and instilling discipline in decision-making processes. The third principle, "Secure Investment," is vital as DT requires significant financial investments planned for several years ahead.
2. The second stage, "Launch and Acceleration," is essential to carefully consider which projects to initiate and support them with necessary resources for successful efforts and momentum. Prerequisites for this stage include a highly skilled starting team, often led by a Chief Digital Officer (CDO) or Chief Digital Technology Officer (CDTO), an examination of organizational structure, and the development of a digital culture. McKinsey suggests initiating the transformation process with "lighthouse projects" at this stage—projects delivering significant results within a short timeframe and manageable risks. Other principles, such as establishing an experienced team overseeing the DT process, adopting a flexible approach, and

developing a digital culture aligned with customer needs, are also crucial principles for implementing DT in an organization.

3. The third stage is focused on scaling and accelerating, with a key element being a well-thought-out sequence of subsequent initiatives. Attention should be given to creating additional opportunities, and to fully leverage the fruits of transformation, a completely new operational model will eventually be required. In this phase, companies need to prioritize initiatives based on their return speed, enhance employee competencies through training and hiring new specialists, and modify the organizational structure.

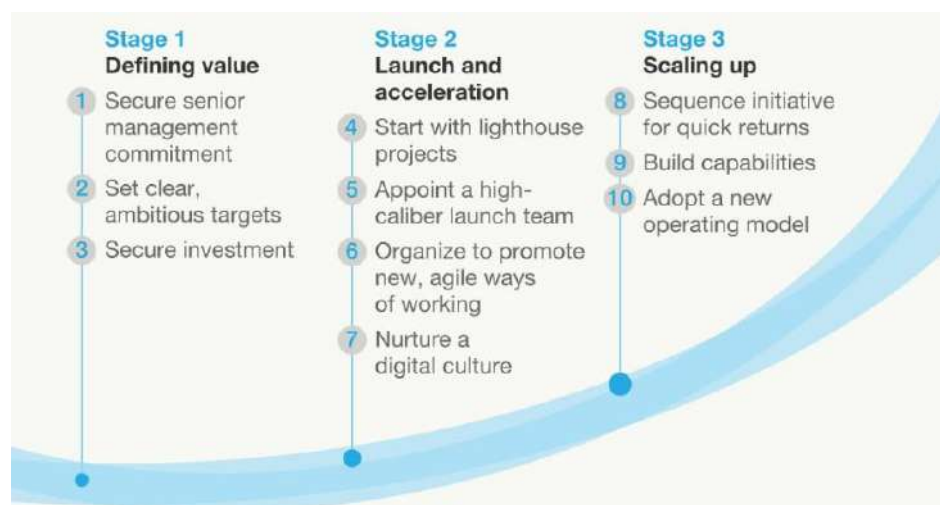


Figure 8. *McKinsey & Company roadmap for digital transformation.* (Catlin et al., 2017)

2. Cognizant framework for digital transformation (Fig. 9) (Corver & Elkhuizen, 2014).

Digital transformation often begins with the customer, aiming to better understand clients, enhance service levels, and digitize customer service quality. It then extends to three additional areas: digitizing operations, products, and services. Therefore, Cognizant views Digital Transformation (DT) as comprising four components: customer experience, products and services, and organization and operations. Not all elements may be relevant to every industry, so the structure must be adapted for each market and organization to ensure proper alignment. For example, not every organization is ready to conduct business according to the Agile methodology.

To transform customer relationships, which is the first element of the framework, companies must handle information about customers, currently collected from various sources. In museums, for instance, this includes ticket and subscription

purchases, buying branded merchandise, connecting to the museum's Wi-Fi network, passing through access control systems, and more. This data aids in building user profiles, creating personalized offerings, and reaching customers through digital marketing. Additionally, users now expect an omnichannel approach—a unified experience across different entry points such as mobile applications and websites.

The proposed customer-centric approach directly influences the products created. Organizations can predict what customers will need and how they will use products and services. Cognizant also emphasizes a business model where users pay for precisely what they use, for instance, not for the entire magazine but for individual articles.

Customer focus should also be considered in operations transformation. Besides the agile approach, the framework suggests using a unified cloud platform accessible to employees from any device, irrespective of time and location. Finally, in the digitalization of organizations, emphasis is placed on developing digital skills among employees, fostering collaboration between departments, and creating an ecosystem with partners.

Cognizant also notes that when an organization decides to adopt this digital structure, it should implement it gradually, not all at once. Therefore, prioritizing and defining the most critical areas of focus becomes crucial.

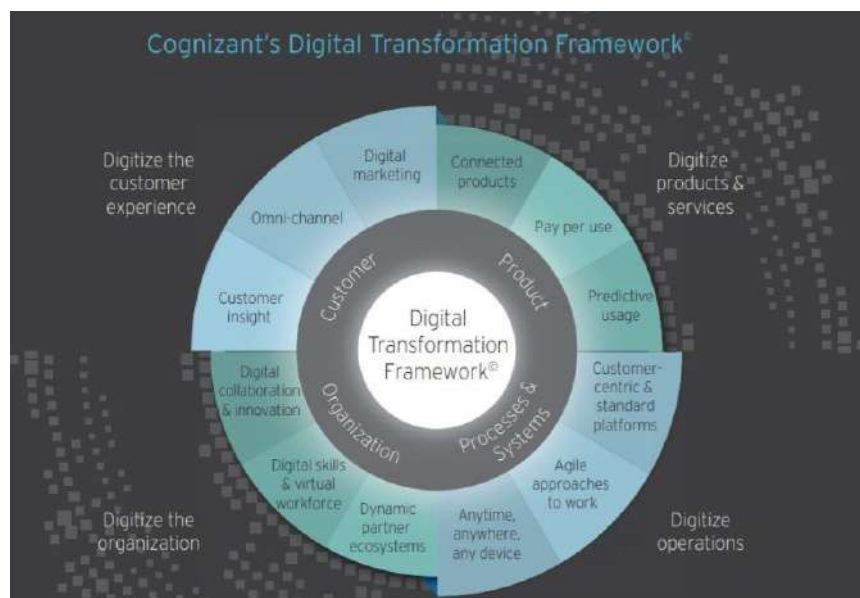


Figure 9. *Cognizant's digital transformation framework.* (Corver & Elkhuizen, 2014)

3. Framework to navigate DT by Capgemini (Fig. 10) (Bonnet & Priyank, 2011).

This concept significantly aligns with the Cognizant framework described in the previous section. At the core of Capgemini's digital transformation (DT) (Bonnet & Priyank, 2011) is a focus on user experience, similar to how Cognizant highlights digital marketing and a multichannel approach, as well as the digitalization of operations. These aspects are justified in the context of human resources and data analytics. However, Capgemini places crucial importance on people, explaining that companies too often overlook this fundamental element of transformation (not only digital). The implementation of technologies and changes to the business model are considered supporting tools. This model emphasizes the need for a cautious approach to digital transformation, developing a strategy and a clear roadmap for people, processes, and technologies. Equally important is the combination of skills, which are often scattered across the enterprise and its external partners. To achieve success in this endeavor, leadership must unhesitatingly reconsider traditional boundaries between different structures, making them more permeable and flexible. A notable example is the strengthening of technical skills in marketing or commerce departments to respond promptly to rapid technological changes, as well as fortifying IT organizations in marketing and sales for more effective company service.

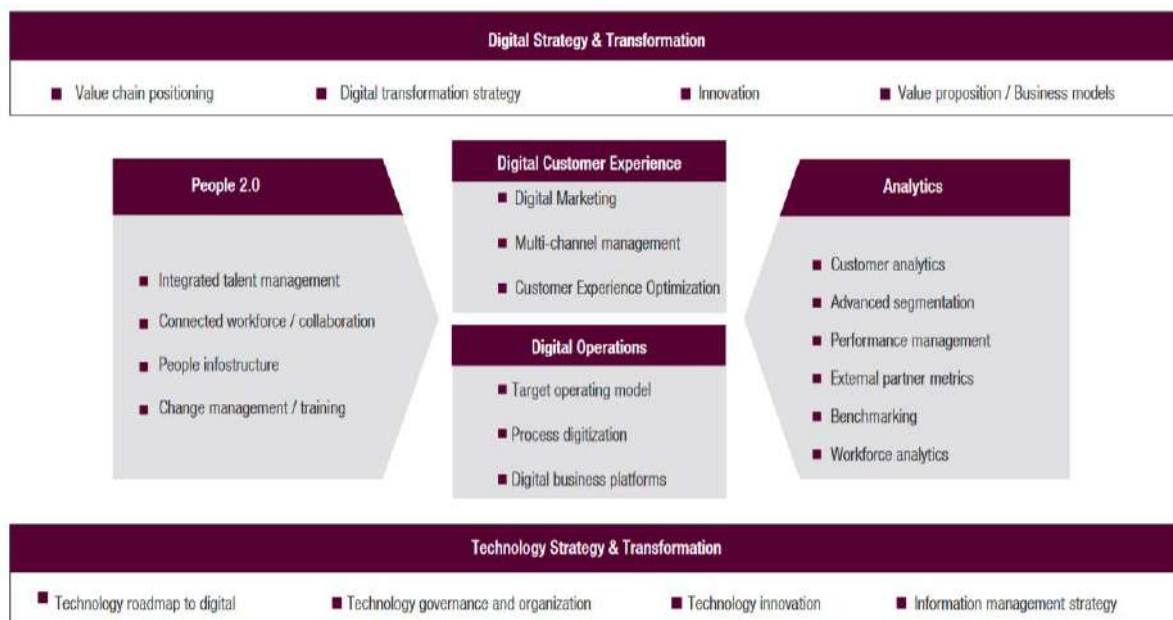


Figure 10. Framework to navigate DT by Capgemini. (Bonnet & Priyank, 2011)

4. Gartner framework (Fig. 11) (Gartner, 2014) (McGee et al., 2014).

Gartner (2014) outlines a six-step process that enables organizations to build a

successful digital transformation (DT):

1. **Establishing a Common Understanding of Digital Transformation:** DT goes beyond simply expanding the use of technologies. Leaders must reconsider their approach to technology, viewing it not just as a tool for achieving business tasks but as a source of innovation and opportunities for shaping new business models that provide a competitive advantage. This more active model focuses on creative changes and the development of new strategies to achieve competitive advantages.
2. **Appointment of Digital Transformation Leaders:** It is recommended to create three key roles: a digital technology strategist, a leader in digital marketing, and a head of the digital business unit. The titles of these roles may vary, and the same person may perform several of them. The main requirement is the appointment of competent and responsible specialists dealing with key aspects of digital transformation.
3. **Creation of a Digital Business Center of Excellence:** This involves establishing a qualified team responsible for the digital transformation process.
4. **Formulation of a Digital Transformation Strategy:** Taking into account opportunities and threats, Gartner (2014) identifies five key directions to consider when formulating a strategy: creating a new digital business model, transforming products and services through the implementation of digital technologies, effective data management, integration of cutting-edge technologies, and the development of customer interaction tools (media platforms, content, communication channels).
5. **Identification and Development of Employees with Digital Competencies:** This step emphasizes the importance of human capital. Gartner (2014) highlights the significance of this aspect and recommends using innovative methods for attracting personnel, such as creating educational camps and training programs to attract new specialists.
6. **Creation of New Opportunities for Digital Business:** This step also concerns human capital. Gartner (2014) emphasizes the importance of this aspect and recommends using innovative methods for attracting personnel, such as creating educational camps and training programs to attract new specialists.



Figure 11. *Six key steps to build a successful digital business according to Gartner. (I-Scoop, 2014)*

5. Digital transformation (DT) framework by Ionology (Fig. 12) (Ionology, n.d.).

Ionology (n.d.) suggests that companies should fill in three blocks of the framework to initiate the process of digital transformation. Firstly, it is necessary to analyze the company itself, the competitive market, customers, and available resources. Secondly, it is essential to determine the current and potential position on the quadrant. Each quadrant is assigned to a specific market state in which organizations find themselves: "advocacy" – companies reaching customers through direct mail and social networks, "attention" – companies employing more advanced marketing, search engine advertising, sponsorship, etc., "authority" – companies establishing a strong brand and attracting customers through their mission, "prime" – companies dominating the market and known to the majority of potential customers, securing their positions against other player types. Thirdly, Ionology (n.d.) recommends structuring digitalization directions into projects, within which specific tasks are set.

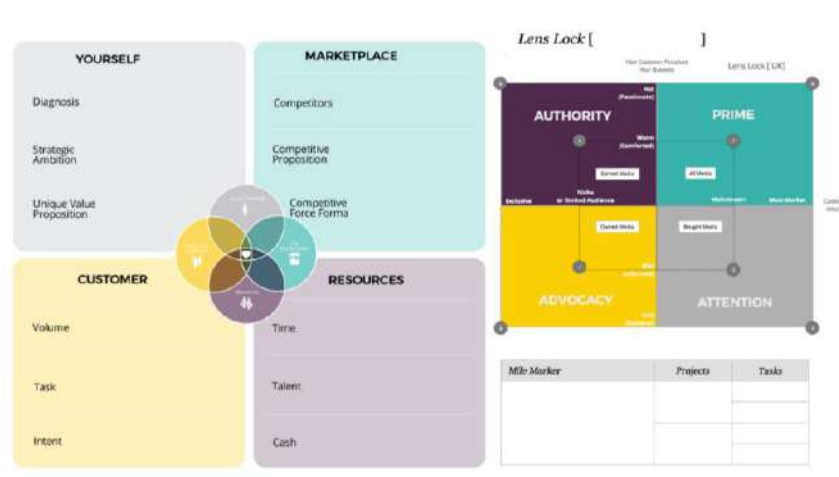


Figure 12. *Digital transformation framework by Ionology. The 7 principles of digital business strategy.* (Ionology, n.d.)⁶

6. Roadmap for digital transformation (DT) by Deloitte (Table 1) (Deloitte, n.d.).

Deloitte (n.d.) emphasizes that successful digital transformation should be built on the foundation of the business architecture concept. Business architecture provides a comprehensive and multidimensional view of the organization, encompassing capabilities, value delivery perspectives, information and organizational aspects, as well as the interconnections between them and strategies, products, policies, initiatives, stakeholders, and indicators. The primary objective of business architecture is to offer an abstract representation of the organization and its system. Thus, business architecture serves as an effective means of communication and an analytical foundation for translating strategy into concrete practical initiatives (Business Architecture Guide, 2019).

Deloitte's approach to digital transformation relies on constructing a high-level roadmap based on business architecture principles. This detailed roadmap consists of four main stages and 24 sub-stages, as presented in Table 1. This framework stands out as the most comprehensive among the proposed ones.

Table 1. *Roadmap for DT by Deloitte.* (Deloitte, n.d.)

1. Assessment of external and internal situation	1. Analysis of external forces and trends. Deloitte recommends utilizing PESTLE analysis (Political, Economic, Social, Technological, Legal, and Environmental) to examine broad environmental factors. For more specific insights, Porter's industry analysis (Porter, 1980) can be employed.
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⁶ <https://www.ionology.com/wp-new/wp-content/uploads/2021/03/Digital-Transformation-Framework-1.pdf>

	<p>2. Identification and prioritizing customers' and other stakeholders' needs. Given that customers constitute a primary stakeholder, their satisfied and unsatisfied needs and desires should be accorded high priority.</p> <p>2. Analysis of digital technologies suitable for enhancing customer experience. Technologies for deep engagement should be selected based on the company's capabilities that require improvement, as well as the needs and desires of customers.</p> <p>3. Analysis of current business and operation model. Business and operation models should be analyzed from the perspective of meeting the needs and desires of customers.</p> <p>4. Analysis of people and cultural potential for changes. Understanding competencies, motivation, reward systems, as well as organizational culture and their potential for adapting to new realities of using digital technologies, is the next step.</p> <p>5. Map and cross-map core and extended architectural domains. The idea is to create a map for each domain and identify relationships between them.</p>
2. Developing strategy and assessing business impacts	<p>1. Defining different business scenarios. Consideration of opportunities and risks is crucial at this stage, aiding the ability to respond to various evolving events.</p> <p>2. Defining target customer segments and technologies to be used. Needs and desires of each segment are incorporated into corresponding value creation streams and matched with the best technological solutions to support these value creation streams.</p> <p>3. Development of to-be (future) business model. Taking into account various factors, business scenarios, target customer segments with corresponding technologies.</p> <p>4. Development of goal/objective hierarchy. The strategy can be represented as a hierarchical chain of goals and tasks, based on the premise that each action leads to achieving a specific goal, and consequently, all actions lead the organization to achieve strategic objectives.</p> <p>5. Analysis of objectives/business architecture impact. Tracking the relationships of goals with all other areas demonstrates the scale of impact, while intensity and nature should be analyzed separately.</p> <p>6. Analysis of business architecture and IT architecture impact. The impact of business/IT architecture should contribute to understanding how strategy and other areas of business architecture influence technologies, data structures, and applications.</p>
3. Creation of architecture of business solution	<p>1. Visualization of to-be business architecture.</p> <p>2. Development of to-be people practices and organizational culture. Defining competencies, motivation and reward systems, etc</p> <p>3. Designing of to-be organization structure. Division of labor into specific tasks and definition of mechanisms needed for achieving coordination between these tasks.</p> <p>4. Designing of to be value chain and processes. The value chain explains how the company creates value and exchanges it with stakeholders.</p>

	5. Visualization of to-be IT-architecture. At this stage, technologies, data structures, and applications are considered to ensure alignment between business architecture and IT architecture.
	6. Analysis of current and target state transformation. After the current and target states become well-known, the gap between them needs to be analyzed to understand its width and what is required to overcome it.
4. Establishing initiatives and solutions deployment	1. Defining initiatives based on the objectives. At this stage, specific choices on how to achieve each goal in the hierarchy of goals/tasks need to be made.
	2. Initiatives' prioritizing. This is necessary for budget calculation and other resources since they are limited.
	3. Initiatives measurement criteria and KPIs' creation. Monitoring the implementation progress of each initiative.
	4. Project plan establishing. Each initiative requires a brief project plan with deadlines, goals, scope, etc.
	5. Progress monitoring and corrective measures deployment. This allows for timely adjustments to actions.
	6. Evaluation of the level of success. Assessment of the effectiveness of the digital transformation and informing all stakeholders.

7. Gimpel et al. Framework (Gimpel et al., 2018).

A research group from Germany (Gimpel et al., 2018) has developed its own Digital Transformation (DT) framework. In their study, they analyzed existing models, including some presented here, and conducted interviews with IT executives, contributing to the formulation and refinement of the new DT model. Since this framework draws on the works of consulting companies, it can be characterized as comprehensive. Indeed, the majority of measures proposed in the six directions of this framework (customers, data, value proposition, organization, operations, and transformational management) are encountered in previous models. An important addition in the data domain is the consideration of issues related to their protection and confidentiality. The researchers also suggest focusing on "smart" products and services, i.e., Internet of Things technologies, to create value.



Figure 13. *Gimpel et al. DT Framework.* (Gimpel et al., 2018)

8. Correani et al. Framework (Fig. 14) (Correani et al., 2020).

An Italian research group (Correani et al., 2020) has introduced their systematic model for the digital transformation process. In the initial step, the content of digital transformation (DT) is defined, and a strategy is formulated. Subsequently, internal and external data are collected, stored, and processed on a platform utilizing artificial intelligence technologies. This enables the company to gain insights into customer information, their perceptions of products and services, as well as internal processes. Leveraging these insights, the organization can steer processes and products using technologies in the desired direction, fostering customer relationships and attracting new ones. Partners and human resources within the company actively participate in the information gathering process, supported by internal operations. These three aspects are further transformed based on the acquired information.

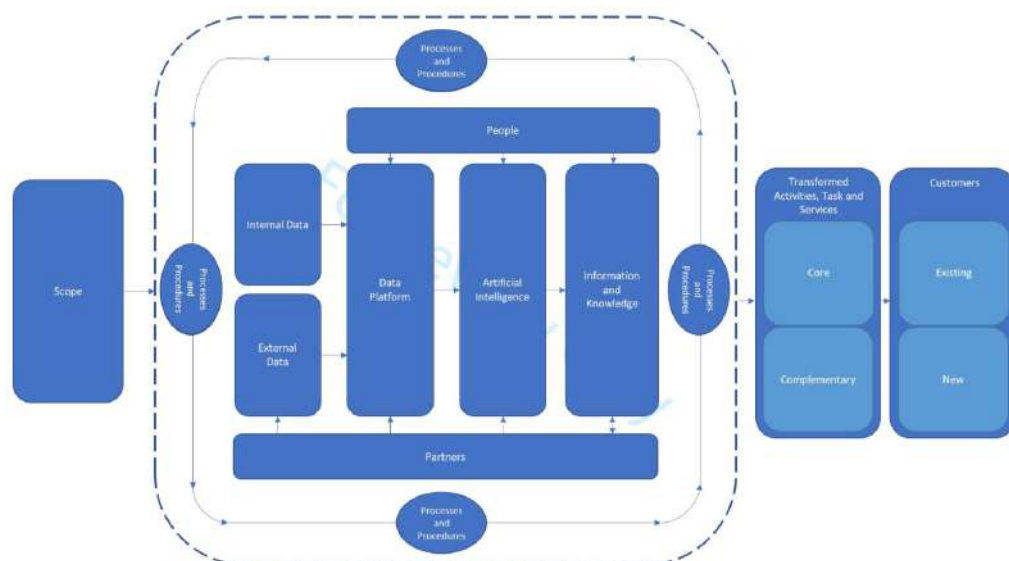


Figure 14. *Correani et al. DT framework.* (Correani et al., 2020)

In general, several aspects of digital transformation (DT) are consistently highlighted in models and acknowledged by experts as particularly crucial. Firstly, there is the clear articulation of what the company aims to achieve through DT, fostering a shared understanding within the organization, especially among leadership, to garner support and resources. Secondly, it involves the analysis of the external environment and internal infrastructure. Thirdly, the establishment of a dedicated team possessing the necessary competencies for overseeing the transformation process. Fourthly, the digitalization of internal operations to ensure maximum flexibility. Fifthly, the enhancement of digital literacy among employees through training and the hiring of qualified professionals. Additionally, it entails working with data, which serves as the basis for decision-making in the DT process. Finally, it encompasses customer-centric approaches, focusing on understanding customer needs, and the digitization of products and services.

1.4 Digital transformation and digitalization of museums.

Throughout the course of civilization, humanity has amassed a truly vast body of cultural heritage. Unfortunately, many masterpieces and monuments of cultural heritage have not been able to reach us in their full splendor. However, the memory of them is preserved in the primary institutions of memory: museums, libraries, and archives. The modern world is evolving at an incredible pace, with people immersed in the information environment. The new generation, from early childhood, utilizes various gadgets for quick access to information about the surrounding environment and interaction with it. These technologies have become an integral part of our lives, abundant with advancements that were once unimaginable.

Consequently, the perception of art and art itself has changed, with contemporary objects often created using digital tools or presented in digital form. To maintain interest in traditional forms of art, museums are compelled to adapt to their audience and alter the format of human interaction with cultural objects.

In an era where digitalization has become more of an obligation than an option, companies in all sectors must adapt their business models to avoid falling behind. A museum is a reflection of the society that created it. As society changes, so do museums. Our relationship with museum space and its "expansion" into the digital realm is evolving. In modern society, there has been a shift from information consumption to active participation, replacing the culture of consumption with the culture of engagement. Concepts such as "cultural software," "information aesthetics," media art, digital artistic visualization, and "big data" as a "means of expressing the world and humanity" are altering our behavior, modes of interaction with museum content, and ways of perceiving it (Vasilieva et al., 2019).

Certainly, when discussing digitalization, digital transformation (DT), it is essential to understand that it occurs gradually, and in our case, it begins with something simple – the emergence of computers and their application in museum spaces. The initial use of computers in museums took place in Canada and France in the early 1960s. Nearly simultaneously, efforts to implement automated catalogs began in the United States (Vasilieva et al., 2019). In the U.S., one of the pioneers in museum computerization was the archaeologist Robert Chinghall, who actively participated in the development of the first museum databases. Chinghall served as the Executive Director of the Committee on Museum Databases and was also the Director of the Museum of Natural History in Albuquerque. In 1975, his book "Museum Cataloging and Computers" was published in the United States and translated and published in Russia in 1983

by Yuri Aseev and Yakov Sher (Aseev, Podnozova & Sher, 1983). In the introductory article to the book by Aseev, Podnozova, and Sher (1983), it was stated:

"In the modern world, the museum does not exist in isolation from other market entities. It serves as a public space, engaging a broad audience and becoming a platform for dialogue within the local community. To involve people in participation, museum professionals increasingly resort to participatory technologies, i.e., they use 'tools through which the museum must transform into a modern, multifaceted, dynamic, responsive place, oriented towards the needs of the audience.'" (Aseev et al., 1980, p. 5)

In recent years, a substantial body of literature has emerged on the topic of digital technologies in museums (Liao et al., 2020). However, the majority of these studies focus on the concepts of digitization and digitalization. The theme of the digital transformation of museums is scarcely addressed. Indeed, due to resource constraints, both financial and human, and a lack of conceptual frameworks in this domain, museums tend to implement specific technologies rather than create a comprehensive ecosystem. A 2021 study among Italian museums (Raimo et al., 2021) reveals that inadequate funding is the primary barrier to the adoption of digital tools. Nonetheless, museums recognize its importance and note a noticeable reduction in costs, increased revenues, and the emergence of non-financial benefits resulting from technology utilization. Raimo et al. (2021) point that implementation of digital technologies by Italian museums in the Apulia region found that, among other things, digital transformation has led to cost reduction (via online market analysis through internet sponsorship, rather than relying on more expensive external companies) and has brought numerous financial benefits by facilitating visitor access and consequently increasing their numbers.

The focus on digitalization in the context of museums is also linked to the COVID-19 pandemic. The pandemic crisis has, in fact, imposed a burden on the entire museum sector. On the one hand, it led to the closure of approximately 90% of museums (of which 10% may never reopen), and on the other hand, it accelerated the rapid digitalization of customer relationships (Raimo et al., 2021). These efforts align with the recommendation of UNESCO (2015) (as cited in Raimo et al., 2021), emphasizing the importance of information and communication technologies (ICT) in light of the crucial role of museums in the cultural sphere, both for education and the development and well-being of individuals.

Many researchers argue that digitalization in the cultural sphere was necessitated and expedited only by the spread of the COVID-19 pandemic. Pronchatov (2022) cites researchers D.V. Kolesnik and A.I. Nafikov:

"Under the guidance of UNESCO, a global movement called ResiliArt was organized, the goal of which is to unite efforts to support arts workers and ensure universal access to culture during the pandemic."
(Pronchatov, 2022, p. 89)

However, the pandemic merely accelerated, rather than prompted, digitalization in the cultural sphere, as this process began long before the COVID-related restrictions. For instance, Raimo et al. (2021) discuss the acceleration of digitalization due to the pandemic, noting that the COVID-19 pandemic led to an increased level of digitalization among museums as they were compelled to transition to virtual spaces to maintain relationships with visitors. The ICOM study (2020), focused on the impact of the pandemic on the international museum community, revealed that over 60% of museums worldwide publish their exhibits on websites, 38% organize online exhibitions, over 20% conduct online broadcasts and release podcasts. Almost 15% of museums without websites or social media plan to create them.

Other Italian researchers (Agostino, 2021) reached a similar conclusion regarding the acceleration of museum digitalization due to COVID-19. In their study, they analyzed the social media posts of the top 100 Italian museums, finding that museums posted 20% more content. While this is a positive change, researchers note that most museums are not implementing cutting-edge technologies currently used in other fields (Internet of Things, virtual reality, blockchain, etc.), but are exploring the possibilities of already commonplace tools such as websites and social media. On one hand, this is explained by some lag in the museum sector's digitalization, and on the other hand, by the necessity to meet audience demands.

The authors of the book "Museums and Digital Culture," Giannini and Bowen (2019), illustrate that museums are shifting from being collection-centered to being visitor-centered. They (Giannini & Bowen, 2019) argue that people are accustomed to smartphones, social networks, and other digital tools in everyday life, so they expect museums to offer a new level of interaction and integration of these technologies. Today, museums must provide a seamless experience within real and virtual spaces, including access to museum collections through the internet, virtual tours, augmented reality, interactive audio guides, maps, etc. The authors (Giannini & Bowen, 2019) also present interesting statistics: although online collection

publications are expected to reduce the number of visitors, surveys show that people generally visit museums after exploring digitized copies to see real art objects.

The primary trends of digitalization in museums today involve expanding their presence in the digital space through the digitization of collections, ensuring broad access to them, and the development of websites and social media (MTM, 2019). The necessity of studying the audience, including within the framework of working with big data, is often mentioned as well. However, while digitization is widely covered in scientific articles and is an essential part of the work of many museums today, visitor studies typically emerge in the literature only as one aspect of digitization and are insufficiently explored in practice.

Nevertheless, at the core of creating a digital museum lies the extensive work of digitizing its exhibits and collections. The world's largest museums have converted a significant portion of their collections into a digital format. Budagyan (2021) indicates in their article that art experts have estimated that, on average, the largest global museums digitize around 80,000 exhibits. Specifically, specialists from the first and largest museum in the field of decorative arts and design—the Victoria and Albert Museum (V&A) in London, UK—have made descriptions of 1.2 million of their exhibits available online. Curators at The Metropolitan Museum of Art in New York, USA, have enriched their official website with digital images of over 400,000 exhibits. Representatives of the Rijksmuseum in Amsterdam, Netherlands, have digitized virtually all of their collections, allowing website visitors to download photos of more than 600,000 exhibits (Budagyan, 2021).

In Russia, the digitization of collections has been initiated, in part, by the Ministry of Culture as part of the State Catalog of the Russian Federation project⁷. Major museums, such as the State Pushkin Museum (GMII), independently engage in digitization and have the technical capability for the automatic upload of collections from their own exhibit accounting systems to the State Catalog. Smaller museums, on the other hand, are usually supervised by regional centers, which centrally upload images and information about museum objects. More details on this topic will be discussed in the next chapter.

Turning back to museum audiences, as mentioned earlier, the study of audiences is also a trend in the digital transformation of museums because the audience is becoming new—digital (virtual). Today, researchers increasingly turn to the study of the virtual audience of museums. Vasilieva et al. (2019) cite examples such as Silvia Fantoni, Director of Audience Engagement at the North Carolina Museum of Art, Robert Stein, Vice President of the

⁷ Retrieved from <https://goskatalog.ru/portal/>

American Alliance of Museums, and Grey Bowman, an IT expert. They have shown that visitor motivation is a key variable for understanding online visitor experiences and can be used as a means of segmenting the audience and predicting their behavior on the website. Today, museums have to find new ways to interact with their audience and use new platforms for this purpose. The internet allows them to become more democratic and closer to their audience, pay more attention to already loyal visitors, and reach those who have not yet visited the museum. The digital environment gives museums the opportunity to express themselves, conduct new memorable experiments, and attract visitors' attention.

Over the past approximately ten years, museums have been actively expanding their presence in the digital environment. Researchers have begun to study visitor behavior not only within the physical museum space but also on its website. They identify specific categories of website users based on their motivations and behavioral characteristics. The virtual audience of museums represents large communities that are much more numerous than the audience of actual visitors.

Discussing the changes in museum activities and the behavior of museum audiences with the advent of the digital era, Vasilieva et al. (2019) highlight the following aspects:

- On the one hand, museums need to reach a broader and more diverse audience. On the other hand, they need to convey the value of cultural heritage and enhance cultural capital.
- Museums need to consider two new social changes. Firstly, international migration increases cultural diversity in the population, creating more producers and consumers of culture. Secondly, an aging population implies more free time for individuals, resulting in a broad potential audience.
- Museums should transform from exclusive spaces to inclusive ones, shifting from places of education to spaces of learning. Museums need to change their vision from being "someone" to being "for someone."

Modern technologies play a key role in attracting a new audience. The digital environment provides museums with the opportunity to showcase a creative approach, conduct innovative experiments, and capture the attention of visitors. It is important to note that users of museum websites can easily transition to offline visitors at any moment.

Thus, changes in the museum field affect either the perception by visitors or the methods of providing experiences. Starting from the creation of websites, museums

increasingly integrate digital technologies into their structure to enhance visitor services and provide an alternative space for interaction among various participants in the cultural process (Teece, 2018).

After studying the article by Raimo et al. (2021), three distinct areas in which the application of new technologies has proven to be extremely important for museums can be identified:

1. **Cultural Promotion:** The first category encompasses technological tools adapted by museums to capture the attention of the online audience and focus on customer needs (McCall & Gray, 2014). They also aim to enhance visitor interaction both before and after museum visits (Colbert & Courchesne, 2012; Vassiliadis & Belenioti, 2017). Examples of such technological tools include museum websites and social media. Museum websites provide easy and instant access to services such as ticket booking, tours, and other cultural events, along with comprehensive information on schedules and costs. Advanced communication technologies, particularly social media platforms like Facebook, Twitter, or Instagram, actively contribute to the use of online spaces for disseminating information about museum events, thereby increasing their popularity.
2. **On-Site Entertainment:** The second category of technologies pertains to tools museums implement on-site, addressing both informational and exhibition levels to enhance exhibition design. This represents a crucial area where technologies find the most impressive applications. According to several researchers, this digital experience includes the use of applications and smartphones as digital devices (Solima et al., 2016; Yoshimura et al., 2014) and other tools such as audiovisual and augmented reality. These tools help improve the virtual experience (Pallud, 2017, as cited in Raimo et al., 2021) and contribute to enriching the educational and communicative content of the museum, while stimulating interaction between the museum and its visitors.
3. **Management and Organizational Activities:** One of the key issues for cultural institutions is the effective storage, preservation, and documentation of information. This necessitates the promotion and provision of higher efficiency, quality, and speed in processing information using new technological devices. These technologies are aimed at enhancing online consultation of museum archives. They are actively applied to optimize museum management and include intranet and cloud services, as well as digital and laser technologies. Intranet and cloud services facilitate efficient internal museum operations and improve communication among its staff. Digital and laser technologies contribute to the preservation and restoration of artworks (Li et al., 2010,

as cited in Raimo et al., 2021), as well as the creation of digital versions of these objects. These tools provide museums with the opportunity to effectively manage their collections, innovatively gathering and storing information about objects.

Budagyan (2021) identifies three main components of the modern information museum space, albeit using different criteria than the previous source, relying more on the classification of technologies applied in the museum sphere rather than their global goals of application. The first component consists of internal systems utilized for ticket and service sales AIS, CRM systems, and media archives (DAM). The second is based on exhibition technologies (multimedia for exhibitions, support for scientific, enlightening, and educational programs), while the third involves external systems (virtualization of exhibitions and displays, VR and AR, 360 photos/videos, electronic publications, mobile applications). All these components are implemented due to the application of innovative, unique projectors, touch panels, screens, etc., by museum and gallery specialists.

The image of a museum professional is also undergoing changes. Thanks to open communication on the Internet, we observe that museum staff are not only curators and guides, custodians and art historians but professionals from various fields: curators, managers, engineers, IT specialists, lawyers, sociologists, architects, producers. According to Vasilieva et al. (2019), digital technologies, paving the way for interdisciplinarity, have led to the emergence of new professions in museums: digital content producers, online project managers, specialists in working with online audiences and social media, and big data analysts. Today, professionals who can combine a systemic understanding of the museum institution with the effective use of tools to realize its mission and strategic goals are highly valued.

However, a debated issue in the museum sphere is the digital literacy of staff, which is one of the barriers to digitalization and further digital transformation of the museum. Abdrahmanova et al. (2019), at a conference on the digital economy, pointed out that one of the key success factors in the digitalization processes is the availability of highly qualified personnel in sufficient quantity and appropriate workplaces, as well as a system for training specialists with specific competencies for the development and implementation of digital technologies. The implementation of digital technologies entails significant changes in workforce needs and requirements for professionals (Gartner, 2018b, as cited in Abdrahmanova et al. 2019):

- increased demands for flexibility and adaptability of personnel;

- increased demands for "soft skills"
- possession of social and emotional intelligence, ultimately the abilities that distinguish a person from a machine;
- growing demand for professionals with "digital dexterity";
- the ability and willingness to use new technologies to improve results.

The lack of IT competencies can be attributed to the predominantly humanities background of most museum staff, as well as a higher percentage of older workers. The study "Digital Competencies of Museum Staff" (2020) among Russian specialists showed that over 93% of workers are confident in using text editors, internet skills, and email; however, many require additional training when it comes to more complex tasks. Based on this research, the Digital Development Council at ICOM Russia launched the project "School of Digital Development of Museum"⁸, which currently offers free educational courses for museum industry professionals. In the European Union, a similar initiative is undertaken by the "Mu.SA. Museum Sector Alliance"⁹, organizing courses based on the research of professions by Dibitonto et al. (2020), which museum specialists consider most promising: curator of digital collections, developer of digital interactive experiences, digital strategy manager, and community manager. Feedback from those who have completed the courses indicates a relatively high satisfaction with their content (84%). British and American museums are participating in the "One by One"¹⁰ project, aimed at enhancing the digital skills of museum staff through various initiatives, including researching current issues in organizations and creating a common space for collaboration and knowledge exchange.

⁸ Retrieved from <https://icom-russia.com/data/proekty/shkola-tsifrovogo-razvitiya-muzeev/>

⁹ Retrieved from <http://www.project-musa.eu/>

¹⁰ Retrieved from <https://one-by-one.uk/>

1.5 Museums' Digital strategies.

As mentioned earlier, many museums, especially small and medium-sized ones, currently lack sufficient resources for a comprehensive digital transformation. Consequently, these institutions prefer to implement individual technologies as opportunities arise rather than adopting a digital strategy. Italian researchers De Bernardi et al. (2019) addressed this issue by categorizing museums into three types: 1) those using technologies without developing a strategy; 2) those implementing technologies in line with a digital strategy; 3) those integrating a digital strategy with an overall strategy. A survey of managers from 11 museums revealed that the majority still fall into the first category. The researchers (De Bernardi et al., 2019) also identified three main obstacles to museum digitization: lack of funding, digital illiteracy, and resistance to technology among museum staff, as well as difficulties in fostering collaboration among people from different departments. Although the study sample is very small, the works and surveys of other researchers suggest that this situation persists in most medium and small museums. In contrast, larger museums are increasingly inclined to develop digital strategies, with American and British institutions being particularly successful in this regard. Only a small number of strategies are available in the public domain, with the current relevant ones being:

1. Digital Strategies of the Science Museum Group (SMG).

To conduct a more comprehensive investigation, let's briefly examine their strategies for 2018-2021 and 2022-2024.

The 2018-2021 strategy¹¹ is built on the principles of visitor focus, openness, accessibility, scalability, innovation, partnership development, and organization-wide change implementation. Based on these principles, the authors propose the following program of activities:

- Enhancing visitor experience through its expansion via digital technologies in museums and working with new tools (3D scanning, image recognition).
- Increasing audience outreach through the development of the Group's museum websites, expanding revenue-generating methods, digitizing collections (images, media, archives, as well as volumetric objects using 3D scanning).
- Ensuring visitor engagement by creating games, providing access to museum resources (Creative Commons licenses, etc.), and launching crowdsourcing-based projects, i.e., involving visitors in museum activities.

¹¹ Retrieved from <https://www.sciencemuseumgroup.org.uk/about-us/policies-and-reports/digital-strategy-2018-21>

In the plans for 2022-2024¹², SMG has advanced its strategy, focusing not only on the audience and visitors but also paying closer attention to strategic collaborations, collection curation, and income growth. In summary, for 2022-2024, SMG has set four priorities:

- Drive museum visits, amplify programs, and support income generation:
 - Continuing the integration of Digital Technologies (DT) to uphold strategic goals, such as facilitating marketing and audience communication through the website, social media, and partnership relations. Special attention to educational activities at SMG, improving and enhancing the effectiveness of online education through technology. Online donation opportunities will also contribute to increasing museum revenues.
 - Curate the world's greatest science collection online: Enhancing digital access to museum collection items for the public, researchers, and educators through an ongoing digitization program, digital collection initiatives, and the implementation of new technologies.
 - Build a digital SMG to multiply reach: Developing a new content strategy for a global digital audience, primarily targeting two audiences (adults and children) and focusing on topics aligned with state programs that are popular and strategically important. Creating repeatable content using the "test and learn" methodology. Optimizing content for easy discovery through search engines.
 - Partner smartly to enhance SMG's strategic priorities: Seeking new digital partnerships to implement strategic priorities and enhance opportunities, building on the success of previous partnership initiatives and external funding that demonstrated potential for innovation, impact, and outreach.
2. Städel Museum Digital Strategy¹³: This museum is also focused on ensuring openness and accessibility of content. Its goal is not just to create a virtual copy of the museum but to expand the audience's experience and explore new ways of interaction. Within this strategy, numerous projects have already been implemented. For example, the development of a new website and application, the establishment of WiFi infrastructure, the creation of a resource with a digitized museum collection, an online art course, and

¹² Retrieved from <https://www.sciencemuseumgroup.org.uk/about-us/policies-and-reports/digital-strategy-2022-2024-reach-and-impact>

¹³ Retrieved from <https://www.staedelmuseum.de/en/digital/digital-strategy>

more. Currently, statistics are collected for each digital product to improve and refine them.

3. Tretyakov Gallery Strategy (Tretyakov Gallery, 2016) ¹⁴: Initiatives in the field of digital technologies at the Gallery are incorporated into the overall development concept until 2025. They encompass both physical aspects (the use of technologies in exhibition activities) and virtual aspects (online education, development of social media, etc.) of museum visits. Additionally, specific focus areas include the digitization of the collection, the enhancement of professional skills, and digital marketing.
4. Digital Strategy of the Chicago History Museum (CHM), USA (Ludden & Russick, 2020):

Employees of the Chicago History Museum engaged with the concept of digital transformation and articulated principles in their strategy that encompass not only technical but also organizational changes. Their approach exhibits similarities with models discussed in Section 1.3.

- **People:** In this section, the significance of digital skills development among staff is highlighted. The idea is presented that digital transformation should be initiated by the leadership, as they possess the resources for it. However, it is equally important to listen to proactive employees. By defining the directions of digital transformation (accessibility, collaboration, infrastructure, etc.), the CHM leadership delegated to department managers the task of surveying employees for initiatives within these directions.
- **Assessment of the Current and Planned Situation:** Understanding where to progress is emphasized through the evaluation of the current and planned situation.
- **Environment:** CHM underscores the importance of creating a digital ecosystem that considers the preferences of employees. This is viewed as the first step toward digital literacy and overcoming resistance to technology.
- **Governance:** In this section, the importance of aligning digital transformation goals with the museum's overall strategy is emphasized. Even cutting-edge technologies, if implemented without supporting the museum's mission, may divert employees from what is truly essential.
- **Data:** Similar to many museums, CHM collects extensive visitor information through ticketing systems, websites, etc. However, museums must now ensure the

¹⁴ Retrieved from <file:///C:/Users/11099/Downloads/Kontseptsiya-razvitiya-Tretyakovskoy-galerei.pdf>

systematic collection of data ready for analysis. This will enhance internal processes and service quality. The next step is data-driven museums, where data is used not only for obtaining information but also for decision-making.

- Audience: CHM discusses the need to research visitor needs but stresses the importance of aligning these needs with the goals and objectives of the staff.

The approach of the Chicago History Museum significantly differs from that of other museums. While others focus on implementing technologies for audience interaction, CHM concentrates on its staff and internal process organization. Indeed, it can be argued that working with personnel is the foundation of Digital Transformation (DT), as employees are responsible for both transformation and internal operations, as well as interacting with visitors. For instance, the acquisition of a new Customer Relationship Management (CRM) system would be meaningless if the visitor services department cannot learn to use it. As mentioned in Section 1.4, the issue of digital illiteracy among staff is particularly crucial in the museum community. In general, the DT model of the Chicago History Museum can be considered the first comprehensive framework for museums, as it represents an adaptation of business models while taking into account the specificities of the museum sector. However, it should be noted that this model is suitable only for large organizations with an adequate budgetary allocation.

The issue of museum digital strategies is also considered on an international level. In 2018, the International Council of Museums (ICOM) established a working group for the development of regulatory documents and frameworks for creating a digital strategy – the Digital Strategy Development¹⁵. ICOM emphasizes the importance of taking into account the current infrastructure and needs of the museum when formulating a strategy, as well as the necessity for ongoing updates to align with changes in technology and visitor expectations.

¹⁵ Retrieved from <https://cidoc.mini.icom.museum/working-groups/digital-strategy-%20development/>

1.6 Conclusion to the chapter.

This chapter explored key aspects of digital transformation (DT) and digitalization, examining strategies aimed at the successful implementation of digital innovations. The analysis of existing DT frameworks revealed a particular emphasis on the development of digital infrastructure, human resource management, internal operations digitization, and service enhancement in line with customer expectations.

In the museum sector, the issue of DT is addressed less frequently than that of digitization and the implementation of individual technologies, mainly due to museums' limited resources. Currently, museums in the field of digital technologies seek to provide access to collections through internet tools and digitization technologies.

A critical challenge in museums is the issue of digital skills among staff, which is being addressed through educational projects led by leading experts in the field from different countries. Analyzed digital strategies of museums available in the public domain demonstrate that in their strategic vision, leaders primarily consider the development of external customer services, often overlooking the need for operational and organizational changes, i.e., changes within the organization.

It is essential to recognize that digital technologies are merely tools for the museum's development, capable of bringing the boldest ideas to life, but should not be seen as an end in themselves. They represent an effective and convenient means to enhance the museum experience and embody cultural values.

2. Digital transformation in Russia and in Russian culture in particular.

2.1 An overview with a focus on government programs and legal framework.

While this paper aims to focus on digital transformation as a comprehensive tool for implementing digital strategy within organizations, specifically within museums and the broader cultural environment, it is acknowledged that this is challenging due to the scarcity of its creation and implementation. However, this section of the thesis emphasizes that successful digital transformation overall requires a holistic approach and active government participation, highlighting the necessity for national programs and initiatives. It underscores the importance of creating and implementing strategies and programs focused on improving digital literacy and developing digital infrastructure as key elements for the effective use of digital technologies, particularly in the field of interest, which is the cultural and museum sector.

Abdrahmanova and colleagues (2019) write that any global changes in the activities of organizations within a state start with the state itself. In all leading countries in the field of digital technologies, the state acts as the driver of corresponding initiatives. Without its active participation, it is impossible to imagine the successful development of technological offerings in leading countries, forming the "digital face" of the modern economy.

In most developed countries, there are national strategies and programs for the digitalization of the economy and society. Recall the example of Singapore mentioned by O'Leary and co-authors (Liew et al., 2022) and its plan for digital initiatives described in the previous chapter. The goals and objectives of countries are generally similar, yet approaches to policy implementation vary. Some initiatives are part of a broader supranational scientific, technological, and innovative agenda. For instance, the digital development strategies of Germany (Jākobsonē, 2022) and other EU countries are aligned with the European digital agenda (OECD, 2017).

Based on the empirical findings of their article, Gao and colleagues (2023) assert that governments should incentivize organizations to develop and implement digitalization to facilitate the overall qualitative development of the country. They argue that the government needs to formulate policies to support digitalization, especially in the service sectors, including museums. Drawing on WEF (2016), Abdrahmanova et al. (2019) contend that the effective use of new digital technologies will be one of the main factors determining the international competitiveness of not only individual organizations but entire countries, shaping the infrastructure and legal environment for digitalization. Undoubtedly, organizations themselves

must also develop strategies to adapt to changes brought about by digitalization processes, aiming to enhance efficiency and keep pace with modern trends.

It is also essential to understand the distinction between museums with state support and funding and private ones, as state museums typically have more financing and political backing for digitization initiatives, making them better prepared to leverage the benefits of digitalization.

Before delving into the analysis of the characteristics and effects of digital transformation in Russian museums, it is necessary to consider the general situation of digital transformation in the country.

In recent years, Russia has been actively striving to form a digital economy and society, reflected in legislative acts and strategic documents. Chernykh and Baibulatova (2023) claim that while digitalization processes have been unfolding in Russia since the early 2000s, a new impulse for the accelerated adoption of digital technologies in the economy and social sphere is associated with the development and approval by the Government of the Russian Federation on July 28, 2017, of the "Digital Economy of the Russian Federation" program¹⁶. Despite the overall importance of this policy document for the development of the digital economy, Chernykh and Baibulatova (2023) note that some authors have critically evaluated its formation and content. The speed at which the document was created, which reflected on its thoroughness (from the proposal to launch such a program to its approval took just six months), resulted in the state's specific target orientation in the digital sphere not being defined, and the program's initial tasks were formulated too broadly and vaguely (Yakutin, 2017). The program's priorities were also unclearly outlined, although the success of its implementation depends precisely on a clear understanding of which areas need government support and which do not. As Yapparov (2018) writes, it is crucial to direct budgetary resources not into areas of digitalization where business can successfully manage on its own but into areas where the market truly needs it, such as the cultural sector under discussion.

Addressing the identified shortcomings of the mentioned program was the objective of the national project (program) "Digital Economy of the Russian Federation"¹⁷, the development of which was approved by the Decree of the President of the Russian Federation of May 7, 2018, No. 204 "On National Goals and Strategic Objectives of the Development of the Russian Federation for the Period up to 2024"¹⁸ - hereafter referred to as Decree No. 204. Indeed,

¹⁶ Retrieved from <http://government.ru/docs/28653/>

¹⁷ Retrieved from http://www.consultant.ru/document/cons_doc_LAW_328854/

¹⁸ Retrieved from <https://base.garant.ru/71937200/>

ensuring the accelerated implementation of digital technologies in the economy and social sphere must be one of the national development goals. For the formation of the national program, Decree No. 204 defined the following tasks, as also discussed at the conference "What is a digital economy? Trends, competencies, measurement" (Abdrahmanova, 2019):

- Increasing internal expenditures on the development of the digital economy from all sources (as a share of the gross domestic product) by at least three times compared to 2017;
- Creating a sustainable and secure information and telecommunication infrastructure for high-speed data transmission, processing, and storage, accessible to all organizations and households;
- Predominantly using domestic software by state authorities and local self-government bodies.

At the conference "What is a digital economy? Trends, competencies, measurement" (Abdrahmanova, 2019), it was also discussed that moderately favorable conditions have emerged for successfully addressing the specified tasks in terms of technological offerings. Thus, the ICT¹⁹ sector is one of the most dynamically developing segments of the Russian economy. Over the period 2010–2017 (precisely at the time of forming the aforementioned decree), it grew by 17%, almost doubling the GDP growth. The sector's share in GDP in 2018, the year the document was compiled, amounted to 2.7% (National Research University Higher School of Economics, 2019). As of now, according to the latest statistical data, the ICT sector has increased its share in the total volume of goods, works, and services sold in the first quarter of 2023 from 3.5 to 4.1%. Zinina (2023), in her comments on the statistical study of the Russian ICT sector, states that in the first quarter of 2023, the annual dynamics of the ICT sector in Q1 2023 remained positive, although it slightly slowed down. A significant factor was the high base effect - in the pre-sanction January-February 2022, the sector still showed growth, and in March, sales increased manifold due to the rush demand in anticipation of restrictions.

However, in most developed countries, the ICT sector plays a more significant role - for example, its share in the value added of the business sector in OECD countries in 2017 was 1.6 times higher than in Russia (5.4 and 3.4% respectively) (OECD, 2017). Abdrahmanova et al. (2019), citing the evaluation by National Research University Higher School of

¹⁹ The ICT sector encompasses telecommunications services, software production, and information and communication equipment manufacturing, along with wholesale trade of ICT goods.

Economics²⁰, argued that Russia lagged behind the leaders in technological offerings - Korea, Sweden, Finland - by 2-3 times in this indicator.

The status of a national project²¹ implies not only that this document meets certain standards, requirements, and methodology but also its close linkage with related acts of strategic planning, such as the Strategy for Scientific and Technological Development of the Russian Federation (approved by the Decree of the President of the Russian Federation of December 1, 2016, No. 642)²² and the Strategy for the Development of the Information Society in the Russian Federation for 2017–2030 (approved by the Decree of the President of the Russian Federation of May 9, 2017, No. 203)²³, which was not the case before its transformation into a national project. Chernykh and Baibulatova (2023) point out that it is also essential to ensure alignment with the National Security Strategy of the Russian Federation (approved by the Decree of the President of the Russian Federation of July 2, 2021, No. 400)²⁴.

In the context of implementing the Presidential Decrees of the Russian Federation dated May 7, 2018, No. 204, previously mentioned, and July 21, 2020, No. 474 "On National Development Goals of the Russian Federation for the Period up to 2030,"²⁵ including the objective of ensuring the accelerated introduction of digital technologies in the economy and social sphere, the Government of the Russian Federation formed the national program "Digital Economy of the Russian Federation" (hereinafter referred to as the Digital Economy NP) approved by the protocol of the Presidium of the Council under the President of the Russian Federation for Strategic Development and National Projects on June 4, 2019, No. 7.²⁶

The program 'Digital Economy of the Russian Federation' is one of the key initiatives in the context of implementing digital transformation and digitization in the country. It sets ambitious tasks in this area, touching upon many sectors, including culture (Ministry of Digital Development, Communications and Mass Media of the Russian Federation, 2023). The program is set to be completed by December 31, 2024, with an initial allocation of 1,052 billion rubles (approx. €153 million²⁷). The program aims to make new digital services accessible to improve citizens' comfort and quality of life, as well as to reduce costs and develop business, fostering competition.

²⁰ Retrieved from <https://www.hse.ru/en/>

²¹ Retrieved from http://www.consultant.ru/document/cons_doc_LAW_328854/

²² Retrieved from <http://kremlin.ru/acts/bank/41449>

²³ Retrieved from <https://base.garant.ru/71670570/>

²⁴ Retrieved from <http://www.kremlin.ru/acts/bank/47046>

²⁵ Retrieved from <http://kremlin.ru/events/president/news/63728>

²⁶ Retrieved from https://www.consultant.ru/document/cons_doc_LAW_328854/

²⁷ The euro amount is calculated based on the exchange rate of €1 = 98,32 rubles as of February 2024.

To implement digitalization of priority economic sectors and the social sphere, including healthcare, culture, education, transport and logistics, industrial sectors, energy, agriculture, construction and housing and communal services, and financial services, the National Program "Digital Economy of the Russian Federation" includes the following federal projects²⁸:

1. "Regulatory Framework of the Digital Environment" - creating a flexible legal regulation system aimed at removing barriers for the implementation and development of digitization projects.
2. "Personnel for the Digital Economy" - preparing highly qualified personnel possessing digital competencies in demand in the labor market. This implies, among other things, accessibility and personalization of education through the development of online services at all levels of the educational process.
3. "Information Infrastructure," "Information Security" - establishing a stable and secure infrastructure for data transmission, processing, and storage, as well as internet access for all citizens and organizations in the country.
4. "Digital Technologies," "Artificial Intelligence" (added within the Presidential Decree of the Russian Federation of October 10, 2019, No. 490 on the National Strategy for the Development of Artificial Intelligence for the period up to 2030) - supporting the development and implementation of domestic products and solutions in the field of advanced "cross-cutting" digital technologies, such as artificial intelligence, quantum technologies, distributed ledger systems, augmented and virtual reality, wireless communication technologies.
5. "Digital Public Administration" - digital public services and data. Enhancing the efficiency and transparency of the public administration system and the provision of public services through the introduction of digital technologies and platform solutions, forming and developing "digital government."

We will also delve into an important decree mentioned earlier, the Decree of the President of the Russian Federation of July 21, 2020, No. 474 "On National Development Goals of the Russian Federation for the Period up to 2030" (hereinafter referred to as Decree No. 474)²⁹. Chernykh and Baibulatova (2023) note that this document revised the national

²⁸ Retrieved from http://www.consultant.ru/document/cons_doc_LAW_328854/

²⁹ Retrieved from <http://kremlin.ru/events/president/news/63728>

development goals set in 2018, clarified, and specified the target indicators characterizing their achievement, considering a longer-term planning horizon. Specifically, the national goal of "Digital Transformation" was highlighted, with the following target indicators by 2030:

- Achieving "digital maturity" in key sectors of the economy and social sphere, including healthcare and education, as well as public administration;
- Increasing the share of mass socially significant services available electronically to 95%;
- Growth in the share of households provided with the opportunity for broadband access to the information and telecommunication Internet network to 97%;
- A fourfold increase in investments in domestic information technology solutions compared to the 2019 figure.

In January 2023, Deputy Prime Minister Dmitry Chernyshenko and the Minister of Digital Development, Communications, and Mass Media (Ministry of Digital Development) Maksut Shadaev held a joint briefing on the main results of achieving the national goal of "Digital Transformation" and the National Program "Digital Economy" in 2022, and key plans for the coming year³⁰. They noted that the indicators of the national goal were exceeded, for example, the level of digital maturity reached 65.8% against the plan of 56.2%; the share of mass socially significant online services amounted to 99.97% (against the plan of 65%). It was also mentioned that 2022 became a year of reorientation to new markets and directions, including the digital sector, due to sanctions.

At the end of 2023, on December 27, Maksut Shadaev, head of the Ministry of Digital Development, spoke at the final meeting of the ministry (Ministry of Digital Development, Communications and Mass Media of the Russian Federation, 2023), where he also discussed the results of the national program "Digital Economy" and outlined the directions that will be included in the new national program "Data Economy." Shadaev noted that over the past five years, a basic digital framework and infrastructure had been formed, and the telecom industry had developed significantly. Ecosystems are occupying an increasingly significant share in the economy's structure. The creation of ecosystems as an important factor in implementing comprehensive digital transformation in an organization was discussed in the previous chapter. Russia has not remained on the sidelines of progress related to the development of artificial intelligence - this sector has more than doubled in five years.

³⁰ Retrieved from <http://government.ru/news/47578/>

Digital ecosystems and online platforms are developing successfully. Significant progress has been made in digitalizing public administration. Educational programs and services for schoolchildren and students are being implemented. Programs to support IT personnel are being realized. Regarding further work and new projects, experts at the meeting noted that the most important issues are the protection of personal data and the development of educational programs in the IT field, which are also extremely necessary for the primary sector under consideration - culture and museums in particular.

Let's delve into the goal setting of the two main documents under discussion, the National Program "Digital Economy" from 2019³¹ and Decree № 474 from 2020³². As is known, the success of any endeavor depends on clear and specific goal setting. However, Chernykh and Baibulatova (2023) write that in Russian strategic planning practice, there are problems with goal setting, and unfortunately, the National Program "Digital Economy" is no exception. Besides the fact that the goals of the federal projects included in the national program appear too broad (as with the previous Digital Economy of the Russian Federation program from 2017, which was recognized to be reviewed and changed due to a similar problem), the actual implementation of advanced digital technologies requires a review of domestic production standards established over decades, and this process may take longer than the narrow planning horizon of the national project (until 2024 and the planned period until 2030).

Another problem arises here. Chernykh and Baibulatova (2023) indicate that while in developed countries the development of the digital economy is associated with the production of semiconductors, scientific and measuring equipment, communication devices, as well as automation and robotization of industrial enterprises, in Russia, digitalization processes are mainly related to the sphere of public services, and other stated goals, unfortunately, play a purely auxiliary role.

For example, according to the Institute for Statistical Studies and Economics of Knowledge at the National Research University Higher School of Economics, the intermediate goal of increasing the availability of broadband Internet to the population by the end of 2021 was not met, with the target set at 89% but the actual indicator was only 82.6% (Abdrakhmanova et al., 2023). Chernykh and Baibulatova (2023) also noted that over the five years (to 2023) that the National Program "Digital Economy of the Russian Federation" has

³¹ Retrieved from http://www.consultant.ru/document/cons_doc_LAW_328854/

³² Retrieved from <http://kremlin.ru/events/president/news/63728>

been in effect, this indicator has not yet reached the set targets. At the same time, specialists (Chernykh & Baibulatova, 2023; Hotulev, 2022) continue to note the presence of significant digital inequality (digital divide) in the country, associated with the uneven level of access to digital technologies, relatively low digital skills of the population, traditionally serious external security challenges, and problems with technological support for digital sovereignty. After all, access to the Internet and the ability to use it (having even basic digital skills) is the foundation for the implementation and development of digital transformation among the population.

In general, the primary orientation in goal setting towards the digitalization of public services, rather than on the interconnection of the digital economy with the real one, can be explained by existing problems with the implementation of the so-called innovation chain: the reproduction of knowledge through fundamental research — conducting applied research and developments — implementing scientific and technical results in production — producing competitive innovative products (Chernykh & Baibulatova, 2023). The Decree of the President of the Russian Federation from July 21, 2020, № 474³³ emphasizes the necessity to ensure by 2030 that Russia is among the top ten leading countries in the world in terms of the volume of scientific research and development. However, the country is losing in the global competition for factors determining the competitiveness of national innovation systems, including "smart money" — investments that attract new knowledge, technologies, and competencies to digital production projects (Chernykh, 2018).

A few words about achieving the target indicator of Decree № 474, the "digital maturity" of public administration. As foreign researchers, for example, Janowski (2015), emphasize, success in the field of digital transformation of the public administration system is usually not achieved when its total digitalization is set as an end in itself, but when specific digital solutions are considered as a means to overcome specific social, economic, political, and other challenges. In relation to Russia, such challenges include: addressing acute problems in the social sphere; ensuring economic growth and the competitiveness of Russia on the world market under conditions of sanctions pressure; increasing scientific and technological potential; conducting innovative and structural modernization (Chernykh & Baibulatova, 2023).

Unfortunately, it should be noted that as the National Project "Digital Economy" from 2019 was implemented, there has been a continuous reduction in funding. For instance, in 2020, it was reduced by 11%, and in 2022 discussions took place about reducing expenses for 14

³³ Retrieved from <http://kremlin.ru/events/president/news/63728>

national projects in 2023, where the most significant budget decrease was expected for the national project "Digital Economy" we are considering (TadViser, n.d. (a)). The federal budget for 2023 and the planned period for 2024 and 2025 implies a significant reduction in financial support for the national project. Thus, in 2023, 129.3 billion rubles (approx. €1,3 billion³⁴) are allocated for the implementation of its activities, which is almost twice less than the volumes laid down in the passport of the national project³⁵, and in 2024 — 126.9 billion rubles (approx. €1,2 billion³⁶), or about 62% of the planned volumes. This is while the National Project "Digital Economy of the Russian Federation" is the main source of financing for digitalization processes in Russia up to and including the time horizon of 2024 and the planned period up to 2030 (Chernykh & Baibulatova, 2023).

Chernykh and Baibulatova (2023) also point to the chronic underfunding, which negatively affects the achievement of such a target indicator as the increase in domestic expenses for the development of the digital economy from all sources (as a share of the country's GDP) by at least three times compared to 2017, as mentioned earlier. Statistical data indicate that the interim goal of increasing domestic costs by the end of 2021 was not achieved, with an established benchmark of 3% the actual indicator was 2.2% (Abdrakhmanova et al. 2023). However, even if this target indicator is achieved, as planned, by 2024, its value will be 5% of the country's GDP (Chernykh & Baibulatova, 2023).

This level has already been achieved by the leading countries in digital development — the United States, China, Japan, the Republic of Korea, and the countries of Northern Europe. Thus, even though Russia has made certain advances in areas such as the digitalization of the financial sector and public services, it will remain in a catch-up position (Chernykh & Baibulatova, 2023).

As is known, the new reality and the current situation in the country, coupled with the sanction pressure, have exposed some vulnerabilities in the domestic economy, necessitating a critical review of approaches to ensuring the resilience of the country's socio-economic system. Both tactically and strategically, it is necessary to acknowledge the need to ensure the functionality and independence of a number of significant sectors (industries) from "foreign partners," despite the substantial resources required for this (Chernykh & Baibulatova, 2023). This assurance is impossible without digital transformation based on domestic technologies

³⁴ The euro amount is calculated based on the exchange rate of €1 = 98,32 rubles as of February 2024.

³⁵ "Financial support for the national project" Retrieved from https://www.consultant.ru/document/cons_doc_LAW_328854/be12b6f0639b75c84c94627ad1572878a2f9b677/

³⁶ The euro amount is calculated based on the exchange rate of €1 = 98,32 rubles as of February 2024.

and/or easily replaceable alternatives, which, in turn, requires reasoned goal-setting combined with funding initially laid down in the passport of the relevant national project (program).

2.2 Government initiative and regulatory framework in Russian culture and its digital transformation.

Government initiatives and regulatory framework in cultural sector.

Glushakova (2022) highlights that during the transition from a planned economy to market relations, the development of the cultural sector was unfortunately not considered a national priority, leading to funding on a residual basis. It should be noted that in 2006, a cultural development project was not included among the priority national projects. The issue of the need for the development of sectors such as science and culture, which have a direct impact on the formation of human capital, remained open until 2012–2013. A revision of strategic priorities occurred in response to the consequences of the global financial and economic crisis of 2009, which threatened not only the stability of the country's financial system but also national security as a whole (Glushakova, 2022).

Currently, culture is not only recognized as a national priority but also acknowledged as a key factor in improving the quality of life and harmonizing social relations, serving as a guarantor of preserving a unified cultural space and the territorial integrity of Russia (Glushakova, 2022). Therefore, it is extremely important to ensure adequate strategic planning for the development of the cultural sector.

The laws and programs of the Russian Federation discussed in the previous section of this thesis, particularly the programs for the development of the digital economy, represent documents that have laid the foundation for the introduction of modern technologies into various industries. In accordance with them, digital transformation becomes one of the key tools in achieving national goals, including, undoubtedly, supporting cultural development.

Against the backdrop of state efforts in the field of the digital economy and the development of information technologies, it is necessary to examine how these trends reflect on the cultural sphere and, more specifically, on the museum experience in Russia.

A significant component of the digital transformation (DT) process of culture in Russia is the effort to create accessible and attractive cultural resources for a wide audience. The use of information technologies provides museums with unique opportunities to rethink their visitor engagement strategies, including, for example, conducting virtual tours and online exhibitions. However, attention should also be paid to the internal aspects of the operational activities of cultural organizations, particularly museums. Digital transformation and digitalization, in particular, open up opportunities for reviewing internal processes and staff

interactions, becoming a significant component of the overall strategic development of the cultural sector.

Elevating culture to the status of national priorities in the Russian Federation, as indicated by Glushakova (2022), demands high-quality strategic management of the cultural sector. In the context of the rapid development of digital technologies and their impact on the cultural sphere in Russia, an important document aimed at defining strategic priorities in cultural development is the "Strategy for the Development of Culture in the Russian Federation for the period up to 2030"³⁷. Approved on February 29, 2016, this strategy has become a fundamental benchmark in the digital transformation of Russian culture, including museum institutions.

However, it should be noted that the document primarily focuses only on digitization technologies and the formation of an informational space of knowledge, based on digitized book, archival, and museum collections, assembled in the National Electronic Library and national electronic archives across various branches of knowledge and areas of creative activity. The document also mentions the creation of a national Russian system for the preservation of electronic information, including resources on the information and telecommunications network "Internet".

Initially, the document ("Strategy of State Cultural Policy for the Period up to 2030," 2016) proposed to implement this strategy in two stages: from 2016 to 2020; from 2021 to 2030. However, in fact, only one action plan for the implementation of the strategy was approved, calculated for 2019-2021 from June 11, 2019 - Action Plan for the Implementation of the State Cultural Policy Strategy for the Period up to 2030 in 2019-2021³⁸.

This document in accordance with the main Strategy of 2016 covers various aspects of cultural development, as well as contains elements related to digital transformation. The main directions include:

1. Preservation of Cultural Heritage: The strategy emphasizes the preservation and development of cultural heritage, including monuments and traditions.
2. Development of Creativity and Cultural Industries: Focuses on stimulating creative activities and cultural industries, facilitating diversity and cultural exchange.
3. Accessibility of Cultural Resources: Aims to improve access to cultural resources for all population segments, including remote and sparsely populated regions.

³⁷ Retrieved from <http://static.government.ru/media/files/AsA9RAyYVAJnoBuKgH0qEJA9lxP7f2xm.pdf>

³⁸ Retrieved from <http://government.ru/docs/all/122376/>

4. Youth Policy in Culture: Special attention is given to engaging youth in cultural life and supporting their creative initiatives.
5. International Cooperation: Encourages international cooperation in the field of culture for experience exchange and expansion of cultural ties.
6. Technologies: The concept envisages the use of innovative information and communication technologies to enhance the accessibility of cultural goods, cultural heritage objects, and creative industries' products.

The 2019 action plan³⁹ allocates minimal attention to digital transformation and the digitalization of culture. However, according to this strategy, one of the main goals in the field of culture is to create an integrated and modern cultural space. The law emphasizes the need for cultural institutions, including museums, to adapt to the challenges of the digital era. However, the clear proposed actions in the field of digitalization and digital transformation only suggest providing online streaming of key cultural and artistic events and creating virtual exhibition projects equipped with digital guides in augmented reality format.

In the Report of the Ministry of Culture of the Russian Federation dated June 1, 2023 (Ministry of Culture of the Russian Federation, 2023), on the implementation of the State Cultural Policy Strategy for the period up to 2030 in the field of informatization, it is only mentioned that an important task of state cultural policy in the field of carrying out all types of cultural activities and the development of related industries is the use of digital communication technologies, including to ensure citizens' access to cultural values regardless of their place of residence. Within this direction, the Ministry of Culture of Russia conducts systematic work along three main lines (Ministry of Culture of the Russian Federation, 2023):

1. Fulfilling the Ministry's powers in terms of maintaining various registries and providing state services and functions;
2. Digital transformation of mechanisms of state management in the field of culture;
3. Promotion of cultural heritage and improving access to cultural goods.

On June 28, 2023, the Ministry of Culture proposed the adoption of a new State Cultural Policy Strategy up to 2030⁴⁰, as its previous version, approved in 2016, no longer met the new challenges and risks in the cultural sphere. Accordingly, the government decree of February

³⁹ Retrieved from <http://government.ru/docs/all/122376/>

⁴⁰ Retrieved from <https://regulation.gov.ru/Regulation/Npa/PublicView?npaID=139548>

29, 2016, approving the previous version of the strategy, was proposed to be declared invalid (at the time of writing thesis, this has not yet occurred). The explanatory note to the project (Federal Portal of Draft Normative Legal Acts, 2023) states that the need for its development was caused by changes that occurred both within the country and globally. The document is intended to align the strategy with the Constitution of the Russian Federation and current normative legal acts.

As noted in the Document (Federal Portal of Draft Normative Legal Acts, 2023), one of the problems in the implementation of state cultural policy is the observed decrease in expenditures on the consumption of cultural values and goods within the family budget, which impacts the reduction in the number of active participants in cultural and public processes, as emphasized in the strategy. To address this and other problems, as Vasilyeva (2023) writes, the new strategy envisions:

- Creating conditions for forming a safe information environment by popularizing resources through which reliable information will be disseminated, contributing to cultural-historical enlightenment and upbringing based on traditional Russian spiritual and moral values;
- Creating conditions for forming a state order for the creation of informational materials in media, cinema, print products, television and radio programs, and internet resources that meet the goals and objectives of state cultural policy;
- Ensuring conditions for the creation of new and development of existing exhibition spaces in the regions;
- Aligning the availability of cultural institutions and organizations with social norms for the population;
- Reducing regional disparities in the provision and development of cultural infrastructure, particularly theaters, which remain significant;
- Slowing down the reduction of professional education infrastructure in the cultural sphere, as well as the network of educational organizations in the field of culture and arts, including children's art schools;
- Preserving and developing small towns and historic settlements of the Russian Federation;
- Improving measures to support and develop rural culture;
- etc.

Like the previous version of the strategy, the new one anticipates its implementation in two stages: the first — 2023-2026 and the second — 2026-2030 (Federal Portal of Draft Normative Legal Acts, 2023). The first stage approves the implementation plan of the strategy, aligns strategic planning documents, and adopts regulatory measures. The same was envisaged by the previous version of the strategy. However, the second stage of the strategy envisages changes, including the implementation of the national project "Culture"⁴¹ and projects such as "Pushkin Card,"⁴² "Invented in Russia" (Solovieva, 2022).

Expected Outcomes. Vasilyeva (2023) states that while the previous document among the expected outcomes anticipated an increase in cultural funding from all sources to 1.4% of Russia's GDP by 2030, the new draft strategy no longer includes such an indicator among the expected results. However, the expected outcomes such as (Federal Portal of Draft Normative Legal Acts, 2023) are presented:

- Ensuring cultural sovereignty, preserving the country's unified cultural space and Russian identity;
- Contributing to the preservation of the Russian people, raising the status of the family, affirming traditional family values;
- Increasing the number of citizens, especially youth, aspiring to live and work in their homeland, considering Russia the most favorable place for living and revealing creative abilities;
- Increasing the number of participants in the interdepartmental project "Culture for Schoolchildren" to 2 million people by 2030, expanding cooperation of school museums with cultural institutions;
- Increasing the volume of book sales in Russia from 3 to 5 per capita compared to 2014 (in the previous strategy — from 3 to 7);
- Increasing to 2030 the number of accesses to digital resources in the field of culture to 690 million.

It's worth noting that, as Glushakova (2020) asserts, the measurability of the stated goals is a key condition for the successful implementation of any strategy at any level. Target indicators serve as control instruments for conducting activities. In the mentioned documents, the results of achieving any proposal are mostly presented in a general form, making it impossible to assess their implementation. For example, it's not entirely clear how to measure

⁴¹ Retrieved from <https://culture.gov.ru/about/national-project/about-project/>

⁴² Retrieved from <https://www.culture.ru/pushkinskaya-karta>

a goal such as ensuring cultural sovereignty. If a goal cannot be measured, its achievement cannot be monitored. This is why there is a huge need in any field, and particularly in culture, for the development of Programs and Documents with clearly outlined activities and results of their achievement, so that cultural organizations can more easily navigate and fulfill the specified requirements for the rapid development of this sphere.

We will also delve a bit deeper into the aforementioned national project "Culture" from 2019⁴³ (The project's passport was approved on December 24, 2018⁴⁴, in accordance with Decrees №474⁴⁵ and №204⁴⁶, previously discussed) with an implementation period until December 31, 2024. It's also important to mention that such a project in the cultural sphere is being implemented in Russia for the first time. At the heart of the national project "Culture" is the increase in the accessibility of cultural goods and opportunities for participation in the creation of cultural values across the country. Among the goals of the project, the authors indicate a 15% increase in the number of visits to cultural organizations, as well as a fivefold increase in the number of accesses to digital resources in the field of culture. The structure of this national project "Culture" includes⁴⁷:

1. Project "Creative People"⁴⁸ - creating conditions for the realization of the nation's creative potential;
2. Project "Cultural Environment"⁴⁹ - ensuring a qualitatively new level of cultural infrastructure development;
3. Project "Digital Culture"⁵⁰ - digitalization of services and formation of an informational space in the field of culture.

Among the tasks of the project that interest us, the creators indicated ensuring the accelerated implementation of digital technologies in the economy and social sphere (according to one of the clauses of Decree No. 204⁵¹). As a result of the implementation of the "Culture" project by the end of 2024, one of the indicators is a fivefold increase compared to 2017 in the number of accesses to digital cultural resources, up to 30 million people: virtual concert halls,

⁴³ Retrieved from <https://culture.gov.ru/about/national-project/about-project/>

⁴⁴ Retrieved from <http://council.gov.ru/activity/documents/124787/>

⁴⁵ Retrieved from <http://kremlin.ru/events/president/news/63728>

⁴⁶ Retrieved from <https://base.garant.ru/71937200/>

⁴⁷ Retrieved from <https://culture.gov.ru/about/national-project/about-project/>

⁴⁸ Retrieved from <https://culture.gov.ru/about/national-project/creative-people/>

⁴⁹ Retrieved from <https://culture.gov.ru/about/national-project/cultural-environment/>

⁵⁰ Retrieved from <https://digital-culture.ru/>

⁵¹ Retrieved from <https://base.garant.ru/71937200/>

model libraries with access to digital resources, online broadcasts, guides with augmented reality (Strategy24, 2019). Another important task is the preparation of qualified personnel for cultural institutions (Strategy24, 2019), as we discussed in the theoretical part of this work, the presence of appropriate human capital is extremely important for the successful implementation of digital transformation and digitalization in particular.

Let's briefly analyze the results of the project. Within the implementation of the "Culture" project, mainly the construction and reconstruction of cultural institutions were carried out and continue to be carried out. For example, by the end of the 1st quarter of 2020, it can be noted that the number of accesses to digital cultural resources (which is one of the two main indicators of the national project) amounted to 20.5 million visits against the overall plan for 2020 - 32 million (Cultmanager, 2023).

At the end of 2020, the Russian Minister of Culture Olga Lyubimova reported that from March to December, state museums held about 23 thousand online events with a total attendance of about 300 million, and approximately 40 million citizens of the Russian Federation gained access to modern cultural infrastructure. In 44 regions of the Russian Federation, 80 virtual concert halls were created. Also, in 2020, 4 centers for continuous education were opened, operating in regular mode, including for distance learning (Cultmanager, 2023).

Also, the Cultmanager portal (2023) reports that in 2021, 305 model libraries were updated in 75 regions, and in the mobile application "Svet" of the National Electronic Library, rare editions and ancient manuscripts appeared, indicating continuous digitization of various archives.

In early February 2023, Deputy Prime Minister Tatyana Golikova at a meeting on the implementation of the "Culture" national project in 2022 and 2023 (Government of Russia, 2023) mentioned that the cash execution level of the "Culture" national project is one of the highest among all national projects: 99.9%. In 2022 it was implemented at 99.95%. In addition to everything else, it is planned to open 73 virtual concert halls. The portal "Culture.rf"⁵² will conduct 100 online broadcasts of events. 5 thousand film materials and 8 thousand book monuments will be digitized. Moreover, in 2023 it was planned to allocate funds for the technical equipment of 316 municipal museums and improve the skills of 40 thousand cultural workers.

⁵² Portal "Culture.RF". Retrieved from <https://www.culture.ru/>

The Cultmanager portal (2023) also notes that funding for the project has been increased during its implementation. In 2023-2024, according to budget adjustments, they planned and plan to spend: 2023 - 24.5 billion rubles (approx. €245 million); 2024 - 47 billion rubles (approx. €478 million). For comparison, for example, in 2021, only 18.3 billion rubles (approx. €186 million) were allocated for it, and in 2022 - 20.5 billion rubles (approx. €208,5 million)⁵³. In addition, the "Culture" national project was decided to be extended beyond 2024. The details and plan for the new period have not yet been presented.

Almost all funds are allocated from the federal budget. A large part of the funds is involved in the implementation of the federal project "Cultural Environment". In second place in terms of expenses is "Creative People", and the project "Digital Culture", unfortunately, occupies the last place (Ministry of Culture of the Russian Federation, n.d.).

As reported by Postnikova (2020), a serious issue in achieving the set indicators for increasing visits to cultural institutions was the period of the coronavirus pandemic. On one hand, quarantine required a review and adjustment of the indicators set for 2020 and subsequent periods, and on the other hand, it confirmed the urgency of implementing the federal project "Digital Culture," as the opportunity to access cultural goods was shifted to the virtual space. Many Russian and foreign art institutions provided access to viewing their performances and concerts, and the number of virtual tours in leading museums around the world and in Russia significantly increased. Municipal cultural and art institutions in the regions follow this example, trying to post recordings and conduct live broadcasts of events on their websites. There was also interesting experience in conducting classes, rehearsals, and performances of creative groups in interactive mode.

Let's delve deeper into the "Digital Culture"⁵⁴ project within the "Culture" project. It's also important to mention that the federal project uses the term "digitalization" in relation to the sphere of "services and the formation of information space in the field of culture." The main task of the project is to ensure the wide implementation of digital technologies in the country's cultural space. The goal of the project is to increase by the end of 2024 the number of citizens involved in culture by creating a modern cultural infrastructure, introducing new forms and technologies into the activities of cultural organizations, and broad support for cultural initiatives (RosKultProekt, 2019).

⁵³ The euro amount is calculated based on the exchange rate of €1 = 98,32 rubles as of February 2024.

⁵⁴ Retrieved from <https://digital-culture.ru/>

In 2020, as part of the "Digital Culture" project, more than 16 thousand book monuments were digitized, as reported by the Culturmanager portal (2021). In 44 regions, 80 virtual concert halls were opened, providing free access for residents even of the most remote corners of the country to concerts in recording and online mode. Another achievement of "Digital Culture" was multimedia guides in museums. Such guides appeared in 2020 at the A.S. Pushkin Historical and Literary Museum-Reserve in Bolshiye Vyazyomy, the Serpukhov Historical and Art Museum, and the P.I. Tchaikovsky Museum-Reserve. Achievements in conducting online events have already been mentioned earlier, but it is important to note that about 40 million citizens gained access to modern cultural infrastructure. Moreover, by the end of 2020, the number of accesses to the resources of the "National Electronic Library" amounted to more than 16.5 million. Its fund increased to 5 million publications. Now, through the "NEL" portal, more than eight thousand rare books from leading domestic libraries, digitized within the national project, are available (Culturmanager, 2021).

The attendance of digital cultural resources by the end of 2020 reached about 118 million accesses. The attendance of the Cultura.RF⁵⁵ portal for 2020 amounted to more than 69 million visits, a quarter of which were for the children's audience.

Data for 2022 and 2023 are not available in the public domain, and final figures for 2021 are also absent. As of early October 2021, almost 58 million rubles (approx. €590 thousand⁵⁶) from the state budget had already been spent on digitizing books. About 124 million rubles were spent on creating virtual concert halls. More than 46 million (approx. €468 thousand⁵⁷) were allocated for organizing online events. 45 million rubles (approx. €458 thousand) were spent on multimedia guides, and more than half a billion rubles (approx. €5 million) went to creating cultural content on social networks (Culturmanager, 2021).

Among the expected results, for example, by the completion of the "Digital Culture" project (Federal Project "Digital Culture", n.d.) in 2024, authorities plan to create at least 500 virtual concert halls, conduct 600 online broadcasts of cultural events, create 450 multimedia guides, etc.

⁵⁵ Portal "Culture.RF". Retrieved from <https://www.culture.ru/>

⁵⁶ The euro amount is calculated based on the exchange rate of €1 = 98,32 rubles as of February 2024.

⁵⁷ The euro amount is calculated based on the exchange rate of €1 = 98,32 rubles as of February 2024.

The 'Smart City' Concept: Moscow.

Let's also touch on the "Smart City" concept, as in 2018, the Moscow government developed the document "Moscow City Strategy 'Smart City – 2030'"⁵⁸. It is crucial to explore this concept as it represents a unique example of such strategies within Russia. Additionally, we focus on Moscow because the Pushkin State Museum of Fine Arts, whose digital transformation strategy will be further examined, is located in Moscow and operates in alignment with the smart city concept.

There are two approaches to understanding the "Smart City" concept. The humanitarian approach, as Kolodiy et al. (2020) writes, is associated with the idea that a "Smart City" is a responsible institution based on the principle of sustainable development. Sustainable development implies, first and foremost, care for future generations. This includes environmental friendliness, attention to its mission, educating the next generations, and creating such economic and socio-cultural situations, such infrastructure, that would create comfortable living conditions, motivating people not to leave but to work enthusiastically in their places. In 1987, the World Commission on Environment and Development formulated the widely accepted definition of "sustainable development," where "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Kolodiy et al., 2020).

The technological approach to the formation of a "Smart City" is associated with the development of IT infrastructure and digital services. For example, Huawei Russia (2017) identifies four basic elements in the technological structure of a "smart city":

- Internet of Things, whose technological concept allows collecting necessary information from objects and provides feedback with them;
- Data transmission infrastructure, connecting applications to urban infrastructure objects;
- Data analysis systems, allowing to extract useful information from a large volume of data;
- A system of aggregation and unification of data, aimed at ordering and synchronizing huge data flows.

Components of the Smart City concept (Government of Moscow, 2018):

- Smart People - developing human and social capital

⁵⁸ Retrieved from https://ict.moscow/static/strategy/stage3/2018_05_18_Umnyy_gorod_v20.pdf

- Smart Living - improving the quality of life
- Smart Mobility - developing digital mobility
- Smart Economy - enhancing competitiveness
- Smart Environment - protecting and improving the living environment
- Smart Government - digital government

However, the Smart City concept cannot be perceived and developed merely as an accumulation of various technical solutions and digital services provided by the city, without the humanitarian component, as stated by Opredelev Vladimir (2018) in a presentation with the project for the Digital Development Strategy of the Pushkin State Museum of Fine Arts. It is precisely a conscious understanding through humanitarian meanings of what a "smart city" is that allows for creating the most effective digital environment that meets the goals and tasks of a specific space, developing the necessary toolkit. All these developments are linked with responsibility towards future generations, hence they consider various components: economy, energy efficiency and resource saving, habitat, mobility, population, management, comfort of living. These are also elements in the development of the information society.

Moscow's digital strategy "Smart City - 2030" (Government of Moscow, 2018) defined key vectors for the development of the Russian capital as an innovative smart city of the future for the next 12 years. The discussion of this strategy was held at ICT.Moscow⁵⁹ in the summer of 2018, lasted 84 days, and attracted the attention of more than 20,000 experts and IT specialists. Subsequently, the strategy project was discussed with the residents of the capital, and only after considering all comments, the final version of the project was published.

Unlike traditional sectoral strategies, "Smart Moscow 2030" is not confined to one area (ICT) and implies interconnected development of all sectors in the city (Fig. 15).

⁵⁹ Retrieved from <https://ict.moscow/>

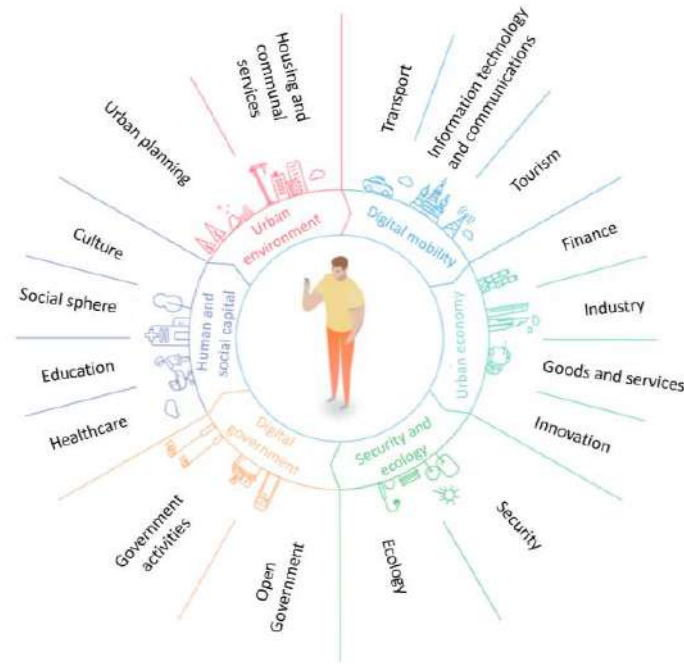


Figure 15. Directions of “Moscow's digital strategy "Smart City - 2030".
(Government of Moscow, 2018, p. 30) [translated by Author, 2024]

The strategy (Government of Moscow, 2018) states that information and communication technologies are needed by the city to enhance the standard of living for its citizens, make management processes and service delivery more efficient, and meet people's needs. Within this strategy, the use of the following cross-cutting technologies is anticipated in all areas of life (Government of Moscow, 2018):

- Big Data and predictive analytics;
- Virtual, mixed, and augmented reality technologies;
- New communication technologies and the expanded use of the Internet of Things;
- Blockchain;
- New human-machine interaction interfaces;
- Security technologies, including cybersecurity;
- 3D modeling and printing.

One of the development directions of this program is the development of human and social capital, which also includes the cultural sphere. Accordingly, the program envisages the digitalization of the collections of libraries, museums, and cultural centers, digitization of fund objects with multilingual support, and organizing access to materials on the Internet.

It also foresees the further development of online broadcasts of cultural and sports events, including the use of AR/VR/MR technologies and holography, which will expand the audience and stimulate interest in cultural and sports events.

According to the "Smart City - 2030" strategy of Moscow (Government of Moscow, 2018), information services about the city's cultural and sports life events will become more personalized, considering individual user preferences based on the analysis of their "digital footprint." Moreover, the organization of registration for overview, thematic, and interactive tours in museums in electronic form will be developed, along with the sale of electronic tickets to all museums, exhibition centers, concerts, and other cultural and mass events. Navigation systems with elements of virtual and augmented reality will be implemented, interactive tours developed, and 3D modeling of cultural objects advanced.

The "Smart City" concept of Moscow is an important element in the context of digital transformation and digitization of the museum space in Russia, especially in the capital region. Considering this strategy reveals additional opportunities and challenges associated with integrating museums into the city's and society's digital infrastructure. The strategy developed by the Moscow government suggests a comprehensive approach to developing urban space, including the cultural sphere, through the use of modern information and communication technologies and digital services.

Conclusion to the section.

The data presented emphasize that, despite the recognition of culture as a national priority and a key factor for improving the quality of life, the implementation of digital transformation in the cultural sphere faces several problems, including:

1. **Insufficient funding:** Throughout the transition period and until recently, cultural development was not considered a priority, leading to inadequate and residual funding. Projects and strategies aimed at developing the cultural sphere did not receive proper attention and support at the state level.
2. **Digital transformation as an instrument for national goals:** In recent documents and strategies, digital transformation is highlighted as a key tool for achieving national goals, including supporting cultural development. However, despite strategic planning, specific steps for digitalization and transformation remain insufficiently defined and funded.
3. **Regional disparities:** Special attention needs to be paid to regional support, as there are significant differences in the level of development and accessibility of cultural

resources and services between central regions, such as Moscow and St. Petersburg, and other regions.

4. The need for a new strategy: Considering the changing world and new challenges, a new Cultural State Policy Strategy until 2030 was proposed in 2023, highlighting the recognition that old approaches no longer meet contemporary requirements and risks.
5. The National Project "Culture": Despite the launch of significant initiatives like the national project "Culture," focusing on digitizing cultural services and increasing accessibility to cultural goods across the country, the funding and full realization of these projects have not yet achieved their goals, especially in the context of digital culture.

Thus, despite efforts and recognition of the importance of culture and its digital transformation at the strategic planning level, actual support and implementation of these initiatives in practice require additional attention, especially in terms of funding, regional support, and specification of actions. Enhanced state support is necessary to overcome current challenges and successfully implement digital transformation in Russia's cultural sphere, aiming to create an integrated and accessible cultural space for all citizens.

Regarding the "Smart City" concept in Moscow, it represents a significant step towards integrating digital technologies into the urban environment and cultural life, opening new perspectives for the development of museums and other cultural institutions. This not only contributes to improving the quality of life and cultural enrichment of residents and visitors to the capital but also serves as an example for other regions of Russia in creating a sustainable and innovative cultural space in the era of digitization. Thus, the "Smart City" concept complements and reinforces the need for state support and strategic planning in the field of digital transformation of the cultural sphere, highlighting the importance of a comprehensive and integrated approach to the development of modern society.

3. Digital transformation and digitalization of museums in Russia

3.1 General overview from different angles.

History of digitalization in Russian museums.

The digitalization journey of Russian museums encompasses a broad and evolving narrative, starting from early efforts in the 1960s through to the advanced digital initiatives of the 21st century. This history is marked by pioneering work in the application of information technologies within the museum sector, aimed at enhancing cataloging processes and the overall accessibility of cultural heritage. The collaboration between museum professionals and IT specialists during this period laid the groundwork for what would become a comprehensive shift towards digital transformation.

1960s – 1980s. During the period from the 1960s to the 1980s, the process of informatization began in Soviet museums, actively developing from the mid-1970s. The pioneers of this direction were Shera and Aseyev, as mentioned in the first theoretical part of this work, in the context of their contributions to museum cataloging and the use of computers, as emphasized in the study by Vasilieva et al. (2019). This period was characterized by collaboration among specialists from different fields, which Sizova (2017) refers to as a "romantic time" – an era of creativity, dreams, and fantasies about the future where artworks would become accessible to everyone, similar to books, and would contribute to the cultural enrichment of society.

Vasilieva et al. (2019) highlight that the initial stages of informatization mainly concerned the accounting and storage activities of museums. In a significant publication of that time, "The Modern Art Museum: Problems of Activity and Development Prospects" under the auspices of the Russian Museum in 1980, Yuri Aseyev, Yakov Sher, and Irina Podnozova focused on cataloging as a key element of museum work, upon which its primary functions depend (Sher, 2006). This is interconnected with Daniel Bell's idea of the information society, where the systematization of knowledge is the basis of progress (Budnikova, 2021). The author (Budnikova, 2021) points out the lack of theoretical works dedicated to analyzing the information needs of museums, indicating the necessity for the development of museum informatics as a specialized field.

From the early 1980s, museum employees began to realize the significance of technological innovations for the museum field, but active implementation of these technologies became possible only in the mid-1990s. Vasilieva et al. (2019) note the beginning

of the creation of automated museum catalogs in the Hermitage under Sher's leadership from 1975 and in the Russian Museum under Aseyev's leadership from 1978. By 1981, informatics departments were organized in both museums. Lev Noll, who worked at the Main Information and Computing Center of the USSR Ministry of Culture, participated in creating the first database for accounting museum exhibits, including a complex system for describing Sasanian coins with about two hundred characteristics (Vasilieva et al., 2019).

Speaking of the pioneers of informatization in Soviet museums, it is impossible not to mention Dmitry Pertsev, the founder of the informatics department at the Tretyakov Gallery, as written by Vasilieva et al. (2019). He made a significant contribution to the development of museum informatics, developing conceptual models for scientific description and contributing to the unification of museum data. Within the framework of the All-Union Seminar on Museum Informatics, which operated until 1996, current issues of museum informatization were discussed (Ideas for Museums, 2012a). However, after the department's closure, many of Pertsev's achievements remained underappreciated, and the issues he raised were not resolved (Vasilieva et al., 2019).

The study by Vasilieva et al. (2019) focuses on the significance of the first automated catalogs for museum activities, on the possibility of eliminating the need for multiple card indexes, and on creating catalogs for individual collections. It is noted that informatization faced several problems, including the difficulties museum staff encountered in mastering new equipment and the incompleteness of inventory card indexes, underscoring the need for further development and improvement of information systems in museums (Vasilieva et al., 2019).

Tatyana Bogomazova recalls the first computer at the MAE RAS named after Peter the Great (Kunstkamera):

"And, despite the somewhat painful first encounter with the computer, because mastering all this was not very easy, there was colossal interest, a very strong motivation, and the advantage I gained, of course, outweighed all the existing problems. The speed at which I could subsequently work completely amazed me. And at the same time, I was struck by the attitude of colleagues who perceived my enthusiasms with some caution, and probably for several more years I remained the museum's only computer user" (from an interview with Tatyana Bogomazova (Ideas for Museums, 2013)).

Milestones shift: the museum in the transitional period (1987—1990). The turning point of museum informatization in the USSR was marked in 1987 when the USSR Ministry of Culture

acquired advanced computer equipment for the State Tretyakov Gallery through a contract with the Italian company Olivetti, as noted by Vasilieva et al. (2019). A similar update of equipment also occurred in the Russian Museum. From this moment began the creation of a database of museum exhibit images, which later became the basis for the development of multimedia projects.

This period became a time of transition, coinciding with global changes in the country, including the dissolution of the USSR in 1991, the construction of a new state structure, democratic reforms, and economic restructuring, which deeply affected cultural institutions, including museums.

The introduction of new technologies opened limitless possibilities for processing and presenting information. In particular, the first multimedia programs were created to accompany the main part of the exhibitions. Alexey Lebedev, head of the Laboratory of Museum Design at the School of Design, National Research University Higher School of Economics, recalls the beginning of the work of the Department of Theoretical and Applied Research of the State Tretyakov Gallery on multimedia projects:

"The first multimedia program presented to the Russian audience was called 'From the Life of Christ. The Gospel Cycle by Polenov' and was developed in early 1994 for an exhibition dedicated to Polenov's anniversary. The program was displayed on a large television next to a computer, which only showed text. This approach allowed viewers to simultaneously see and read information about the artworks" (from an interview with Alexey Lebedev (Ideas for Museums, 2012b).

At the same time, it was recognized that computer technologies should serve only as a tool for working with information, rather than becoming an end in itself. The results of this stage outlined the key directions for the further development of informatization in Russian museums, according to Vasilieva et al. (2019):

- Emphasized the need to continue the automation of museum document flow;
- Laid the foundation for the creation of multimedia kiosks and touch panels, thanks to the emergence of the first multimedia discs and programs;
- Russian experts, such as Lev Noll and Alexander Dremailov, for the first time participated in international conferences on museum informatics, facilitating the exchange of experience and ideas on a global level (1992 — Ljubljana, 1994 — Washington).

Mid-1990s to 2000s. The period from the mid-1990s to the 2000s marked a new stage in the informatization of museum affairs in the new Russia, characterized not only by the development and implementation of automated accounting systems but also by the active exploration of the Internet for the museum's daily tasks. While museum projects were still largely experimental, driven by the nature of this activity as well as the high cost of equipment and limited IT knowledge among staff, these initiatives were also influenced by the overall conditions in the country.

The complex political situation in the country created obstacles for the formation of commercial structures capable of competing with state enterprises. Thus, museums faced a choice: to develop their own accounting system or to purchase a ready-made software solution, as noted by researchers from the National Research University Higher School of Economics (Vasilieva et al., 2019).

Two organizations were pioneers in developing an electronic database for museums: the State Institute for Cultural Programs of the Ministry of Culture of the Russian Federation⁶⁰, which began its first developments in 1987, and JSC "Alt-Soft"⁶¹, which started its activities based on the Russian Museum in 1991.

By the early 1990s, although the concept of an automated database had already been developed, suitable software and hardware were not yet accessible (Vasilieva et al., 2019). The development of two key systems, "Museum-3"⁶² from the Ministry of Culture based on Microsoft Access and KAMIS⁶³ from "Alt-Soft" (initially on Fox Pro, then on Oracle), occurred in parallel but on different software bases.

The widespread adoption of the Internet marked a significant event for the museum world. In 1996, Kirill Nasedkin, then an employee of the Darwin Museum, created the "Museums of Russia"⁶⁴ portal, which is still operational today, although it requires updating and a revision of its development concept.

Since then, many museums have launched their own websites, with the Museum of Anthropology and Ethnography named after Peter the Great (Kunstkamera)⁶⁵ being among the

⁶⁰ Retrieved from <https://givc.ru/index/>

⁶¹ Retrieved from <https://altsoft.spb.ru/>

⁶² Retrieved from <https://givc.ru/solution/museum-givc/>

⁶³ Retrieved from <https://kamis.ru/kamis/moduli/>

⁶⁴ Retrieved from <http://www.museum.ru/>

⁶⁵ Retrieved from <https://www.kunstkamera.ru/>

pioneers. Tatyana Bogomazova, head of the IT department at the MAE and an initiator of informatization in the museum, discussed this development (Ideas for Museums, 2013):

"Much depends on the position of the administration. The administration that was in the museum until 2002 was extremely conservative about these phenomena. The first thing we did, with youthful zeal, overcoming certain administrative barriers, was to create a website. We launched it on January 19, 1997. The creation of this website was that initial core that then allowed us to expand activities on the informatization of the museum." (from an interview with Tatyana Bogomazova (Ideas for Museums, 2013))

Today, museum websites have become not just platforms for informing visitors but also scientific reference resources, allowing the public to explore collections, plan visits, and interact with staff. However, only a few museums provide open access to their databases. An example of a leader in this area is the Rybinsk Museum-Reserve, which posted its complete database online in 2000 (Vasilieva et al., 2019).

Before discussing the latest trends in museum informatization, it is worth mentioning the international activity of Russian specialists, such as the participation of Noll and Dremailov in the CIDOC conference in Ljubljana in 1993 (ADIT, n.d.) and the creation of the professional association ADIT in 1996.

The virtual exhibition in 2003, "Horizons: Landscape in Russian and Canadian Painting (1860—1940)," was an example of a successful international project. The project involved 14 museums from Russia and Canada, as well as the Canadian Heritage Information Network. Another significant event was the participation of a delegation of employees from Moscow museums in the AVICOM conference, which took place in 2004 in Taiwan. Multimedia discs with museum programs were presented there. Largely thanks to the "Horizons" project and the AVICOM conference, the Tretyakov Gallery eventually established the Multimedia and Internet Projects sector (Vasilieva et al., 2019).

Since 2010. Since the early 2010s, Russian museums have been actively embracing digital technologies, as highlighted by digitalization experts from the Higher School of Economics (Vasilieva et al., 2019). In the first half of the decade, museums embarked on integrating into social networks, with major institutions like the State Tretyakov Gallery, Kunstkamera, Hermitage, and the State Historical Museum leading the way. The professional community began to actively discuss the role and significance of social networks at specialized events,

notably at roundtables during the EVA-2012 conference, where Tatyana Nikolaeva from the Tretyakov Gallery, responsible for the Multimedia and Internet Projects sector, was one of the organizers. Since 2014, the State Historical Museum has served as a venue for seminars and conferences focused on internet promotion for museums (Vasilieva et al., 2019). Russian museums actively participate in international social media campaigns like “Ask a Curator” and “MuseumWeek”, launching their own initiatives.

In addition to official museum pages on Facebook, professional museum worker communities thrive there. On March 8, 2013, Alexey Lebedev initiated the "Museum Design Laboratory"⁶⁶ group, where participants share experiences on current museum issues, discuss new museums and exhibitions, important publications, and interviews. Currently, Facebook hosts over ten such professional communities discussing various aspects of museum activity, including inventory and storage, social media work, children's projects, and coordinating informal museum worker meetups #drinkingaboutmuseums and Museum Club (Vasilieva et al., 2019).

In 2015, the Russian Ministry of Culture launched the Unified Information Space in the Sphere of Culture (UISCC) project, now known as the "Personal Account on the Culture.RF portal"⁶⁷. The project aims to promote and popularize museums and cultural institutions online. The system enables scheduled posts on social networks, email newsletters, event announcements, and participation in educational webinars. Thanks to partnerships with VKontakte and Odnoklassniki, broadcasts reach millions of viewers. Live broadcasts of lectures and tours from museums became a trend in 2017 (Vasilieva et al., 2019).

The development of mobile applications for museums also emerged as a notable trend in the early 2010s. The market features two popular solutions: the storytelling platform izi.travel⁶⁸ and the augmented reality platform Artefact⁶⁹, both available for free use by museums and visitors. Some museums, including the State Tretyakov Gallery and the State Hermitage, have developed their own mobile applications, such as Tretyakovka's "Books of the Tretyakov Gallery" app⁷⁰, offering electronic versions of catalogs and scholarly collections.

Collection digitization continues: by 2025, information about all exhibits in Russian museums should be available on the "Goskatalog" portal⁷¹.

⁶⁶ Retrieved from https://www.facebook.com/groups/museumprojecting/?locale=ru_RU

⁶⁷ Portal “Culture.RF”. Retrieved from <https://www.culture.ru/>

⁶⁸ Retrieved from <https://www.izi.travel/ru/search>

⁶⁹ Retrieved from <https://play.google.com/store/apps/details?id=ru.datastack.artefact&hl=ru&gl=US>

⁷⁰ Retrieved from <https://play.google.com/store/apps/details?id=ru.tretykovgallery.kiosk&hl=gsw>

⁷¹ Retrieved from <https://www.goskatalog.ru/portal/#/>

Some museums are experimenting with virtual reality technologies and 3D modeling. For example, the Darwin Museum reconstructs exhibits in 3D and publishes them on the popular resource sketchfab⁷². In the summer of 2018, the Tretyakov Gallery and the VRTech group of companies launched the edutainment project in virtual reality "In Three Dimensions: Goncharova and Malevich"⁷³.

Digital technologies are used not only for audience engagement but also for solving internal museum tasks, including video surveillance, analytics, information security, and support for corporate services (Vasilieva et al., 2019). In 2017, the Pushkin State Museum of Fine Arts initiated an educational project for museum employees - the IT Laboratory⁷⁴, one of its tasks being the digitalization of museums within the "smart city" concept, which will be discussed in more detail later.

For the successful continuation of museums' digital transformation, it is essential to establish interaction between museum workers and specialists in IT, communications, and PR, as well as to transfer experience from one generation of professionals to another. As Nadezhda Brakker emphasizes, it is important for young specialists trained in museum affairs and informatization to actually come to work in museums and find common ground with the older generation. This requires tolerance and a willingness to communicate even with those who may seem incomprehensible (from an interview with Nadezhda Brakker, Ideas for Museums, 2012c).

International Communities.

Currently, Russia is also part of international communities that facilitate the digital transformation of museums worldwide. For example, it participates in the "Information for All Programme" (IFAP)⁷⁵, an intergovernmental program established by UNESCO in 2000. Within this program, governments from various countries worldwide have committed to using the new opportunities of the information age to ensure equitable participation in society through measures for more effective access to information and knowledge. The UNESCO "Information for All Programme" (IFAP) aims to ensure global access to information and knowledge, as well as to promote policies and strategies related to information and communication technologies. It focuses on six key areas: information literacy, access to information,

⁷² Retrieved from <https://sketchfab.com/tags/resources>

⁷³ Retrieved from <https://www.tretyakovgallery.ru/exhibitions/o/avangard-v-trekh-izmereniyakh-goncharova-i-malevich/?ysclid=loov4p9ane906004976>

⁷⁴ Retrieved from <https://pushkinmuseum.art/it-lab/>

⁷⁵ Retrieved from <https://www.unesco.org/en/ifap>

information preservation, information ethics, information diversity, and information security. IFAP fosters international cooperation and partnership for the development and implementation of national information policies and strategies.

There is also a Russian representation of ICOM (International Council of Museums)⁷⁶. ICOM is⁷⁷ the leading global organization representing the museum community. Founded in 1946, it has more than 45,000 members from 141 countries. ICOM is a unique network of museum professionals working in various fields related to museums and heritage. ICOM holds the highest advisory status, category "A", with UNESCO and the United Nations Economic and Social Council. ICOM's mission is to preserve, protect, and disseminate cultural and natural heritage, both within and outside museums. The organization works on establishing standards of professional practice and ethics for museums and promotes international exchange of knowledge and experience in the museum field.

Within ICOM Russia, the Council for Digital Development⁷⁸ has also been implemented. It was created to support relevant cultural projects, provide information, consultation, and methodological assistance to Council members and ICOM Russia member institutions, facilitate the professional qualification and digital literacy of museum specialists, and participate in the development and discussion of regulatory acts, methodological guides, and recommendations in the field of digital development. The council's tasks include (ICOM Russia, n.d.):

- Creating platforms for professional discussion of current topics and experience exchange between IT specialists from museums, scientific and educational institutions, industry experts, technological companies, and associations;
- Popularizing knowledge in applying information and communication and multimedia technologies in museum activities, including enhancing digital literacy among employees in the museum field and other cultural institutions in Russia;
- Participating in research, development, and implementation of advanced information and multimedia technologies and methodologies in museum activities, analyzing opportunities and potential benefits of using specific digital technologies and technological innovations specifically for museums and cultural institutions;
- Providing methodological support to museums in areas of work with IT and multimedia in museum activities;

⁷⁶ Retrieved from <https://icom-russia.com/>

⁷⁷ Retrieved from <https://icom.museum/en/>

⁷⁸ Retrieved from <http://icom-russia.com/data/sovety-pri-ikom-rossii-/sovet-po-tsifrovomu-razvitiyu-muzeev/>

- Participating in the development and discussion of the legal framework concerning the use of IT in culture.

The Council for Digital Development of ICOM Russia includes museum employees (e.g., the Pushkin State Museum of Fine Arts, the State Hermitage, the State Tretyakov Gallery, and others), educational institution staff (e.g., the Higher School of Economics, the Russian Presidential Academy of National Economy and Public Administration, etc.), and collaborates with technology companies like Panasonic Russia, Microsoft Russia, and others to implement digital projects in Russian museums.

International collaboration in digitalization and the digital transformation of museums, especially through organizations like ICOM and UNESCO, is a key element for the cultural sector and museums in Russia. It allows for the exchange of experience, technologies, and best practices in this area. Cooperation promotes the development and implementation of innovative solutions, expands opportunities for training and professional development of museum personnel, strengthens international cultural connections, and supports global access to cultural heritage.

The necessity of digital transformation and digitization in museums.

Given the vast geographical scale of the country, research encompassing all regions, especially on niche topics such as digital transformation in museums, is rare. A study conducted in 2020 by Microsoft in collaboration with TAdviser, focused solely on museums in Moscow, the Moscow region, Saint Petersburg, and the Leningrad region, highlights this scarcity (Microsoft Press Center, 2020). Typically, technological novelties and innovations first arrive in the two capitals, Moscow and Saint Petersburg, with other regions often adopting innovations that have been tested there. This study is particularly relevant for our examination of the Pushkin State Museum of Fine Arts in Moscow, aligning with our geographical focus. The survey, a phone questionnaire of IT leaders from 65 museums in these regions, revealed that over 85% of the museums acknowledge the necessity for digital transformation. Specifically, 20% are actively implementing digitalization strategies, 23% have developed them, and 43% plan to do so (Fig. 16).

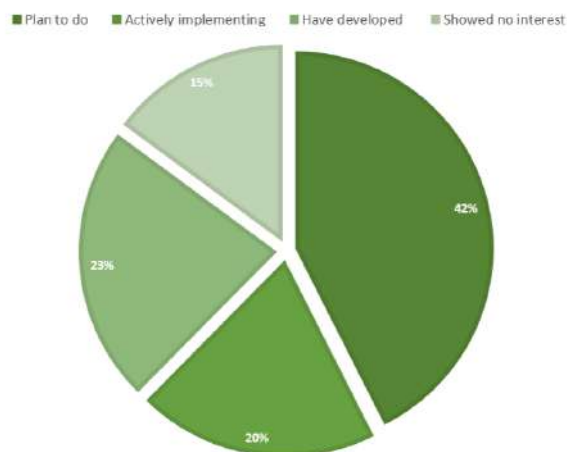


Figure 16. *Museums about digital transformation.* (Microsoft Press Center, 2020)

The primary focus of digital transformation efforts has been to create digital opportunities for visitors, both during physical visits and through online platforms, as indicated by 82% of respondents. This research demonstrates the significant attention paid to engaging with people using innovations: over 50% of respondents are currently using or implementing virtual/augmented reality technologies, 33% use audio guides, about a quarter use virtual assistants (24%), and museum navigation (23%).

Moreover, modern museums are actively engaging with audiences remotely, with over 80% offering online ticket purchasing, 44% utilizing virtual guides, 37% supporting loyalty programs, and 34% having an online store for souvenirs, catalogs, books, and additional services. Museums are also actively present on social media, conduct email newsletters, and regularly research their audience.

As for digitalizing internal museum processes, the majority of respondents are already using or plan to start using artificial intelligence technologies—53% responded affirmatively. In 2020, over a third of respondents also began implementing VR/AR for various tasks, and nearly as many are looking into multimedia solutions (33%). Cloud technologies are widely used: 26% of organizations address their tasks using public cloud, and 22% prefer hybrid scenarios.

Unfortunately, there are no more recent studies or surveys on this topic. From the conducted research, it can be concluded that the majority of museums in Russia's major cities recognize the importance and necessity of digital transformation. The active implementation of digital technologies such as VR/AR, audio guides, and online platforms underscores museums' efforts to improve visitor interaction and expand remote access to cultural heritage. Innovations typically start in major centers like Moscow and Saint Petersburg and spread

throughout the country, highlighting the need for nationwide research and strategy development to cover all regions.

Technologies used by Russian museums for visitor engagement.

Professors Sizova and Gordin (2022) in their study on the digitalization of museums in Russia, based on a survey among Russian museum professionals, report that experts agree on the significance of digitalizing various museum products and services as the second most important area after digitization (which will be discussed in the following part). They note that "customer-centricity" has become a key feature of museum operations in recent years, driven by factors such as increased competition for visitors in the experience industry; declining interest in museum exhibitions and, consequently, visitor numbers from certain population groups; the need to create new, attractive formats for museums in the eyes of the younger generation; increased importance of revenue from museum visits amidst stable or decreasing levels of government or municipal subsidies, among others. In this context, the digitalization of museum products and services emerges as one of the most effective tools for attracting visitors and ensuring their comfortable and engaging museum experience (Sizova & Gordin, 2022).

The respondents of the study (Sizova & Gordin, 2022) also highlighted two key directions in the digitalization of museum products aimed at significantly changing the nature of museum interaction with visitors in Russia in the near future: the creation of special resources for tour and exhibition services (audio guides, video guides, VR, AR, etc.) and the development of digital resources for engaging with a wider museum audience (webinars, online courses, mobile applications, podcasts, etc.).

The international PR agency Vinci⁷⁹, based on its 2020 study of the museum sector (ICT Moscow, 2020), outlined the digital capabilities of Russian museums. The agency detailed the technologies used in Russian museums for digitizing museum products and services to enhance visitor interaction:

1. Interactive Exhibitions: Including augmented reality (AR) projects, character assembly interactive installations, beacon/iBeacon technology for proximity-based content delivery, and interactive maps.
2. Interactive and Multimedia Equipment for Museums: Such as interactive touch kiosks and tables suitable for a variety of interactive content, projection equipment, VR and

⁷⁹ Retrieved from <https://vincipr.com/>

AR technology equipment to immerse visitors in the museum-described reality, and video walls and screens for large-scale exhibitions to attract visitor attention.

3. **Virtual Tours and Video Creation:** Digitization of collections and exhibits allows museums to showcase items difficult to display due to space constraints or fragility through photographs and 360° formats, a key step in creating virtual platforms. Animated videos with infographics engage visitors by presenting information in an interesting manner, and the development of virtual tours brings guests closer to museum spaces and exhibitions, enhancing interest, especially considering the context of viral threats.
4. **Applications/Software and Content:** Information programs and content for equipment are crucial, given the vast amount of content and applications these technologies presuppose. The quality of these is a key success factor for interactive technologies. VR and AR applications draw visitors to exhibits, capturable through ARKit and Unity technologies without additional equipment. Mobile applications offer access to photos, videos, and event tickets, encouraging museums to develop their platforms and keep users informed about new exhibitions or events. Games for touch kiosks present information interactively, particularly appealing to the significant proportion of school-age visitors, and are increasingly used for educational purposes, making content memorable by facilitating learning.
5. **Virtual and Augmented Reality for Exhibitions and Museums:** Motion designers can bring paintings to life for viewers to explore in VR, preserving the physical exhibit while offering an immersive experience. Virtual museum apps enable remote tours via smartphones, with VR requiring headsets and AR accessible directly through mobile devices, enhancing interactivity.
6. **Robots:** Currently underutilized in museums, including domestic examples such as the Museum of Contemporary History of Russia, some models adapt their behavior based on audience reactions. Robots facilitate remote museum visits, expanding accessibility.

In the context of developing a systematic approach to the digitalization of museum activities, work in the identified areas involves establishing relationships between various departments, often situated in different segments of a museum's management structure. This means creating a system of interaction between different departments.

Let's consider some examples of technology use in Russian museums at the moment, focusing on digitalization technologies for visitor interaction. This essentially represents only

a part of the digital transformation of museums visible to visitors since it's created for interaction with them. The Culture.RF⁸⁰ portal writes that interactive displays and tables, allowing visitors to independently choose content for viewing or listening, are currently in high demand in domestic museums. Information kiosks with a touch display and a computer provide essential reference information about the museum and its collection quickly.

For example, the Yekaterinburg History Museum offers its guests to flip through an interactive book⁸¹, on the pages of which the city's history comes to life. Also, in several museums in Russia, as Culture.RF (n.d.) reports — in the Togliatti Local Lore Museum⁸², the Moebius Museum of Entertaining Sciences in Samara⁸³, the Regional Museum of the Northern Ladoga⁸⁴, the Museum of Nature and Man in Khanty-Mansiysk⁸⁵ — an interactive installation "Sandbox," which uses sand and projection technologies to visually demonstrate the formation of mountains and water bodies on the planet, is particularly popular among teenagers.

Another example is the "Stalingrad Battle"⁸⁶ museum-reserve, which was also modernized for the 70th anniversary of Victory. Using modern technologies, the events of the heroic defense of the city on the Volga come alive before the eyes of visitors. An animated layout of the city on a plaster canvas allows detailed viewing of the history of the battle for Stalingrad. The museum's updated exhibition includes interactive stands, tables, and pedestals with photographs, documents, letters, video, and audio materials.

The Darwin Museum in Moscow⁸⁷ uses so-called live labels — small digital panels the size of a palm that transmit information from a flash drive. These panels are dynamic: they not only display photographs but also short video clips, allowing visitors to see animals in their natural environment, hear their voices, and the surrounding sounds of nature. Viewers can avoid reading text, as a narrator names the animal, which is particularly important for the museum's youngest visitors, who may not yet be able to read.

In the Polytechnic Museum in Moscow⁸⁸, the RBOT-100 robot conducts tours for visitors and answers questions related to various objects. The development of robotics allows

⁸⁰ Portal "Culture.RF". Retrieved from <https://www.culture.ru/>

⁸¹ Retrieved from https://www.tripadvisor.ru/LocationPhotoDirectLink-g298540-d2587954-i223114611-Yekaterinburg_History_Museum-Yekaterinburg_Sverdlovsk_Oblast_Urals_Distr.html

⁸² Retrieved from <http://www.tltmuseum.ru/ru/>

⁸³ Retrieved from <https://www.kidsreview.ru/samara/catalog/mebius-muzei-zanimatelnykh-nauk-samara>

⁸⁴ Retrieved from <http://sortavala-museum.ru/>

⁸⁵ Retrieved from <http://ugramuseum.ru/>

⁸⁶ Retrieved from <https://stalingrad-battle.ru/>

⁸⁷ Retrieved from <https://www.darwinmuseum.ru/>

⁸⁸ Retrieved from <https://polymus.ru/>

visitors to participate in tours remotely: the robot becomes the user's eyes, and with digital technologies, the visitor can control the robot and choose the route.

How extensively are digital technologies and communications (for interacting with visitors) implemented in the activities of the country's most famous museums? Let's consider the example of the Hermitage⁸⁹ and its online activities (essentially just one aspect of the museum's digital transformation). Pyataeva and Lomovtseva (2020) note that the museum's use of digital capabilities became particularly relevant during the COVID-19 pandemic when the museum was closed, yet virtually visited by millions from all corners of Russia. The pandemic did not initiate the digitalization of museums but accelerated it, imposing restrictions and forcing museums to urgently adopt technologies. For instance, in the first two weeks of quarantine, the Hermitage was visited by around 15 million guests (Pyataeva & Lomovtseva, 2020). Before the onset of mass restrictions, the museum made significant efforts and recorded about a hundred various lectures, tours, stories, and videos, which became daily online premieres during the pandemic. Every morning, the Hermitage-online site announces the program for the day, with each working day featuring its theme and corresponding videos. Notably, the Hermitage has three cameras recording everything happening in the museum 24 hours a day, allowing visitors to observe the museum's life around the clock. It's important to mention that online tours at the Hermitage are conducted in more detail than in regular mode. One of the main advantages of the digital format is that tours and lectures are available in multiple languages, including Russian, English, Italian, and Chinese, enabling foreign visitors to visit the museum online. The most popular service on the Hermitage site is virtual walks, allowing visitors to visit every hall of the museum and listen to guides' lectures, fully immersing in the process.

Digitalization brings numerous advantages to visitors, including free tours and no long queues. However, according to the museum's management, virtual technologies cannot replace live exhibits that can be seen in person. Nonetheless, the use of digital technologies in museum activities can be considered a significant achievement and a successful practice worth developing further (Pyataeva & Lomovtseva, 2020).

It's crucial that we've discussed museums that were not originally interactive, unlike spaces like "Lunarium,"⁹⁰ "Experimentarium,"⁹¹ "Yeltsin Center,"⁹² which were conceived as

⁸⁹ Retrieved from <https://hermitagemuseum.ru/>

⁹⁰ Retrieved from <https://www.planetarium-moscow.ru/in-planetarium/halls/interaktivnyy-muzey-lunarium/>

⁹¹ Retrieved from <https://www.experimentarium.ru/>

⁹² Retrieved from <https://yeltsin.ru/>

interactive museums/spaces. We are examining museums integrating technologies into an existing structure with non-interactive exhibits. Indeed, currently, most country's museums strive to incorporate digital technologies into their activities, such as creating official museum websites, social media pages, QR codes, virtual projects, and multimedia programs. However, many museums in the country do not fully utilize such opportunities, making it pertinent to highlight the issue of weak information technology adoption in some regions, which will also be mentioned later.

Digitization, State catalog.

In the theoretical part of the Thesis, discussing museum digitalization, we highlighted that current trends in museum digitalization include expanding digital presence through digitizing collections, broadening access to them, and developing websites and social media (MTM, 2019). Digitization is widely covered in scholarly articles and is a crucial part of many museums' work today. The foundation of creating a digital museum lies in the extensive work of digitizing its exhibitions and collections, with major world museums having digitized a significant portion of their collections.

We also explored the terms "digitization," "digitalization," and "digital transformation," with digitization serving as the basis for further digitalization and digital transformation, as per the "Digital Transformation Hierarchy", mentioned in a theoretical part (Liew et al., 2022, p.180). That is, digitization is the basis without which digital transformation is impossible.

A survey of 7 highly qualified museum professionals (Sizova & Gordin, 2022) revealed that digitizing collections is currently the main direction of digital activity in museums. Experts note that the highest activity area includes creating an electronic database of museum items. Today, most Russian museums have successfully digitized their collections, recognizing it as a key tool in modern museum activities. However, widespread museum participation in digitizing collections raises questions about the most effective use of the vast amount of information obtained.

Experts (Sizova & Gordin, 2022) emphasize the importance of digitizing museum exhibits to create more detailed representations, focusing on previously inaccessible features. Digitization enhances exhibition and tour activities and expands the museum audience through AR and VR tours, online excursions, mobile applications, and via websites and social media, requiring close interaction between different museum departments. Additionally, digitization improves museum collection management and enhances the authenticity of exhibit examinations.

In Russia, digitization initiatives include the Ministry of Culture's project "State Catalog of the Museum Fund of the Russian Federation"⁹³ (State Catalog Portal of the Russian Federation, n.d.). It's noteworthy that the overall and, let's say, official informatization of museums in Russia initially had a specific goal declared at the state level: ultimately, databases of all country's museums, regardless of software, were to be integrated into the State Catalog.

Large museums, like the Pushkin State Museum of Fine Arts, independently handle digitization and can automatically upload collections from their inventory systems into the State Catalog. Smaller museums are usually managed by regional centers, which centrally upload images and information about museum items. The State Catalog (State Catalog Portal of the Russian Federation, n.d.) lists 2749 Russian museums and currently contains 24,491,796 exhibits, 92% of which have images. However, only 26% of the museum fund is currently cataloged, indicating that extensive digitization work is ongoing. The catalog includes items such as archeological objects, print products, documents, photographs and negatives, and items of applied art, everyday life, and ethnography, among others. Belgorod region leads in the percentage of exhibits entered into the State Catalog, with 53% of all exhibits, while Karachay-Cherkessia has only 1% of its exhibits entered.

Specialists from Russian museums and galleries are constantly developing their activities in the field of digitizing exhibits. In particular, all the exhibits of the Pushkin State Museum of Fine Arts, mentioned earlier, are currently digitized, allowing website visitors to view masterpieces of world painting on their personal gadgets. For example, the digitization project of exhibits at the State Hermitage Museum started in 2012, and as of the present day, around two million painting masterpieces have been digitized by specialists. Nevertheless, the official website of the Hermitage is gradually enriched with a catalog into which the entire collection is uploaded by specialists. In addition to the enrichment of the State Catalog, the digitization process undoubtedly serves as a means of attracting mass audiences to works of art, as it makes digital copies of exhibits accessible to the public (Budagyan, 2021).

Tikhomirova et al. (2022), in an article on digitization in the Russian Federation in the "System Block" journal, write that from 2019 to 2021, Russian museums have already spent over 1.5 billion rubles (approx. €15 million⁹⁴) on digitization (including not only federal budget grants but also other sources of funding). These expenses include the digitization of collection

⁹³ Retrieved from <https://www.goskatalog.ru/portal/#/>

⁹⁴ The euro amount is calculated based on the exchange rate of €1 = 98,32 rubles as of February 2024.

exhibits. All Russian museums are required to submit data to the State Catalog of the Russian Museum Fund: by 2026, they must digitize 100% of museum collections.

Unfortunately, inequality in the level of digitalization and digitization exists, including in the museum sector. For example, Irina Kizhner, Senior Lecturer at the Department of Information Technologies in Creative and Cultural Industries and Researcher at the "Digital Humanities" Laboratory of Siberian Federal University, revealed to the electronic journal "System Block" in a previous article (Skorinkin, 2022) that regional disparities in digitization in Russia do exist, and they do not necessarily correspond to the expected "center-periphery" inequality. For instance, in 2015, the Far East outpaced St. Petersburg in the number of images published on museum websites. By 2022, the Ural Federal District emerged as a leader in museum digitization, including the Yamalo-Nenets region, which is part of it.

Indeed, in June 2022, the Yamalo-Nenets Autonomous Okrug became the leader in digital transformation (TadViser, n.d. (b)) among all Russian regions (Moscow did not participate in the ranking). Together with Tatarstan and the Khanty-Mansi Autonomous Okrug, it surpasses other regions in transitioning socially significant services to electronic form, including the digitization of cultural heritage. Among the regions with minimal digitalization efforts are Chechnya, Dagestan, Kabardino-Balkaria, and Karachay-Cherkessia.

Irina Kizhner (Skorinkin, 2022) also reports on the challenges faced by digitization and the State Catalog in Russia. The digitization of museum collections in Russia, mandatory for all museums by 2026, encounters serious problems related to the quality of images and metadata due to the lack of qualified specialists and necessary equipment. The Ministry of Culture is tasked with prioritizing the improvement of these aspects. The metadata issue is compounded by the difficulty of attributing many objects, which requires high qualifications and specialized knowledge. While British museums have a practice of discussing attribution doubts, a similar approach has not yet been adopted in Russia. The ongoing work on data normalization in the State Catalog is a long-term project that could lead to significant improvements in catalog quality over the next decade, providing new opportunities for studying and presenting Russia's cultural heritage.

For instance, the creator of the State Catalog should take as an example the organization of the collection at the Metropolitan Museum of Art in New York⁹⁵—a superb quality for many images, clear filters, very precise parameters: what, where, when, and where it is stored. Even the black and white images are of very high quality, with normalized, standardized metadata.

⁹⁵ Retrieved from <https://www.metmuseum.org/>

The quality of images and the information provided through the digitization process play an important role not only for professionals but also for ordinary visitors seeking knowledge and inspiration when they visit museums. The digitalization of cultural assets sparks discussions about accessibility to culture and deep immersion into it, with an emphasis on possibilities that go beyond simply viewing images on a screen. It provides access to contexts, allowing users to create connections between different aspects of culture, such as art, fashion, and history, using aggregated data, filters, and algorithms, facilitating deep immersion and stimulating the cognitive process. Digitalization goes beyond the provision of images; it also includes metadata and descriptions, which give rise to new, unexpected questions and contexts, promoting not only accessibility but also in-depth studies of culture. In the age of knowledge, digitalization also meets the demands of a new segment of users seeking inspiration and creativity, for example, by using cultural examples in their own creative work, underlining its role in fostering cultural and creative interaction (Skorinkin, 2022).

It's also important to note the limitations of digitization for the visitor's full perception of a cultural object. Irina Kizhner (Skorinkin, 2022) points out that two-dimensional digitization has no negative sides, whereas there are several aspects of three-dimensional digitization that could be perceived as negative. For experts, the main drawback is the lack of detail, while for non-specialists, an illusion of authenticity is created, which can be misleading. Distortions in form and texture, made to reduce the model's weight and adapt it to mobile applications, may be perceived by specialists as errors. The issue of photorealistic and non-photorealistic models exacerbates this problem because photorealistic models create an illusion of presence and present a one-sided view of the author's interpretation of the past, which can mislead the user about historical reality. Compared to this, video materials even more strongly enforce the author's point of view, limiting the viewer's perspective and thus further restricting the objective perception of a cultural object.

Portal Culture.RF.

By employing digital technologies in the space of the modern museum, as stated by D.N. Dziuba, the user "experiences a sense of unreality taking them into an alternative semantic world, and virtuality itself appears as an extension of human life, often serving as its substitute" (Budagyan, 2021). Thus, numerous global projects, portals, and platforms have been created to attract mass audiences to the masterpieces of world painting. Specifically, among these

platforms in Russia, we can highlight the "Culture.RF" portal⁹⁶, also known as a portal of the cultural heritage and traditions of the country, as well as numerous online projects such as "Museum Online," "Virtual Tours of Russian and World Museum Exhibitions," "State Historical Museum," "Hermitage," and others.

The process of implementing digitalization in the sphere of Russian culture, as noted by the President of Russia, must also provide conditions "for popularizing Russian culture and science abroad, including countering attempts to distort and falsify historical and other facts" (Budagyan, 2021). Another important goal of using digital technologies in the field of Russian culture is to provide recipients with accessible, high-quality, and legal media products and services of Russian production.

Let's take a closer look at the mentioned "Culture.RF" portal. It is an educational project dedicated to the cultural and historical heritage of Russia. The portal provides news, collections, and materials about significant cultural events, and broadcasts over 30 cultural events daily from cultural institutions across the country. The portal offers free access to a wide range of cultural content, including over 6,000 films, performances, lectures, and concerts. It acts as a platform for bringing together a wide audience and professional community, offering tools for free promotion of cultural events and participation in webinars led by industry experts.

The portal is aimed at popularizing Russian culture, especially among young people, using modern interactive formats and multimedia resources. It is also present on popular social networks and messengers such as Telegram, TikTok, Instagram, and YouTube to attract a wide audience. The project also serves educational functions, for example, helping prospective students prepare for entrance exams.

One of the most comprehensive sections of the portal is the "Culture News." It presents previews of cultural events in Moscow and Russian regions, while also focusing attention on grant programs, contests, and games for young people. However, the materials in this section are primarily centered on Moscow, diminishing the informational coverage for the audience from various regions of Russia. In other words, the audience does not receive information about cultural events not only in their own regions but also across the country as a whole.

The portal fully reflects the diversity of cultural life in Russia through a variety of thematic sections such as Film, Museums, Music, Theater, Literature, Architecture, Education, and Traditions. It offers diverse genres of materials—ranging from traditional journalistic

⁹⁶ Portal "Culture.RF". Retrieved from <https://www.culture.ru/>

genres to ultra-modern media formats such as podcasts, video streams, online lectures, and live broadcasts of iconic cultural events across the country.

In the "Cultural Streaming" section, concerts, performances, film screenings, discussions, lectures, and tours held are broadcast daily. Cultural venues are represented by the largest museums, theaters, concert venues, and libraries in the country, though not all regions are involved (for example, the northwest is not represented here). However, any cultural institution in the country organizing online broadcasts can apply to be featured.

To attract a wide audience, the portal offers multimedia long reads and podcasts that combine classic and contemporary elements, as reflected in the titles such as "How Writers Experienced Isolation" and "Books Written During Epidemics," among others.

The audience engagement is achieved through a large number of materials presented in a gaming format: almost half of the publications on "Culture.RF" are in the form of quizzes, where readers are asked to guess the city on the waterfront, a film based on the first line of a song, film classics based on emojis, distinguish Tolstoy's birthplace from Pushkin's family estate, take a test on theater etiquette, and more.

The principles of selecting formats and topics in any educational project are primarily determined by the specific target audience. According to the creators themselves, the project is aimed at a wide audience, primarily the youth, a segment which includes high school students and college students, and their proportion is constantly increasing.

Thus, the "Culture.RF" portal, as claimed by its creators, is one of the few specialized Russian media that popularizes Russian culture among the general public, particularly the youth. It not only informs about the country's cultural events, but also actively engages them in the art space through cutting-edge interactive and multimedia formats, as well as projects in youth-oriented social networks (Instagram masks, TikTok comics, etc.). This makes it "relevant, timeless, and placeless, allowing it to be utilized at any time, like a virtual 'Wikipedia,' as noted by Olesya Maximova, the chief editor of the "Culture.RF" portal (Culture.RF, n.d.).

The reference of the portal's chief editor to "Wikipedia" sheds light on the specifics of its audience - the project targets a wide range of readers, which seems highly productive - cultural heritage should be the legacy not only of selected specialists in the field, but of the entire population of the country.

Unfortunately, there are scarce publicly available statistical data on the portal's performance. However, for instance, in 2020, the "Culture.RF" portal had 69 million visits, as reported by the press service of the Ministry of Culture of Russia (RIA News, 2020). By the

end of 2022, the portal had attracted 148 million visitors, and it featured over 2 million events in its program (Kultura Newspaper, 2023).

As we have mentioned, there is regional disparity in the representation on the portal, but the Ministry of Culture is working to eliminate them and has no plans to stop there. The development of the "Culture.RF" portal continues, with future plans to create sections dedicated to the regions of the Russian Federation. The regional sections are intended to consolidate all geographically related materials: cultural and historical landmarks of the region, cultural institutions, and traditions of indigenous peoples. This will help the portal's visitors navigate the diversity of the country's cultural heritage and provide a comprehensive view of the culture of Russia's regions.

Highlighting the importance of platforms such as "Culture.RF" for popularizing Russian culture and expanding access to cultural content, it is also important to pay attention to the uneven geographical distribution of digital initiatives and the plans to create regional sections to present Russia's cultural heritage in the future.

Automated information system (AIS). System "KAMIS".

Digitalization of museums and culture as a whole, including Russia, has found its embodiment in a complex of technologies, the most important of which are: digitization, scanning, multimedia, VR technology, AR technology, 3D technologies, as well as mapping, eye tracking, and others (Gendina, 2021).

However, since we are attempting to consider a more comprehensive digital transformation of museums, we will not delve deeply into the specific technologies used by museums. We have already described a few examples of the use of such technologies by Russian museums. Let's focus more on the overall strategy of digital transformation of museums, starting with the digitization of internal processes. As we discovered in the section on the history of digitalization of Russian museums, museums began actively using ICT capabilities to improve their core activities even during the informatization phase: digitization, database usage, museum electronic publications on CD-ROM, and the implementation of AIS (KAMIS⁹⁷, AIS-MUSEUM, etc.).

As mentioned earlier, to create museum products and services for visitors, as well as for comprehensive digitization, it is necessary to establish a system of interaction between

⁹⁷ Retrieved from <https://kamis.ru/kamis/moduli/>

various departments. This is where automated information systems (AIS) come to the aid of museums.

Let's talk a bit more in detail about AIS - Automated Information Systems, which help integrate various museum departments, as well as digitally connect the museum with other organizations and visitors. As previously mentioned, in the first decade of the new Russia, there was a realization of the need and inevitability of implementing such systems. Document workflow automation significantly saved time for research staff, while enhanced information search capabilities improved methods of scientific research. The annual decrease in the cost of personal computers resulted in every museum, regardless of size and location, being able to obtain such a computer, thus beginning to use an accounting system (Vasilieva et al., 2019).

For each museum, an individual AIS system is created based on its specific features, taking into account functional requirements, technical, and financial capabilities. Nevertheless, in Russia, widely used AIS systems for museums are based on standard project solutions that can be easily adapted to the specific requirements of each museum (Bagayeva & Piskorskaya, 2012).

Let's consider one of the most popular AIS systems in Russia - KAMIS, which is also used by the museum we'll further examine in this chapter, the State Museum of Fine Arts named after A.S. Pushkin. KAMIS is a complex automated museum information system. KAMIS is a modern museum information system that addresses a wide range of museum tasks. According to TadViser (n.d. (c)), this system allows for the creation of integrated databases of museum collections containing various media types (text, images, audio, video, animations) linked through hypermedia references.

KAMIS structures information, facilitates quick information retrieval and data selection based on various attributes, conducts accounting operations, and prepares various types of lists, catalogs, documents, electronic interactive publications, and combined databases with internet access. The functional capabilities of this system are as follows (TadViser, n.d. (c)):

- processing, storage, and publication of information about museum objects and collections
- preparation of accounting documentation in accordance with the requirements of the current instruction for accounting and storing museum objects and collections
- definition of search and extraction conditions, provision of reference data on collections in the form of card files, catalogs, lists, etc., upon request
- systematic storage and use of information on museum scientific topics, including those not directly related to objects and collections

- statistical processing of stored information
- production of integrated inter-museum catalogs and databases with internet access
- creation of interactive multimedia systems for visitors
- issuing of thematic CD-ROMs directly from the database
- promptly providing information about ongoing museum exhibitions and creating the museum's website in its entirety

The system's special modules allow for monitoring restoration work, correlating museum collections and items with immovable historical and cultural heritage sites, preparing multimedia publications on museum collections, history, exhibitions, temporary exhibitions for further placement on the internet, on electronic touch kiosks, or for further recording on compact discs, and much more.

Advantages of this system: KAMIS helps to (TadViser, n.d. (c)):

- Adapt the system for use in museums of various profiles and sizes.
- Create a convenient automated document workflow technology for the museum.
- Describe items from various collections, creating cards with the necessary set of attributes and thesauri.
- Design output document forms: lists, cards, catalogs.
- Control access to information for different user categories.

In total, the KAMIS system provides 16 modules for museums of the Russian Federation (on the official website of the system, developers also give recommendations on which museums should implement this or that module. These recommendations will not be indicated everywhere, only in important modules according to the author) (KAMIS, n.d.):

For accounting:

1. Data exchange between museums - The module is designed to upload information about museum items to the KAMIS system from a museum with any automated museum system. It is recommended that museums that are active in exhibition activities interact with other museum institutions. Can be applied to inter-museum projects.
2. Reconciliation of KAMIS data with the State Catalog⁹⁸ - It is recommended for acquisition by all museums, especially those who transmitted information to the State Catalog until April 2017, when another data transfer standard was in effect. It is also

⁹⁸ Retrieved from <https://www.goskatalog.ru/portal/#/>

very necessary for museums in which several employees are responsible for transferring to the State Catalog.

3. Mobile Availability Check (Mobile Reconciliation) - The module is designed to verify the actual presence and safety of museum items in storage facilities and expositions, in which there may be no access to a wireless network (Wi-Fi), as well as for prompt photography of items and uploading images to KAMIS. The module consists of a mobile application, a web application and additional functionality in the KAMIS system itself.
4. User Reports - The module is designed to generate user report templates for KAMIS users to display information about museum objects.
5. Automation of interaction with the State Catalog
6. Labeling of museum items
7. Module "Restoration" - automation of the restoration department of the museum, this module includes information about the process and results of restoration, all related documents and images
8. The module "New attribution" and Audit - The module is designed to fuse and design changes in credentials about museum objects and preserve the history of these changes. It is recommended to museums in which up-to-date information about museum objects and museum collections differs from those entered in the accounting documentation.
9. Digital copies of accounting books
10. Statistics (on work within the KAMIS system for each of the modules and for each of the departments/employees)
11. Immovable monuments, Jewelry examination
12. KAMIS - communicator (corporate messenger) - a module for internal communication between departments and museum employees (user interaction, notification of important events and the need to perform certain actions). (Designed for museums with a staff of 10 or more)
13. And others

For the visitor:

14. Online collection 2.0 - a system designed to publish museum collections on the Internet (the ability of an ordinary user to find out the full collection of the museum, including items that are stored in storerooms/archives, currently inaccessible to ordinary visitors)
15. Mobile museum guide

Not all modules of this system are used by each individual museum. Museums select modules based on their capabilities, nature of activities, etc., to implement within their system. Throughout its development and continuous updates, the KAMIS system itself has undoubtedly evolved, transitioning from individual automated workstations to a networked complex that addresses a multitude of museum tasks. It involves a broad range of museum staff in the process of collective information management.

Currently, KAMIS offers the ability to establish a comprehensive system of digitalization and data automation and interaction between different departments and employees, essentially forming the foundation for implementing digital transformation in museums.

In the presentation "KAMIS from Kaliningrad to Murmansk," KAMIS Museum Systems (2023) provides usage statistics for this system across the Russian Federation. Over 1000 museums across 70 regions of Russia utilize this system, including leading national museums, republic museums, local history and art museums, regional and district museums, as well as private and departmental museums. The databases contain 60 million objects and 55 million images, with ongoing updates. Additionally, the system itself is continuously improved with monthly updates, keeping pace with time and technological developments.

Over twenty years have passed since the initiation of the Automated Information System (AIS) creation. Throughout these years, a pivotal development occurred—the launch of a nationwide process for automating the recording and storage of museum items, as noted by researchers Vasilieva et al. (2019). This process has been uneven, facing challenges and issues, yet it progresses, marking a significant achievement.

Digital transformation in Russian museums involves utilizing a wide range of technologies for digitizing internal processes and creating museum products. AIS, particularly KAMIS, plays a key role in this transformation, facilitating integration across museum departments and interaction with visitors. The digitalization process is supported by updates and expanded functionalities, improving the accounting and storage of museum items across the country.

It's important to recognize that the Russian museum community understands that to maximize the benefits of implementing information technologies in museums, it is not sufficient to merely equip the museum with technical means and develop and introduce specialized software. There must also be an effort to train staff capable of effectively utilizing

these technologies and continuously maintaining their professional level (Bagayeva & Piskorskaya, 2012).

Training of museum staff. Competencies.

As we have mentioned several times, the technology implementation process should create a complex, meaning not a singular introduction but the development of an entire ecosystem of digital technologies and the creation of a digital transformation strategy for the organization. Vladimir Opredelov⁹⁹, from 2013 to 2022, the Deputy Director for Digital Development at the Pushkin State Museum of Fine Arts (CDTO), a member of the presidium, and the chairman of the Council for Digital Development of Museums under the Russian Committee of the International Council of Museums (ICOM)¹⁰⁰, consistently emphasizes this in his lectures, interviews, and as a promoter and researcher of digital transformation in Russian museums.

The previous chapter highlighted the research by O'Leary and Perdana (Liew et al., 2022), stressing the importance of creating an effective ecosystem for digital transformation. This includes the need for systematic development of employees' digital competencies and maintaining their digital literacy at a high level. Russian museums are already utilizing various digital technologies in their operations, including general and specialized software, digital equipment, and the latest solutions such as 3D technologies, virtual and augmented reality technologies, artificial intelligence technologies, and mobile applications.

In their research, Sizova and Gordin (2022) identify barriers to the digitalization of Russian museums, with funding shortages highlighted as the primary challenge by 74.1% of survey respondents. This consensus across both underfunded small museums and financially stable federal ones underscores the need for targeted financial support for digitization processes from sponsors. The lack of modern technical infrastructure and qualified personnel were also significant barriers, noted by 60.5% and 59.3% of respondents, respectively. Leadership's misunderstanding of the issues was another barrier, albeit less significant (28.4%).

Let's examine one of the barriers: the lack of qualified personnel. In the theoretical discussion on digitalization and digital transformation of museums, we addressed the issue of employees' digital literacy, which poses a significant obstacle to digitalization, the development of new technologies in museums, and their implementation. The shortage of IT

⁹⁹ Retrieved from https://pushkinmuseum.art/data/employee/opredelenov_vv/

¹⁰⁰ Retrieved from <https://icom-russia.com/>

competencies can be attributed to the fact that the majority of museum employees have a humanities background, and such organizations typically have a high percentage of older staff members.

In 2020, a joint survey was conducted by the Digital Development Council of ICOM Russia¹⁰¹, the Association for Electronic Communications (RAEC)¹⁰², the National Research University Higher School of Economics¹⁰³ and Microsoft in Russia¹⁰⁴, "Digital Competencies of Museum Staff" (2020). This survey involved the staff of 322 Russian museums (total number of completed questionnaires - 917) across Russia, with no regional restrictions. The survey also included not only employees of departmental museums (state museums), but also non-departmental museums (private, corporate, university, etc.), which means that the survey results provide the broadest possible overview of the situation in the country.

It is also worth noting that the study sample includes all categories of museum staff of all possible ages. However, the fieldwork was implemented under special social conditions related to various restrictions imposed by the state in connection with the COVID-19 coronavirus pandemic announced by WHO (the survey was conducted from 27 March to 30 April 2020). In particular, during the survey period all Russian museums were closed to the public and their employees were switched to remote working mode. As a consequence, there was a certain shift in the final sample towards the most active users of the Internet and digital technologies. This shift is also due to the method of data collection used - an online survey (Digital Competencies of Museum Staff, 2020).

According to the findings of the survey on the general attitude to digital technologies in the museum, we can say that, in general, the survey participants demonstrated a high level of loyalty to them. 90.2% of Russian museum employees who took part in the survey believe that modern lifestyles and the development of society are impossible without the use of digital technologies; the same percentage of employees realize the new opportunities offered by digital technologies. In other words, we can conclude that there is a consensus in the professional community around the digital modernization of museum activities in Russia. Plus, for the majority of respondents, the use of digital technologies is associated with new professional opportunities. However, at the same time, the museum community is sensitive to the issues of security of these technologies, which can jeopardize their key task - the preservation of cultural

¹⁰¹ Retrieved from <http://icom-russia.com/data/sovety-pri-ikom-rossii-/sovety-po-tsifrovomu-razvitiyu-muzeev/>

¹⁰² Retrieved from <http://raec.ru/>

¹⁰³ Retrieved from <https://www.hse.ru/>

¹⁰⁴ Retrieved from <https://www.microsoft.com/ru-ru>

values. This mistrust, incidentally, is also partly due to the insufficient level of education in this area.

In the survey, the creators identified 17 important digital competences. Museum staff use on average about 11 of these 17 competences in their work, and survey participants would like to improve their skills in an average of 4 of the 17 digital competences (Fig. 17). For example, the study found that more than 93% of workers are confident in word processing, internet and email skills, but many need additional training for more complex tasks. Around 60% expressed a desire to learn video editing, 49% were interested in image processing, and around 40% mentioned spreadsheet work, software installation and videography (Digital Competencies of Museum Staff, 2020).

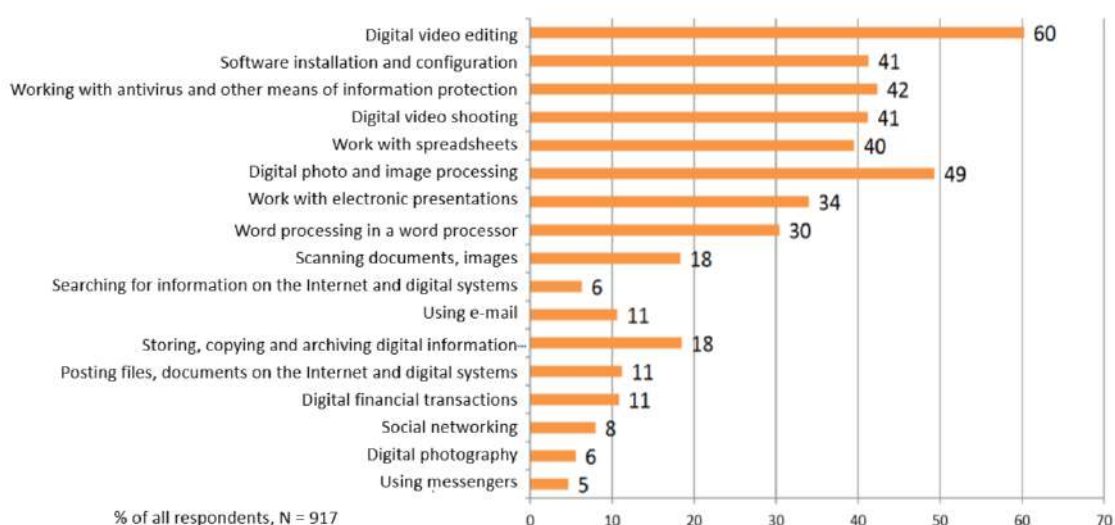


Figure 17. "Desire to acquire additional competencies". (Digital Competencies of Museum Staff, 2020) [translated by Author, 2024]

Based on this research, the Digital Development Council at ICOM Russia with a support from Panasonic Russia¹⁰⁵ launched the project "School of Digital Development of Museum"¹⁰⁶, which offered в 2021 году free educational courses for museum industry professionals.

The mission of the School of Digital Development of Museums is to develop digital competences and improve digital literacy of museum managers and staff.

List of courses of the "Tools and Technologies" cycle:

- "Organising online events"

¹⁰⁵ Retrieved from <https://b2b.cis.panasonic.com/>

¹⁰⁶ Retrieved from <https://icom-russia.com/data/proekty/shkola-tsifrovogo-razvitiya-muzeev/>

- "Basics of video shooting for museums".
- "Culture of digital communications"
- "Recording and editing audio guides"
- "Digital data in the museum: storage and processing basics"
- "Basics of digital accessibility"
- "Basics of video editing for museums"
- "Photography in museums"
- "Practical application of spreadsheets"
- "Preparation of professional presentations"

The State Darwin Museum, for example, is planning a professional development course for the staff of natural history museums in April 2024¹⁰⁷,, the program of which, among other things, includes the direction "Exposition and exhibition activities of the museum. Use of multimedia and interactive technologies in museum exposition".

The Moscow State Institute of Culture implements an additional professional educational programme of advanced training "Multimedia technologies in a modern museum"¹⁰⁸.

Also the Centre for Scientific and Technical Information Progress, Russia's largest centre for training and professional development, offers a Professional Development Course "Digitalisation of Museum Activities"¹⁰⁹. The course offers practical examples of the stages of digital transformation of museums. Its programs include, for example, such courses as:

1. Creating digital museum products and services aimed at interacting with museum visitors and digital partners.
2. Networked digital project, its resources and possibilities. Electronic portal. Support of access technology.
3. Technologies and methods of creating a digital museum fund. General principles and methodology of digitization of documents, museum objects and exhibits. Use of digitized databases.
4. Content storage.

¹⁰⁷ Retrieved from <https://www.darwinmuseum.ru/projects/event/kursy-povysheniya-kvalifikacii-sotrudnikov-estestvenno-istoricheskikh-muzeev-2024>

¹⁰⁸ Retrieved from <https://tvorcheskije-ludi.mgik.org/programm/multimediynye-tekhnologii-v-sovremennom-muzee/>

¹⁰⁹ Retrieved from <https://www.cntiproggress.ru/seminarsforcolumn/46535.aspx>

5. Design, preparation and adaptation of material for the formation of multimedia content.
6. Technical and aesthetic aspects of exposition and exhibition activities.
7. Multimedia projects, curating. Working with panoramic monitors, projectors, LCD monitors. Designing mapping animation, video film. Content production cycle.
8. Multi-sensory experience of museum visitors. Interactive, educational and entertainment content. Presentation of the collection and museum technologies online and offline. Resources of the museum and partners for videoconferences and broadcasts. Material and technical base of the multimedia cinema for work with local and regional audiences. Peculiarities of conducting and building a program of online broadcasts.
9. Interaction with visitors. Free and paid online events. Providing access. Registration for the event. Forms for receiving feedback.
10. Marketing and communication strategies for digitalization of museums.
11. Legal aspects.

The above-mentioned survey on Digital Competencies of Museum Staff (Digital Competencies of Museum Staff, 2020) also raised the issue of the Digital Curator (a specialist whose task is to train and support people in digital technologies and develop digital literacy). The majority of museum staff interviewed recognize the need for Digital Curators as they believe they will help museums through the process of adopting new technologies and enable other staff to be more effective.

A quote from one interviewee (a corporate museum staff member):

"A digital curator will help to build a logical system of digitalization of processes and will be able to assess the feasibility of a particular technology from a professional point of view" (Digital Competencies of Museum Staff, 2020).

In other words, we can conclude that museum staff also realize that it is not enough to hire a person to perform a specific technological task, for example, to create an online tour, they believe that they need a set of technologies and employees who will be able to create a system of digital technologies in the museum, and they also need a leader/creator of this set of transformations, in this case the digital curator is mentioned, but it can be, for example, the head of the IT department, CDTO. Many survey participants believe that, of course, this person should have digital competences at a good level, i.e. in essence it should be a person from IT, but he/she should also know the specifics of museum work.

That is why it is so important to introduce education and advanced training not only for museum workers, but also for IT workers to be immersed in the sphere of museums, to do training aimed at digital technologies in museums (and other cultural organizations). For example, at the National Research University Higher School of Economics until the end of 2023 (opened in 2012) there was a basic department of information technologies in the sphere of culture¹¹⁰ in the structure of the School of Business Informatics¹¹¹. The aim of the department was to train highly qualified specialists to work in the field of ICT application in the cultural sphere, capable of developing both theoretical and practical aspects of this area, to create a sustainable trend of including cultural institutions and profile organizations in solving a wide range of social and economic problems. In general, it can be said that this was the first and only such chair, so its creation was an important contribution to the development of this field in Russia, since to date there is still no systematic training of specialists in this area in any of the national universities.

This department conducted such studies as "Information Technologies in the Museum" on the relevance of these technologies in museums, the study "Evaluation of Websites of Federal Museums of Russia", "Museum Navigator" on the need for an application that allows museum visitors to navigate in the most optimal way, taking into account a person's preferences and time, and so on.

The Thesis emphasizes the need for comprehensive digital transformation in the Russian museum sector in particular, which includes the development of an ecosystem of digital technologies and a training strategy to improve the digital literacy of staff. The studies described in this part of the report point to the active adoption of digital innovations by museums, but also point to the lack of specialized digital competencies among museum staff. The research described in this part also revealed a fairly high level of employee loyalty to digitalization and highlighted the importance of continuing education for the effective integration of new technologies.

Unfortunately, it should be noted that in Russia there are a limited number of programs for training and professional development of museum staff in the field of digital transformation, which is insufficient for the comprehensive implementation of digitalization. Here we are talking both about the education of museum staff with an initial humanitarian education and of staff with IT education, who need to know and be able to work with such a structure as a

¹¹⁰ As this department no longer exists at this time, the department page is no longer available

¹¹¹ Retrieved from <https://gsb.hse.ru/bi/>

museum. The existence of a single department engaged in research in this field, which is currently not functioning, emphasizes the need for increased attention to this issue on the part of the professional community and government structures. Strengthening educational efforts is critical to accelerate the process of digital integration in cultural and museum institutions in particular.

3.2 Digital transformation and digitalization of the Pushkin State Museum of Fine Arts.

General information about the museum.

The Pushkin State Museum of Fine Arts (Pushkin museum)¹¹², situated in the heart of Moscow, stands as one of the largest and most significant museums in both Russia and the world. Established in 1912 as the Museum of Fine Arts by Professor and art critic Ivan Tsvetaev, the museum was named in honor of the great Russian poet Alexander Sergeyevich Pushkin in 1937, marking the centenary of his death, as a tribute to his contribution to the development of Russian culture.

The museum's collection spans a vast array of cultural and historical eras, ranging from ancient Egyptian art to Renaissance works and 20th-century pieces. Among its most renowned exhibits are works by masters such as Vincent van Gogh, Pablo Picasso, Rembrandt, Claude Monet, Paul Cezanne, and many others. The museum's collection encompasses paintings, drawings, sculpture, numismatics, artistic photography, and the art and archaeology of the ancient world, among others. As of the end of 2021, the main collection comprised 607,366 inventory items¹¹³, according to the Inventory Department. Beyond its permanent exhibition, the Pushkin Museum actively engages in organizing temporary exhibitions, international projects, and scholarly research, thereby contributing to the expansion of the realms of art and culture. (The Pushkin State Museum of Fine Arts, n.d.).

The Pushkin Museum ranks among the most visited museums in Russia. For instance, in 2022, it was the tenth most visited museum in the country, attracting 1.2 million visitors within the year (with a capacity for 1.5 million visitors annually) (The Art Newspaper, 2023). Notably, 70% of these visitors purchased their tickets online.

The museum's contemporary development is closely linked with digitalization and the adoption of cutting-edge technologies, enabling not only the preservation of its rich cultural heritage but also making it accessible to a broad global audience. The museum's digital initiatives include virtual tours, digital collections, and educational programs aimed at attracting and engaging a diverse audience in the world of art.

In its strategy for digitalization and digital transformation, the Pushkin State Museum of Fine Arts aims not only at innovations in the preservation and presentation of cultural heritage but also at creating a new space for dialogue between art and contemporary society, with a focus on education and cultural exchange.

¹¹² Retrieved from <https://pushkinmuseum.art/>

¹¹³ Retrieved from https://pushkinmuseum.art/exposition_collection/index.php?lang=ru

The museum also endeavors to attract international experts to address its challenges, indicating that the management is motivated and, in turn, motivates its staff towards development. For instance, in 2017, the Pushkin State Museum of Fine Arts, in collaboration with Avesta Group Consultancy¹¹⁴, developed a strategy for the museum's development (beyond the development of a new concept, master plan, operational plan, etc.) (AvestaGroup, n.d. (a)). Avesta Group Consultancy is a leading international consulting firm in the field of cultural institution design. Avesta's dozens of successfully implemented projects include renowned institutions such as the Centre Pompidou and The Musée des Arts et Métiers (Museum of Arts and Crafts) in Paris, Punta Della Dogana And Palazzo GRASSI in Venice, and the Louvre Abu Dhabi in the UAE.

The development concept created for the Pushkin State Museum of Fine Arts encompasses ten principal areas of activity, which have formed a solid foundation for the museum's growth (Opredelenov, 2017):

1. **Museum Complex:** The Pushkin State Museum of Fine Arts is transformed into a vibrant museum district, based on the expansion of exhibition, display, and event spaces, as well as opportunities for access by both tourists and residents of Moscow.
2. **Versatile Museum:** The Pushkin Museum adapts its event program in accordance with the seasonal changes in nature, living in harmony with the environment.
3. **Resource Center:** The museum serves as a resource center aimed at disseminating knowledge and acting as a Russian source of scientific and methodological base in the fields of curatorial work, museology, and the preservation of both tangible and intangible historical-cultural heritage.
4. **Creative Incubator:** The Pushkin State Museum of Fine Arts is a place for nurturing, supporting, and preserving contemporary creative potential.
5. **Authentic Museum:** The Pushkin Museum strives to exhibit originals of artworks to the greatest extent possible.
6. **Museum as an Artwork:** The buildings and territory of the museum are invaluable heritage that the Pushkin Museum preserves, revitalizes, and presents in an authorial manner.
7. **Museum for Society:** The museum acts as a hub of social communications and an active participant in the life of society.

¹¹⁴ Retrieved from <https://avestagroup.eu/>

8. **Connected Museum:** Museum programs, scientific research, and publications connect the Pushkin Museum with the world, the city, its audience, and specialists in the field of culture.
9. **Accessible Museum:** The museum's collections, buildings, programs, and services are accessible to all visitor categories.
10. **Eco-Friendly Museum:** In its activities, the museum considers the principles of sustainable development, being responsible for the environment.

The Pushkin Museum represents not only a guardian of rich cultural heritage but also an active participant in its digitalization and presentation within the contemporary information space. The museum endeavors to create an accessible and engaging cultural experience for a broad audience, aims to integrate into the global cultural space, and ensures its sustainable development for the future. Indeed, it can be said that the Pushkin Museum is one of the innovative leaders among cultural institutions in Russia.

Interaction with government initiatives' framework.

The Pushkin State Museum of Fine Arts' strategy for digital development (especially the new one) is projected until 2030, given that all federal documents ratified in Russia, as well as many international agreements related to digitalization, cover this period, as asserted by Vladimir Opreddenov (2022). As previously mentioned, the state plays a crucial role in the transformation of cultural institutions in particular. Any significant changes in the operations of organizations within the state commence with the state itself, which acts as the driver of corresponding initiatives.

For instance, Vladimir mentions that in formulating the strategy, attention was paid to the following state strategies and programs discussed in the first part of this chapter. The museum focuses on specific documents and aspects:

1. The National Project "Digital Economy of the Russian Federation"¹¹⁵. The program discusses the necessity of implementing educational projects aimed at providing access to knowledge, achievements of modern science and culture, establishing the National Electronic Library, and other state information systems that include historical, scientific, and cultural heritage objects of the peoples of the Russian Federation, and making them accessible to the widest possible range of users.

¹¹⁵ Retrieved from http://www.consultant.ru/document/cons_doc_LAW_328854/

2. "The Strategy for the Development of Culture in the Russian Federation for the Period up to 2030"¹¹⁶. It highlights the inclusion of information about cultural heritage objects in the electronic database of the unified state register (State Catalog). It also discusses the implementation of a virtual museum, as well as, in general, the active use of technologies to expand the institution's audience, for the enlightenment and development of citizens, and for promoting Russian culture abroad.

Guided by federal and international documents, the museum's aspiration to create an accessible information space for culture and science in the realm of art is emphasized. Thus, it can be concluded that the museum not only aims to expand its audience through the use of digital technologies but also focuses on the importance of preserving and popularizing cultural heritage in the digital era. In general, the regulatory documents considered in the context of applying ICT in the cultural sphere mention that it is necessary to provide access to cultural heritage and knowledge for a wide range of people and to use these technologies for their preservation and to attract more visitors to cultural institutions.

Primarily, specific steps toward implementing these strategies are currently being taken at the level of metropolises, which consider them within the framework of development programs commonly referred to as "Smart/Intelligent Cities" (SmartCity). In this chapter, we have already mentioned that in 2018, the Moscow government developed the document "Moscow City Strategy 'Smart City - 2030'"¹¹⁷. One of the development directions of this program is the development of human and social capital, which also includes the cultural sphere.

Today, the Pushkin Museum, among other things, is trying to understand its tasks both within the general digital transformation of society and its place within the concept of developing Moscow as a "smart city", creating and constantly improving its development concept. It is noteworthy that the museum's activities regarding digital transformation and its overall development strategy already align with the majority of Moscow's city strategy directions, such as digitization of collections, organizing internet access to them for a wide range of people, implementing electronic ticket sales systems, applying VR and AR technologies to attract more visitors and increase interest in cultural events, creating virtual tours, and implementing visitor preference analysis (Opredelenov, 2022).

¹¹⁶ Retrieved from <http://static.government.ru/media/files/AsA9RAyYVAJnoBuKgH0qEJA9IxP7f2xm.pdf>

¹¹⁷ Retrieved from https://ict.moscow/static/strategy/stage3/2018_05_18_Umnyy_gorod_v20.pdf

Vladimir Opredelev (2022) mentions that the idea of a "smart museum" for a "smart city" is currently being gradually implemented. In this context, the "smart museum" is merely a part of the broader concept of a "smart city". However, the development of many practical aspects is necessary, for example, the creation of quantitative plans detailing the projects that need to be implemented within this concept, how and to what extent various ICTs should be utilized, etc. Moreover, to achieve the key development goals of both a "smart city" and a "smart museum", it is essential to develop comprehensive quantitative indicators that could encompass all directions, provide a complete picture of the current development level, assess strengths and weaknesses, the development dynamics of "smart city" technologies, and establish priority development directions for the future. The development of the plan and metrics is anticipated to utilize international experience and the best foreign practices in this field.

Strategy 2013-2020 and the museum's digital ecosystem.

It is important to note that in this part of the thesis, there are numerous references to the works, lectures, and presentations of Vladimir Opredelev¹¹⁸. He served as the Deputy Director for Digital Development at the Pushkin State Museum of Fine Arts from 2013 to 2022 and was the head of the Department of Information Technology in the Sphere of Culture at the Higher School of Economics (HSE University), which we have also mentioned previously. Additionally, he is the Chairman of the Council for Digital Development of Museums under the Russian Committee of the International Council of Museums (ICOM), which has also been previously mentioned. He acts as an enlightener in the field of digitalization and digital transformation for Russian museums, demonstrating how the operation of museums can be improved through technology, exemplified by the Pushkin Museum.

To begin, let us briefly examine the museum's digital development strategy for the years 2018 – 2020 (Fig. 18). The primary task, as Opredelev (2018) states, was to make all information available in the museum as understandable as possible for users.

¹¹⁸ Retrieved from https://pushkinmuseum.art/data/employee/opredelenov_vv/

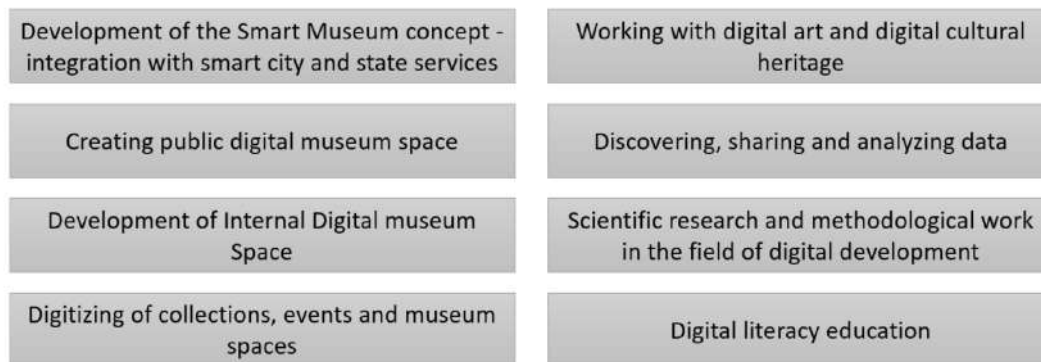


Figure 18. “Key sections of the Pushkin Museum's digital strategy 2018 – 2020”.

(Opredelenov, 2022) [translated by Author, 2024]

During the creation of this strategy, the museum's social contribution as a cultural institution was of utmost importance; hence, for example, there is an item about enlightenment in the field of digital literacy. Moreover, this item was created to ensure that both museum staff and visitors could utilize newly implemented technologies and systems.

Attention was also given to creating a comfortable environment for people's creative development, so that this environment could aid in creation and development. This is connected with the task of creating public digital museum space (creating specialized websites, electronic digital kiosks directly on the museum's premises, etc.). Vladimir Opredelenov also notes that all this would undoubtedly be impossible without the development of the museum's internal potential, hence the strategy also includes items such as "Development of Internal Digital museum Space," "Scientific Research and Methodological Work in the Field of Digital Development of the Museum," and others.

Let us also examine the Digital Ecosystem of the Pushkin Museum in a macro perspective (Fig. 19). It represents a comprehensive complex of various systems, all interconnected, facilitating comfortable operations for the museum, especially from the standpoint of internal communication. That is, it is a developed, complex system connected by unified access points.

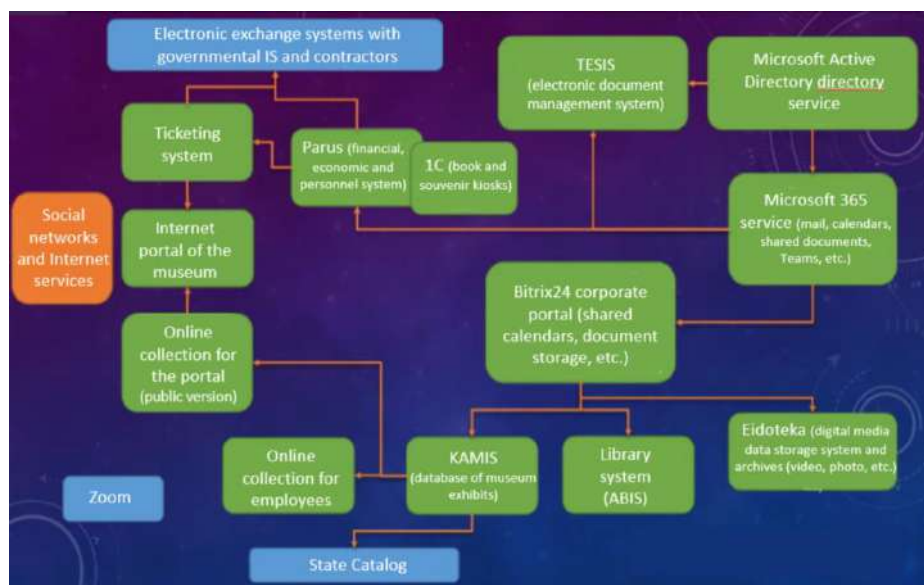


Figure 19. “General scheme of the digital ecosystem of the Pushkin State Museum of Fine Arts”. (Opredelenov, 2022) [translated by Author, 2024]

The three systems at the bottom of the scheme (KAMIS, Library System (ABIS), Eidotheca) are systems that ensure the preservation of digital cultural heritage and information about cultural heritage objects stored in the museum. The museum is developing public versions to provide access to this cultural heritage so that all this knowledge is accessible.

Additionally, there is undoubtedly the operation of ticketing systems, integration with payment services, and so on.

Opredelenov (2022) also mentioned blocks that are gradually being added to this ecosystem, which are the open data blocks. These are created to allow current versions of AI, analytical systems to connect to such blocks, ensuring that the museum is open to the world not only in terms of content being readable by humans but also in terms of content that can be read by machines. That is, there is the formation of an open data system and interaction with it. Unfortunately, there is no information available about the stage of development this system is currently in.

Strategy from 2021.

Since 2021, the Pushkin Museum has begun to revise its digital development strategy. While the digital ecosystem remains the same, the museum decided to change its approach to utilizing and developing it. The museum reviewed its rather traditional, standard strategy and came to understand that it is impossible to predict everything that will happen. Therefore, Vladimir Opredelenov, in his presentation on the strategy of the Pushkin Museum

(Opredelenov, 2022), indicated that the museum needs working principles that will define the creation of a unified digital ecosystem. In other words, the strategy developers moved away from focusing on specific elements to basing their approach on the issues this ecosystem needs to address. Subsequent development of individual elements will depend on these tasks. It was concluded that the museum's efforts should stem from its mission. Here, the principle tasks of a Smart Museum are not only within a Smart City (Moscow) but also within the context of the entire country (Fig. 20). Based on these principles, the museum will develop its ecosystem (both internal and external) (Opredelenov, 2022):

- Digital Openness – For the Pushkin Museum, international exchange and interaction with all cultural and educational institutions worldwide are also relevant.
- Digital Culture – Enhancing the digital culture and literacy of visitors so they can use what the museum creates, and of staff, so they can competently apply the available technological capabilities.
- Digital Accessibility – Access to all knowledge and collections.
- Data Analytics - Working through data analytics, understanding what is needed, relying on solid information, and making forecasts about where to move next.

These principles specifically define the further development of the museum's internal digital ecosystem.



Figure 20. “Principles of the digital development strategy of the Pushkin State Museum of Fine Arts from 2021.”. (Opredelenov, 2022) [translated by Author, 2024]

It is also crucial to understand that the direct strategy for digital transformation of the Pushkin Museum does not reflect the current plan related to the operational activities of the Museum's IT department, which constitutes the core of daily work and the annual plan for

process automation and user support. The main directions for the use of digital technologies in the Pushkin Museum (Opredelenov, 2018) include:

1. Digitization of collections, automated systems for inventory management and digital resource storage, methodology for digital preservation of cultural heritage.
2. Efficiency enhancement (Corporate portal, electronic document management system).
3. Virtual/information space of the Museum (websites, virtual museums, social networks, VR, etc.).
4. Service and product delivery system, point of sale systems, e-commerce, loyalty programs and CRM system, business analytics, marketing video analytics, etc.
5. Multimedia in exhibitions and exhibition projects, application of IT in educational activities, implementation of the "Online Academy" project, and media representations.
6. Design and modernization of structured cabling systems, integrated management systems, IT infrastructure (LAN, data centers, storage systems, system, server, and client software).
7. Design of a comprehensive security and monitoring system (video surveillance, access control systems, etc.).
8. 3D modeling and IT support for architectural and exhibition design (visualization, etc.).
9. Scientific research and experimental application of new technologies in restoration activities.

Despite Vladimir Opredelenov not considering the aforementioned directions as part of the direct Digital Transformation (DT) strategy, they nevertheless constitute a part of the digitization of the Pushkin Museum's processes. We will not delve into each specific technology used by the museum, as we are focusing on the application of more complex technologies that facilitate communication and collaboration both internally, among the institution's staff and departments, and externally, meaning the interaction of the cultural institution with visitors (online and offline), with other organizations, and so forth. After all, the digital strategy is primarily people-oriented. For instance, in the digital strategies reviewed in the first part of the thesis, developed by leading global companies, Gartner (2014) identifies organization employees as the most critical element of the strategy, while frameworks by Capgemini (Bonnet & Priyank, 2011) and Cognizant (Corver & Elkhuisen, 2014) highlight users. Therefore, let us explore several key blocks of the Pushkin Museum's digital development that address the global challenges of digital transformation.

Digital technologies used by the museum.

A significant focus for the Pushkin Museum is the utilization of Building Information Modeling (BIM) technologies and BIM support. Essentially, this technology serves as the foundation for implementing many other elements of the museum's digital development, as well as facilitating interaction and communication between staff and visitors, creating a new user experience.

This technology is employed in constructing new buildings for the Pushkin Museum. Globally, it reduces costs, contributing to the museum's sustainable development. In a BIM project, everything is detailed, including material specifications, thus enabling the disassembly and reuse or recycling of materials from constructed buildings, as everything is precisely marked (such practices, for example, are applied in Germany). Undoubtedly, this technology also simplifies building operation.

However, to imbue the building with meaning, it is necessary to create a complete digital twin with all the physical properties of the structure. These digital twins form the basis for the development of a virtual assistant system and integration with navigational and interactive systems within the museum, enabling the creation of advanced solutions for visitor navigation (Opredelenov, 2022).

In this context, the Pushkin Museum, in collaboration with developers from the companies "3DreamTeam" and "Next.Space", initiated the creation of the Smart Museum platform¹¹⁹ at the request of the Russian Ministry of Culture. This platform represents an advanced 3D model of the museum, designed for comprehensive online design of exhibitions and displays. Thanks to the detailed model, the platform allows exhibition curators, artists, engineers, and tour guides to collaborate on creating and adapting the exhibition space, including the arrangement of exhibits, lighting, and other design elements.

Thus, the implementation of 3D design and BIM technologies in the activities of the Pushkin Museum is not only a step towards modernizing its infrastructure but also a crucial element of the museum's digitalization aimed at creating a sustainable and interactive cultural space accessible and understandable to a wide audience. Importantly, this platform facilitates easy collaboration between various museum departments, for instance, enabling straightforward communication between artists, exhibition curators, engineers, and tour guides.

Moreover, the creation and preservation of digital twins of spaces, as part of virtual tourism, also serve as a tool for preserving the heritage around us, allowing for its exploration

¹¹⁹ Retrieved from https://pushkinmuseum.art/media/smart_museum/index.php?lang=en

and immersion, similar to examining old photographs. This is relevant in the long term, for example, for studying architectural monuments and natural reserves. The creation of a digital twin expands opportunities for scientists, cultural experts, and creative individuals, allowing them to work with these works as with the originals, and also provides visitors with the opportunity to interact with exhibits almost as if they were original (Opredelenov, 2022).

The Pushkin Museum also implements the Navigator 4D project¹²⁰ – a twin of the exhibition space, combining laser scanning and photogrammetry technologies.

Undoubtedly, the museum also operates online. Physically, the museum can accommodate about 1.5 million people a year, but the potential visitors are many times more, making the task of digital accessibility extremely relevant for the museum. There exists a "Virtual Pushkin museum,"¹²¹ where visitors can attend museum tours and lectures online.

The online program "Alone with Pushkin museum"¹²² consolidated all internet projects of the Pushkin Museum and also introduced new formats for interaction with the audience. It amalgamated video tours, films, lecture courses from the museum, and so forth. The project won in the category "Best Online Project" at the "Online Culture" award, organized by the 9th St. Petersburg International Cultural Forum¹²³.

The museum also undoubtedly conducts active work on digitizing items. Currently, 263,083 exhibits¹²⁴ are available in open access on the State Catalog portal (out of a total of 607,366 items).

The Pushkin Museum, as Vladimir Opredelenov (2022) asserts, also pays great attention to the quality of content made available to the public, responsibly approaches the digitization of cultural heritage items, and their study. Indeed, technologies offer the opportunity to show these objects to a larger number of people, but it is crucial to approach the process of creating digital copies with extreme care, thoughtfully and responsibly. And the Pushkin Museum, as an institution of memory, pays special attention to the formation of reliable sources of information.

In this regard, Opredelenov (2022) asserts that the Pushkin Museum is striving to transition from the process of digitization to the process of creating full-fledged digital twins of cultural heritage objects. A complete scanning of the object is performed, for example, shooting under different light angles, UV and IR imaging, followed by digital restoration. Then,

¹²⁰ Retrieved from <https://pushkinmuseum.art/media/navigator4d/index.php?lang=en>

¹²¹ Retrieved from <https://pushkinmuseum.art/media/virtual/>

¹²² Retrieved from <https://www.pushkinmuseum.art/media/online1/>

¹²³ Retrieved from <https://unitedcultures.ru/>

¹²⁴ Retrieved from <https://goskatalog.ru/portal/#/collections?museumIds=2595>

visitors can view hidden layers, such as paintings, using the Artefact application¹²⁵ (which we have already mentioned earlier) or augmented reality glasses.

And the Pushkin Museum pays special attention to the development of augmented reality technologies, alongside the development of virtual assistant technologies. The museum already offers the opportunity to walk through the halls using Epson augmented reality glasses and standard cardboard VR glasses (type A)¹²⁶.

All this becomes possible precisely because of the technologies described above. Therefore, the use of technologies to create quality digital copies, digital twins of cultural heritage objects, and the museum spaces themselves remains a continuous process, that is, the creation of authoritative content remains relevant for the Pushkin Museum.

For this purpose, the Pushkin Museum also works with the international digital certification system based on the ".Art" domain¹²⁷. ".ART" is a new top-level domain created for the international community of art and culture individuals, offering a new digital address for all community members. It establishes a foundation for a unifying interconnected structure, designed to find solutions to newly emerging digital global challenges. The ".ART" domain not only provides a marker of "belonging" to the art world but also opportunities for self-expression, inspiration, engagement within the art community, online communication, and education in the art world about new technologies.

Currently, this domain is used by a large number of various organizations in the field of art and creative individuals. The Pushkin Museum has not remained on the sidelines and has become part of the .ART community by using this domain for creating its updated website (<https://pushkinmuseum.art>).

Additionally, the museum is discussing with the ".Art" organization the possibilities of creating individual domains for each artwork (creating digital twins) so that direct sources of various cultural objects can exist in the future, aiming to create a quality authoritative ecosystem, a global database, as reported by Opredelev (2022). Such databases could then be processed by AI to create a unified global database, as manual compilation is not feasible.

Regarding the museum's collaboration with various organizations for the development of the digital transformation ecosystem, it can also be mentioned that the Pushkin Museum is a participant in the Council for Digital Development at ICOM Russia¹²⁸, which we discussed

¹²⁵ Retrieved from <https://play.google.com/store/apps/details?id=ru.datastack.artefact&hl=ru&gl=US>

¹²⁶ Retrieved from <http://vr.arts-museum.ru/>

¹²⁷ Retrieved from <https://art.art/ru/what-is-art>

¹²⁸ Retrieved from <http://icom-russia.com/data/sovety-pri-ikom-rossii-/sovet-po-tsifrovomu-razvitiyu-muzeev/>

earlier in this chapter. Until March 2022, the museum collaborated with the National Research University Higher School of Economics (HSE University), within which the Pushkin Museum's IT Laboratory¹²⁹ functioned. This collaboration involved conducting research, for example, analyzing current IT trends affecting the cultural sphere or exploring the possibilities and experiences of using augmented reality technologies in museum activities and so forth.

In the activities of the Council at ICOM Russia and together with the students of the Basic Department at HSE University, the Pushkin Museum team sought and discussed optimal solutions for ICT infrastructure, security systems, digital strategies, plans for the development of electronic services for visitors, and the use of the latest achievements in artificial intelligence, machine vision, virtual reality capabilities, etc. This was an educational project that openly discussed how to make museum collections and knowledge about them as open as possible through modern technologies, how even the most conservative types of museum activities are changing, responding to the opportunities and challenges of digital transformation. Unfortunately, at this moment, this project is temporarily suspended.

Conclusion to the section.

In the theoretical part, we mentioned the problem of museums in terms of digital transformation, noting that museums tend to implement individual technologies as opportunities arise instead of adopting a comprehensive digital strategy.

In this respect, the museum under our study, the Pushkin Museum, can be said to be at the forefront, as it possesses a strategy and engages in comprehensive digital transformation. According to the museum categories outlined by De Bernardi et al. (2019), which were also discussed in the theoretical chapter, the Pushkin Museum can be more accurately classified into the third category, namely museums that have integrated a digital strategy with their overall strategy. Undoubtedly, due to the lack of open information, it is difficult to understand how effectively the developed strategy is working. However, considering the opportunities, projects, and programs that the Pushkin Museum provides and implements, it can confidently be stated that the strategy is being executed quite successfully.

Since 2021, the museum has been actively reviewing and adapting its digital development strategy, focusing on creating and developing a sustainable digital ecosystem. The museum is moving away from standard approaches and adopting flexible working principles that allow it to effectively respond to changing conditions and anticipate future

¹²⁹ Retrieved from <https://pushkinmuseum.art/it-lab/>

trends. The museum strives to act on the principles of digital openness for international exchange and interaction, enhancing the level of education among visitors and staff, providing access to all knowledge and collections, and actively using data analytics to determine development directions. Such an approach emphasizes the museum's strategic orientation towards digital integration, improving user experience, and interaction both domestically and internationally, highlighting the importance of the human factor in digital transformation.

Museum approaches such as the use of Building Information Modeling (BIM) technologies and the development of digital twins not only contribute to cost optimization and the promotion of sustainable development principles but also provide an important platform for implementing innovative projects, such as the Smart Museum platform. These technologies serve not only as tools for expanding the museum's audience but also perform a critically important function in the preservation and research of cultural heritage. Projects aimed at creating digital copies and twins demonstrate the museum's aspiration to produce quality and authoritative content that can be utilized on an international scale to address global challenges in creating a unified database of world cultural heritage objects. This, in turn, facilitates the expansion of opportunities for education and cultural development of populations at an international level.

Conclusion.

To conclude, in an age where digital transformation reshapes every aspect of society, cultural institutions, especially museums, stand at the crossroads of tradition and innovation. This transformative journey not only forces these institutions to rethink their interactions with audiences, but also opens up unprecedented opportunities to democratize access to cultural heritage. As museums navigate through this digital landscape, they face a variety of challenges, including technological adoption, digital asset preservation, and creating meaningful digital experiences. However, the potential for expanding reach, improving educational offerings and facilitating global cultural exchanges remains enormous. The concluding discussion is intended to describe the journey of digital transformation within museums, with an emphasis on the unique path undertaken by Russian museums, exemplified by the case study of the Pushkin State Museum of Fine Arts.

The theoretical part of this Thesis clarifies that, despite extensive coverage of digitalization and digital transformation, there is confusion in the application of terms and strategies. Digital transformation is often understood as the implementation of individual technologies, despite its comprehensive nature.

Responding to the first research question, it is established that the issue of comprehensive digital transformation in the museum sector is still insufficiently explored in the academic literature, and the practice is dominated by the implementation of individual technologies, mainly due to limited museum resources. The main direction of using digital technologies in museums at present is to ensure access to collections through the Internet and digitization technologies.

Regarding the description of the Russian museum digital landscape, the study showed that despite the declaration of culture as a national priority in Russia, the implementation of digital transformation in this sphere faces a number of problems, such as insufficient funding and regional differences in the availability of cultural resources. Strategic documents and programs show that practical steps often remain undefined, lacking specificity, clear instructions, and target indicators.

However, the "Smart City" concept in Moscow demonstrates significant success in integrating digital technologies into cultural life, serving as an example for other regions and highlighting the need for a comprehensive approach to digital transformation in the cultural sphere to create an accessible and integrated cultural space across the territory in all museums.

One of the serious problems identified in the examination of studies on the competencies of museum workers is the lack of sufficient educational programs in Russia dedicated to the application of technologies in museum activities. To solve this problem, the development of training courses and educational programs is proposed, including through collaboration between museums and universities. Such measures will allow museum staff to improve their professional skills in the field of digital technologies, which, in turn, will contribute to the more effective use of these technologies in museum practice.

In response to the third research question, the case study of the Pushkin State Museum of Fine Arts demonstrates an advanced approach to digital transformation, distinguished by the use of a comprehensive strategy, as opposed to the simple implementation of individual technologies. The effective use of digital innovations emphasizes the need for strategic planning and collaboration with universities and other organizations for research and knowledge updating. The museum highlights the importance of digital transformation for sustainable development, integration into the urban environment, and responsibility for preserving cultural heritage. This approach not only contributes to audience expansion and digital asset preservation but also emphasizes the museum's role in the global cultural and educational context, making it relevant and accessible in the era of digital technologies.

This Thesis emphasizes the significance of a strategic approach to digital transformation, highlighting the need for museums to adopt flexible, forward-looking strategies that can adapt to technological advancements and changing visitor expectations. The work underscores the need for increased support from both the government and the private sector to facilitate the digital transformation of museums. Future prospects suggest further development towards a more integrated, accessible, and interactive digital museum experience. This emphasizes the importance of collaboration, innovation, and continuous investment in digital skills development. This research contributes to understanding the role of digital transformations in preserving and presenting cultural heritage, illuminating the dynamic interaction between technologies, cultural institutions, and public participation.

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