Digital Enterprise as an Innovative Component of the Economy

T V Goryacheva¹, I N Pchelintseva¹, A P Goryachev¹
¹Yuri Gagarin State Technical University of Saratov, 77 Politechnicheskaya street, Saratov, 410054, Russia

E-mail: tvgsgtu@rambler.ru

Abstract. In recent years the range of the newest business management information tools has considerably expanded, management technologies in use are becoming digital. The constantly growing layer of digital economy is formed, more and more enterprises are digitizing their business processes. The article reveals the stages of enterprises’ evolution – from mechanized to digital. The features of enterprises’ business processes digital transformation are described. The directions of information technologies use at enterprise’s business processes realization are investigated. The practical realization of capital construction system digitization in the part of project and estimation documentation management system on the basis of electronic archive creation is considered. This is especially important for enterprises with long or continuous cycle. Realization of these technologies allows providing quick search of documents by name, to reserve archive in shorter terms. In addition, the quality of management decision making is improved due to the efficiency of presentation, completeness, reliability and convenience of information display formats, an automated system of project document circulation is created, Efficiency of business processes performance is increased by means of non-productive and duplicative, “manual” operations reduction, optimization of process participants’ information interaction. In the future this will allow using complex business processes’ information and analytical support of the enterprise as a whole.

1. Introduction
Development of innovation and information technologies in economy and society has significantly changed our lives. Development and multiplication of virtual enterprises across the Internet space has become a common thing. These enterprises conduct their business exceptionally within the electronic environment, though traditional enterprises are undergoing dramatic changes. This is explained by the fact that not only “customization of services and development of omni-channel logistics” [1] are assuming a paramount importance for the competitiveness of enterprises, but also automatization and simplification of business processes.

The global changes are facilitated by the IT-enabled transformation of technologies and innovative business models, which are strongly supported by the IT management tools. In fact, the ongoing transformations are comprehensive and impressive.

Under current conditions, introduction of a unified information system is of greater significance than modernization of industries. A bigger number of top managers are sharing the given view. “The speed of the managerial decision-making process is a tool for upgrading the efficiency of business. Making accurate and timely decisions means driving ahead of your commercial rivals. This goal can
be achieved by means of “digitization” of business processes. Regarding the given trend, the immediate problem it is vital to create an accounting data system which might help in taking rigorous managerial decisions” [2].

What does the “digital enterprise” mean? This term is rather ambiguous and debatable. First it was described by the founder of MIT Media Lab Nicholas Negroponte in 1996 in the work Being Digital [3]. Actually, the ideas of transition to digital enterprises have been put into practice quite recently.

To manage a digital enterprise, it is of primary importance to cope with substantive data, a wide array of cutting edge information tools used in business management, and a growing number of enterprises with new digitized business models. Thus, we are facing a tremendous and a constantly developing layer of digital economy which interacts with the off-line economy.

2. The relevance and importance of the problem

The current trends in the development of economy determine the need for comprehensive IT technologies, which are due to blur the boundaries between the market segments, infrastructure components of market participants, and define new business models for the processes undergoing both within enterprises and around its business environment. In this way, the global and Russian economies are entering into the age of accelerated digitization of business processes, which is characterized by an unprecedented convergence of technologies, business processes, communications, artificial intelligence and “smart” things [4].

In recent years, the issues of digital economy were considered by many authors [11, 12, 16]. However, the researchers are still forcing us to rethink the way we perceive the essence of this type of economy management. In fact, digital economy can be viewed from differing perspectives. Don Tapscott [15, 16] a Canadian entrepreneur, consultant and CEO of the Tapscott Group, is regarded the Father of the digital economy. His book “The Digital Economy”, which came out in 1994, was the first book to describe the system of virtual economy management [5]. Meanwhile, a number of researchers assume that “digital economy is a modern type of business management characterized for a prioritized role of data and methods of data management being a determinant resource for manufacturing, distribution, exchange and consumption” [6].

Another group of researchers assumes that “the given type of economy is characterized for the rise and practical application of digital technologies... in all spheres of human activity; this is a system of socio-economic and organizational relations based on the digital data and telecommunication technologies”. “The digital economy is built on production of e-goods and e-services by hi-tech business structures, and on marketing these products by means of e-commerce” [7] “The digital economy is a type of activity, where the key production factors are the digitized data; their processing and utilization in big volumes allows upgrading the efficiency, quality and capacity of various types of manufacturing, technologies and facilities...” [8].

The impact of digital technologies on transformation of socio-economic systems is absolutely evident, though many issues remain understudied. Little emphasis is placed on the development of digital potential to be applied in order to achieve innovative improvement of certain companies and branches of industry. There is no due attention to institutional aspects of the digital economy, and the role of the digital economy within the whole system of present-day business processes remains disregarded.

D. Aliev, Head of the Moscow International Higher Business School (MIRBIS), assumes that in 2017 Great Britain, which is one of the drivers of the digital economy, had rate of the digital sector at 12 % of the DGP, which is quite low.

Thus, the aim of the given work is to consider the key aspects in the development of digital business processes of enterprises.

3. Aims and objectives

Digital transformation requires that business models should be upended. The key objective of digital transformation is fostering faster decision-making, increasing variability of processes depending on
the customer needs and customer characteristics, and cutting down the number of employees involved in the process. Digitization allows for decreasing the life cycle of processes.

Let us consider the case of digitization business processes at one of the enterprises dealing with capital construction projects. Compared to traditional concepts relating the document life cycle, where a document should be archived at the final document management stage, the on-line manufacturing documents are placed in the e-archive either at the initial stage of its life cycle, or when received for processing. The considered information system can be used to form a structured electronic archive for project and estimate documentation, as well as to develop an automated system dealing with input, storage, retrieval, acceptance and sharing project documents.

The key aims of the information system are the following:

• upgrading the quality of the decision-making process by improving the formats of information display;
• developing the automated project workflow, improving efficiency of business processes by reducing inefficient operations, and optimizing the data interchange between the participants of business processes;
• providing an integrated research and information support for business processes.

To achieve the given aims, the system should be able to solve the following problems:

• support the current status of the project database and the reference book of the infrastructure facilities;
• provide a structured storage of the e-copies of the construction facility documentation;
• control the changes introduced in the documents, the user’s access to documents, and ensure transfer of rights of document access between the user groups;
• ensure maintaining the register of infrastructure facilities;
• ensure preparation of e-copies of documents to be loaded in the system;
• provide analytical reports.

An umbrella approach to the creation and management of e-funds for technical documentation will ensure systematization, storage, retrieval and immediate access to documents despite their type or storage medium, and provide the opportunity of dealing exceptionally with e-documents at all the stages of manufacturing and maintenance of sophisticated engineering products and industrial units.

4. Theoretical framework

Digital business gives rise to a new wave of innovations in various industries. An enterprise acquires a new image, i.e. the image of a “digital enterprise”. This trend highlights the start of the fourth technological revolution (Table 1) that will reshape the business environment and the whole marketing space.

Economic growth of the XIX century was founded on new technologies, whereas economic advances of the XX century were based on the upsurge of management technologies. Today, early in the 3rd millennium, the role of the key factor of economic growth is performed by knowledge intensive cognitive technologies.

The majority countries focus on creating digital society [13, 14, 17, 18, 19, 20], which is confirmed by the strategies and programmes of digital economy development, which in 2000 was launched in Denmark, in 2005 – in Singapore, in 2008 – in Australia, Hong Kong, UK, and New Zealand, in 2013 – in South Korea, in 2015 – in India and Kazakhstan. In Russia development of the digital economy was initiated by the President of the Russian Federation in his State of the Nation Address made on 1 December 2016, where the emphasis was placed on “the necessary to launch an ambitious system programme for the development of economy of a new age, i.e. the digital economy” [6].

In July 2017 the Chairman of the Government of the Russian Federation approved the programme “The Digital Economy in the Russian Federation”[9,10]. The programme considers and elaborates the aims and objectives set in the package of documents on strategic planning, particularly, in the documents dealing with the forecast of scientific and technological development of the Russian Federation for the period 2017-2030. This programme also fits into the framework of the Treaty on the Eurasian
Economic Union. According to the Treaty, in the immediate future, the Union should create an integrated software system and a cross-border confidence environment.

Table 1. Periods of technical revolutions.

| Period | Title   | Specifics                                           | Configuration |
|--------|---------|----------------------------------------------------|---------------|
| 1784   | Industry 1.0 | Mechanization, displacement of human labour and manpower by steam power | ![Image](image1.png) |
| 1870   | Industry 2.0 | Electrification, development of the assembly line production | ![Image](image2.png) |
| 1969   | Industry 3.0 | Automation, introducing robots and NC machine parts | ![Image](image3.png) |
| 2017   | Industry 4.0 | «Smart industry» | ![Image](image4.png) |

Under these conditions, international and Russian companies should go through transformation of their business processes, i.e. transformation of traditional companies into enterprises with “digital thinking”. The market products provided by such enterprises transform into digital goods.

5. The practical relevance, proposals and implementation results

In this research, we shall consider the cases of digitization the capital construction system, in particular, development of the project documentation managing system based on archival automation. The basic advantages of e-archives are the following:

1. A possibility for long-term storage of documents and ensure that the quality of digitized documents are preserved;
2. A user has no chance of damaging or losing the original copy of the document;
3. Reduction in the time and effort required to search for a document using its name;
4. Reservation of e-archives will result in reduction of the costs associated with paper-based documents.

Additionally, the benefits of an enterprise from the IT system of business processes and project documentation management include:

1. Better control of the modifications introduced into documents and preserving the history of these modifications;
2. Better management of accessibility to documentation depending on the status of the document and the access group of a user;
3. Storage of attributive information by documents and projects, and retrieval of documents by the given information in the archives;
4. Structured storage of e-copies of construction facility documents;
5. Maintaining the registry of infrastructure facilities and retrieval of documents relating the given facilities;
6. Providing analysis reports.

The input data to the information system include e-copies of the project documentation in the form of scanned images of archival paper-based original documents, as well as the data from identification reference books and document retrieval.
The output data of the information system are e-copies of the construction documents in the form of scanned images of archived paper-based original documents and native format files provided upon the user requests to be viewed, printed or e-copied (construction documentation, specification documents, post-completion documentation, permissions for modifications, project evaluation and project approval protocols, bills on passing the documents in the form of scanned images of archival original hard copies and native format e-files; reports on the number of registered documents).

The system consists of functional components presented in figure 1.

**Figure 1.** The block diagram of the system.

The information system has a three-tier structure, including the client application, the applications server, and the database server.

The data referred to the entities and subjects of the system are stored in the database managing system (DBMS), whereas the “file” data are stored on hard discs located on the applications server. Data mapping and data editing is performed using applications installed in the users’ workstations.

6. **Conclusions**

The results of the research showed that the performance rate of a company depends on introducing and application of digital technologies and management methods. The profit share of companies facilitating digital technologies and cutting edge management technologies is on average 26% higher than the profit share of their commercial rivals. Those enterprises that have not adopted their development strategies demonstrate the negative financial state results at minus 24%.

Today, among the leaders of digital production are hi-tech industries, banks and retailers gaining the biggest advantages from transition to digitization. At the bottom in the rating of digital maturity
are pharmaceuticals industry, manufacturing industry and consumer goods industry which have to respond to the current changes and design the models for digital transformation.

In fact, for an enterprise using technologies does not mean using digital tools. Many organizations have to reshape their information infrastructures in order to satisfy the demands of the digital world.

Shifting towards digitization, does not mean that an enterprise should give up using the existing software and introduce innovative programmes. The development process follows the path of modernizing corporate systems. However, in the context of new objectives the established technologies need rethinking and reconsideration.

Today, development of automated systems in the area of industrial production in Russia is limited to using particular services, such as electronic document flow in accounting, aggregate planning, etc. (the so-called "precious little" in all areas). Whereas, automation at advanced European enterprises encompasses the whole life cycle of products and is realized within a common information space.

7. References

[1] Boyko I, Evnevich M, Kolyshkin A 2017 The economy of the enterprise in the digital age Russian Entrepreneurship 18 (7) 1127-1136
[2] Digitization of Business https://read-this-text.blogspot.ru/2013/07/blog-post_8944.html. last accessed 2018/05/03
[3] Golyshko A Different facets of the digital enterprise https://habr.com/post/353864, last accessed 2018/01/29.
[4] Semjachkov A Digital economy and its role in the management of modern social-socio-economic relations Modern management technologies http://sovman.ru/article/8001, last accessed 2018/04/30
[5] Digital economy and digitalization in historical retrospect https://medium.com/cemi-ras/, last accessed 2018/03/12
[6] General e-commerce issues http://elcomrevue.ru/tsifrovaya-ekonomika/, last accessed 2018/04/15
[7] Strategy for the development of the information society in the Russian Federation for 2017-2030
[8] Message of the President of the Russian Federation to the Federal Assembly (01.12.2016)
[9] Decree of the President of the RF of 01.12.2016 N 642 "On the strategy of scientific and technological Development of the Russian Federation"
[10] Order of the Government of the Russian Federation № 1632-R of July 28, 2017 "On approval of the program "Digital Economy of the RF"
[11] Gnezdov V 2017 Development of the digital economy of Russia as a factor of increasing global competitiveness Intellect. Innovation. Investment 5 16-19
[12] Evtjanova D 2017 Criteria for creation of digital platforms for economic management Economy systems 3 (38) 54-57
[13] Brynjolfsson E and Kahin B (editors) Understanding the Digital Economy The MIT Press, Cambridge, Massachusetts, and London (England)
[14] Singh N 2003 The Digital Economy, for The Internet Encyclopedia
[15] Tapscott D 1995 The Digital Economy: Promise and Peril In The Age of Networked Intelligence, McGraw-Hill
[16] Tapscott D 2014 The Digital Economy Anniversary Edition: Rethinking Promise and Peril In the Age of Networked Intelligence, McGraw-Hill
[17] Varian H R 1998 Markets for information goods University of California (Berkeley)
[18] Varian H.R.: Buying, Sharing and Renting Information Goods, Journal of Industrial Economics, 48(4), 473–488 (2000)
[19] Varian, H R 2005 Copying and Copyright Journal of Economic Perspectives 19(2) 121-138
[20] Wheelwright S C, Clark K B 1992 Revolutionizing product development: Quantum leaps in speed, efficiency, a. quality New York: Free press, Cop.