Managing the Digital Transformation of Enterprises: Assessing its Level in Woodworking Industry Companies

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ABSTRACT

The research is devoted to analysing the woodworking industry from the point of view of using modern digital technologies at its enterprises. The **relevance** of this work is due to the fact that the timber industry is an important sector of the Russian economy, and the solution of such a **task** as determining the level of digital transformation (DT) of one of its industries will help identify problem areas and potential opportunities for improving production processes and introducing innovations. The methodological basis was the use of private and universal scientific **methods** such as analysis, synthesis, comparison, observation, ranking, and expert judgement. The authors of the study studied the activities of foreign and domestic timber processing companies, presented two options for calculating the level of their DT — both by quantifying the level of digitalisation of business processes and the scale of the company, and by analysing the effect of project implementation and the complexity of the technologies used, and found that the results obtained in both cases coincide. In the course of the work, three approaches to digital transformation were considered and it was concluded that its level not only in Russian, but also in foreign companies in the woodworking industry is average. The practical **significance** of the research consists in the development of recommendations and creation of a methodology for assessing the digital transformation of woodworking industry enterprises, which the latter can use when preparing for changes in the business model and the introduction of new technologies.

Keywords: digital transformation; industrial enterprises; digital technologies; timber industry; woodworking industry; innovation; practice analysis; digitalization

INTRODUCTION

The forestry industry is an important sector of the Russian economy, combining industries related to the harvesting and processing of wood, and playing a significant role in the creation of biological resource potential.

To ensure its effective functioning, high-quality, accessible and complete information about available resources is necessary, which is why the introduction and development of digital technologies at forestry enterprises is such an important and relevant topic [1]. Currently, an increasing number of large companies are increasing investments in IT startups, as they understand the importance of these projects [2].

The branches of the timber industry complex can be provisionally divided into four groups: logging, wood processing, wood chemical and pulp and paper industries. As part of this study, it was decided to analyze the activities of enterprises in the wood processing industry (as a narrow segment of the forest industry).

Digital transformation (DT) provides a business with a competitive advantage, and companies that have mastered new technologies become market leaders [3, 4]. This is due to improved efficiency of business processes, improved customer experience, the emergence of resilience to change and the emergence of more accurate data analytics.

Experts distinguish 3 approaches to DT: process, industry and technology. In the first case, the organization seeks to optimize and automate its business processes through the use of digital technology tools. With a technology approach, it focuses on the development and use of digital technologies to optimize its own business models, processes, products or services. . In the case of an industry approach, a company considers change and innovation within the entire industry, and not just in the context of its own organization [5]. One more approach can be distinguished — an integrated one, which combines those previously listed and includes all changes in business models, business processes, technologies and culture of the organization.

The terms automation, digitalization and digital transformation refer to the implementation of technology in various aspects of a business.

Automation involves the use of computers, increases the efficiency and accuracy of procedures and reduces the cost of managing repetitive operations. *Digitalization* is associated with the use of various kinds of electronic devices for storing and processing information; it helps to increase the efficiency of work processes, facilitate access to data and improve communication within the company. A digitalized business process involves the use of digital technologies and solutions for its automation and optimization [6]. *Digital transformation* covers a broader spectrum of transformations, affecting not only processes, but also the structure and culture of the company as a whole, and also involves modern technologies, organizational and cultural changes to improve business processes and meet the needs of stakeholders. As a result, the company becomes more competitive in the long term [7–9].

Both automation and digital transformation projects can have the same effect if they complement each other and they use similar technologies and tools (for example, if automation is one of the tools for implementing digital transformation). Improving business processes through automation can be the first step of DT, which will set the stage for larger changes. Once this is done, the company will be able to move on to more complex projects using complex technologies — say, such as artificial intelligence, the Internet of things and

blockchain. Digital transformation opens up new avenues for automation and increases its efficiency.

RESEARCH METHODS

During the work, general scientific methods of cognition were used — analysis, synthesis, comparison, observation, ranking, expert assessments. Scientific journals and Internet resources became the information base. The level of digital transformation of six wood processing enterprises was determined by analyzing data (including performance indicators) obtained from open sources. The calculations were based on such quantitative indicators as the efficiency of project implementation, the number of digitalized business processes (i.e. those that use at least one digital solution) and the scale of the company. The evaluation criteria were the effect of project implementation and the level of technology complexity.

The companies selected for comparison are fairly representative of the industry, and their practices and experiences may reflect general trends and characteristics of the wood products industry.

FORMULATION OF RESEARCH PROBLEM

This study selected three Russian and three foreign companies in the wood processing industry for analysis:

1. Segezha Group (Russia) is the largest manufacturer and supplier of wood construction materials: rounded and edged, as well as laminated veneer lumber, etc.[1]

2. Ilim Group (Russia) is one of the largest producers of pulp and paper on the world market; actively works on environmental projects and socio-economic development of

the regions of its presence. The company is also a timber manufacturer.[2]

3. Sveza company (Russia) is engaged in the production and export of wood panels and materials for construction and transport; In its activities, it adheres to a policy of environmental responsibility and uses only environmentally friendly materials.[3]

4. West Fraser (Canada) is a company specializing in the production of a wide range of wood products. West Fraser manages its resources sustainably while maintaining high environmental standards.[4]

5. Weyerhaeuser Company (USA) is a company that is the largest manufacturer of laminated laminated wood and one of the leaders in the production of particle boards. Weyerhaeuser has a strong focus on sustainable forestry practices and environmental stewardship and has significant logging and land management assets.[5]

6. Canfor Corporation (Canada) is one of the world leaders in wood processing. The company actively works to reduce the environmental impact of its production processes.[6]

All of the above organizations are international and have enterprises and subsidiaries around the world, have extensive experience in the production of wood, wooden products, specialize in the production of pulp, paper, plywood, OSB boards and other building materials and have advanced technologies and highly qualified personnel, which allows them to produce high quality products.

Let's analyze the state of digital transformation in these 6 companies (*Table 1*)

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[1] Company Segezha Group (official website). URL: https://segezha-group.com/

[2] Ilim group (official website). URL: https://www.ilimgroup.ru/

[3] Sveza (official website). URL: https://www.sveza.ru/

[4] West Fraser (official website). URL: https://www.westfraser.com/

[5] Weyerhaeuser (official website). URL: https://investor.weyerhaeuser.com/quarterly-and-annual-results

[6] Canfor Corporation (official website). URL: https://www.canfor.com/

Analysis of digital transformation practice

Company name	Country	Name of the approach to digital transformation	Type of digital solutions	Project	Received effect
Segezha Group	Russia	Process	Universal	1. Automated dispatch system "SegezhaLes". 2. Hardware and software complex for raw material accounting. 3. Digital inventory. 4. Project of a unified enterprise management system	– Reducing the number of routine processes; – increase in measurement accuracy; – simplification of document flow; – saving time; – increasing data reliability; – increased efficiency; – planning accuracy; – cost optimization
Ilim Group	Russia	Process	Local	1. Digital twin of the organization. 2. Project to optimize the supply of raw materials. 3. Operational dispatch control system	– Cost optimization; – planning accuracy; – optimization of logistics; – simplification of logging and cargo transportation; – reduction in the number of errors; – increased efficiency; – increased safety
Sveza	Russia	Process	Universal	1. Robotization of logistics. 2. Digitalization of the recruitment procedure. 3. Digital educational project for staff. 4. Automated process analysis	– Time saving; – increasing the digital literacy of staff; – reduction in the number of errors
West Fraser	Canada	Sectorial	Universal	1. Order tracking application. 2. Zero approach to IT security	– Simplification of the process of tracking and managing orders; – online order tracking; – increased data security
Weyerhaeuser Company	USA	Complex	Mixed	1. Project for digital transformation of the logging process. 2. Cloud storage	– Increase in the efficiency of interaction within the company; – high-quality production process management
Canfor Corporation	Canada	Complex	Mixed	Project "Enterprise Design for Global Enterprise" (cloud platform)	– Increase in the efficiency of interaction within the company; – improvement of the quality of information; – increasing planning accuracy; – risk reduction; – cost optimization; – increasing the efficiency of production activities

Source: compiled by the authors based on Segezha Group Sustainability Report. URL: https://www.akm.ru/upload/akmrating/SEGEZHA_sustainability_report_2020.pdf; Ilimgroup.ru portal. URL: https://www.ilimgroup.ru/press-tsentr/detail/gruppa-ilim-vystupila-generalnym-partnerom-foruma-smart-forest/; Sveza Sustainability Report. URL: https://www.sveza.ru/upload/iblock/4b7/%D0%9E%D1%82%D1%87%D0%B5%D1%82%20%D0%BE%D0%B1%20%D1%83%D1%81%D1%82%D0%BE%D0%B9%D1%87%D0%B8%D0%B2%D0%BE%D0%BC%20%D1%80%D0%B0%D0%B7%D0%B2%D0%B8%D1%82%D0%B8%D0%B8%202020.pdf; Westfraser.com portal. URL: https://www.westfraser.com/; Weyerhaeuser.com portal. URL: https://investor.weyerhaeuser.com/quarterly-and-annual-results; Questoraclecommunity.org portal. URL: https://questoraclecommunity.org/learn/customer-stories/canfor-transforms-its-business-from-a-legacy-system-to-a-cloud-hosted-erp-platform/

Weyerhaeuser Company and Canfor Corporation use local and universal solutions in their activities. Basically, companies in the woodworking industry introduce ready-made technologies that are used by other organizations.

The effect of projects within the DH framework may be similar to the result obtained from automation and digitalization, despite the fact that these concepts are not identical. This is due to the close interaction of these processes and the synergy resulting from the use of similar technologies.

Based on the data in *Table 1*, the implementation of projects has led to cost reduction, improved quality and increased efficiency of existing business processes.

Wood products companies often take a process approach to digital transformation; sectoral and technology approaches can be useful complements, but are more likely to be focused on specific areas of activity, such as innovation in production technologies or improved forest management.

Taking an integrated approach can help industry organizations achieve greater efficiency.

Calculating the level of digital transformation by assessing the level of digitalization of business processes and assessing the scale of the company
The priority areas of digital transformation are working with data and digitalization of business processes [10] — *Table 2* shows quantitative and qualitative assessments of the level of the latter: the number and type of business processes are determined, and the maturity levels of the digital technologies implemented in the companies under consideration are classified [10, 11]. All data necessary for the calculation was obtained from open sources.

The "+" sign indicates processes that have been digitalized in the company — in general,

these are the majority of all organizations under consideration. A high level of digitalization is indicated in green, an average level in yellow, and a low level in red. Ilim Group and Canfor Corporation received the highest scores. The quantitative assessment of the remaining companies is two points (which corresponds to the average level of digitalization).

The number of top-level business processes (aimed at achieving the company's strategic goals) at forest industry enterprises may vary depending on the size and organizational structure of the latter. On average, from 10 to 16 such processes can be distinguished. They may be related to production, logistics, personnel management, etc. [12].

The timber industry complex is currently actively introducing new digital technologies, but generally the level of digitalization of business processes remains average [13, 14]. For further assessment, it is necessary to analyze such an indicator as the number of employees of the organization (*Table 3*).

All listed companies belong to large businesses, which are rated with the highest score. To determine the level of digital transformation, we will indicate the standard values of this indicator for each type of business (*Table 4*).

Since, as mentioned above, the organizations in question belong to large businesses, to confirm a high level of DT they need to score nine points; the average will be for companies that received six points; and low — for those who scored 3 points. Let's calculate the level of digital transformation (*Table 5*) using the data in *Table 2, 3 and 4*.

Based on the results obtained, we can conclude that two companies have a high level of DT: Ilim Group and Canfor; the rest are characterized by an average level of this indicator.

A *high level* of digital transformation means that an organization has introduced

Table 2

The level of digitalization of business processes

Type of business process	Name of the business process	Company name					
		Segezha* Group	Ilim Group	Sveza	West Fraser*	Weyerhaeuser* Company	Canfor Corporation*
Main	Transportation	+	+	+	+	+	+
Main	Production processes	+	+	+	+	+	+
Providing	IT support	+	+	+	+	+	+
Administartive	Personnel m	+	+	+	+	+	+
Administartive	Financial management	+	+	+	+	+	+
Administartive	Quality control	+	+	+			+
Administartive	Sales management	+	+	+	+	+	
Administartive	Supply and inventory management	+	+	+	+		+
Administartive	Project management		+	+			+
Administartive	Marketing management		+		+	+	+
Administartive	Warehouse management		+		+		
Administartive	Resource management		+			+	+
Administartive	Sales planning		+				+
Total:		**8**	**All digital twin**	**9**	**9**	**8**	**11**
More than 10 business processes have been digitalized — 3 points (high level of digitalization). From 6 to 10 business processes have been digitalized — 2 points (average level of digitalization). Less than 5 business processes are digitalized — 1 point (low level of digitalization)	Quantative evaluation	2	3	2	2	2	3
	Quality evaluation	Middle	High	Middle	Middle	Middle	High

Source: compiled by the authors.

Note: * — Apps run the world company (official website). URL: https://www.appsruntheworld.com/customers-database/

the maximum amount of digital technologies into its activities, allowing it to achieve maximum operational efficiency, automate most processes and quickly respond to changes in the business environment. The *average level* indicates that the organization is using digital technologies, but some business processes are still performed

Table 3

Estimating the scale of companies

Name of indicator		Company name					
		Segezha Group	Ilim Group	Sveza	West Fraser	Weyerhaeuser Company	Canfor Corporation
Number of employees, people		14600	14845	6712	9000	9200	8000
A company with up to 50 employees — small business — 1 point. The company has from 50 to 250 employees — medium business — 2 points. The company has more than 250 employees — large business — 3 points	Quantative evaluation	3	3	3	3	3	3
	Quality evaluation	Large	Large	Large	Large	Large	Large

Source: compiled by the authors based on data from [15].

Table 4

Normative values of digital transformation level for the first calculation method

Company scale					
Large business		Mid-sized business		Small business	
Quantitative assessment of the level of digital transformation, points.	Qualitative assessment of the level of digital transformation	Quantitative assessment of the level of digital transformation, points	Qualitative assessment of the level of digital transformation	Quantitative assessment of the level of digital transformation, points	Qualitative assessment of the level of digital transformation
9	High	6	High	3	High
6	Middle	4	Middle	2	Middle
3	Low	2	Low	1	Low

Source: compiled by the authors.

Table 5

The first way to assess the level of digital transformation

Company name	Name of indicator			Explanation
	Assessment of the company's scale, points	Assessment of the level of digitalization of business processes, points	Level of digital transformation points	
	S	BP	L1 = BP*S	
Segezha Group	3	2	6	Middle
Ilim Group	3	3	9	High
Sveza	3	2	6	Middle
West Fraser	3	2	6	Middle
Weyerhaeuser Company	3	2	6	Middle
Canfor Corporation	3	3	9	High

Source: compiled by the authors.

Table 6

Technology complexity assessment

Complexity of technologies		Company name					
		Segezha Group	Ilim Group	Sveza	West Fraser	Weyerhaeuser Company	Canfor Corporation
From 1 to 3 points, where 3 points — high difficulty, 2 points — average difficulty, 1 point — low difficulty	Quantative evaluation	3	3	3	3	3	3
	Quality evaluation	High	High	High	High	High	High

Source: compiled by the authors.

Evaluation of the effect of implemented projects

Name of effect from implemented projects	Company name					
	Segezha Group	Ilim Group	Sveza	West Fraser	Weyerhaeuser Company	Canfor Corporation
1. Increase in the speed and accuracy of decision making	+	+	+	+	+	+
2. Reduction of labor and resource costs	+	+				+
3. Improvement in the quality of customer service		+	+	+		+
4. Creation of new opportunities for business growth and market expansion	+	+			+	+
5. Increased security and data protection		+		+		+
6. Reduced environmental impact		+	+	+	+	+
7. Increase in the efficiency of interaction within the organization and between its divisions	+	+	+		+	+
Total:	4	7	4	4	4	7

Source: compiled by the authors based on data from [17, 18].

Digital transformation level values for the second calculation method

Name of indicator	
Quantitative assessment of the level of digital transformation, points	Qualitative assessment of the level of digital transformation
from 15 to 21	High
from 8 to 14	Middle
from 1 to 7	Low

Source: compiled by the authors.

manually or using outdated methods. A *low level* of digital transformation is an indicator that the company does not use modern digital technologies and does not implement digitalization; its business processes may be inefficient, slow, and unable to adapt to a rapidly changing market. Each level of DT has its own advantages and disadvantages, and its choice depends on the specific needs and capabilities of the organization. However, companies seeking to take a leading position in the market must use modern digital

The second way to assess the level of digital transformation

Company name	Name of indicator			Explanation
	Assessment of technology complexity, points	Evaluation of the effect of implemented projects, points	Level of digital transformation, points	
	T	E	$L_2 = E*T$	
Segezha Group	3	4	12	Middle
Ilim Group	3	7	21	High
Sveza	3	4	12	Middle
West Fraser	3	4	12	Middle
Weyerhaeuser Company	3	4	12	Middle
Canfor Corporation	3	7	21	High

Source: compiled by the authors.

Comparison of the results of calculating the level of digital transformation

Company name	Name of indicator	
	Qualitative assessment obtained by the first method of assessing the level of digital transformation	Qualitative assessment obtained by the second method of assessing the level of digital transformation
Segezha Group	Middle level	Middle level
Ilim Group	High level	High level
Sveza	Middle level	Middle level
West Fraser	Middle level	Middle level
Weyerhaeuser Company	Middle level	Middle level
Canfor Corporation	High level	High level

Source: compiled by the authors.

technologies and processes to their full potential.

Calculation of the level of digital transformation by assessing the effect of project implementation and assessing the complexity of technologies

Let's calculate the level of digital transformation in the second way. To do this, we will analyze the effect of projects implemented as part of digital transformation and the complexity of the technologies that were used [22].

When assessing technologies, we will be guided by the following: low complexity is characterized by the use of standard solutions for process automation; medium involves the development of mobile and web applications; high is associated with the use of

advanced and innovative solutions. Assessing the complexity of technologies within the framework of digital transformation depends on how much they influence the company's current business processes and the extent to which their implementation and use are complex (*Table 6*).

All the companies examined used high complexity technologies in their projects based on digital transformation [16] *Table 7* shows estimates of the obtained effect.

The "+" sign indicates the effect achieved by the company when implementing projects as part of digital transformation. Ilim Group and Canfor Corporation received the maximum number of points. The remaining companies have four points out of seven possible. *Table 8* presents the standard values of the DT level necessary for interpreting the results of the calculation performed by the second method.

Let's calculate the level of digital transformation in the second way (*Table 9),* using the data in *Table 6, 7 and 8.*

Thus, Ilim Group and Canfor Corporation have a high level of DT; for other companies it is average.

COMPARISON OF THE OBTAINED RESULTS OF CALCULATION OF DT LEVEL

The high level of digital transformation of forest industry enterprises plays an important role in ensuring their efficient and sustainable operation. However, according to this indicator, the industry lags behind other sectors of the economy for reasons (related to its specifics) such as the complexity of its automation, the low level of qualifications of workers and insufficient funding. Let's compare the data (*Table 10*) obtained using the first and second calculation methods (*Tables 5 and 9*).

Obviously, the calculation results coincide (and this confirms their reliability). However, it is worth considering that the DT level is not an absolute value, but a relative indicator that can be assessed differently depending on what criteria and methods were used for this. Therefore, even if the results obtained by using different calculation methods are identical, they should be analyzed and the possibility of improving business processes using DT should not be neglected.

Based on the results of the study, we can conclude that, in general, enterprises in the woodworking industry are characterized by an average level of DT, which is confirmed by numerous foreign studies [19–21]. Most companies have not reached a high level of digital maturity and need further development.

According to scientists, the forest industry is moving towards digital transformation and it has enormous opportunities for further growth and development [22, 23].

INTERPRETATION

The study made it possible to identify the main projects that woodworking industry enterprises are implementing as part of digital transformation — for example, most companies use universal options for their business. This article does not provide clear recommendations on the choice of digital solutions, but its authors will continue to work in this direction.

Open sources on the research topic emphasize the importance of introducing innovations related to digital technologies. Thus, in the work of Yu. S. Polozhentseva, O. V. Sogacheva and A. S. Byankin says that the forestry, woodworking and pulp and paper industries, in terms of the degree of implementation of digital technologies, rank 7th out of 9 possible in the ranking of Russian industrial sectors, which is an average indicator [24]. H. Le believes that Vietnam's wood processing industry occupies a fairly important place in the world. However,

the contribution of digital transformation and high technology to the industry's performance is still modest, and more efforts should be made in this direction to change the situation. It is noteworthy that many wood processing enterprises are hesitant to speed up this process for various reasons, including high costs [25]. Digital development in the Slovenian forest industry, including wood processing, is at a relatively low level compared to other countries, but judging by the latest strategic guidelines adopted at both the state and business levels, this situation should improve in the near future [26].

The digital transformation of the woodworking industry is estimated at 6 or 7 points on a scale from 1 to 10 (10 points is the highest level of digital transformation), and the metalworking industry — at 10 [27]. A study by M. Makkonen revealed a connection between the digitalization of the wood processing industry and the consumer value of products, but at the same time emphasized that companies in the industry have not fully appreciated the importance of DT, so its indicator is at an average level [28].

CONCLUSION

As mentioned above, the level of DT in the woodworking industry is average, since companies, when implementing projects, mainly adhere to a process or integrated approach and use ready-made digital solutions.

The authors reviewed 6 large companies (3 domestic and 3 foreign); a high level of digital transformation was noted by the Ilim Group (Russia) and Canfor Corporation (Canada); the activities of other organizations in the field of digital technologies are at an average level. These conclusions were made through the use of two different methods for calculating the DT indicator: the first is based on assessing the level of digitalization of business processes and the scale of the company, and the second is based on determining the effect of implementing digital transformation projects and the complexity of the technologies used in them.

Further work in this direction will make it possible to classify digital technologies in the woodworking industry, analyze the factors of the effectiveness of using digital solutions and formulate recommendations for DT of industry enterprises not only in Russia, but also in friendly countries.

The use of digital technologies can help optimize logging and timber production processes, improve product quality, reduce waste, reduce costs, increase the efficiency of production processes and reduce the negative impact on the environment. The presented research complements those previously carried out on this topic and can become a starting point for more in-depth research aimed at studying the specifics of digital transformation in specific industries.

The methods used to calculate the level of digital transformation can be useful in analyzing other companies and industries, and the results obtained can contribute to the exchange of experience and a better understanding of the digital transformation process in different sectors of the economy.

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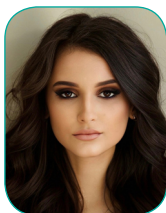
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Conflicts of Interest Statement: The authors have no conflicts of interest to declare.