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**LEAN TECHNOLOGIES IN THE MANAGEMENT OF RUSSIAN
UNIVERSITIES**

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Abstract

Russian universities are adopting lean tools to improve operational efficiency. The purpose of the study is to determine the features and trends in the use of lean technologies at universities in Russia. The research method is a qualitative analysis of documents and materials from universities that are members of the Association of Lean Universities. The study found that the following tools are usually used by universities: mapping, Continuous Flow, Gemba, Kaizen, Visual Factory and standardized work, which are objectively necessary at the initial stage. In the future, it is advisable to use tools such as Poka-Yoke, Bottleneck analysis and Hoshin Kanri. In the period 2018-2020, lean technologies were introduced mainly in auxiliary operations (work with personnel, paperwork, activities of admissions committees). The main direction in the development of lean universities should be the introduction of lean instruments into the main activities, the standardization of the activities of personnel and workplaces.

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1. Introduction

Effective management of an educational organization, such as a university, requires the use of modern methods and technologies of management. University management is actively developing now (Hendriks & Sousa, 2013; Thien & Jamil, 2020), and universities often use the concept of new public management (Bolotov et al., 2019; Funck & Karlsson, 2020; Kurbatova et al., 2017) and other business practices, for example, the balanced scorecard (Taylor & Baines, 2012). The use of management methods and tools in universities is often critically assessed due to the differences between the private and public spheres.

At the same time, the use of such tools as key performance indicators in the form of an effective contract, a client-oriented approach towards students, market principles of funding allocation have significantly changed the work of universities in Russia and in the world. In 2018-2019 in Russian universities, the introduction of such a management methodology as “lean production” has begun. It is a new tool for reducing costs, saving time and increasing university stakeholder satisfaction. The use of lean manufacturing, however, is complicated by the fact that few studies have been published that analyses the features of this methodology in universities and in education in general.

2. Problem Statement

Hess and Benjamin (2015) believe that a university must apply Lean because, like any modern organization, it must work to create value for the customer. The use of lean manufacturing is promising for auxiliary operations, the organization of admission procedures, and the main activities of the university – educational and scientific work. In particular, lean technologies ensure that the costs of the admission procedure are minimized per student, and they allow integrating the work of all participants involved in it based on a value creation model. To identify external clients (employers, alumni, professional associations and unions) it is advisable to use value stream maps.

At the same time, according to Thomas et al. (2015), universities still have more favourable conditions for the implementation of lean manufacturing in comparison with industrial enterprises or high schools, since their organizational culture is more conducive to innovation and thrift. In addition, Lean technologies in universities tend to enjoy more leadership support.

In a review by Balzer et al. (2016), where about 60 papers on the use of lean manufacturing in universities were reviewed, concluded that lean technologies have a measurable positive impact on the economic performance of universities and customer satisfaction (students, employers, partners). At the same time, the introduction of lean manufacturing should be part of the university's strategy, supported by top management.

However, most of the work on lean manufacturing in universities is not generalized and considers specific cases. Nicholson and Pakgohar (2020) examined the use of lean manufacturing at the Sheffield University Law Clinic. Training in a legal clinic is the most effective way to train lawyers working in litigation. But a legal clinic requires the allocation of large financial and time resources of the university, and also requires a lot of time from the students themselves. In the cited work, the Ishikawa diagram was

used to understand the reasons for the high time spent by teachers and students. The current organization of the legal clinic led to the fact that clients had to wait up to three months for consultation.

This negatively affected the quantity and quality of legal aid, and also negatively affected the preparation of students. In addition, a value creation map was constructed that showed the root cause of high student time losses and dissatisfaction. Students were forced to study the procedure for preparing documents, which may be different in a particular law firm or law office. Therefore, in the cited work, a new value stream map was developed with a different structure of the educational process. Specific staff members were instructed to take responsibility for the administration of ongoing litigation and simply delegate individual assignments to students with the academic support of a broader group of faculty members.

The study by Gaivoronskaya (2019) examines the implementation of lean manufacturing at Belgorod State University, and formulates some recommendations for university management: when introducing lean technologies, use a project-based approach, define project goals using SMART technology (requires that the goals be measurable, achievable, realistic, limited by time and resources), involve senior management in the process of lean change, and apply a stakeholder approach.

Along with this, for implementation they saved out technologies will require staff training in new technologies; standardization and control of stability of results; replication of results in the external and internal environment; creation of a scientific and methodological base and the formation of a corporate culture of lean management. Nevertheless, the practice of using lean technologies in the management of Russian universities, in particular, the work of the Association of Lean Universities, has not been sufficiently studied by researchers of university management.

3. Research Questions

In course of the study the following questions were raised:

- what is the frequency of using various lean manufacturing tools in Russian universities?
- in what areas are Lean methods most commonly used?
- what are the prospects for using lean manufacturing methods?

4. Purpose of the Study

The purpose of the study is to identify the features and trends in the development of lean technologies in the management of Russian universities.

5. Research Methods

The research strategy is a qualitative comparative analysis of materials about lean production projects at universities that are members of the Association of Lean Universities (11 universities). The analysis was carried out in such areas as the tools used in lean manufacturing and the scope of lean manufacturing. The research materials are reporting, presentation documents, publications and public

statements of these universities and their representatives, as well as search results on the official websites of universities for the keywords “lean”, “lean manufacturing”, “lean technologies”.

6. Findings

Table 1 show the lean manufacturing tools used in Russian universities. There is no exhaustive list of such tools; therefore, the most common and applicable in the field of public services were selected for the study.

Tools known to be inapplicable for organizations that are not involved in production activities, such as “Overall Equipment Effectiveness”, were not considered in the work. The data in Table 1 indicate interesting trends in university adoption of lean tools. Without exception, all universities used visualization and mapping tools for value creation to analyse specific situations (for example, issuing business trips, receiving documents, or publishing a collection of scientific papers).

Table 1. Lean manufacturing tools used in Russian universities

	Number of universities using the instrument	Share of universities using the instrument, percent
Mapping (value creation maps)	11	100.00
5S	4	36.36
Andon	1	9.09
Bottleneck analysis	3	27.27
Continuous Flow	9	81.82
Gemba	8	72.73
Heijunka	0	0.00
Hoshin Kanri	2	18.18
Kaizen	9	81.82
Just in time	0	0.00
Kanban	2	18.18
Muda	6	54.55
Poka-Yoke	2	18.18
Root Cause Analysis (5 "Why?")	8	72.73
Visual Factory	11	100.00
Standardized work	9	81.82

On the one hand, these are the main tools of lean manufacturing, which allow analysing production situations, identifying losses and identifying bottlenecks, due to which university resources are inefficiently used. On the other hand, without visualization, it is generally impossible to map the flow (process) of value creation. Therefore, visualization and mapping can be considered as basic, initial tools for the implementation of lean manufacturing projects at the university.

The vast majority of universities (9 out of 11) used tools such as Continuous Flow, standardized work, and kaizen. Continuous Flow assumes the rationalization of the value stream and, in fact, can be viewed as building an “ideal” or optimal flow map with subsequent implementation in change projects. Therefore, the fact that not all studied universities reflect the use of Continuous Flow in their reporting,

documentary, presentation materials may be due to either a lack of understanding of the essence of this tool or the lack of a practical solution to the identified problems. In the author's opinion, Continuous Flow should be applied in Lean University in any case.

The same provisions can be attributed to the tool “standardized work”, because one of the results of the use of flow maps and Continuous Flow is always the change or development of documents regulating the activities of employees and the specific operations they perform. In relation to the use of the kaizen tool, it should be noted that it has a rather complex structure. It includes a number of isolated tools, including organizational culture, openness to employee suggestions, work in small groups, for example, in quality circles. There are approaches when other tools of lean production are included in the kaizen, for example, general maintenance of equipment, a “just-in-time” production system (Kumar, 2019).

In the study, we attributed the development of a culture of frugality, staff involvement, and the creation of collective forms of collaboration to the Kaizen tool. Based on this, it can be noted that kaizen is used in 9 out of 11 universities, although a lean culture and involved staff are necessary anyway.

Gemba and 5-Why Root Cause Analysis are also commonly used (8 out of 11 universities). Gemba assumes direct participation of top management in the research, analysis and improvement of processes, finding managers at the workplaces of subordinates and production sites. The underutilization of the Gemba tool also limits the potential of lean manufacturing at the university.

As far as the 5 whys principle is concerned, it is optional, but its use allows for more meaningful development of the value stream map. Consequently, all or the vast majority of Russian Lean Universities use Lean tools such as Mapping, Continuous Flow, Gemba, Kaizen, Visual Factory and Standardized Work. These tools form a single complex for starting the implementation of lean manufacturing projects. Therefore, they should be used by all lean universities. The absence of one of the tools significantly reduces the effectiveness of other lean technologies.

Other lean tools are used much less frequently. In particular, Muda is used in just over 50% of universities. There are various reasons for this attitude towards Muda. Firstly, this tool can be considered important for the production area with a high level of material costs. Universities believe that if the cost of materials and raw materials is a small share of total costs, then the need to eliminate waste will be less. Secondly, the simultaneous implementation of a large number of lean manufacturing tools can be very difficult for a university, since the methodology under consideration has only been used since 2018.

But it should be borne in mind that the Muda tool deals not only with material losses, but also with wasted time. For example, in universities, there is often unnecessary movement of people in the course of work. For example, university staff may spend ineffectively working time searching for documents that are not stored correctly, or seeking advice from colleagues, since they were not properly trained before work. Russian universities also rarely pay attention to the rational organization of staff jobs, which capacity, this kind of bottleneck is also found in universities.

Table 2 shows the main directions of the use of lean manufacturing in Russian universities. The data in Table 2 show typical trends in the use of lean technologies by Russian universities. Firstly, most often the rationalization of auxiliary, service processes is carried out – work with staff, students, processing various documents, issuing certificates, the work of the selection committee (these projects were implemented by all lean universities).

This is quite reasonable at the first stage of implementation of lean manufacturing. But in the future, it will be necessary to introduce lean tools into the main processes of the university – educational and scientific activities. So far, lean tools have been embedded in the core activities of a limited number of universities. Secondly, most universities classify the introduction and use of electronic information and educational systems, mobile applications and other digital tools as lean projects.

Table 2. The main directions of using the lean manufacturing methodology in the universities of Russia

University	The main areas and areas of application of lean manufacturing
Belgorod State Institute of Arts and Culture	Changing the work of the admissions committee, automating the educational process, library work, managing research activities, teaching lean technologies within the framework of student self-government, streamlining workflow, canteen work
Belgorod State National Research University	Optimization of processes (personnel work with teachers and students, preparing and holding meetings, conducting internal audits, supporting publications), improving the planning and implementation of scientific projects, improving energy saving processes
Kemerovo State University	Rationalization of audits of the management system, work of the selection committee, optimization of processes in personnel work, creation of work standards, improvement of the editorial and publishing process, creation of convenient navigation
Kirov State Medical University	Improving the work of the admissions committee, optimizing personnel work and obtaining passes, universal equipment maintenance and rationalizing stocks in the clinic, optimizing workflow
Kuban State Medical University	Optimization of the processes of obtaining admission by students to medical and pharmaceutical activities, the work of the admissions committee, planning the dissertations of graduate students, personnel work
Maikop State Technological University	Routing and navigation in premises, increasing the efficiency of using information systems, simplifying a number of procedures, introducing a 5S system, rationalizing the preparation and conduct of events
Nizhny Novgorod State Engineering and Economic University	Rationalization of personnel and support processes (for example, optimization of the formation of educational cards and diploma supplements), improvement of the use of electronic information and educational systems
Privolzhsky Research Medical University	Optimization of processes in medical activities (in particular, patient routing, organization of the work of the admission and consultation department), the introduction of information technologies and mobile services for consumers
Pyatigorsk Medical and Pharmaceutical Institute	Creation of a routing and navigation system, automation of document circulation of dean's offices and admissions committee, optimization of the work of one faculty and department, the project “Lean Pharmacy”
Siberian State Medical University	Optimization of the admission campaign, library work, registration for practice, rationalization of the processes of working with students, issuing certificates, projects in university clinics, a 5C workplace, rationalization of document flow
Udmurt State University	Rationalization of a number of operations for working with students and staff on the principle of “one window”, improvement of the work of the selection committee, lean electronic document management, electronic publishing, implementation of mobile applications, optimization of the execution of orders and protocols, drawing up reporting documents

However, this is not entirely correct, since lean manufacturing is not directly related to digitalization. Digital technologies can only be an auxiliary tool for the implementation of lean manufacturing. Most likely, the inclusion of information technologies in the number of lean production projects is explained by

institutional factors (the possibility of obtaining funds and resources for informatization of the university's activities within the framework of special projects on lean).

Thirdly, complex projects to rationalize the work of the university as a whole are of great interest (creating common work standards at Kemerovo State University, introducing a system of organizing jobs at Maikop State Technological University). They have the greatest potential and their replication is promising in other universities.

7. Conclusion

Russian universities are in the early stages of implementing the lean manufacturing methodology. The most commonly used lean tools are Mapping, Continuous Flow, Gemba, Kaizen, Visual Factory, and standardized work, which are objectively needed at the outset. Andon, Bottleneck analysis, Hoshin Kanri, Kanban, Poka-Yoke, Heijunka are used much less frequently. However, in the future, we can recommend the introduction of at least Poka-Yoke, Bottleneck analysis and Hoshin Kanri, since they can solve many problems of university management.

In 2018-2020, lean technologies were introduced mainly in the auxiliary and service processes of universities (personnel work, paperwork, activities of admissions committees). At the next stage of implementation of lean manufacturing, universities will need to create work standards, change the organization of workplaces, and use lean tools in educational and scientific activities.

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