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VALUE STREAM MAP OPTIMIZATION MODEL IN THE FIELD OF EDUCATIONAL SERVICES

The relevance of the implementation the Lean Production quality management model in higher education institutions (HEIs) in Ukraine has been proven to optimize the stream of HEIs business processes in order to improve the quality of functioning of HEI as an economic activity subject and increase the competitiveness of educational services, scientific and educational products. The modern approaches of scientists to the Lean Higher Education and the construction of a process model of activity and the identification of key business processes of HEIs are analyzed. The purpose of the article is to develop the optimization model for the stream of business processes based on Lean technologies and to apply the model to visualize and optimize the key process of business process at the Kharkiv National University of Radio Electronics (NURE). A DFD model of the optimization process of the Value Stream Map (VMS) - a quality management tool created within the framework of the Lean methodology for process stream analysis - was developed. The model optimization criteria are proposed. During the development of the map optimization model, the peculiarities of the result of the HEI activity, which is a combination of educational service, educational and scientific product, were taken into account. The practical significance of the article lies in the study of the HEI key process "Development of educational and methodological support of the educational process". Decomposition of the main process was carried out. The second and third levels processes for the value stream mapping was distinguished. The current state VSM of the process "Development of educational and methodological support of the educational process" was developed, the indicators of the effectiveness of the value stream at the department of information and measurement technologies of the NURE were calculated, the "bottlenecks" of the stream were analyzed. Measures to optimize "bottlenecks" based on the criterion of minimizing time are proposed. Prospects for further research in the chosen direction are determined as the implementation of Lean technologies in the activities of HEIs are the development and optimization of VSM for all key processes of HEIs.

Keywords: *Lean Production, Lean Higher Education, business process flow, optimization model, Value Stream Map.*

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МОДЕЛЬ ОПТИМІЗАЦІЇ МАПИ ПОТОКУ СТВОРЕННЯ ЦІННОСТІ В СФЕРІ НАДАННЯ ОСВІТНІХ ПОСЛУГ

Доведено актуальність впровадження моделі управління якістю Lean Production в закладах вищої освіти (ЗВО) України для оптимізації потоку бізнес-процесів ЗВО з метою підвищення якості функціонування ЗВО як суб'єкта економічної діяльності та підвищення конкурентоспроможності освітніх послуг, наукових та освітніх продуктів. Проаналізовані сучасні підходи науковців до реалізації моделі управління якості в сфері вищої освіти Lean Higher Education на базі процесного підходу. Метою статті є розробка моделі оптимізації потоку процесів ЗВО на основі Lean-технологій і застосування моделі для візуалізації та оптимізації ключового процесу діяльності ЗВО в Харківському національному університеті радіоелектроніки (ХНУРЕ). Розроблено DFD-модель процесу оптимізації Мапи потоку створення цінності (МПСЦ) – інструменту управління якістю, створеного в рамках методології Lean для аналізу потоку процесів. Під час розробки моделі оптимізації мапи враховано особливості результату діяльності ЗВО, який є сукупністю освітньої послуги, освітнього та наукового продукту. Наведено рекомендації щодо застосування сучасних інструментів управління якістю під час реалізації кожного функціонального блоку моделі. Практичне значення статті полягає в дослідженні ключового процесу функціонування ЗВО «Розробка навчально-методичного забезпечення освітнього процесу». В результаті декомпозиції ключового процесу виокремлено процеси другого та третього рівнів для побудови МПСЦ. Розроблено МПСЦ поточного стану процесу «Розробка навчально-методичного забезпечення освітнього процесу», розраховано показники ефективно-

сті потоку створення цінності на кафедрі інформаційно-вимірювальних технологій ХНУРЕ, проаналізовано «вузькі місця» потоку та запропоновано заходи щодо їх оптимізації за критерієм мінімізації витрат часу. Перспективами подальших досліджень в обраному напрямку вважаємо розробку та оптимізацію МПСЦ для всіх ключових процесів ЗВО в рамках створення комплексної моделі управління якістю.
Ключові слова: *Lean Production, Lean Higher Education, заклади вищої освіти, потік бізнес-процесів, модель оптимізації, Мапа потоку створення цінності.*

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Introduction

The current Law of Ukraine "On higher Education" declares the principle of autonomy of higher education institutions (HEI) in relation to the organization of educational process, internal management, economic and financial activities in order to ensure the competitiveness of HEIs by improving the quality and consumer value of educational services. Due to the wider powers granted to the HEIs in the field of educational, economic and financial activities, it becomes important to implement modern methods of doing business, based on advanced concepts and models of quality management. In the context of the need to revive the economic and educational potential of Ukraine during and after the end of the martial law regime, the application of the organization management model, which provides for a continuous increase in the consumer value of the product through the minimization of all types of losses, improvement of the efficiency of resource use, and improvement of quality, becomes especially relevant. This model is the internationally recognized Lean Production methodology, which in the field of improving the provision of educational services of higher education institutions is known as the concept of Lean Higher Education (LHE).

LHE considers the functioning of the HEI as a set of interrelated processes, which has the form of a continuous flow of educational services from the customer to the consumer. The purpose of Lean principles is to optimize the flow of business processes of the HEI by eliminating or minimizing all types of losses that do not add consumer value to the educational service. The improvement of business processes occurs due to the rationalization of the use the all types of resources in order to minimize the costs of pedagogical activities and time for the creation and implementation of educational products and their scientific and methodological support, guaranteed provision of quality knowledge in a minimum period. Therefore, the actual task of forming a modern model of HEIs development in Ukraine is to develop a system for optimizing the processes of providing educational services based on the use of Lean-quality management tools.

However, the result of the activities the modern HEIs is not only educational services, but also educational and scientific product, that is, intellectual property in the form of teaching and methodological support for the educational process, scientific articles, patents, services for production tests, etc. Thus, the result of the HEI activities is a set of educational services, educational and scientific products (Buaita, 2021). This duality of the nature imposes its influence on the peculiarities of the Lean technologies usage during its implementation in the HEI, which requires mandatory accounting in the modeling of business processes.

Literature review

The creation and development of the theory, methodology, tools and aspects of the applied implementation of the Lean production concept were world-renowned experts in the field of quality management T. Ohno (1988), S. Shingo (1989), J. Womack and D. Jones (1996), M. Vader (2013), M. George (2002), W. Levinson (2002), etc. The emphasis on the analysis and optimization of business processes flow was made by modern scientists M. Rother and J. Schuk (2017), B. Keyte and D. Locher (2016), P. L. King and J. S. King (2015), R. M. Belokar, V. Kumar, S. S. Kharb (2012), Nuri Özgür Doğan and Burcu Simsek Yagli (2019) and others.

In Ukraine, the substantiation of the prospects for the implementation the principles of Lean Management philosophy and the analysis of the application the Lean tools in various sectors of the economy have been covered in the scientific works of such leading scientists in the field of quality management, as H. M. Skudar (2011), M. A. Myronenko (2015), T. V. Omelianenko (2009), F. D. Shvets (2020), H. IU. Shportko (2015), etc. Since 2016, Lean Institute Ukraine has been operating in Ukraine. Lean Institute Ukraine is a representative of the worldwide Lean Global Network, which was founded by James Wumek and Daniel Jones, thanks to whom the Lean philosophy became known all over the world. Lean Institute Ukraine actively contributes to the implementation of Lean methodology in the Ukrainian business space by conducting courses, trainings, webinars, conferences, consulting services and auditing of organizations in various spheres of business.

The experience of implementing the LHE principles in foreign HEIs is analyzed in the article “Implementing Lean in a higher education university” (University of Central Oklahoma (USA), University of Minnesota (USA), British business schools and universities) (Dragomir & Surugiu, 2013). In Ukraine S. Yermakova was the initiator of the Lean principles implementation in the field of educational services. She noted that implementation of Lean technologies in the process of students professional training in the HEIs can be considered as an investment in the training of future specialists of the highest level and the most productive, reliable, economical way to ensure the competitiveness of Ukrainian HEIs (Yermakova, 2013). O. V. Vahanova and A. S. Kumarhei note that Lean technologies help in solving many internal problems of HEIs, namely: improving the quality of educational services and developing the educational and scientific products, improving production processes in the structural units of the university, increasing the level of corporate culture (Vaganova & Kumarhej, 2019).

The implementation of Lean technologies in the process of HEI functioning is based on the formation and analysis of the continuous flow of educational, scientific and managerial business processes of the university.

M. S. Sohail identifies the key processes in the activities of the HEI (Sohail, 2006):

1. Product development (design and development of educational programs and courses).

2. Marketing (all types of HEI marketing).

3. The process of providing related services to students (registration, accommodation, tuition fees, etc.).

4. The educational process (all processes related to educational process).

5. Assessment (all academic procedures relating to continuous assessment and control of knowledge).

6. Student activities (processes related to student self-government).

L. M. Vitkin identifies eight key processes in the activities of the HEI: leadership responsibility; management of resources; analysis, measurement and improvement; students recruiting; educational process; development of curriculums and educational programs; employment of graduates; teachable process (Vitkin, 2018). Construction of the HEI process model is devoted to quite a lot of works of Ukrainian scientists (Annienkova, 2011; Savchenko, 2015).

However, the issue of analysis and optimization of HEI business processes in the framework of the LHE principles implementation in Ukrainian universities, taking into account the peculiarities of their functioning, which is due to the specificity of the product, that is, the totality of educational services, educational and scientific products, has not been developed.

The purpose of the article is the developing a model for optimizing the processes flow in HEIs on the basis of Lean technologies and applying a model for visualization and optimization of the key process at the Kharkiv National University of Radio Electronics (NURE).

Research methodology

The value stream is formed by the sequence of production and logistics processes of developing and moving value from supplier to consumer and synchronized with the flow of orders.

Value Stream Mapping (VSM) is the visualization tool of value flow in the Lean Production methodology. VSM – a graphical representation of material and information product flows from supplier to consumer in the form of a set of interrelated processes indicating significant parameters. Value stream optimization is aimed at achievement the target values of flow efficiency factors by minimizing wasteful or non-value adding activities simultaneously with ensuring product compliance with customer demands.

The general optimization process by VSM consists of the stages:

1) development of the current state map;

2) analyzation of the current state map in order to identify the wasteful activities that do not add value to the product;

3) formulation of the measures to minimize the identified wasteful activities;

4) development of the future state map.

To achieve the purpose of the research, it is necessary to develop a comprehensive model of the VSM optimization process with the identification of quality management tools for each functional block of the model, and make recommendations on the peculiarities of their using, taking into account the dual nature of the HEI activity result as a product and service.

VSM optimization process modeling is carried out according to the methodology of structural analysis of data flows DFD (Data Flow Diagrams) (Noha, 2015). The basic working element of the DFD model is a graphical representation of the data flow in the information system (DFD-diagram). DFD-diagram describes the movement of data, processing and storage. The DFD model syntax is represented by functional blocks, data storages, external entities and arcs that reflect the direction of the information flow.

The functional blocks display the function of the studied process, which converts input data into output results. The functional blocks are denoted by letter A (Activity) and numbered in the direction of the data flow.

Data storages reflect the temporary storage of intermediate processing results or the results obtained during the implementation of the previous process. They are marked by letter D (Data store) and numbered in the direction of the data flow.

Arrow arcs visualize the direction of the data flow in a simulated process with comments on the object movement features.

External entities describe data sources for model inputs and data receivers for outputs E (external).

The advantages of DFD-modeling to VSM optimize are an intuitive representation of passing the data flow process, which allows to use the model by specialists of different profiles during teamwork; the possibility of processes decomposition, that is, separation into structural components, the relationships between which can, if necessary, be modeled within the framework of the same notation; the ability to create a context chart that displays the limits of the DFD model for clarity of its functional purpose. Due to these advantages, the DFD methodology is widely used in business process modeling as part of system documentation.

DFD-model of VSM optimization is given in Fig. 1.

A1 – Construction of the current state map. It consists of the subprocesses of setting the VSM purpose, selecting an object or group of objects according to certain criteria, forming a graphical representation of the current state map (Fig. 2). At this stage, the flow input and output, the process stages, the parameters of the process stages, inventories, indicate material and informational flows. The result is a graphical model of the current state map – D1.

A2 – Constructing the TimeLine of the process. TimeLine or process chronology is formed to visualize the time ratio that is spent directly adding value to an object, to the total time of the process, and has the form of a broken line with upper and lower levels. The top level of TimeLine corresponds to the average length of time during which a unit of product moves through the entire process, including the waiting time between the steps of the process (LeadTime (LT)), and the lower level of TimeLine is the average length of time during which one or more steps are performed within the process (CycleTime (CT)).

A3 – Calculation of flow efficiency indicators. The result of the A3 process is the D2 storage, which contains calculated values of flow efficiency indicators.

The indicator of the flow efficiency is called the Flow-Time Efficiency Index or Process Efficiency Index or Stream Efficiency Index (SEI). SEI is calculated by the formula:

$$SEI = \frac{CT}{LT + ILT} \cdot 100\,\% \qquad (1)$$

where ILT (Inventory Lead Time) – waiting time that the products spend in inventory, which is calculated by multiplying takt time and average number of items in inventory.

In the case of analysis the process of providing services, the Inventory Lead Time is transformed into the time spent on a partially performed service, for example, the student’s unverified control work or e-mails that waiting for an answer, etc.

The task of flow optimizing is a maximum increasing of SEI (the target value is 100 %, which means a hypothetical situation of the absence of any wasting time that are not directly related to the processing of the object, and the absence of inventory). For modern companies that use Lean Production methods to optimize the production or service delivery process, the value of the SEI is not less than 10 %, and the target is the SEI at 20 % (George, 2002).

Another indicator of flow efficiency is the Stream Non-Defectiveness Index (SNI), which reflects the share of suitable output products to suitable products at the flow input. Calculated by the formula:

$$SNI = \prod_{i=1}^{n} \left(\frac{(100 - PD)}{100} \right) \cdot 100\,\% \qquad (2)$$

where PD is the proportion of defective products on the *i*-th operation;

n is the total number of operations.

Thus, the benchmark of the SNI is 100 %, when the percentage of suitable products at the flow output is equal to the percentage of suitable products at the flow input. The increase of the SNI is ensured by measures aimed at ensuring the non-defective production at each production cycle operation.

During the construction of the VSM for educational service, the SNI is transformed into a stream quality indicator (SQI):

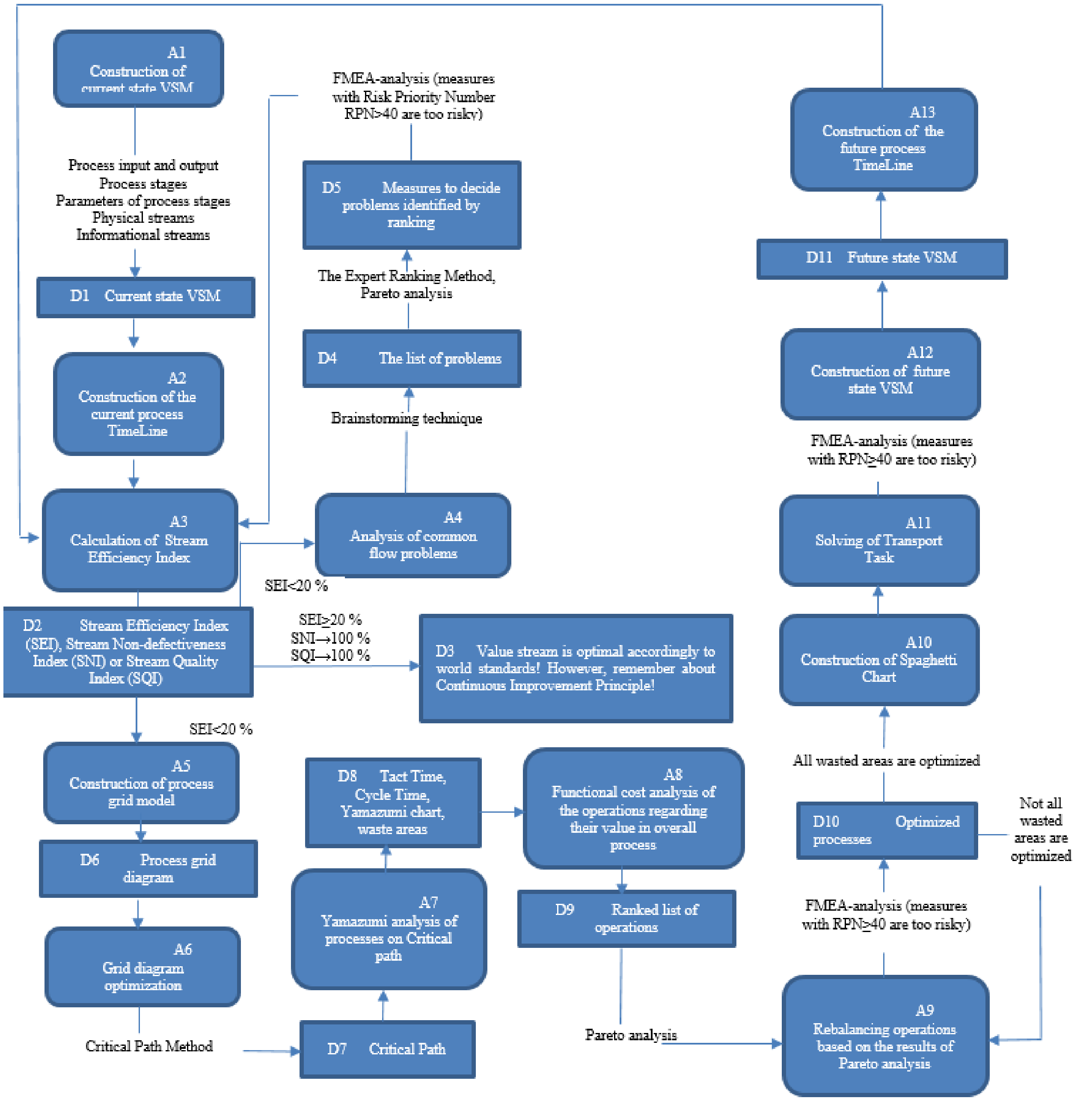

Figure 1 – DFD-diagram of the VSM optimization process (developed by the authors)

$$SNI = \prod_{i=1}^{n}\left(\frac{(100 - PD)}{100}\right)\cdot 100\,\% \qquad (2)$$

where QI is the resultant quality coefficient of performance on each stage of the educational services process, which is calculated as the actual value of the quality indicator for a certain process, reduced to the target value of this indicator.

The target value of the SQI is 100 %, which means full compliance of the quality indicators of each flow process with the target value.

D3 – If the flow performance indicators are equal to the target value defined by the company, the value stream is optimal. That requires according to the principle of continuous improvement the revision of the target values in order to exceed the current results. But perhaps after solving more urgent problems!

A4 – Analysis of common flow problems is the first step to improve the efficiency of the value flow that requires optimization. Identification of flow problems, that is, the process deviation from target indicators, is carried out by the "brainstorming" method. Then the problems are visualized on the VSM, determined the places of their detection and occurrence. The main indicators of flow problems are downtime and the inventory for the production of educational or scientific product, or wasting time to provide educational services.

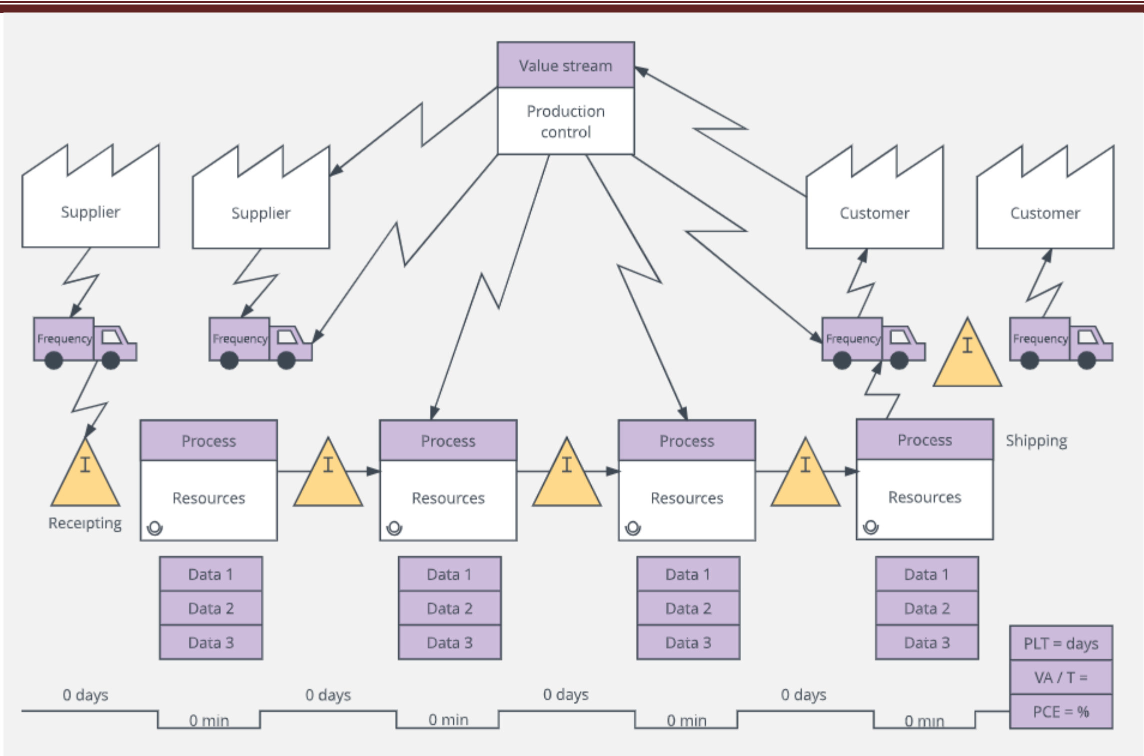

Figure 2 – General view of the current state map

D4 – Flow problems list with the identification of the operation on which the problem is detected and the operation on which the process was physically deviated. The ranking of problems by importance is carried out using the Expert Ranking method, Pareto analysis, Ishikawa diagram, etc.

D5 – Measures to solve the problems that identified as a result of ranking, developed by an expert group. The risks of implementation of the proposed measures are analyzed using FMEA-analysis (Failure Mode and Effects Analysis). Measures for which the calculated value of the Priority Risk Number (PRN) exceeds 40 points are rejected. New flow efficiency indicators are calculated taking into account changes in the production process as a result of the implementation of approved measures (A3).

In case of failure to achieve the target flow efficiency indicators, the functional unit A5 (Construction of process grid mode) is realized.

D6 – The Process Grid diagram displays a full set of operations with the linkages (paths) and duration between them. The purpose of using the grid planning is to optimize the process by the criteria of time minimization by determining the critical path (the path on which the reserve for each operation is zero – D7) (Nikitenko et al., 2019).

A7 – Yamazumi analysis is carried out in relation to processes that are located on the critical path of the grid model. The Yamazumi analysis technology is the Workload chart – visualization of loading each stage of the process in the form of a column chart (George, 2002).

Operations for which the cycle time does not equal to the takt time, that is, the so-called "bottlenecks", are subject to rebalancing – redistribution of loading operations. During rebalancing, the sequence of subprocesses changes for operations requiring regulation. Some subprocesses are transferred from more loaded operations to less loaded or selected into a separate operation according to the takt time.

For the correct carrying out of the rebalancing procedure, it is expedient to determine the value of each sub-process in the operation, which is achieved by applying the methodology of Functional Cost Analysis (FCA) (A8) (Lytvyn, 2007). The result of FCA analysis is a ranking list of subprocesses regarding their value in the general process (D9). Based on results of Pareto's analysis conducted by the expert group, the list of subprocesses is analyzed for the possibilities of rebalancing individual operations, or even eliminating some subprocesses that do not add value to the object and can be eliminated without reducing the process quality (A9).

In the case of an analysis of the educational service VSM the subprocesses of this service are rebalanced as necessary within the framework of a certain operation, defined as a "bottleneck" of the general process. For example, during the assessment of a student’s group, it is advisable not to wait for the student to answer the question, which caused him a complication, but to give him some time to formulate the answer. This time is advisable to apply to start the assessment of another student or to make the assessment for answers to other students.

D10 – Optimized processes. After analyzing the risks of the rebalancing procedure using FMEA-analysis, if there are optimized “bottlenecks”, we return to the functional unit A9. If all “bottlenecks” are optimized, then the next step in optimizing the value flow is to analyze the waiting time between processes on Timeline, i.e. the time wasted on transporting or transferring the production object in the case of a product, or the time wasted on preparing the next process in the case of making the service.

A10 – Construction of Spaghetti Chart (a tool for visualizing the movement of an object between the locations of physical process execution). First, we have to construct the actual plan for movement of the objects with the indication of the inventory and needs of each operation, which is then visualized by VSM. In the case of the educational service analysis, the Spaghetti Chart is transformed into Process Decision Program Chart (PDPC) in the UML notation (Unified Modeling Language).

A11 – Solving of the Transport Task or optimization of the PDPC. Optimization of the way of moving the production is achieved by solving the Transport Task (Bilichenko, 2017). Based on the target Spaghetti Chart formed as a result of solving the Transport Task, the expert group formulates a list of possible measures that will maximally approximate the current state Spaghetti Chart to the target state.

PDPC for the case of making the educational service can be optimized by quantifying the current chart according to the criteria of information value and complexity of elements and forming the target PDPC, to which it is necessary to approximate the current chart.

After checking the efficiency of implementing measures by FMEA-analysis, we have to move to the A12 functional units – the Construction of the VSM future state (the result in the D11 storage) and A13 – the Construction of the future state Timeline. The calculation of the flow efficiency indicators on the VSM future state closes the optimization cycle.

Results

One of the key processes in the functioning of HEIs is the process of developing educational and methodological support of the educational process (Sohail, 2006). The main component of educational and methodological support for the training of higher education applicants in Ukraine is the complex of teaching and methodological support (TMS), which is a set of didactic and methodological documents aimed to the making the educational services of a particular science or field of knowledge. In the "Regulations on the complex of educational and methodological support of the discipline" NURE determined that TMS is a set of normative and educational materials in paper and/ or electronic forms, necessary and sufficient for the effective performance by students the discipline working program provided by the Curriculum of training students of the certain educational level in the specialty (educational program, specialization) preparation.

The map of the processes obtained as a result of the decomposition of the key process "Construction of teaching and methodological support of NURE educational process" is given in Fig. 3.

Based on the allocation of subprocesses as a result of decomposition, the VSM current state of the key process "Construction of teaching and methodological support of NURE educational process" is developed (Fig. 4).

According to the order of NURE № 170 from 02.06.2021 "On the norms of time for planning and accounting of educational, methodological, scientific, organizational work of scientific and pedagogical workers of NURE" the development of the TMS of the academic discipline is 50 hours per 1 ECTS (European credit transfer-accumulation system). Process TimeLine is built for the discipline of 6 ECTS, that is, the time spent by the lecturer to develop and implement in the educational process TMS, calculated based on the target value of 300 hours.

The value-adding time during the implementation of each process and the waiting time between processes was defined as the average value of the certain values according to the survey of scientific and pedagogical workers of the Department of Information and Measurement Technologies (IMT) NURE. We also took into account that according to the survey results, during the development of TMS, the lecturer pays time to create value on average 3-4 hours per day.

The occurrence of the event "Approval of the document" will be determined by the Poisson distribution, since the process of development and approval of the TMS can be considered as a "flow of events", each of which occurs with small probability at a certain period of time. Since, according to the internal normative documentation (ND) of NURE, the renewal of the TMS of each discipline should take place at least once every 5 years, we have a time interval taking into account the leave of 1546-1826 days. The probability of the event occurrence at this time interval for one discipline and one teacher is 0,0005-0,0006. At the department IMT 10 lecturers are teaching 155 discipline. Hence the probability of the event occurrence is 0,78-0,93.

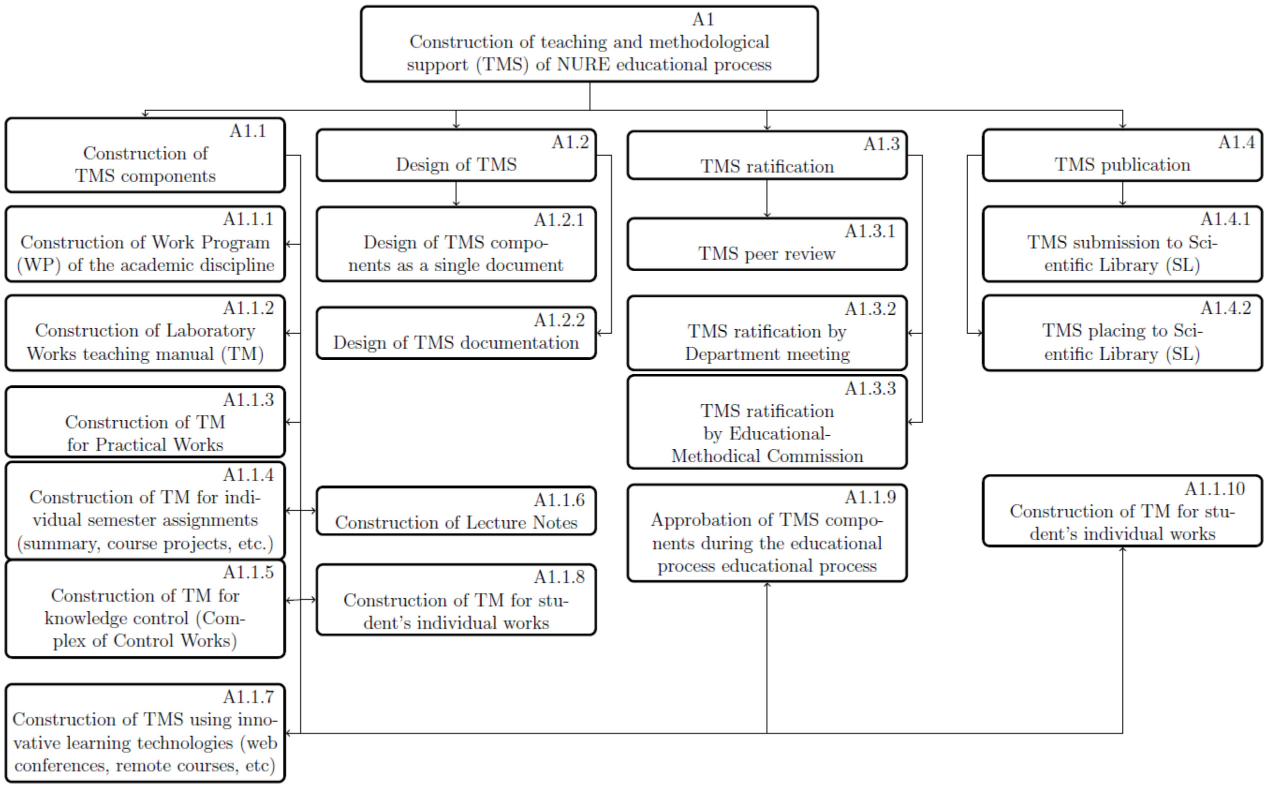

Figure 3 – Decomposition of the process "Construction of teaching and methodological support of NURE educational process"

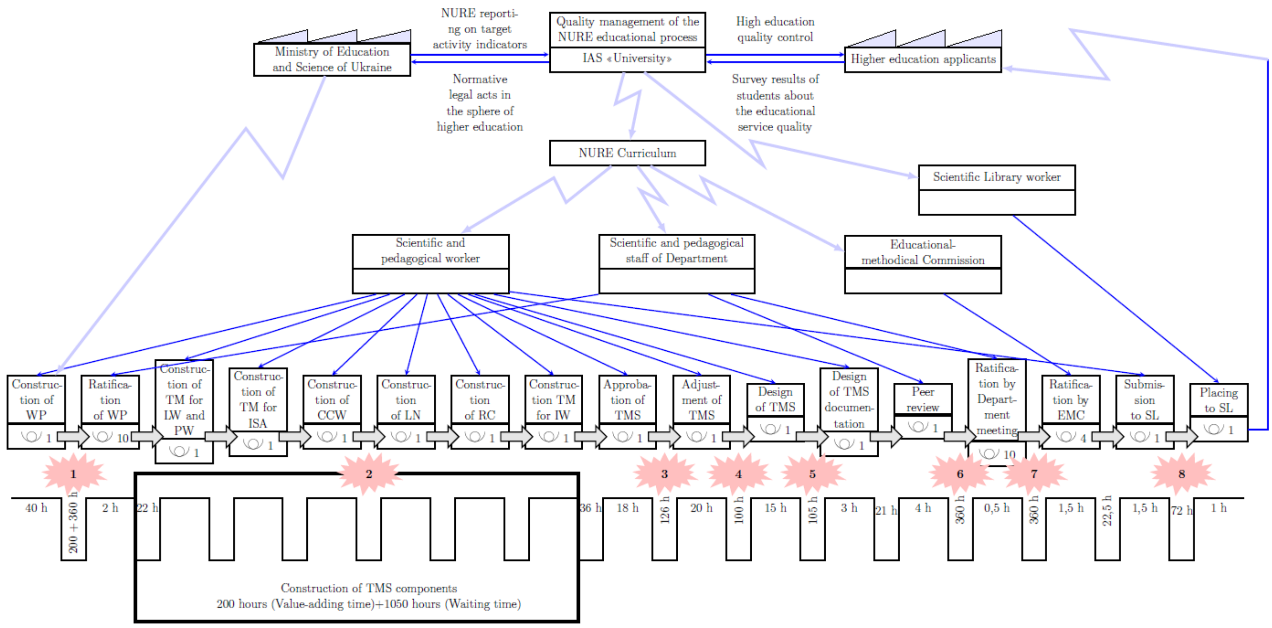

Figure 4 – VSM current state of the process "Construction of teaching and methodological support of NURE educational process"

Since, according to the internal ND of NURE, the meeting of the Department and the Educational-Methodical Commission (EMC) should be held at least once a month, the waiting time from the process of document development to its approval by the Scientific and Pedagogical Staff (SPS) of the Department and EMC is an average of 360 hours (15 days).

Thus, we got the CycleTime=320 hours, the LeadTime=2834,5 hours. Accordingly:

$$SEI = \frac{320}{2834,5} \cdot 100\% = 11,3\%.$$

According to the results of the survey, the SNI is 100%, that is, all the developed TMS elements are suitable and implemented as an educational-methological support of the discipline in the educational process.

Discussion

The SEI of the process “Construction of teaching and methodological support of NURE educational process” at the IMT Department, NURE (11,3 %) reaches the accepted by Lean-management practitioners lower permissible limit of SEI (10 %), but is far from the target value (20 %). At the same time, the SNI is equal to the target value (100%).

To increase the SEI of developing the educational product, we have to analyze the "bottlenecks" of the process and offer measures for their optimization by the criteria of minimizing the waiting time. At the VSM "bottlenecks" are allocated with the help of a special symbol “Kaizen explosion” .

The first “Kaizen explosion” – Reducing the waiting time from the process of working program (WP) development to the process of its approval at the meeting of the Department can be achieved by preliminary planning of the development terms the current TMS in order to synchronize the date of approval or holding an unscheduled meeting of the Department in order to approve the WP by the Department SPS.

The second “Kaizen explosion” – Reducing the waiting time between the processes within the framework of the TMS elements development process can be achieved by planning the loading of the teacher and setting the specified terms of TMS development. For example, if the lecturer by means of time planning the download will free up time to develop TMS elements for 6 hours a day, then the waiting time will decrease from 1050 hours down to 900 hours (21·50=1050 hours, 18·50=900 hours). The reducing of the TMS development process time can be obtained by rebalancing the operations within the framework of the general process according to the Yamazumi methodology. For example, after the development of lecture material on a specific topic, immediately develop practical, laboratory tasks, control tasks, tasks for self-study on this topic. Such rebalancing will eliminate the unnecessary process of re-concentrating on the lecture material before developing other TMS elements on the topic.

The third and the forth “Kaizen explosion” – The reduction measures are based on the appropriate planning of loading the lecturer.

The fifth “Kaizen explosion” – Reducing the waiting time between sub-processes within the framework of the TMS registration process can be achieved by using specialized software for the preparation of scientific documents, for example, the Latex publishing system.

The sixth and the seventh “Kaizen explosion” – Measures to reduce the wasted time are similar to the measures proposed to reduce wasted time for the first “Kaizen explosion”.

The eighth “Kaizen explosion” – Reducing the waiting time from the process of TMS submission to the Scientific Library (SL) NURE to the process of TMS placing in SL can be achieved by planning the loading of the SL employee.

Conclusion and agenda for future research

In the course of the research, the relevance of Lean-technologies implementation in Ukrainian HEIs for optimizing the flow of business processes in order to improve the quality of HEI functioning as a subject of economic activity and increase the competitiveness of educational services, scientific and educational products was substantiated.

The DFD-model of the VSM optimization process was developed. The proposed model of VSM optimization takes into account the features of the HEI’s activity result, which is a set of educational services, educational and scientific product.

Practical application of the developed model was carried out during the analysis of the key process of HEI’s functioning "Construction of teaching and methodological support of NURE educational process". As a result of using the decomposition method to the analyzed process, the processes of the second and third levels for the VSM construction have been allocated. The current state map of the process “Construction of teaching and methodological support of NURE educational process" has been developed, the flow efficiency indicators at the IMT Department (NURE) have been calculated, the "bottlenecks" of the flow have been analyzed and measures for their optimization have been proposed according to the criteria of wasted time minimizing.

Prospects for further research in the chosen direction are seen in the expert analysis of potential risks and dangers of the proposed measures, the implementation of the measures at the Department of IMT, NURE and the calculation of flow efficiency indicators after optimization process.

The next steps in the implementation of Lean technologies in the activities of HEIs are the development and optimization of VSM for all key processes of HEIs, which will be the first stage of implementing a comprehensive Lean quality management model to minimize wastes in all aspects of the organization's activities.

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