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# TECHNOLOGY FOR IMPLEMENTING THE LEAN SIX SIGMA QUALITY MANAGEMENT MODEL IN HIGHER EDUCATION INSTITUTIONS. PART 1: IDENTIFICATION AND MEASUREMENT OF THE EDUCATIONAL PROCESS CRITICAL TO QUALITY CHARACTERISTICS

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**Abstract**
The relevance of the Lean Six Sigma (LSS) quality management methodology implementation in the Ukrainian higher education institutions (HEIs) to improve the efficiency of educational and scientific business processes in accordance with the recommendations of DSTU ISO 21001:2019 Educational organizations — Management systems for educational organizations — Requirements with guidance for use (ISO 21001:2018, IDT) and Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) is substantiated. The scientific and applied works of modern foreign and domestic scientists devoted to the adaptation of the LSS model to the conditions of HEIs functioning are analyzed. The aim of the article is analyzing the features of the technology for implementing the LSS methodology in HEIs in order to improve educational and scientific business processes and the applied application of LSS technology in the Ukrainian educational environment. The use of the DMAIC cycle as a basic LSS technology for consistent improvement of the functioning business processes of HEIs is substantiated. The tasks, tools and results of each stage of the DMAIC cycle implementation for the sphere of higher education are defined, taking into account the specific of the result of the HEIs activity which is defined as a set of educational and scientific services and products. The practical significance of the article lies in improving the quality of the educational process in HEIs through the use of the continuous improvement cycle DMAIC and LSS tools in order to increase the efficiency of the implementation of the key process "Development of educational and methodological support (EMS) for the educational process". Critical to quality characteristics (CTQC) of the educational product "Complex of Educational and Methodological Support (CEMS)" are determined. The initial CTQC of the process "Development EMS for the educational process" and its target values have been established and calculated. The prospects of the study are the application of DMAIC technology and other tools for the implementation of the LSS quality management methodology to improve the efficiency of all key educational and scientific business processes within the framework of the development of a comprehensive model of the HEIs quality management in accordance with the principles of modern International and European standards in the field of education. The perspectives of the study are a critical analysis of CTQC with the aim of determining the causes of their non-compliance with the target critical characteristics, the implementation of corrective measures in the educational process, and the development of CTQC sustainability control procedures.
**Keywords:** Lean Six Sigma (LSS), higher education institutions (HEIs), business process, DMAIC cycle, Value Stream Map, CTQC.

## 1. Introduction

The International Standard in the field of the educational process quality assurance DSTU ISO 21001:2019 Educational organizations — Management systems for educational organizations — Requirements with guidance for use (ISO 21001:2018, IDT) was introduced in Ukraine as a national standard in 2019. This normative document directly correlates with the general standard for quality management systems in organizations DSTU ISO 9001:2015 Quality Management Systems — Requirements (ISO 9001:2015, IDT) and reflects the principles of the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG).

The ISO 21001:2018, in addition to general guidelines and principles for the implementation of quality management systems in educational institutions, contains a list of processes, quantitative indicators and tools for quality assessment in educational organizations (Annex E. Processes, measures and tools in educational organizations). For quality management in educational institutions, the standard recommends using, along with expert quality control methods, tools that were previously used to analyze the quality of production processes, namely: statistical data analysis, functional and cost analysis (FCA) and the most modern hybrid methodology "Lean Six Sigma (LSS)", which combines all the advantages of the "Six Sigma" and "Lean Production" quality management models. The implementation of the principles and tools of the LSS quality management model in higher education institutions (HEIs) is of particular relevance in Ukraine during martial law, as LSS focuses on eliminating the causes of defects and product quality on the one hand and minimizing resource costs on the other hand.

## 2. Literature Review

The idea of combining the quality management methodologies of "Lean Production" and "Six Sigma", which were previously considered to be competing, appeared in the early 2000s in the works of J.H. Sheridan (2000) [1] and was quickly adopted by scientists and practitioners of quality management, namely Michael L. George (2002) [2], B. Smith (2003) [3], E.D. Arnheiter and J. Maleyeff, J. (2005) [4], R. D. Snee (2010) [5], L. Corbett (2011) [6], M. Brenig-Jones and J. Dowdall (2018) [7], J. Antony (2021) [8], etc. The appearance of such a popularizing publication as Lean Six Sigma Business Transformation for Dummies [9] testifies about the prevalence of the LSS concept, and since 2010 Emerald Publishing Limited has been publishing the Limited International Journal of Lean Six Sigma edited by Professor J. Antony.

The key principles of the LSS methodology reflect the basic Six Sigma tenets [2]:

1) emphasis on reducing the number of defects and improving the quality of products and services from a consumer point of view;

2) increasing the stability of processes;

3) use of both own and well-known statistical tools for informed decision-making, which ensures effective problem solving;

4) creating a resilient infrastructure that supports cultural changes in the organization;

and the basic Lean principles:

1) Lean considers the functioning of the organization as a continuous flow of interrelated business processes;

2) Lean distinguishes the processes that add and do not add consumer value to the product;

3) Lean uses its own tools to analyze, optimize the flow of processes and maximize the process rate;

4) Lean has a set of technologies that minimize the cost of resources of all types.

Although not so long ago these quality models were considered by some scientists as competing, today the synthesis of the main directions of Six Sigma" and "Lean Production" influence on the processes in modern models of quality management is considered mandatory [2], because:

1) "Lean Production" does not solve the problem of achieving statistical controllability of processes;

2) "Six Sigma" does not significantly affect the increase in the processes rate and the reduction of resource consumption.

The integrated use of two approaches can ensure the product and services quality increasing at the same time as accelerating and stabilizing business processes and reducing all types of wastes.

The service industry has actively adopted the philosophy, methodology and toolkit of LSS and adapted its achievements in order to reduce cycle times and improve the quality of customer service. Thus, according to a study by V. Sunder, the acceptance rate of the LSS model in service organizations in the banking and financial sector, healthcare and information technology is 98.8% [10]. Studies of practical implementation in the service sector were carried out by Frings and Grant (2005), Antony et al. (2007), Laureani et al. (2010). The theoretical basis for the adaptation of LSS in service organizations was the works of M. George (2003) [2], J. Antony (2021) [8]. In 2003, M. George, founder and president of the consulting company George Group, formulated the reasons that make the LSS model effective for use in service organizations [2]:

1) service delivery processes are often slow, i.e. costly, which causes errors and, as a result, customer dissatisfaction;

2) the service delivery rate is low due to the excess of work-in-progress that accumulates as a result of the excessive complexity of the service;

3) for slow processes, the Pareto principle is effective, according to which 80% of time and resources are spent on 20% of the activity.

The above reasons fully apply to the field of educational services. And as a result of these considerations, in 2012 J. Antony, N. Krishan, D. Cullen and M. Kumar, M. analyzed the opportunities, difficulties and conditions for the use of LSS in HEIs. Scientists have formulated the challenges posed by the implementation of LSS principles in HEIs [11]:

1) difficulties in applying the production-oriented terminology of LSS in the education sector;

2) the need for a systematic approach to the analysis and optimization of educational processes;

3) the bias of University administration regarding the effectiveness of LSS in the field of education, based on the perception of Lean as a purely production model of quality management;

4) immoderate and rapid implementation of LSS in practice, which leads to budget deficits and problems with customer satisfaction;

5) the need to apply a process approach to the analysis of the HEI functioning;

6) the HEI corporate culture should be based on the principles of openness, trust and acceptance of changes;

7) lack of understanding between all types of consumers of the educational product, namely, students, teachers, engineering and technical staff and administration;

8) lack of understanding and competition between individual departments of HEIs;

9) lack of financial and time resources;

10) weak connection between projects to improve the quality of educational services and the strategic goals of HEIs.

Some elements of LSS have begun to be implemented in the field of education (Sunder, 2016) in institutions such as Kings College, London; National University of Singapore; Valdosta State University, Georgia; Heriot Watt University, UK; Gordon State College, USA, etc. But there was no scientific literature on the methodology of LSS applying, taking into account the specifics of consumers, the result of activities, and corporate culture in HEIs.

In 2022, a full-fledged book by Antony S. and Anthony J. was published, in which the authors theoretically substantiated the features of the use of LSS in higher education and, using specific cases as an example, analyzed the conditions and results of implementing the LSS model in UK HEIs [12]. This book has become the theoretical and practical basis for the use of the LSS model in educational institutions around the world.

In Ukraine, although there are some works on the application of the Lean Higher Education methodology in the field of higher education [13], there is no literature that analyzes the peculiarities of the LSS principles and tools implementation in HEIs, taking into account the specifics of activities, corporate culture, and the conditions of martial law in our country.

The aim of the article is analyzing the features of the technology for implementing the LSS methodology in HEIs in order to improve educational and scientific business processes and the applied application of LSS technology in the Ukrainian educational environment.

## 3. Research Methodology

The technology for implementing the LSS methodology is based on DMAIC (Define, Measure, Analyze, Improve, Control) and DMADV (Define, Measure, Analyze, Design, Verify) + DFSS (Design for Six Sigma) improvement cycles. The DMAIC cycle is used to consistently improve the organization's already functioning business processes, while the DFSS methodology, implemented in the DMADV cycle, helps to design, develop and implement new business processes that will best meet the Six Sigma excellence criteria, namely the DPMO (Defects per Million Opportunities) has a score of 3.4. The results of improving business processes in the field of higher education with the help of the DMAIC cycle as part of the Six Sigma and LSS models implementation are presented in scientific papers [14, 10]. However, more significant results will be achieved by using a huge Lean+Six Sigma toolkit, taking into account the specifics of the results of the HEI's activities, which combine both educational services delivery and the generation of educational and scientific products. This feature must be taken into account when modeling the business processes of HEIs and determining the conditions for the use of quality management tools [15].

Table 1 shows the tasks and tools for the implementation of each stage of the DMAIC cycle for higher education, taking into account the duality of the results of HEIs.

Table 1 – Tasks, tools and results of the implementation of the DMAIC cycle in HEIs according to the LSS model (developed by the authors)

| Stage | Tasks | Tools | Results |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| D (Define) | Determination of goals, parameters and indicators of the educational process effectiveness in HEIs. Development of a process map with the identification of "bottlenecks" | Methodology for determining key performance indicators (KPIs) of the process<br>Methodology for Determining Indicators Critical to Quality Characteristics (CTQC) of the process<br>Quality Function Deployment (QFD) Technology<br>SIPOC (Supplier, Input, Process, Output, Customer) diagram method<br>Value Stream Mapping (VSM) Method | A project definition form that includes a description, goals, timelines, and process executors<br>Process Performance Indicators<br>SIPOC Diagram<br>Value Stream Map |
| M (Measure) | Planning the collection of statistics and quantifying the performance indicators of the process. Calculation of the "sigma" coefficient of the process. Analysis of the process reproducibility. Analysis of process variability | Methodology for calculating DPMO according to ISO 13053-1:2015<br>Seven Classic Quality Control Tools<br>Methodology for Calculating Value Stream Performance Indicators<br>Failure Modes and Effects Analysis (FMEA)<br>Statistical Data Analysis<br>Methodology for Evaluating Quality Indicators Based on Process Reproducibility Coefficients | DPMO indicator<br>Check Sheets<br>Control Maps<br>Quality Histogram<br>Pareto Chart<br>Process Cycle Efficiency (PCE)<br>Stream Non-Defectiveness Indicator (SNI)<br>Stream Quality Indicator (SQI)<br>FMEA Table<br>Process Reproducibility Index |
| A (Analyze) | Analysis of the KPIs for compliance with target values. Identification of influencing factors that cause non-compliance and their ranking by priority | Cause and Effect Diagram<br>Decision Tree<br>Correlation and regression analysis<br>Analysis of Variance (ANOVA)<br>Priority Matrix Method<br>FMEA Analysis<br>The 5-Why Method<br>Analysis of «bottlenecks» at the VSM<br>Pareto Chart<br>Hypothesis testing methods | FMEA Process Results<br>Ranked Influencing Factors<br>Factors that cause 80% of problems<br>Correlation coefficients<br>"Bottlenecks" at the VSM<br>Hypothesis test results |

*The end of the table 1*

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| I (Improve) | Development of Sustainable Process Improvement Measures<br>Identification of the most effective measures according to the established criteria<br>Event Risk Analysis<br>Implementation of measures | Benchmarking<br>Total Productive Maintenance (TPM) Method<br>Process rebalancing<br>Just-In-Time (JIT) Methodology<br>Kaizen Events<br>5S+1 Ordering System<br>Single Minute Exchange of Dies (SMED)<br>Experiment Design Method<br>Value Stream Mapping<br>Priority Matrix Method<br>FMEA Analysis<br>Pareto Chart<br>Methodology for Evaluating Quality Indicators Based on Process Reproducibility Indices | Priority Decision Matrix<br>Sustainable Process Improvement Measures<br>FMEA-Table of the Event Risk Analysis<br>Improved Process Reproducibility Index<br>MPSC of Future Status<br>Future State Process Cycle Efficiency |
| C (Control) | Documenting an improved process<br>Development of a control plan<br>Monitoring the effectiveness of activities<br>Development of an automatic control system | Standard Operating Procedure (SOP) Map<br>Visual Management Technique (Andon)<br>Rule for stopping the process in case of poor-quality work (Jidoka)<br>"Poka-Yoke" anti-bug system<br>Control Map Method<br>Calculation of the process economic efficiency<br>Process Audit | Process Management Plan<br>Control Maps<br>Updated Metrics Critical to Process Quality (CTQC)<br>Financial indicators of process performance<br>Process Audit Results |

Since the LSS methodology is focused primarily on the management of individual projects in order to achieve the business goals of the organization, the appropriate quality management tools are selected depending on the characteristics of the process (project), which is improved through the DMAIC cycle.

## 4. Results

Based on the analysis of literary sources in the article "Value Stream Map optimization model in the field of educational services [15], it is established that one of the key processes in the functioning of HEIs is the process of educational and methodological support (EMS) development for the educational process. Therefore, an important applied task of implementing the LSS concept to improve the quality of the educational process in HEIs is the development of a methodology for applying the DMAIC continuous improvement cycle in order to increase the efficiency of the process implementation "Development of the EMS for the educational process".

**D (Define)**

The main component of EMS for the training of higher education applicants in Ukraine is the complex of educational and methodological support (CEMS), which is a set of didactic and methodological documents aimed at the implementation of educational services of a particular science or field of knowledge.

Taking into account the requirements of the normative document "Recommendations for the application of criteria for assessing the quality of the educational program" [16] and the internal document of NURE "Regulations on the complex for educational and methodological support of the discipline", the authors have developed a list of CTQC characteristics that are critical in terms of the process " Development of the EMS for the educational process" quality, and can be considered as criteria for the suitability of an educational product:

1) the volume of the CEMS material should correspond to the volume of the educational program (EP);

2) the structure of the CEMS should comply with the Curriculum and the content of the EP;

3) the content of the CEMS should provide practical training for higher education applicants in order to acquire professional competencies;

4) the EMS forms and methods of teaching should meet the requirements of the student-centered approach and the principles of academic freedom;

5) CEMS should contain clear information on the objectives, content and program outcomes of learning;

6) compliance of the CEMS content with modern scientific achievements and practices;

7) the forms of control measures and evaluation criteria should be clear and understandable;

8) design of CEMS should comply with the requirements of DSTU 3008:2015 "Information and documentation. Scientific and technical reports. Structure and rules of putting into official form";

9) the time of development and promulgation of CEMS should meet the requirements of the Order of

NURE No.170 dated 02.06.2021 "On Time Standards for Planning and Accounting of Educational, Methodological, Scientific, Organizational Work of Scientific and Pedagogical Staff of NURE".

Identification of customers, inputs, processes, outputs and consumers of the process under study, which is traditionally performed in the Six Sigma methodology by constructing a SIPOC diagram, can be more effectively implemented using the VSM method, since it allows to simultaneously visualize the information links between subprocesses and highlight the "bottlenecks" of the process.

Visualization of the value-adding stream for the process "Development of the EMS for the educational process", which is formed by the sequence of production and logistics processes of creating and transferring the value of the object (CEMS) from the customer (Ministry of Education and Science of Ukraine) to the consumer (higher education applicants) and synchronized with the flow of orders, is carried out using decomposition methods and the VSM method and is shown in Fig. 1.

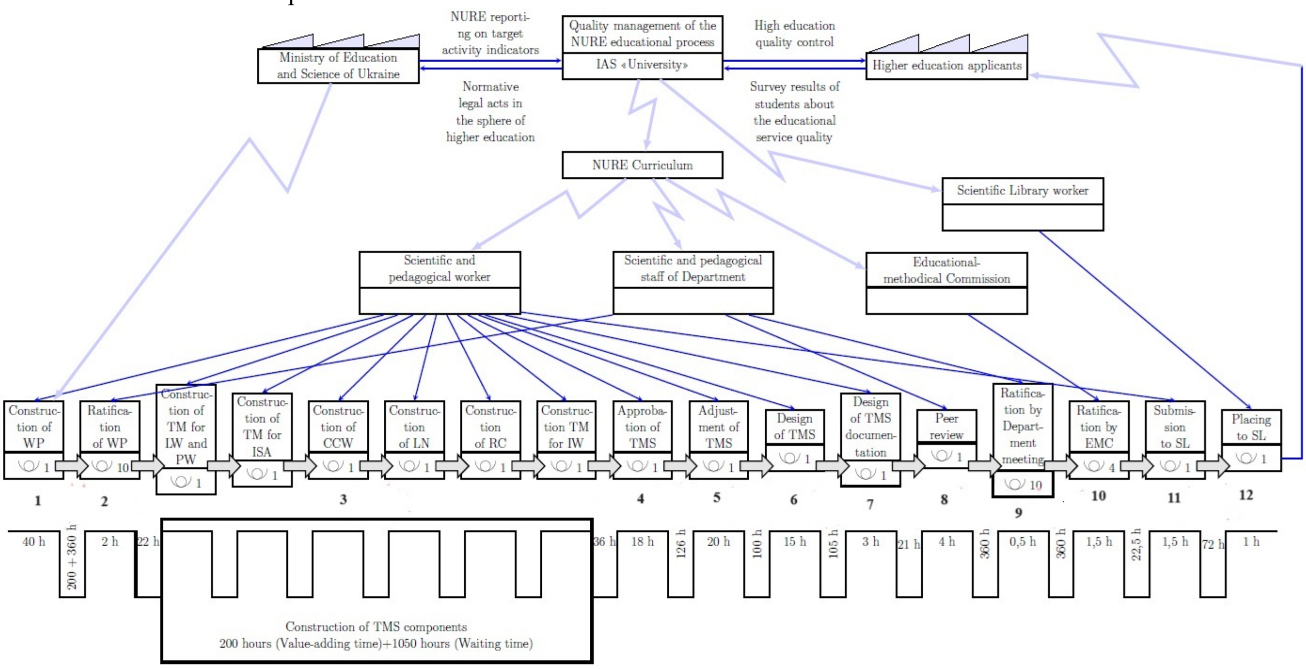


Fig. 1. The current state VSM of the process "Development of the EMS for the educational process" [15]

**M (Measure)**

To quantify the efficiency of the process functioning, the "Sigma" defect-free coefficient was calculated, which is based on the determination of the DPMO indicator according to the formula given in paragraph 5.2 (ISO 13053-1):

$$Y_{\text{DPMO}} = \frac{c}{n_{\text{units}} \cdot n_{\text{CTQC}}} \cdot 10^6, \qquad (1)$$

where $c$ is the total number of defects; $n_{units}$ – the number of inspected units of production (100 CEMS over the past 5 years); $n_{CTQC}$ – the number of characteristics critical for product quality (9).

For the critical characteristics of the process "Development of the EMS for the educational process" at the Department of Information and Measurement Technologies (IMT), NURE, the following number of inconsistencies was identified:

1) discrepancy of CEMS material volume with the requirements of EP - 0;

2) inconsistency of the CEMS structure with the Curriculum and the EP content - 0;

3) discrepancy of the CEMS content with the requirements of the regulatory documentation - 0;

4) inconsistency of the forms and methods of teaching used in the CEMS with the requirements of the student-centered approach and the principles of academic freedom - 0;

5) non-compliance of the CEMS in terms of clarity of information on the goals, content and program learning outcomes with the requirements of the regulatory documentation - 0;

6) inconsistency of the content of the CEMS with modern scientific achievements and practices - 1;

7) non-compliance of the control measures forms and evaluation criteria with the requirements of the regulatory documentation (RD) - 0;

8) non-compliance of the CEMS design with the requirements of regulatory documentation – 1;

9) failure to meet deadline on the CEMS – 4.

The DPMO of the process "Development of EMS for the educational process" at the Department of IMT is equal to:

$$Y_{\text{DPMO}} = \frac{0+0+0+0+0+1+0+1+4}{100 \cdot 9} \cdot 10^6 = 6666,(6).$$

We calculated the "sigma coefficient" of the process quality, taking into account the fact that the number of sigmas is derived from the normal distribution with a shift of 1.5σ from the mathematical expectation, using the formula:

$$Z_{\text{value}} = F_N^{-1}(P) + 1{,}5\,, \qquad (2)$$

where $P = 1 - \frac{Y_{\text{DPMO}}}{10^6}$ is the probability of developing a high-quality CEMS; $F_N^{-1}(P)$ is the function of the inverse normal standard distribution.

For probability $P = 1 - \frac{6666{,}67}{10^6} = 0{,}99333$ the values $F_N^{-1}(P)$=2,47474 and $Z_{value}$= 3,974738. The calculated number of sigmas is within the interval $Z_{value}$ = 3.97... 3.98, which is given in the table in Annex A to ISO 13053-1 for $Y_{DPMO}$=6666,(6).

Thus, it can be concluded that the quality indicator of the process "Development of the EMS for the educational process" according to the LSS methodology at the Department of IMT $Z_{value}$ = 3,975 corresponds to the average level of defect-free (target level $Z_{value}$ = 6).

Moreover, it can be noted that the largest number of non-compliant CEMSs arises as a result of non-compliance with the criterion of "compliance of the development time with normative values". In the LSS methodology, the indicator of time spent on creating a product or providing a service is estimated by constructing a line of chronology of the process and calculating the Process Cycle Efficiency (PCE) using the formula:

$$PCE = \frac{CT}{LT} \cdot 100\,\%\,, \qquad (3)$$

where CT (Cycle Time) is the average length of time it takes to complete one or more steps within the process (value-adding time);

LT (Lead Time) is the total time of the production cycle.

To analyze the efficiency of the value stream during the implementation of the process, the PCE is calculated, which characterizes the ratio of the value-adding time to the total cycle. The PCE indicator of the process "Development of EMS for the educational process" at the Department of IMT, NURE (11.3%) is far from the target value adopted by Lean management practitioners (20%) [15].

Let's calculate what target value the PCE indicator should have in order for the time of development and implementation CEMS in the educational process met the normative value. Since the CEMS should be implemented into the educational process before the start of teaching the discipline, in practice the total time for the development and implementation of the CEMS is the time from the approval of the teacher's workload to the start of teaching the discipline (approximately 3 months or 2196 calendar hours). During the analysis of the VSM of the process under study at the Department of IMT, NURE, it was found that the value-adding time (CT) was 307.5 hours (300 hours according to the document "On the norms of time for planning and accounting of educational, methodological, scientific, organizational work of scientific and pedagogical staff of NURE" for the development of CEMS in the amount of 6 ECTS + 7.5 hours for other subprocesses). The total time of the process (LT) was 2834.5 hours (PCE = 10.8%). Based on the target time for the process implementation (2196 hours), the PCE should be at least 14.6%.

That is, when analyzing the process under study, it is necessary to focus on identifying and eliminating unproductive time expenditures in order to optimize the value stream by minimizing time wastes.

An indicator of the flow efficiency for the CEMS development in terms of satisfying the critical characteristics of the educational product, which characterize the product quality, is the Stream Non-Defectiveness Indicator (SNI), which reflects the proportion of suitable products at the output to suitable products at the flow input. It is calculated using the formula:

$$SNI = \prod_{i=1}^{n} \left( \frac{(100 - PD)}{100} \right) \cdot 100\,\%\,; \qquad (4)$$

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

n is the total number of operations.

Regarding the available statistical data of the process "Development of EMS for the educational process" at the Department of IMT, which consists of 12 subprocesses, according to formula (4), we get:

$$SNI = (1 \cdot 1 \cdot 0{,}98 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1) \cdot 100\% = 98\%.$$

Thus, it was found that subprocess 3 on the VSM (Fig. 1), namely "Development of the EMS for the educational process", is the most likely place of a defective educational product occurrence. Therefore, it is necessary to develop measures to eliminate the causes of nonconformities at this stage in order to achieve the target value of SNI = 100%.

## 5. Conclusion and agenda for future research

The article substantiates the relevance of the LSS quality management methodology application to improve educational business processes and formulates the challenges that the implementation of LSS principles poses to HEIs. These difficulties are primarily related to the need to adapt the production-oriented concept of LSS to the field of educational and scientific services and the bias of the HEI’s administration and staff regarding the effectiveness of LSS in the field of education.

The features of the DMAIC improvement cycle implementation, as the basic technology for the LSS implementation, are analyzed, taking into account the specifics of the results of the HEI's activities, which combine both the educational services delivery and the educational and scientific products generation. The tasks, implementation tools and results of each stage of the DMAIC cycle in HEIs are formulated.

A methodology for the application of the DMAIC cycle has been developed and implemented in order to increase the efficiency of the implementation of the HEI's key process "Development of the EMS for the educational process". The criteria for the suitability of the educational product CEMS are proposed.

The identifying stages of the DMAIC cycle were implemented, the results of which were the determination of the researched process CTQC list and the calculation of their quantitative current and target values.

On the basis of the defined criteria, it is established that the studied process has a "sigma" level of defect-free $Z_{value} = 3,975$ (target value $Z_{value} = 6$). The current and target indicators of process efficiency (PCE and SNI) have been identified and calculated. The PCE current value is equal to 11,3 %, while the PCE minimum target value is equal to 14,6 %. The SNI current value is equal to 98 %, SNI target value is equal to 100 %.

In the continuation of the study, an analysis of the process effectiveness will be carried out. The key indicators of the process will be studied and critically analyzed in order to identify the influencing factors that cause their non-compliance with the target values, and after that, the most important factors will be identified. Measures will be developed to bring the process "Development of EMS for the educational process" CTQC to the target values, namely, that the number of non-conformances for all CTQCs is equal to zero. During the implementation of the «Control» stage, it is planned to build the Future-State VSM, to implement it into the educational process, and to calculate new values of the process key indicators. Control of the process stability over time is provided by the control maps construction of the process key characteristics.

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**Технологія реалізації моделі управління якістю "Lean Six Sigma" в закладах вищої освіти. Частина 1: Ідентифікація та вимірювання освітнього процесу, критичного до якісних характеристик**

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**Анотація**
Обґрунтовано актуальність впровадження методології управління якістю Lean Six Sigma (LSS) в закладах вищої освіти (ЗВО) України для підвищення ефективності освітніх і наукових бізнес-процесів згідно з рекомендаціями ДСТУ ISO 21001:2019 Освітні організації. Системи управління в освітніх організаціях. Вимоги та настанови щодо застосування (ISO 21001:2018, IDT) та Стандартів і рекомендацій щодо забезпечення якості в Європейському просторі вищої освіти (ESG). Проаналізовано наукові та прикладні праці сучасних закордонних і вітчизняних науковців, присвячені адаптації моделі LSS до умов функціонування ЗВО. Метою статті є аналіз особливостей технології реалізації методології LSS в ЗВО з метою покращення освітніх та наукових бізнес-процесів та прикладне застосування технології LSS в умовах українського освітнього середовища. Обґрунтовано використання циклу DMAIC як базової технології LSS для послідовного вдосконалення функціонуючих бізнес-процесів ЗВО. Визначено задачі, інструментарій та результат реалізації кожного етапу циклу DMAIC для сфери вищої освіти з урахуванням специфіки результату діяльності ЗВО, який визначається як сукупність освітніх та наукових послуг і продуктів. Практичне значення статті полягає в покращенні якості освітнього процесу в ЗВО за допомогою застосування циклу безперервного поліпшення DMAIC та інструментів LSS з метою підвищення ефективності реалізації ключового процесу «Розробка науково-методичного забезпечення освітнього процесу». Визначено критичні характеристики (CTQC) освітнього продукту «Комплекс науково-методичного забезпечення (КНМЗ)». Встановлено та розраховано початкові індикатори якості процесу «Розробка НМЗ освітнього процесу» та їх цільові значення. Перспективами дослідження є критичний аналіз CTQC з метою визначення причин виникнення їх невідповідності цільовим критичним характеристикам, впровадження корегуючих заходів в освітній процес та розробка процедур контролю сталості CTQC.

**Ключові слова:** Lean Six Sigma, заклади вищої освіти, бізнес-процес, цикл DMAIC, Мапа потоку створення цінності, CTQC.