

“Process Factory” Project as a Tool of Logistics Management in a Lean University

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ABSTRACT

The task of raising labor productivity in the field of education, set by state authorities, requires sustainable development and management system modernization through introduction of more efficient activities based on the concept of logistics management. In this context, lean production logistics technologies become tools for solving the set task, the use of which is preceded by training in conditions as close as possible to production ones. Such training makes it possible not only to simulate real production processes occurring in organization, but also allows you to simulate the desired organizational changes, including those at the training sites created under the “Process Factory” project. The article presents the authors' experience in organizing “Process Factory” project in a regional educational organization, considered from logistics management point of view. The stages of the project to optimize logistics flows of a specific process at experimental site are presented and characterized. In the article, the authors conclude that a training program based on the model of real professional activity should play as a result of several script approbations of the process factory. In this regard, simulation training for “process holders” launch in the definitions of logistics management under this program will achieve the set goals for streamlining processes, in particular, by channeling intellectual capital to solve problems of improving labor efficiency.

Keywords: *Lean management, simulation training, logistics management, project, university training ground, process factory*

1. INTRODUCTION

Lean manufacturing is a management technology focused on eliminating any losses through production processes. The use of lean technologies reduces labor costs and turnaround time to provide high quality at minimum cost; allows elimination of resource losses which are not aimed at creating value, and this is embedded in overall concept of logistics management.

Lean management in higher education follows the same principles and practice. Studying in higher education institutions or managing them in the office is similar to business. Training and administration consist of fully or partially repetitive transactional processes [1, 2].

“Lean Higher Education” refers to adaptation of lean thinking to higher education, as a rule, with the aim of increasing efficiency and effectiveness of operations. Lean approach encourages employees at all levels of the organization, which requires increase at the developmental stage, which does not increase value, while at the same time emphasize the stages that enhance it [3, 4, 5]. Although the concepts of “customers” and “products” are controversial in higher education, there are certainly different sides in which students, teachers, administrators, potential employers and various levels of government are involved.

The use of Lean management in higher education is more common in administrative processes (for example,

admission, registration, personnel management and procurement), but it is also used in academic processes (for example, course development and teaching, updating programs, feedback with students as well as job processing) [6, 7].

One of the projects to implement the set goals for managerial functions modernization in education was creation of Association of lean universities which included 11 Russian institutes and universities of different directions. It is assumed that Association, created within the framework of Project Design and Lean Synergy Forum as a Factor in Increasing Labor Productivity, will bring to a new level the development of university community interaction concerning lean technologies introduction into their logistics systems. It is planned to accumulate experience with the help of advanced processes of management models, and also to direct the potential to solve problems of increasing labor productivity, one of which is creation of universal training system concerning lean manufacturing methods and tools.

Alongside with Association activities, promotion of Lean-management tools is also carried out within the framework of project “Effective Government, Effective Municipality” launched in Nizhniy Novgorod region. A number of laws for its implementation have been adopted in Nizhny Novgorod Region Ministry of Education, Science and Youth Policy. They are aimed at introducing lean production methods in educational organizations as well.

Since success of lean manufacturing model is 80% dependent on the number of introduced organizational technologies it is important to have a training ground where not only the process itself is demonstrated, but also the effect of changing it. That is why one of the main activities identified in the Roadmap for lean technologies introduction in education system is implementation of “Process Factories” projects [8, 9]. As part of such projects, it is planned to conduct training and innovative trainings at training sites, where participants use the example of a real process to get acquainted and gain practical experience in using tools of lean manufacturing. They understand their impact on operational performance by developing cognitive strategies in simulation and professional activities [10]. Many companies abroad are introducing training factories as a way to improve the skills of their specialists from floor to management level. The main purpose of training in such factories is accessible and clear demonstration of complex business processes and methods and concepts modeling that contribute to proc lean management processes, ensure efficient use of resources, as well as arrange intra-company processes. Despite the fact that these are three completely different areas of activity, they are interrelated, and these relationships can be traced in “production” of training product. Thus, integration of different areas in training factory becomes a single concept.

2. PROBLEM STATEMENT

Problems of education organizations functioning, ensuring formation of human resources in all economy sectors, require effective management approaches that can generate a high level of competitiveness of graduates and ensure maximum satisfaction of society’s needs for professionals. We can distinguish increasing amount of information and the need to work in conditions of limited resource support among general problems of education that require organizational changes introduction in the context of the study. At the same time it is demanded to demonstrate target indicators increase. Such effects can be achieved by optimizing streaming processes aimed at modernizing higher education management and, as a result, achieving maximum efficiency of university’s logistics system [11]. It follows higher education management that modernization on the basis of logistics methods is a way to change social and economic sphere at a large scale by introducing more efficient forms of activity, namely, by channeling intellectual capital to solving business problems associated with increase in financial and organizational assets [12]. This can be achieved through the application of principles and methods of lean management, as a model of sustainable development of organization that contributes to maximum return from available material, human and financial resources [11, 13]. These resources are considered as end-to-end flows in management system, optimization of which allows achieving specified (target) performance indicators. Thus, a university as an object of research for lean

technologies implementation, providing educational services, acts as logistics system with value streams inherent in service industry [14].

3. RESEARCH QUESTIONS

Educational technologies, developed in projects for competencies development in the field of lean production, mainly represent imitational training based on immersing learners into the actual production process and, at the same time, stimulating “cognitive” competencies development [10]. Such an approach to training allows you to increase the amount of perceptions and skills, thanks to real processes modelling in learning environment, in which it is possible to transfer information about technologies and features of the unit, work objectives, expected results, responsibility, regulatory indicators, interchangeability between employees, corporate culture and the most common mistakes in the work. A successful combination of various types of information obtained in the course of simulation training saves time resources for professional retraining of employees.

Thus, “Process Factories” projects implementation, according to the authors, allows considering staff as the company’s fixed capital. In relation to logistics management concept it is also important to consider the flow of creating a particular result - the “work flow”.

4. PURPOSE OF THE STUDY

The study defines the goal of testing the scenario of educational and innovative training for the subsequent development of a training program for real professional activities that synchronizes lean management methods and production situations.

5. RESEARCH METHODS

The goal, which is pursued during “Process Factory” project implementation, is the launch of simulation training for students, administrative and scientific-pedagogical staff of universities, as well as enterprises and organizations in various industries and forms of ownership employees. Of course, the proposal of such training programs as a finished product is preceded by the stages of planning, preparing and working out scripts for the most effective implementation of the project. Stages of the project at university site are considered in Figure 1.

During “Process Factory” project implementation in various industries, for example, medicine, mechanical engineering, etc., their sectoral orientation is traced. That is why, when defining topics within the framework of the developed project, it was decided to build training taking into account sectoral affiliation of the university - using food processing operations as an example - a model of the full cycle of confectionery production.

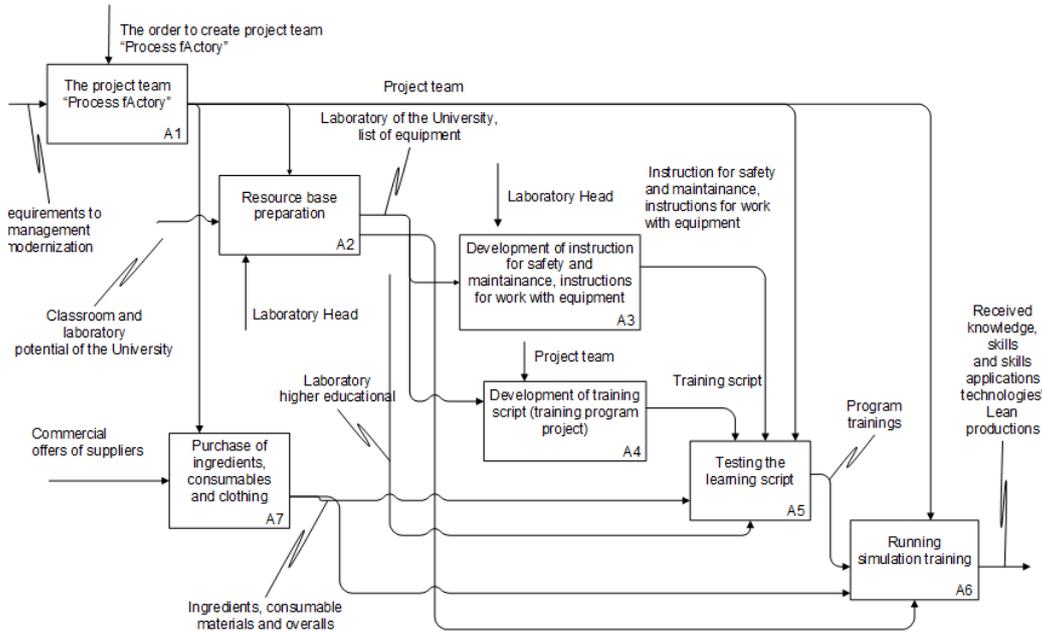


Figure 1 Preparation stages for “Process Factory” implementation project [Compiled by the authors]

At the initial stage - team building stage (Figure 1) – people responsible for project management and implementation, as well as sectorial specialists of “Process Factory” project are identified. The team includes senior officials of the university: Deputy Director for Science, Dean and Deputy Dean of the Faculty of Technology, Head of Catering Technology Department and Head of Additional Education Sector. This became a critical success factor, as it emphasized the importance of introducing lean technologies and accelerated the adoption of important decisions [10].

The “Process Factory” project script work out base was the

Laboratory of Experimental Tastes of Bakery and Confectionery Products of the Resource Center of the University. Due to the fact that project implementation involves equipment use, as well as presence of dangerous factors, special attention is paid to the development of instructions for labor protection and safety, as well as instructions for working with equipment.

To determine time resources, equipment, consumables and ingredients optimal cost, which should ensure successful launch of simulation training, several tests of the developed script are provided and they resulted in a training program (Figure 2).

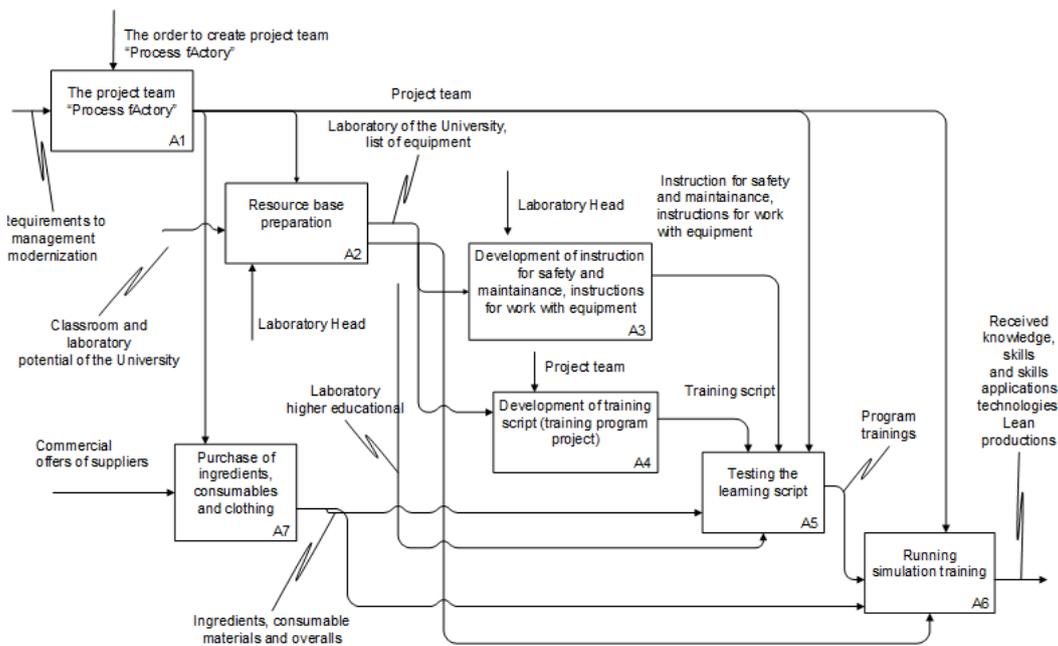


Figure 2 Stages of simulation training testing [Compiled by the authors]

At the first stage of the developed scenario, the following things are conducted: introductory briefing, acquaintance with the purpose and objectives of training, role distribution among the participants, briefing on working with equipment. Explanatory introductory word is given orally for no more than five minutes, although the option of a blitz survey, a stress method or an “open audience” technology is not excluded, depending on the level of participants’ training, motivation and discipline. It is recommended not to overload participants with excessive scientific and pedagogical information. The main points touched upon in the explanatory instruction include: the reality of the situation being played, its relevance for practical activities, tasks complexity and lack of the only right solution.

Interactive training used in “Process Factory” project assumes that each participant has roles and functions that can be distributed randomly or purposefully (by facilitators or by participants themselves). In each case, the question of role distribution is decided individually, depending on characteristics of the audience, personal and professional relationships between the participants.

One of the training key components is the final result achievement, reflected in the target indicators, which can be performed in each process and have their own specifics, for example, producing a certain amount of products at a set time.

During the first working out of the scenario in real time, the participants perform technological process, determine how technology violation affects the final product, control time and identify the most optimal approaches and record actual result of their work. At the same time, it is necessary to identify and record all losses emerged in the course of work, as well as problems related to safety, quality, order fulfillment, financial results and comfortable environment.

After that, the participants should discuss obtained results and draw conclusions on assessing types of losses; to establish communication with “neighboring” workshops; to develop ways to improve each of the stages which would increase temporal and economic indicators that affect process efficiency.

In the course of the second development, participants are invited to revise production technology, taking into account all comments and suggestions for improving simulation production process.

The final stage can be called “debriefing” or “reflection”. At this stage, in order to create environment which will improve effectiveness and efficiency of all departments, participants need to discuss obtained results through brainstorming, as well as informal communication among process participants will take place. During the discussion, signs of inefficient production should be identified, reduced to a value expression, for example: excess movements, excess reserves of resources or product, excessive processing that does not add value to the product, overproduction, unclear logistics, expectation or simple, undiscovered potential of employees.

Thus, “Process factory” should contribute to project participants’ awareness that result and efficiency are not the same: the goal can be achieved, but the way to achieve it will be long or costly. To achieve the target performance

indicators it is necessary to optimize resources based on initial process analysis and subsequent performance to identify the causes of losses [11].

6. FINDINGS

A training program based on a model of real professional activity was the result of several approbations of “Confectionery Making” scenario (Figure 3). The launch of simulation training for students, teachers and administrative staff under this program will allow achieving the goals set for optimizing the use of university resources by channeling intellectual capital to solve the tasks of improving labor efficiency.



Figure 3 Teams’ work at the stages of “Process Factory” script testing [by the authors research archive]

7. CONCLUSION

Summing up preparations for “Process Factory” project implementation, it should be noted that motivation for effective, creative and long-term use of lean technologies to achieve the goals of education management modernization should be supported through training and targeted communication for knowledge sharing. This, in turn, will allow staff to improve their skills, to master skills in working in related and auxiliary processes, to understand causal relationships between management decisions and their consequences.

At the stage of organization sustainable development, knowledge gained during the interaction of “Process Factory” participants should become an integral component of daily activities, and lean management technologies should be integrated into the overall concept of the university’s logistics flows. Moreover, the proposed simulation production situations make it possible not only to organize the standard process of production life cycle from design to implementation, but also to accumulate theoretical knowledge, practical skills and abilities to project participants with their further use in professional activities [15].

In other words, project “Process Factory” at the university has possibility of embedding best practices into management system and aims at designing effective university management system, which should be conducted in accordance with effective tools for developing strategic decisions in logistics system.

REFERENCES

- [1] Medvedev V.R., Korenkov M.M. Formation of an effective high-tech production management system through the prism of the concept of “lean production”. *Sustainable development management*. 3(10) (2017) 31-44. (In Russ.)
- [2] Gayvoronskaya S.A. Practice of Introducing Lean Technologies into the University Management System: a Project Approach. *University Management: Practice and Analysis*. 23(4) (2019) 104-115. (In Russ., abstract in Eng.)
- [3] Reinhart G., Greitemann J., Niehues M. Lean Production. In: Chatti S., Laperrière L., Reinhart G., Tolio T. (eds) *CIRP Encyclopedia of Production Engineering*. Springer, Berlin, Heidelberg, 2019. DOI: <https://doi.org/10.1007/978-3-662-53120-4>
- [4] Groshev A.R., Dubrovskaya E.N. Lean-technologies and university development. *Kant*. 3(32) (2019) 272-277. (In Russ., abstract in Eng.)
- [5] Groshev, A.R., Karataeva, G.E. Lean-Technologies as a Resource of Education Modernization. *Higher Education in Russia*. 27(5) (2018) 30-36. (In Russ., abstract in Eng.)
- [6] Kozyrkov R.V. Internal conditions and concepts of improving management of a regional higher education organization. *Baikal Research Journal*. 8(3) (2017) DOI: 10.17150/2411-6262.2017.8(3).15. (In Russian)
- [7] Pribylova, N., Pribylov, S., Makhova, O., Barbashina, T. Formation of paradigms for the development of lean higher education, University science: a glance into the future [Abstract]. In: *Collection of scientific works on materials of the International scientific conference dedicated to the 83 Anniversary of Kursk State Medical University, Kursk, 2018*, pp. 500- 504. (in Russian)
- [8] Tisch M, Hertle C, Cachay J, Abele E, Metternich J, Tenberg R (2013) A systematic approach on developing action-oriented, competency-based learning factories. *Procedia CIRP*. 7 (2013) 580-585. DOI: <https://doi.org/10.1016/j.procir.2013.06.036>
- [9] Kurmangulov, A.A., Reshetnikova, Yu.S., Bagirov, R.N., Frolova, O.I., Brynza, N.S. «Factory of Processes» – A New Format of Educational Process Organization at Higher Education Institution. *Higher Education in Russia*. 27(5) (2018) 37-41. (In Russ., abstract in Eng.)
- [10] Sataeva D.M., Pavlova L.V., Bulkina L.V. Gaming techniques for modeling professional activity in the study of quality management systems. *Pedagogical*. 4 (2018) 84-91. (In Russ.)
- [11] Kraynova O.S. Marketing support optimization of the logistics system: monograph. Moscow, R.F.: ed.: MU S.Y. Vitte, 2019. (In Russ.). DOI: <https://doi.org/10.18411/kray-2019-mong-00033>
- [12] Bedoreva I. Yu. Factory of processes as an integration form of education in a steadily developing organization. In: I. Yu. Bedoreva (eds). *Integration of education*. 3(22) (2018) 508–518. (In Russ.). DOI: 10.15507 / 1991-9468.092.022.201803.508-518
- [13] Adler Y. Lean Logistics. *Logistics*. 4(125) (2017) 24-26.
- [14] Bannikova E.A. Improving internal logistics using the principles of lean manufacturing [Abstract]. In: *Economic aspects of industrial development in the transition to a digital economy. Materials of the International Scientific and Practical Conference*. Moscow, 2019, pp. 20-23. (In Russ.)
- [15] Kreimeier D., Morlock F., Prinz C., Krückhans B., Bakir D.C., Meier H. Holistic learning factories – a concept to train lean management, resource efficiency as well as management and organization improvement skills. *Procedia CIRP*. 17 (2014) 184-188. DOI: 10.1016/j.procir.2014.01.040