

Implementation of Lean Practices in a Higher Education Institution's Student Affairs Office: A Case Study from a Bosnian University

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Abstract — Higher education is a key element of prosperous communities, and the quality of education should be a priority in attracting prospective students. Good education implies good academic staff, well-equipped laboratories, facilities, and efficient processes. Maintaining efficient processes is challenging but achievable. One of the possible solutions to improve education processes is to pursue a lean strategy in order to reduce waste and non-value-added activities. The purpose of this paper is to combine paying off strategies from manufacturing companies with higher education institutions (HEI), in order to enhance the quality of education and efficiency of higher education institutions. This research deals with applying lean tools in university processes with the aim of investigating the possibility of applying lean concepts in HEI. Processes from the student affairs office from a Bosnian university were taken as a case study. The tools were used for data collections, student satisfaction measurement, process efficiency analysis and assessment whether the university is ready for the implementation of the lean concept. As a result, it was observed that communication channels between university and students are weak, the student information system does not respond to students' needs, internal communication channels need to be improved and human resources are underused. Overall, it was found that the lean strategy can be applied in HEIs but for the successful implementation of lean thinking, lifestyle from top management to lower management must be adopted.

Keywords— lean; strategy; higher education institutions; student satisfaction; continuous improvement; quality; value stream mapping.

I. INTRODUCTION

Globalization and fast-growing markets are becoming the biggest concern for companies that operate in the century. Besides regular business companies, we cannot exclude educational institutions [1], especially the private ones. They all have the same vision, to satisfy their customers and workers and increase productivity as well as their profit. Vision is stated clearly but then one question arises. How? What are the possible ways a company or an institution can use in order to complete the vision? One possible solution is optimization [2].

There are many aspects that can be optimized but, in this project, we will focus on the processes inside the university. Optimization requires developing new technologies and methods, decreasing the time needed for a certain task and improving the quality of the results [3]. This also requires introducing new management methods and organizing tasks [2]. Educational institutions are complex systems that need special attention. This complexity arises due to many

activities and different users and partners. Due to the innovation in technology and strong competition caused by individual customer needs, the dynamics of processes increase over time [4].

A. Problem Definition

The modern world faces many challenges in terms of efficiency and productivity. While some organizations, mostly manufacturing ones, try to pursue some strategies that will enhance their organization productivity, other ones see that as not possible to improve anything or see it as 'fix it, make it work'. That is the case with many organizations in Bosnia [5][6], most probably because of human mentality, but there are successful examples of implementing strategies that brought many wonderful results [7]. If it is possible to do an activity in a different better and shorter way that brings the same or higher quality to the product or service.

The country and the region suffer from a constant decrease in the number of students due to a low birth rate [8]

and continuous emigrations [9]. As it was shown in Figure 1, it is expected that the number of graduate students in the upcoming five years will be significantly reduced (to 8,500

students) and the universities in Bosnia will struggle to get enough students. The estimate is based on several enrollees in the past five years and linear relationships.

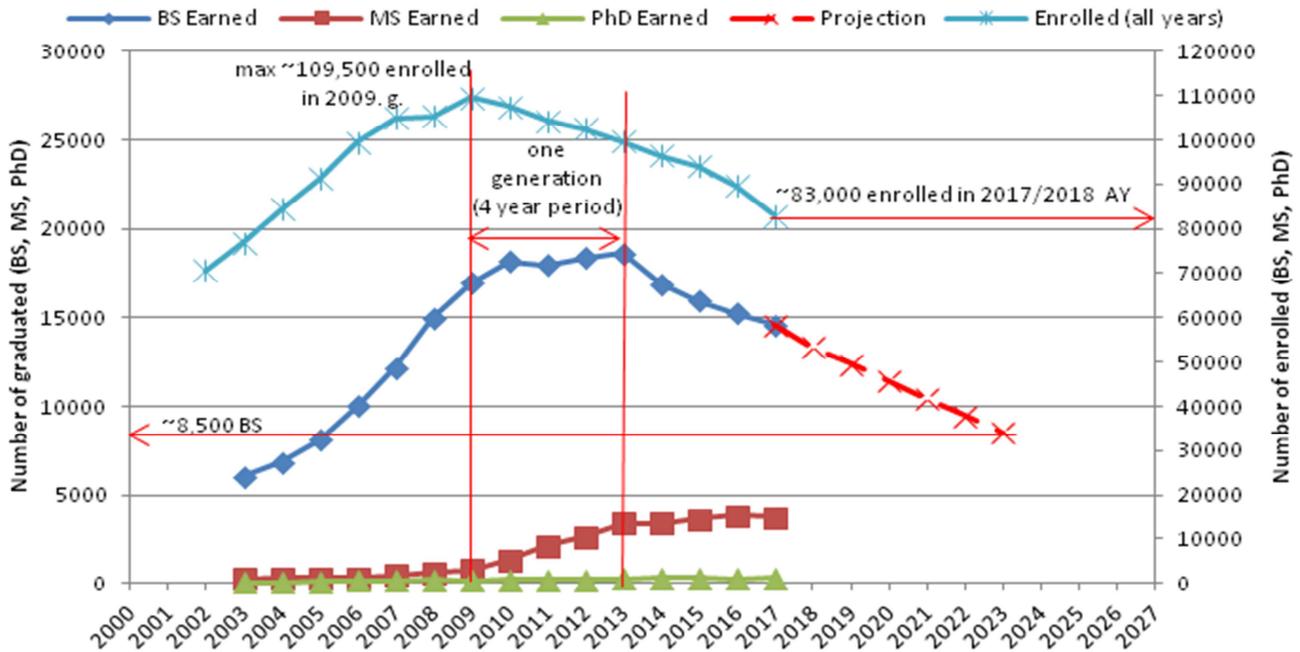


Fig. 1. Trends of enrolled and graduates in Bosnia - all universities (data collected from *Bosnian Statistical Agency* [39])

The trends in reduced number of graduates will more affect the local business since it was noticed a higher demand for graduates from Science, Technology, Engineering, and Math (STEM) fields. In the upcoming period, the demand for engineers and managers is expected to be increased [9]. The trend in reducing the number of enrollees will affect the universities and the demand for new students will be increased in all Bosnian universities. Therefore, the upcoming period will be challenging for the Bosnian industry and universities as well. In this situation, both, industry and universities have to change strategic thinking and start working on creating a more competitive environment to attract foreigners [10].

The universities may attract foreign students by offering attractive study programs and improving their services. Instead of increasing the price of services, cost reduction projects were proved to work in these situations. Lean thinking is one of the most impactful long-term strategies that work and has the potential to reduce waste, cost, and improve customer satisfaction [11]. For instance, Lean projects implemented in a quality control laboratory can reduce 40 to 60% in turnaround times, 10 to 30% in cost per test, 20 to 30% in space utilization, 80 to 90% in the number of steps taken during a shift, 15 to 30% in inventory levels, 10 to 25% in staff, or comparable increase in the number of tasks performed in a normalized situation, and increase more than 75% increase in productivity [12].

Bosnian university managements should think about introducing new strategies that will reduce the waste and non-added values that they did not see before. The promising strategy that the universities (both public and private) should consider in Bosnian context may be the Lean. Especially in

private universities, students may be considered as customers [13], which are purchasing the quality of the product/service for a reasonable price. Furthermore, some universities were founded by a foundation whose end goal is not to make a profit but to be sustainable, to grow and provide the quality of education. Therefore, the purpose of this work is to enhance the Lean importance in services, especially in universities, where it should not be only about making profit but the quality is the priority. Therefore, it could lead to investing in the quality of education by introducing long-term lean strategy, lean office and lean culture for better strategy outcomes.

B. Purpose and scope

The purpose of this research is to investigate possibilities for the introduction and implementation of the lean concept in higher education. As a case study, a university a member of the European University Association (EUA) from Bosnia was taken for the analysis. Particularly, student affairs office processes were taken as a case study to investigate student satisfaction and possibilities of the lean application concept. The aim was to find answers to the following questions: (1) how the students satisfied with the current situation at the university; (2) whether the university ready for the implementation of the lean concept.

With the aim of getting answers to the previous questions, the following objectives were set: a detailed analysis of processes at the Student Affairs Office; (2) conduct a survey regarding student satisfaction; (3) use lean and quality tools for further analysis.

The scope of this project is limited to a university level considering students as well. Process layout and information

flow in the student affairs office were studied. Seven main processes that every student must pass through were analyzed in detail. Student Affairs Office oversees almost all student inquiries. A student enters and leaves the university from this place, so that was the main reason for taking this office particularly for conducting our research as it affects student satisfaction the most. The office is divided into five sub-offices: the main office for undergraduate students, office for graduate students, the office of deputy manager, and office of coordinator for graduation and student services and the office of Student Affairs Manager.

C. The Lean concept

'Lean concept' or 'Lean thinking' comes from the automotive industry in Japan with a focus on doing more with less by reducing waste or non-added value activities [14]. It is developed as a management strategy which found a place in any kind of organizations, no matter is it manufacturing, service providing, NGO's, or hospitals and educational institutions [15]. However, still the focus is in manufacturing to lower cost of the product in order to be competitive in the market. Service providers are neglecting such a strategy since they do not see the direct and tangible results at the end on a first glance [16]. Lean is a way of functioning of an organization where all people that are part of the organization are involved in it and it is a lifestyle of an organization. It does not give desired results when it is adopted by one department of an organization, or by one member. It gives significant results when the whole organization starts thinking of Lean [16] [17].

In order to have fewer defects and to perform business faster and more accurate, repeating processes must be standardized. By eliminating waste, management communication become simpler and more accurate [18][19]. In business there are always three types of activities [20] that managers should pay attention to :

- Necessary activities that add value
- Necessary activities that do not add value
- Unnecessary activities that do not add value

Lean deals with "seven types of waste", and some authors add the eighth one, which is the creativity and the capacity of staff the organization already has. The types of waste are considered as follows: (1) *over-production* – producing more than needed; (2) *inventory* – a number of products waiting for shipment; (3) *waiting time* – waiting for information to continue the task; (4) *extra processing* – extra processing, higher quality than necessary; (5) *defectives* – common errors and fixing them; (6) *excess motion* – unnecessary walking and moving steps; (7) *transportation* – movement of material and products; (8) *underutilized people* – unused human potential, skills and creativity [21].

1) *When to Introduce Lean*: According to Vincent Brigel and Cajsa Olsson [22] if one or more of the following questions are answered with YES, the lean thinking should be introduced in an organization:

- Does the organization have frequent overtime?
- Rework is very often - it became a fact of life?
- Do employees spend so much time on paperwork, copying, etc.?

- Is there another possible way of performing certain activities?
- Is the other way better than the current one?
- Does the organization grow without changes in processes?
- Do employees spend so much time searching for something?

If one or more of the following questions are answered with NO, the lean thinking should be introduced in an organization [22].

- Does the organization have standardized procedures?
- Is the practice that an organization implements the best one possible? (it may be optimized)
- Does every process have an owner and a manager?
- Do employees understand their roles and the impact of their work on the whole process?
- Do people communicate the right information to the right office at the right time and place?

All these questions must be carefully, precisely and honestly answered in order to have maximum improvement from further Lean implementation.

2) *Lean in Offices*: Service organizations use Lean tools to reduce different types of wastes, and be more competitive in the market [23]. Benefits for service organizations were standardized work, increased awareness of the value and process, reduced paperwork, customer focus, communication is improved, and lead time and rework are reduced [23]. Therefore, the process of introducing the Lean concept within an organization can be roughly divided in five steps: (1) screening of the current state of the processes and conducting interviews; (2) process mapping; (3) categorizing activities as value added (VA) or non-value added activity (NVA); (4) data analysis; and (5) data based improvements. Usually 95% of the time of a process is waiting time. The ultimate goal of the lean tools application is to obtain 100% efficiency, which means the elimination of waiting times [24].

3) *Lean Tools*: Lean is a set of tools that are designed and focused on eliminating or reducing waste [25]. By waste it is meant unnecessary long cycle times, waiting times between value-added activities, rework or scrap. Lean also uses tools to analyze and identify wastes such as discrete-event simulation to measure the impact of the changes and improvements [26]. Tools that are used in lean analysis and implementation are listed below.

- Value stream mapping (VSM) is necessary for process definition and process understanding in detail as it provides clear information about the cycle times, tact times and lead times. Flow-charts are converted to VSM and then it is possible to identify value added activities and non-value added activities in the process [27]. The main difference between VSM and flow-charts is that VSM provides the information flow between two stations and there are different symbols for these two representations of processes.
- Standardized work is about creating a baseline of the process. When baseline exists, the idea for possible improvements can be identified so the process can be more stable as people become more experienced and

more skilled in performing certain tasks since the learning curve is established.

- 5S's is a methodology to organize work to be able to perform tasks efficiently by making the working area clean and sorted working equipment. 5S's stand for: sort - unnecessary items throw away; straighten: make a clear position for set of tools used frequently/daily; shine - keep the working area clean; standardize - keep items at same position all the time; sustain - keep the standards and commit to them [28], [29].
- Jidoka is a tool/strategy of pausing the working process when the defect is noticed in order to avoid systematic error in the batches. It is about that quality assurance is taken seriously and preventing errors to happen in the future [30].
- Poka-Yoke is about preventing errors to happen in the future by establishing the process in a way that will prevent future mistakes [31]. In services, it may be introducing some checklists to assure that everything needs is considered.
- Kaizen is about continuous change/improvement which starts with small changes and follows the PDSA cycle, Plan-Do-Study-Act [32]. It is about understanding the situation, finding a root cause of the problem and developing a way to solve the problem in the future.
- Visual Workplace is about setting visual signs in the workplace to provide information and guidance for staff and employees. It can be in the form of floor painting, color-coding etc.

All of the mentioned Lean tools can be employed in the analysis of the administrative and academic processes at a university including the design of experiments [33] in order to reduce wastes and be sustainable and competitive in the market.

4) *Lean implementation:* For an organization to have a successfully implemented Lean thinking, it has shown that the 4-step model was effective in many types of organizations and at universities:

- Identify the Opportunities – do a diagnostic search for issues, problems and opportunities in a whole organization
- Solution Design – a draft for success should be created. In the draft all employees should be involved in training, mapping and planning.
- Implementation – kaizen events and metrics should be used in the implementation stage.
- Continuous Improvement – after the project is completed, the performance should be monitored. Continuous improvements will add value to the organization constantly.

The first step in Lean concept implementation at universities is to identify the current processes at university and to mark the added and non-added value activities. All *non-added* value activities should be reduced or eliminated from the process in order to save resources. Usually, it is not possible to exclude all non-added activities because of legal procedures. More emphasis should be put on added-value activities in order to increase student satisfaction. Key added value activity for universities is lecturing, and all others are supporting necessary ones. For each process all activities should be determined for each of them to check necessity and to eliminate non-added value, unnecessary, activities. The aim is to achieve maximum productivity with no waste.

II. MATERIAL AND METHOD

The methodology used in this paper includes quality and lean six sigma tools considering its "*eight types of waste*" associated with university processes. The quality aspect determines the individual effects of factors that may influence our processes [34], while the lean aspect represents a method that is designed to remove waste and eliminate problems with the aim of reducing cycle time. The focus of the research is student satisfaction whose factors (causes) were observed and are represented in Figure 2.

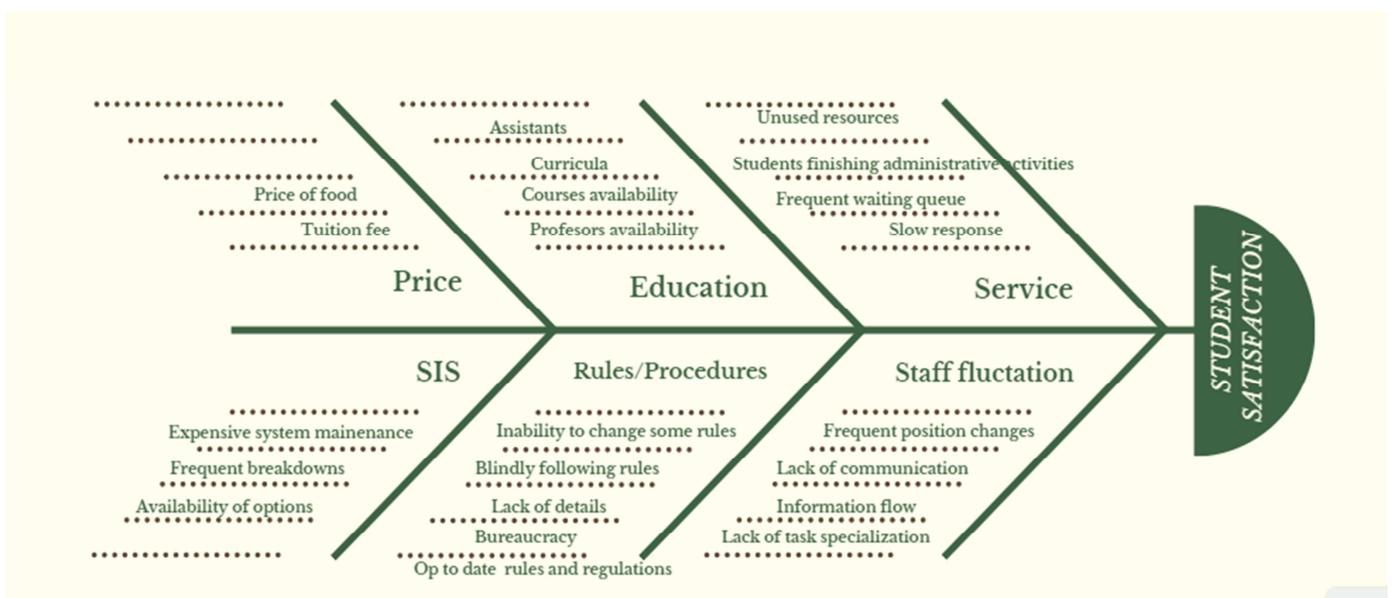


Fig. 2. Fishbone diagram for student satisfaction

Types of waste that may occur are *defects, overproduction, waiting, non-utilizes talent, transportation, inventory, motion, and extra processing* [15]. The major concerns of this paper are *waiting, motion and extra processing* defects. *Seven tools* of quality were used for such analysis [35]. This research used almost all of them. Namely, for the purpose of the project, the fishbone diagram, flowcharts and Pareto diagrams are used. Approaches from operations research and strategic management were used to analyze and discuss specific issues. A root cause diagram is used to identify all student concerns. In order to identify issues better, the following factors were considered: all stakeholders were attended brainstorming sessions; the group agreed on the discussed topics; the group listed all causes and factors for categories; the diagram was produced at the end of sessions. The diagram included four areas that supposed to influence student satisfaction: price, education, services, SIS, rules and procedures, staff fluctuation.

A. Survey

Students were rarely asked about their opinions regarding the university. For the purpose of this research, a survey is conducted to have an insight into student satisfaction. For the case of total ignorance of the behavior of the population, Slovin's formula [36] was used:

$$n = \frac{N}{1+N*e^2} \quad (1)$$

where: n is a sample size, N is population size, and, e is an error tolerance. In the case of this project, the population size of the university is 1500 and error tolerance is 0.05 for 95% confidence interval.

According to this formula, the sample size needed for this survey should be 315 students. An online survey is conducted and spread among students randomly, in order to get a non-biased sample, and 120 replies are received by online survey. The printed version of the same survey was distributed among students randomly. In the end, 257 replies were gained which was not the approximated one but it was enough for the purpose of this project. The survey contained questions regarding Student Affairs Office (SAO) and other offices, as well as some main processes at the university. All questions were created based on the fishbone diagram. The aim of this survey is to gain information about student satisfaction with the university and to identify possible correlations among answers.

B. Interviews

Interviews were arranged frequently with employees working at SAO and upon the need for some information. Questions that were mostly asked were regarding the details of processes in order to be able to sketch flow-charts. Additionally, during the interviews all times were given to calculate the total time needed for a process to be done so VSM can be drawn. Not all employees were interviewed. Also, three three-hour long discussions were done with the dean of the faculty, SAO manager and the lawyer in order to find possible solutions. In total, 30 hours of interviews were conducted for the purpose of the research.

In this paper only analysis is done with a few brief suggestions that have to be implemented by higher

management, but the focus was the analysis of current state processes.

C. Lean tools

By using interviews with administrative employees and by observing the current situation the following answers listed in Table I were obtained.

TABLE I
ANSWERS THAT INDICATE IF THE LEAN CONCEPT SHOULD BE IMPLEMENTED

Question	Answer
1. Does the organization have frequent overtime?	YES
2. Rework happens very often- it became a fact of life?	NO
3. Do employees spend so much time on paperwork, copying, etc.?	YES
4. Is there another possible way of performing certain activity?	YES
5. Is the other way better than the current one?	YES
6. Does the organization grow without changes in processes?	PARTIAL LY
7. Do employees spend so much time searching for something?	YES
8. Is the practice that company implements the best one possible?	NO
9. Does every process have an owner and manager?	NO
10. Do employees understand their roles and the impact of their work overall process?	PARTIAL LY
11. Do people communicate the right information to the right office at the right time and place?	NO

Answers match the ones that indicate that the lean concept should be implemented. People that are interviewed for those questions work in different offices, which gave an unbiased picture of the situation at the university.

The main lean tool used to obtain times and screen the current situation of the processes was VSM. For each VSM value added and non-value-added activities are differentiated. Waiting time and total process time (sum of times for all activities) are calculated in order to get lead time which is obtained as a sum of two times. An important metric in lean is the process cycle efficiency (PCE) and it is a direct measure of how efficiently the process is converting the work in-process into the final product or service [31]. Value-added time is a time spent in a process that transforms the form and that the customer is willing to pay for. Process cycle efficiency is defined as a portion of value added time in lead time and it is calculated per formula [37]:

$$Process\ Cycle\ Efficiency = \frac{Value-added\ time}{Lead\ time} \quad (2)$$

Where lead time is the time elapsed from the initiation and completion of a process [38]. Activity ratio is the portion of time spent on value added and non-value added activities compared to total lead time, and it is calculated per following formula [14]:

$$Activiy\ ratio = \frac{Total\ process\ time}{Lead\ time} \quad (3)$$

Note, non-value-added activities can be further categorized as necessary and non-necessary. To improve the

efficiency of a process non-necessary activities, need to be eliminated or reduced.

III. RESULTS AND DISCUSSION

A. Screening current processes

In order to identify all activities in a process and to be able to sketch VSM, flow charts representing current state processes should be obtained firstly. Each column of the flow charts represents the instance/office/authorized person for certain activities. After flow charts analysis, grouping activities and identifying value-added and non-value-added activities, value stream maps (VSM) would represent the current and real picture of the process.

1) *Course Registration*: In order to find a solution, a cause of the problem must be found. Best way to do so is to draw a flowchart diagram to see every process into details. First process that is chosen is the course registration since it is first processes that a student gets in touch when come to the university. Since there is no ultimate curriculum, every student needs to register different courses which makes it complicated. This process is done between four subjects; Student, Adviser, Student Affairs Office and Finance Office if needed. When a student made his/her System Account he/she needs to enter his profile in order to add some courses by himself/herself. After the student sends the added course to the advisor student had to visit him/her to add other courses and accept those that are already added. Registration cannot happen if a student has debt, so in this case Finance Office plays a big role. If some courses are not visible in the system student must fill in the Special Course Registration Form that own the Advisor, if not student had to visit SAO to take one copy. After filling in the form student must visit SAO again for them to enter the course through their system. After adding the course student must go again to the adviser to sign the Registration Form. Three forms are printed; one for the student, another for adviser and third for SAO archive. The registration is officially done and the student can see courses in the system.

2) *Course Withdrawal*: The course withdrawal process can only happen if courses are registered in the system. The student can withdraw his/her courses from fourth week of the semester until midterm grades are published. University rules state that a student is not able to withdraw more than one course per semester, or eight courses throughout four years of studying. Also, one course cannot be withdrawn twice. If all these rules are obeyed, the student can go to SAO to take the Withdrawal form where the student writes the course that wants to withdraw and then visits the adviser to take the signature. After that, a student visits SAO again to submit the form and in maximum few hours, the course is withdrawn. If a student did not obey the university rules stated earlier or used up all options, the student is automatically at the end with the process.

3) *Course Add/Drop*: Course Add/Drop is very similar to Course Withdrawal but this process does not have many requirements or rules, so every student can add or drop a course. The only regulation is in ECTS credits. The student is not allowed to have more than 36 ECTS per semester, except in last semester where he/she can have a maximum

42 ECTS. If a student wants to add a course and make credits higher than allowed, it is not possible to do it. Every other student can add or drop any course. It is the same procedure regarding the Special Case Course Registration Form and the same steps until the end of the process.

4) *Withdrawal from University*: Withdrawal from the university is not that common process and only some students pass through that process. It is taken for this research because it is complicated and useful to analyze as it is the last face with the university. This process happened between eight offices, or in case of debt, nine. Student, after willing to withdraw from the university, must visit SAO to pick up the Withdrawal form, then visit Finance office, Visa department (if student is foreigner), Library, Dormitory and ELS office (for ELS students) to take signatures. Time for taking these signatures depends on the busyness of every office or if the obliged employees are present at the workplace. After all signatures are collected, student goes back to SAO to return the form and pick the original high school documents. Student is obliged to return the ID card as well. After submitting the paper, the student is waiting to receive the call that the withdrawal letter is done. For a withdrawal paper to be made it usually takes up to one day. SAO employee needs to enter the data into the online withdrawal letter form, print it out and bring to the Rectorate to take the stamp when the letter is ready to be taken.

5) *Clearance and Diploma Issuing*: Clearance process is mostly the same as the withdrawal from the university. Regarding the offices, students doing clearance process have two extra offices to visit (the dean's and program coordinator's offices). By entering every office student must fulfill certain requirements in order to get the signatures. If any of the requirements is not satisfied, student must wait for a certain period or cancel the process until everything is solved. Emphasis is on the student since the student must visit every office in order to graduate.

Regarding the diploma issuing, emphasis is on the SAO. When all signatures are collected, the student comes back to SAO to submit the form together with ID card and take original high school documents back. SAO employee takes the obligation to check the grade congruence between the system and official books. If mismatching occurs employee must find evidence in archive to prove which document is correct, and correct the wrong one. After grade check, the student file is ready for preparing the graduation certificate. Another SAO employee takes the file and makes the certificate together with two transcripts (Bosnian and English for Bosnian students, 2 times English for foreigners). Same procedure is with the Graduation certificate. After everything is printed out, employee goes to the dean to take signatures and in the Rectorate to take stamps, when the documents are ready for student to take them.

When student picks the graduation certificate, diploma issuing procedure starts. The same employee enters the needed information to diploma and diploma supplement template. Here also SAO prints two transcripts with the same procedure as for the certificate. After the information is entered, diploma and diploma supplement are printed on an A4 paper to check if there are any mistakes. Two employees do the checking. If there are no mistakes, they are ready to

be printed into the regular golden paper. The diploma and diploma supplement are signed by dean and the rector and stamped in the Rectorate. When everything is signed and stamped documents are ready to be taken in SAO.

All six processes mentioned before are between students and IUS employees, where student is in focus. In grading process focus is on the professors. Students only deliver the solved exams and professors must grade them. After the grading, the professor is obliged to enter the grades into the system and print them out. Then, the professor must go to the dean to take signatures on the printed version of grades and distribute one to the IUS archive, and the another one to the SAO to allow them to publish the grades through the system. The third copy goes to the professor's archive. After everything is finished, student can see grades in the system. In case of wrong record of the grade, there is Grade Change Form through which a professor can correct wrongly entered grades in the system.

6) *Appeal writing process*: Even though this process is not coordinated by SAO, still it is the one that many students

are engaged in and it is closely related to overall student satisfaction and experience at the university. When student face problems and want to appeal on them, the process must go smoothly, carefully and students must be provided with the acceptable solution or reasonable explanation. This process is quite dispersed among authorized offices and instances, and unique for any kind of appeal, but it is quite simplified and covers the main steps and activities common for all different kinds of appeals. This process involves 8 instances which make it quite complicated.

B. Current Processes Value Stream Mapping (VSM)

Based on flowcharts from previous section, VSM are created in order to map the processes, their waiting times with aim to spot bottlenecks. When we have all required times, we can calculate indicative ratios: process cycle efficiency and activity ratio. They are represented in percentage and can be benchmarked with other case studies, or to be compared with usual values mentioned before which is 5%-10% for process cycle efficiency as in Table II.

TABLE II
VSM DATA SUMMARY

Grading process	Name of the process	Value Added Time (hours)	Non-Value-Added Time (hours)	Total Process Time (hours)	Total Waiting Time (hours)	Lead Time (hours)	Process Cycle Efficiency (%)	Process Activity Ratio (%)
1	Registration Process	2.1	2.7	4.8	44	48.8	4.3	9.7
2	Course Add-Drop	0.8	0.2	1.1	32	33.1	2.5	3.2
3	Course Withdrawal	0.1	1.7	1.7	12.1	13.8	0.6	12.5
4	Grading	4	2.3	6.3	34.17	40.5	9.9	15.6
5	Clearance form and Diploma Issuance	0.8	8.4	9.3	104	113.3	0.7	8.2
6	Withdrawal from the University	0.3	1.3	1.7	42	43.7	0.8	3.8
7	Appeal Writing	6.9	1.2	8.1	77.8	85.9	8	9.4

Value stream maps represent the current situation of the processes. In Methodology formulas are mentioned as well as concept behind this lean tool and the Table II which summaries all important information obtained in VSM for each process. Process cycle efficiency is obtained as expected to be around 5% before lean tools application except grading process, which has an outstanding result. The reason for that is the bigger value-added time for grading activity, four hours as an average time required to grade all exams. One student is waiting for all exams to be graded. The perspective is important, so from the student perspective, this process may be very inefficient compared to professor's perspective currently presented in the table which shows the process to be quite efficient. Table II clearly shows the efficiency of all processes and indicates the need for process improvement.

C. Survey Results

After an extensive brainstorming, fishbone diagram was created in order to map the critical student's concerns that

affect overall student satisfaction. Based on fishbone diagram and brainstorming, survey questions were created in order to examine the situation and justify assumptions in an unbiased way. Fishbone diagram helped in the process of designing questions pointing on the main topics to be asked and focused on. The survey questions and answers are used to map the priorities in the lean adoption processes. A survey conducted at the university showed that students who are dissatisfied with tuition fee or Student Information System that they are dealing with most of their time at the university, they are less likely to recommend the university to others which is the indicator of students' dissatisfaction (see Figure 3) and possible area to work on. The high tuition fee is a sufficient reason why to decide to pursue the Lean strategy in order to cut the wastes so the university can be sustainable and grow in terms of quality of education and providing the students with facilities that will increase their overall study experience at the university.

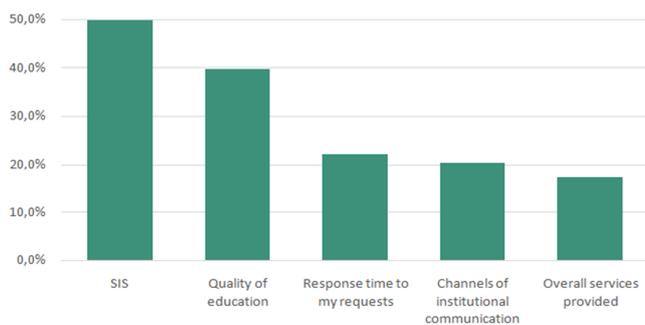


Fig. 3 Students' dissatisfaction

Descriptive and correlation analysis is worked off to examine about what students are satisfied or dissatisfied. For correlation analysis Pearson correlation coefficient was used where critical value is 0.105 for sample size of 260 and 0.05 1-tailed test. Moderate positive correlation is found between quality of food in the canteen and financial offices services on one side and overall services and facilities on another side, which means that financial matter and food are one of the most important segments when talking about overall satisfaction with services and facilities provided at the university. Also, moderate positive correlation was found between course availability in the Student Information System (SIS) and registration through the System, which means that if students have better course availability in the System every semester, they will be more satisfied with the whole System. This is supported by another fact obtained through this survey that the second item among offered ones for dissatisfaction is the System which shows students' everyday frustration at the university. One more moderate positive correlation was found between value of education for the price and academic resources in the library on one side and academic reputation on the other side, which shows that satisfaction with academic reputation of the university depends on how students perceive the quality of education and how they are satisfied with library resources. This is supported by the fact that those who said that are dissatisfied with having assistants giving lectures instead of professors are more dissatisfied with quality of education at the university than average student of the university. Close to moderate positive correlation is found between satisfaction with overall campus services and facilities and academic reputation of the university.

Weak correlation is found between having assistants giving lectures instead of professors and their satisfaction (see Figure 4) with academic reputation of the university. Even though some correlations are weak, they are still statistically significant since they are above Pearson critical value which is followed by rejecting H_0 hypothesis which states that there is no correlation between 2 sides.

When it comes to likelihood of recommending the university to others, in the scale from 1 to 10, students are 6.6 on average likely to recommend the university to others. Interesting is the fact that students who are dissatisfied with the System are less likely to recommend compared with an average student of the university. Furthermore, those who do not know where to find solution for their problems, issues and concerns at the university are less likely to recommend compared with an average student. Also, those who

appreciate the brand are more likely to recommend the university compared with an average student.

Students had opportunity to express their opinions and feelings regarding complexity of the processes related to SAO. For Course registration, appeal writing and clearance form/graduation process they said they are complex.

Students are generally dissatisfied with frequent curricula changes, course availability every semester, value of education for the price and having assistants giving lectures instead professors, but the most dissatisfaction they expressed toward course availability every semester. On the other side, students see course add/drop process and course withdrawal quite simple. This is a clear indicator for the top management of the university to research more on this in order to find roots of the problems for dissatisfaction in order to work on them.

In total, students see Student Affairs Office very helpful, whereas they see advisors less helpful according to this survey. The following results are obtained and shown through Pareto charts. As expected, university fee and SIS causes many problems at the university and students feel them as well. From fishbone diagram it is also known that the maintenance of the System is expensive. Student graduating from the Department of Computer Science showed at it is also easy to hack and it is not secure as it should be. University fee is high for many reasons but in discussion later it will be shown how university can survive a crisis without making higher prices.

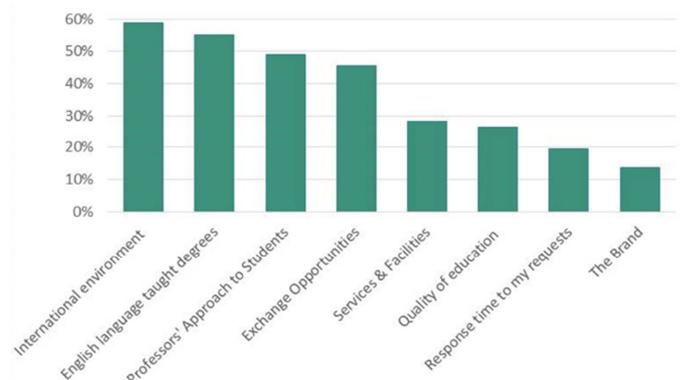


Fig.4. Students' satisfaction

Regarding student satisfaction, they are mostly satisfied with international student environment and English taught degrees as it is an international university having students and professors from all around the world. Satisfaction with quality of education is at low percentage (25%), but it is the most important thing for a university as it should provide the best education possible. Only 12% of students expressed their satisfaction with the brand of the university. 20% of the students are satisfied with the response time for their request, which is a low percentage which may mean that students appreciate it but not as a major thing.

Students were complaining about the lack of information regarding events or changes occurring at IUS such as non-working days, changed working hours, announcements etc. Some of this information are published but using wrong communication channels (See Figure 5). Also, some professors use different sites for sharing materials with the students so it is difficult for a student to catch up with all

different sites. 75% of the students said that they would like to communicate to professors and staff through e-mail and 40% said that they prefer social networks.

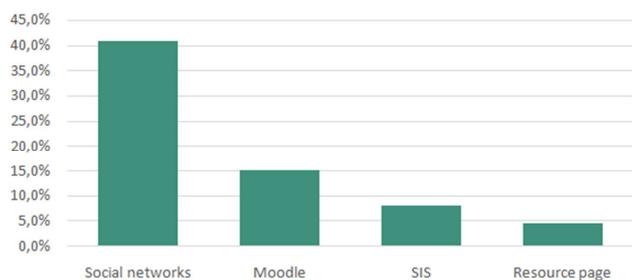


Fig.5 Preferable channels for communication

A small number of professors use resource page and only 5% that they would like to keep that channel. Moodle is mostly used for professor-student communication but from the diagram it is shown that only 15% support this channel. However, the overall conclusion from this chart is that students would like to communicate through e-mail the most.

D. Suggestions and recommendation

Now when big picture is presented including survey results, analysis, charts and maps and beginning questions for lean implementation, all this indicate that the university needs certain improvements in everyday processes. Based on the case studies about Lean implementation in HEI all around the world, there are 3 possible ways to achieve that:

- Using current resources start with establishing Lean Culture,
- Establish Lean Office,
- Outsource consulting company for Lean implementation in the institution.

Among these three choices, second and third are the most serious and promising in terms of achieving better efficiency, cutting costs and increasing overall student satisfaction. In the very beginning of this paper, case studies from universities in UK and USA are mentioned in terms of implementing Lean concept in HEI. The following Table III summarizes some general recommendations and remarks based on observation of the processes and concluded from the survey general questions.

TABLE III
GENERAL RECOMMENDATIONS FOR TOP MANAGEMENT OF THE UNIVERSITY

Recommendation	Explanation	Impact
Understand customer (student) needs and wants.	Conduct survey once or twice per year to track the progress and student concerns, satisfaction and dissatisfaction.	Overall satisfaction will be improved.
Introduce Lean thinking and lifestyle from top management to lower management.	Lean must be adopted at all level of the organization, but not only in one department. It is necessary for all employees to understand the concept and live it.	Customer satisfaction increased, waste reduced, lower fee (may be decrease soon as a result of lean adoption).
Establish good communication between offices.	Good communication is crucial for frustration minimization and rework.	Less defects and rework, employees are well informed.
Establish proper communication channels between the university and students.	Survey says that 75% students prefer communication through e-mail which is currently not the case. Students are not informed about important details such as non-working days and working hours of some facilities.	Overall student satisfaction will increase when they know important details for daily activities.
Replace current Student Information Systems with another, more suitable for the university needs.	Almost 60% of students are dissatisfied with the System. Top Management should seriously rethink about the new Student Information System that meet current needs.	All processes are going to be more efficient and simpler with change of the system.
Before registration period, SAO should organize meetings with all advisors and instances involved in registration process to explain them the rules, needs and procedures.	It is necessary for advisors to know activities that students and SAO perform during the registration period since they play important role in the whole process.	Rework, time waste and frustrations decreased, student satisfaction and productivity increased.
Before add/drop process send special course registration form to advisors and explain them why it is important to have it printed out and force them to do that.	SAO should not participate in activities that are reason for dissatisfaction for the students. They must do all necessary measures to stop bad practices that cause walking from office to office.	Students will walk less between offices; overall process will be more efficient.
Employ more professors for certain departments.	It is not acceptable that certain departments have one or 2 professors. The survey indicates that 40% of students are dissatisfied with quality of education for the price they pay. Education get boring when all field related courses are taught by only one or 2 professors through all 4 years.	Quality of education will increase; overall student study experience will be better.

Recommendation	Explanation	Impact
Think of providing more courses each semester, at least few program electives.	Survey indicates that students are dissatisfied with courses availability in each semester.	Student expectations from the university will be met. Students will be able to choose between directions in respective fields and to take courses they want but not the one they must because of lack of courses each semester.
Update university rules and regulation documents, align them with current situation, and needs of the university. Distribute them among all employees and offices that are involved in a certain process.	Documents that regulate study cycles, clubs and such activities are outdated or incomplete. There is lack of communication between departments, so students are not able to solve problems immediately, but they walk from office to office in order to find the solution.	Overall student satisfaction will increase. Students will be able to find the solution for their problem on one place. Time waste will be reduced. Over processing will be decreased as the clear solution for a repeating problem are going to be provided.
Say stop to frequent position changes.	When positions are changed frequently, it becomes frustrating for students to experience different people on the pint. Also, the biggest drawback is that learning curve is established again and again and cannot become productive as it is not stable.	Learning curve will be stabilized, rework and defects will be reduced. Response time will be improved and overall student experience with the office will be increased.
Use e-mail address data base to communicate with students about all their concerns, information and details. Every student must receive information about any change at the University.	In 21 st century it is very important for all to be informed by the mean they want and they use the most. Official communication with students needs to be through e-mail and not through social networks. Email should not be sent to only one student so the student can spread the word, as many professors do currently. It is important to have one, official, way of communication and to be able to find all information in there, but not to have many of them.	Communication improved. Rework and defect reduced. Overall satisfaction increased. Time waste significantly decreased and better organized students, professors and overall courses.
Standardize processes and write clear procedure for any of them.	Write and decide about the procedure for any process and establish standards for them.	New employee is more introduced better about the processes. It will reduce adding new, unnecessary, activities. Over processing will be reduced.

IV. CONCLUSION

In the context of Bosnia and Herzegovina, top management of any university should consider the option of implementing the Lean culture and Lean tools. There are already many positive examples of Lean implementations all over the world and there is enough of material, articles and papers written on this topic that can be used for a research and ideas on this topic. Today universities are a businesses and students are their customers. In order to be competitive in the market, they must provide quality for the reasonable price that customers are ready to pay and to maintain the quality of the time. Customer loyalty is seen as a competitive advantage of a company; therefore, universities must work on maintaining loyal students that are ready to spread good word about the university and to attract more people to there or to recommend it.

In order to successfully implement the whole concept, it is necessary to establish the Lean culture in the organization and to spend some time on developing it. After the culture is established and all employees are aware of the benefits that Lean can bring to an organization and believe in it, the implementation process should start. When Lean culture is established in the organization, the employees are more likely to continuously improve processes in an organization. It is necessary that all employees are aware of benefits and the goal of an organization.

In the case of this university, there are three possible ways how to start the transition towards Lean University:

implementing it using current resources, outsource consulting companies for Lean implementation and establishing Lean office at the university. Each of these suggestions has certain pros and cons, but top management of the University must sit and brainstorm about the best solution in order to achieve the best benefits in cheaper ways, since this research has shown that the university needs Lean strategy to prosper in the future.

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