Lean Application in Student Finance Department within a Learning Institution Can Lead to High Academic Throughput: A Case Study

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Abstract--**The knowledge of lean principles is just as applicable to offices and other work environments as it is to manufacturing plants. Lean is a theory that can help organizations to simplify and organize their working environment so that waste can be reduced, avoid high employee turnover and proper equipment and workspace is used. Although services can be consumed and perceived, they cannot be measured easily and objectively, like manufacturing products. An objective measurement is a critical aspect of lean, which requires data-driven decisions to eliminate defects and reduce variation. Waste and the misuse of time could cost the company and the clients' money and time, and in an academic environment, this is known to be extremely valuable. The study focuses on the finance department supporting students in one of the leading South African institution. There has been a number of incidents of wastage and non-professionalism identified in that department, which led to some students not getting their tuition and study material on time and some unable to register for the current year. The research attempts to highlight these problems and provides a solution as to how they can be resolved in order to assist the university to reach its expected throughput.**

I. INTRODUCTION

Lean is a process improvement methodology used to deliver products and services better, faster and at a lower cost. Womack and Jones [19] defined it as "a way to specify value, line up value-creating actions in the best sequence, conduct those activities without interruption whenever someone requests them, and perform them more and more effectively. In short, lean thinking is lean because it provides a way to do more and more with less and less – less human effort, less human equipment, less time, and less space – while coming closer and closer to providing customers with exactly what they want."

Lean production/manufacturing is one of the practices any organization should consider when dealing with waste, as lean also ensures resources are working on the right activities [14].

Lean production in the service industry was first mentioned in articles titled 'Production line approach to service' and 'The industrialization of service' [10]. After these articles were published, a number of companies attempted to implement lean in the service industry. Lean in the service industry only started gaining momentum in the late 80s [2]. Lean processing is a way of adding value in a service industry by doing away with waste and adding value by improving quality, speed, customer satisfaction and reducing overall costs [6]. It was identified that the use of the Lean concept, practices, principals, tools and techniques will help improve on quality and processes in the service industries [13]. The service industries that Lean was implemented in were banks, hospitals and airlines, and these types of practices were said to improve efficiency in those industries [6].

II. WASTE AS A PROBLEM

Lean focuses on the maximization of process velocity through the reduction of waste. It provides tools for analysing process flow and delay times at each activity in a process. The focal point is the separation of "value-added" from "non-value-added" work. This is complemented by tools which aide in the identification and elimination of root causes of non-valued activities. The primary problem addressed by lean is waste, which can affect value in a number of ways. It may result in lower quality products, higher costs, less favourable customer experiences, excessive time or effort expended to complete goals, or fewer resources available for innovation which could provide potential value at a future date. Waste can be found in people, processes, tangibles, and other areas. Eliminating waste through the lens of Lean production can help to achieve the goals of service organisations which can be identified through root cause analysis.

III. SOURCES OF WASTE

There are many sources of waste and these vary greatly industry by industry. In most service related industry, waste is concentrated in flow and throughput. As a result, lean implementations in this field are primarily focused on the elimination of waste in staffing and staff processes. Services industries typically spend a larger percentage of operating expenses on overhead and labour costs. This can account for 50 percent of the operating costs while inventory is in the range of 2 percent as compared to manufacturing which has high inventory costs ([3]. Understanding waste in throughput entails a comprehension of the relationships between process variables and costs. Costs are not causes of waste but are indicators of interrelationships between processes. While the ultimate goal of most Lean implementations is to recover costs as tangible benefits, eliminating costs without fully understanding processes is problematic

IV. THE FOLLOWING APPROACHES FORM A CORE FACTOR IN LEAN PROCESSES

- Root Cause Analysis
  A crucial process in Lean is the identification of waste

through root cause analysis. Root cause analysis in Lean involves a method called 5-Whys [16]. This method rapidly identifies root causes and aides in determining the relationship between multiple root causes. It can be learned quickly and does not require statistical analysis. This method is especially effective for an implementation team in the initial stages of problem exploration. The application of this strategy involves asking a series of "why-related" questions to drill down into a problem area. Asking progressive questions about a perceived difficulty forces team members to think critically about the actual sources of waste and inefficiency. It is suggested that at least five questions (5-Whys) are posed in order to arrive at the root cause of the problem.

- Standardizing
  Standards are documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics, to ensure that materials, products, processes and services are fit for their purpose.
- Visual management
  Visual management is a concept that is a part of lean. It is the researcher's opinion, that visual management is one of the top 2 or 3 concepts of lean. Visual management is a concept that allows lean principles to come to life more easily. So, what is visual management? Visual management is a workplace that has a self-ordering, self-explaining, self-regulating and self-improving environment where what is supposed to happen does, on time, every time because of visual solutions.
- Value stream mapping
  Value stream mapping is the use of graphical representations of the flow and processes in an organization. It is used to map out the present and future state of a system and process. It identifies, step by step, the flows of the process. Value stream mapping includes time diagrams. Time diagrams are the total time it takes to see to one individual requiring the departments' service.
- Better utilization of resources
  Better utilization of resources (both human resource and technology), leads to a reduction in the costs of running the finance department.

  Benefits of lean in the industrial world (both manufacturing and service) include:
- Ensuring services/products conform to what the customer needs (voice of the customer);
- Removing non-value adding activities (waste);
- Reducing the incidence of defective products/transactions;
- Shortening cycle time; and
- Delivering the correct product/service at the right time in the right place.

V. PRODUCTIVITY AND PROFITABILITY

The two most important variables in any organization are productivity and profitability [5].Productivity is a measure of the efficiency of production. Productivity is a ratio of production output to what is required to produce it (inputs). The measure of productivity is defined as a total output per one unit of a total input. These definitions are short but too general and insufficient to make the phenomenon productivity understandable. A more detailed theory of productivity is needed, which explains the phenomenon productivity and makes it comprehensible. In order to obtain a measurable form of productivity, operationalization of the concept is necessary. In explaining and operationalizing, a set of production models are used.

A production model is a numerical expression of the production process that is based on production data, i.e. measured data in the form of prices and quantities of inputs and outputs. It is most advisable to examine any phenomenon whatsoever only after defining the entity of the phenomenon under review. Then it will be possible to analyze the phenomenon as part of such an entity. Hence, productivity cannot be examined as a phenomenon independently but it is necessary to identify the entity it belongs to. Such an entity is defined as production process. Productivity is a critical factor of production process in one way or another.

Market production is the prime source of economic well-being and therefore the "primus motor" of the economy. Studies have shown that the misuse of work time negatively impacts productivity variables. Productivity variable are the three factors critical to productivity improvement that is labor, capital and the art of science in management [9]. It is understood that in order for any organization or institution to be successful, a high level of productivity and profitability should be considered paramount [15]. Productivity is in this economic system the most important feature and an essential source of incomes.

VI. CASE STUDY

This study is focusing on the National Student Financial Aid Scheme (NSFAS) department based on Bunting Road campus at the Institution of Excellence (IE). The NSFAS is a government initiative that administers loans and bursary schemes for needy South African students at tertiary level. Students are given the option to approach this department in order to acquire financial help. The department reviews each case and decided which individuals are most deserving of the financial aid. This research will focus solely on how time wastage and staff functions in this department, has affected the students applications. It will ask the following questions.

- Why is this happening in this department?
- What is the cause of time being wasted?
- What are student's contributions to this delay?

The issue is to identify these problems and to determine how they can be addressed. There are many symptoms of the problem, but in order to solve any problem it is best to focus on the root cause [1]. When dealing with employees in any institution it is important to understand whether the job they are performing is what is suitable for that particular employee [7]. The biggest cause of abuse of work time, as studies have shown, is when employees are unsatisfied at work [18].

The inefficiency of any organization can be influenced largely by the lack of employee contribution and the abuse of work times [8]. A large number of employees are wasting time because they are lacking motivation. Some employees may feel that their work is not challenging or rewarding enough to motivate them to want to try harder in order to achieve satisfactory results [18]. Motivation is the desire to do things. It's the difference between waking up before dawn to pound the pavement and lazing around the house all day. It's the crucial element in setting and attaining goals. The research will show how individual can influence their own levels of motivation and self-control.

Various problems were identified at the Institute of Excellence. Amongst others are that staff members were not empowered in terms of decision making. There was a complete lack of motivation which resulted in the lack of satisfactory job output. There were no specific job procedures in place. Staff had a tendency of surfing the internet during working hours and ignoring their work. All these affected the student application output leading to long queues in the department.

Figure A below paints a picture of the situation before lean was introduced. The figure shows the number of students waiting in the queue during the NSFAS application The Y axis shows the number of students queuing up the X axis. The X shows the months during the year when the queues are long. These long queues decline towards the end of the year probably due to student writing examinations.

Figure B below represents the Y axis showing the time (in minutes) it takes the student to process an application when students gets to the counter. The X axis shows the time in hours students spend waiting at the department for assistance.

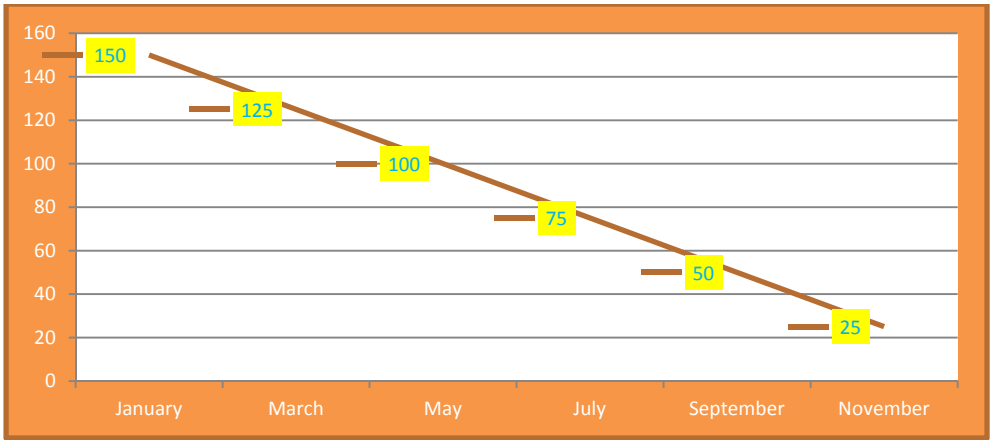

Figure A: Number of student waiting in queue
(Source: The Researcher 2014)

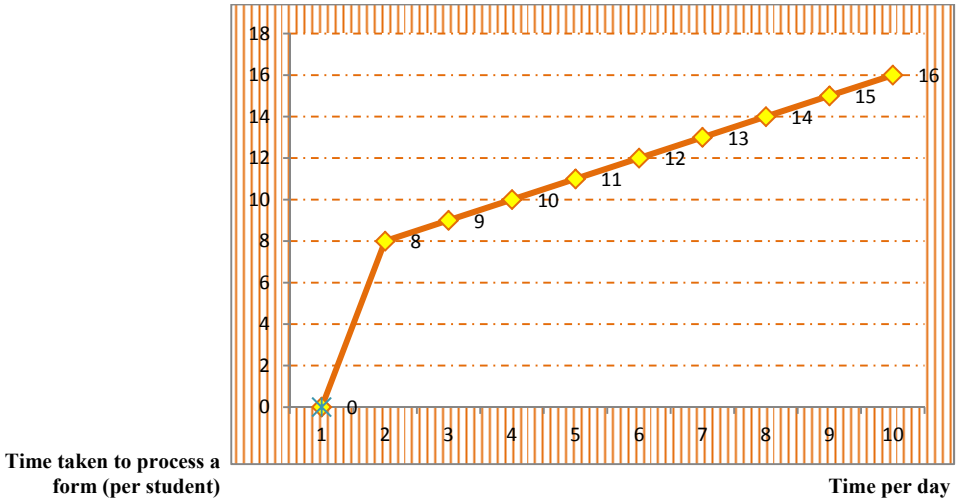

Figure B: The time the students take in a department: to process an application form
(Source: The Researcher 2014)

Figure C below represents the movement of student in the NSFAS office. It clearly shows unnecessary steps that students followed to submit applications. Sometimes student takes the whole day to have a form processed.

VII. METHODOLOGY

The methodology outlines the approach used for data collection. The researcher conducted direct observations. Data collection was carried over a period of six months and firm conclusions were made. The approach was considered flexible since it included a number of interview questions, of which some were open ended and some closed. According to Cooper & Schindler [4] there are only two alternatives that can be used to gather data and that is by observing conditions, behaviour, events people and processes and to communicate with people about various topics. The other one is by a personal interview (i.e. face to face) in a two-way conversation initiated by an interviewer to obtain information from a respondent [4]. According to Womack. & Jones,[17], observation is one of a few options available for studying records and recording data. Both methods were used.

The researcher also tapped from his previous experience and felt that an appropriate way to achieve these objectives was to obtain quality primary data from leading role players in the department mainly the workers who formed the backbone of this research paper. The research approach helped in addressing the goal of the department. The approach also outlines the analysis of data. The goal was to eventual reduce waste in the NSFAS department.

The primary objective was to study and analyse the application processes of the Finance Department (NSFAS) at the Institution of Excellence (IE) based on Bunting Road Campus. The secondary objective was to identify waste in the process. The researchers carried out direct observation as they were physically present and personally monitored what was taking place. This approach is flexible because it allows the observer to react and to report subtle aspects of events and behaviour as they occur [4].

The departments' employees are the key aspect in implementing lean processing. It was crucial to identifying key people that were used in the lean processing exercise. It was also essential that data was collected from the correct subject matter expects who were part of the lean processing. The department employees assisted in collecting information since they knew all players in the processes.

VIII. DATA COLLECTION

Data collection involved the use of the five steps applicable to lean. The initial step entailed capturing of the process map (see figure C), which was then used to review targeted work process information. This information was, in turn, applied in analysing the process. The second step involved conducting a walk-through of the targeted work process, where sources of waste were identified. The research team focused on waste that contributed significantly to time wasting.

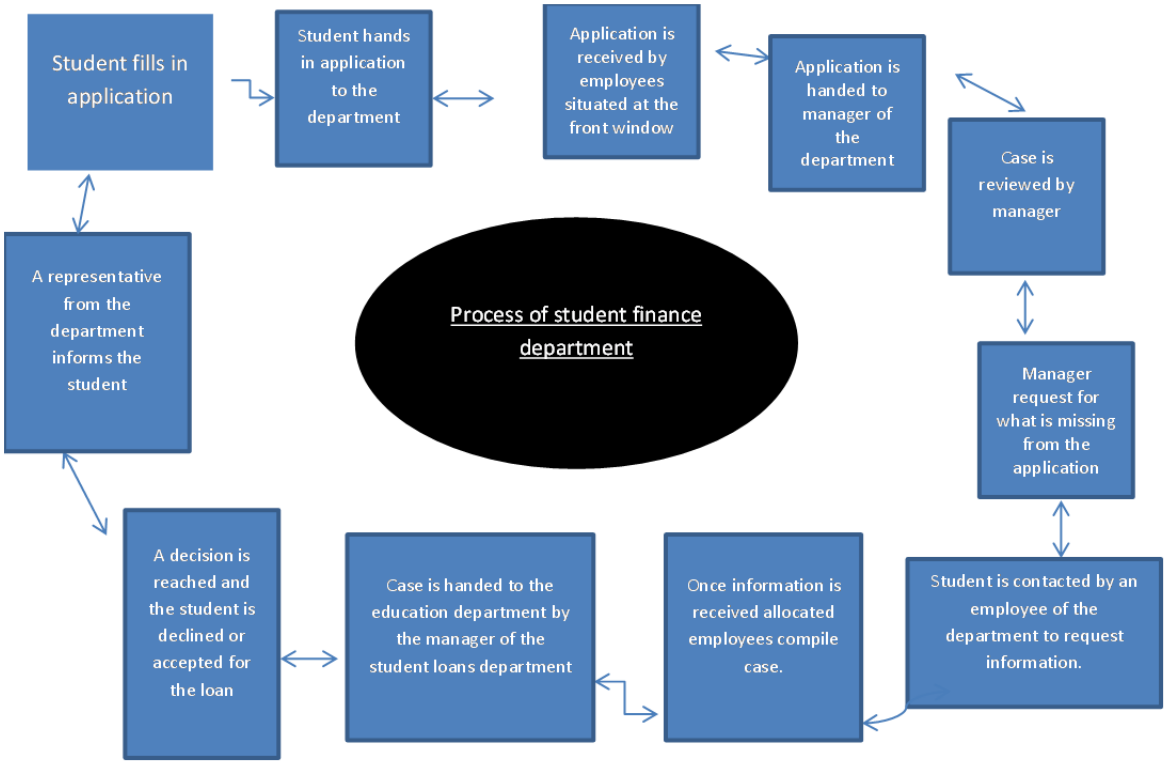

Figure C: The process map of students.
(Source: The Researcher 2014)

A draft plan was prepared to expedite the work involved and to ensure reliability of information acquired. Records of the variability from reports on cycle times were made to complete the preparation of work process.

The research required observation of employees work patterns as well as the student's participation in making the processes effective, which involved monitoring the processing of multiple applications. In this instance, the approach included only two observations of the application process, as this seemed to show a consistent process.

In terms of the observations, the focus was placed on actual operations performed by employees as well as student. To facilitate this process, a researcher was identified to observer the students, whilst an experienced supervisor was selected to conduct the process observation. The supervisor recorded and described each work activity executed by the employees and students by using the Waste Observation Form. The researcher performed the utility role, which included collection of sample documentation received or produced by employees as a part of their job function.

A team member was elected to assume the role of documenter and was responsible for recording all collected information electronically. In addition, a timekeeper recorded and reported the end time for each work activity using a stopwatch. The cycle time of each work activity was also computed. During the observations, the process observer recorded the information in the Process Observations Data Sheet along with the identity of each work activity.

The observations of the application process continued over a period of five hours. This enabled verification of the activities and allowed for certain activities to be repeated for confirmatory purposes.

The mission statement was developed in order to clarify the business problem. This was followed by a goal statement, which consisted of dual components, namely a "what" described the state of waste to be reduced and a "how much" and what processes were followed in order to reduce waste. Finally the "do's" and the "don'ts" were considered as final steps in order to define the scope of the event.

IX. FINDINGS

Organizations understand that time equals money which makes these issues a very serious problem that had to be looked into [11]. A survey revealed the following (1) There were long queues at the department as applications took long to be processes. (2) Staff members/employees were not empowered and could not take decisions on their own. (3) There were no specific job procedures. (4) Students were delaying the application process by not applying timeously. (5) Incorrect information was supplied to the students by staff members. (6) Employees within the department were doing multiple jobs and (7) Employees were surfing the internet during working hours.

X. RECOMMENDATIONS

The NSFAS department introduced lean practices in order to change the working culture and to reduce waste in the department. The following are lean processes that were introduced. Root Cause Analysis, Value stream mapping, Visual Management and *Standardized operation*.

- Root Cause Analysis (RCA)
  As explained in literature, RCA is a process that introduces organizational improvements in many situations, and most importantly, is a learning process for thorough understandings of relationships between cause and effect and solutions. By practicing RCA, organizations can identify possible causes and act on them immediately. A swift and immediate action is necessary so as to stop any causal effect downstream. An application of RCA will help achieve intended results.
- Value stream mapping (VSM)
  Value stream mapping is essential in identifying what processes are adding values and which process should be done away with. It will also identify the flow of communication from the department to the students, as the research identified that one of the students' complaints was miscommunication. It will assist the department to communicate with the student and provide them with the correct answers the first time and identify visually where wastage within the department is occurring.
- Visual Management
  The benefits of using Visual Management are that the work progress can be seen and if necessary recognised and resolved immediately. It is easy to identify inventory levels and see the defects as well as correcting deviations thus enabling interventions. This will help the NSFAS department to guide process activities and evaluate what is happening [16] in order to maintain a clean and uncluttered environment. The process of how the department runs could be shown to each staff member by showing them how to deal with queries, which allows them to make decisions on the spot.
- Standardized operation
  Standardized operation focuses on efficiency and people productivity in everyday operations and then standardizing operating procedures using best practices. Organizations of all sizes in every industry are finding real, measurable improvements they can implement for high return on investment (ROI). Good standard operating procedures are key objectives to achieving 4 important business goals:
  a. Working Faster
  b. Eliminating Waste.
  c. Better Utilizing Staff and Supervisors.
  d. Navigating Change and Uncertainty

By introducing standardized operation will assist NSFAS department where the roles are not clearly stated. All employees could be given the same training and given the

same information in order to deal with the students. This will allow employees to be flexible and will help the departments to provide clear roles and responsibilities to staff members [12].

Table A provides the information before and after the implementation of lean practices. The number of student in the queue was greatly reduced allowing the staff member to attend to other important issues. It was also observed that this action contributed to staff motivation and high morale.

TABLE A. TABLE OF COMPARISON

	Before the Lean concept was implemented	After the Lean concept was implemented
Number of students in line	150 students at a time from 09:00 – 17:00, "first come first sever"	10 students as bookings were made by online appointment.

The activity is captured well in figure D which explains the decrease in student numbers after Lean intervention**.**

XI. CONCLUSION

This paper gives a detailed picture of lean application in the National Student Finance Department (NSFAS) at the Institution of Excellence (IE) based on Bunting Road Campus. There have been long queues in the department which needed to be addressed. Other problems related to low staff morale and low workmanship leading to low processing student applications. The observation was made that staff would surf the internet during working hours indicating that job descriptions were not in place and obviously poor management.

After the introduction of lean processes e.g. root cause analysis, value stream mapping, visual management and standardized operation, there was an obvious change in the workmanship of the staff. They became motivated and this was seen when long queues became short in the department. The students also obtained their tuition and study material on time and were able to register for the current year.

The study shows that lean requires data-driven decisions to eliminate defects and reduce variation. Waste and the misuse of time could cost the company and the clients' money and time, and in an academic environment, this is known to be extremely valuable.

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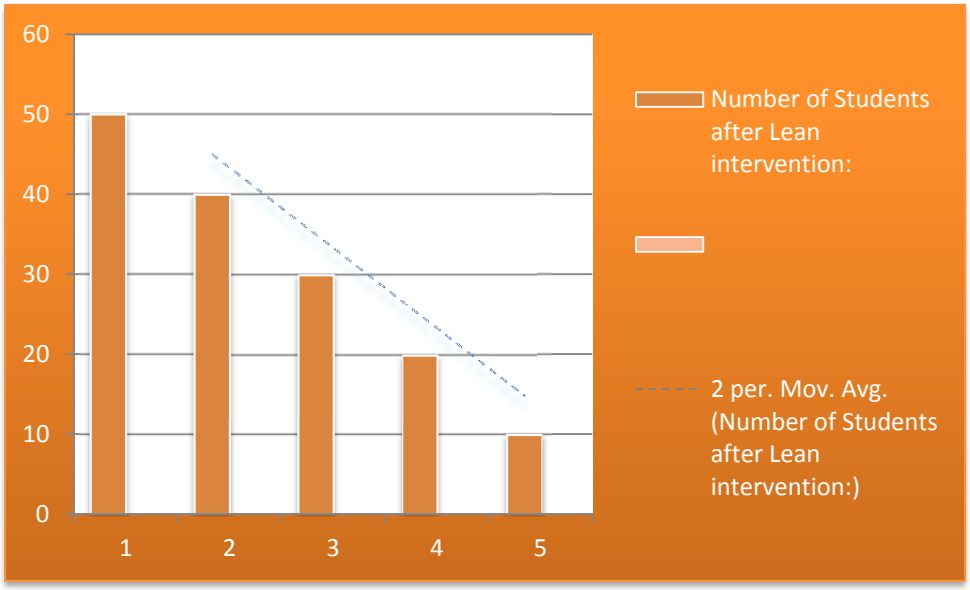

Figure D : Decrease in student numbers after Lean intervention
(Source: The researcher 2014)

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