

**Professional bureaucracy**  
**A support for the implementation of the lean six sigma method in  
higher education**

**Mr. Ahmida FERHAT**

**Lecturer, MAA, University of Laghouat, Algeria**

**ferhatahmida7@gmail.com**

**Summary:**

The objective of this study is to integrate the lean six sigma method into academic institutions in order to improve the quality of services. Given that professional bureaucracy is the best design for such organizations, it promotes the application of the lean six sigma method.

Based on the organization of the quality team of Lean six sigma with its hierarchical organization formed by Master Black Belt, Black Belt, Green Belt, Yellow Belt, Professional bureaucracy consists of technostructure which is composed of specialists who plan the work of employees.

To achieve this, changes are needed in the technostructure: defining work processes, defining the responsibilities of each member in the quality team, and introducing information systems capable of managing processes.

**الملخص:**

هدفت هذه الدراسة إلى توضيح إمكانية تطبيق منهجية لين ستة سيجما في الجامعات وهذا بالاعتماد على الهيكل البيروقراطي المهني والذي يعتبر الأكثر تلاءمًا مع خصائص التسييرية لجامعات، وخاصة جانب الاختصاصيين. بالاعتماد على فريق الجودة لستة سيجما و المتكون من بطل الحزام الأسود، الحزام الأصفر، والحزام الأخضر والحزام الأصفر. يمكن إسقاط هذا التنظيم في الجانب الاختصاصيين في الجامعة مع إجراء بعض التغييرات على هذا الأحيو كالتكوين وتحديد عمليات تهدف إلى رفع من مستوي الجودة.

وذلك بإجراء بعض التغييرات كوضع عمليات لرفع من الجودة، تحديد مهام كل أعضاء الفريق، دمج نظم المعلومات.

***Introduction:***

Today, quality is the main concern of many academic institutions that want to achieve a level that allows them to satisfy their customers, and achieve a level of excellence. To do this there are a multitude of methods that allow the acquisition of quality, among them the method Lean six sigma; that is based on a five step process "D.M.A.I.C". Implementation of this method requires adjustments to the organizational structure of the university, which is the professional bureaucracy.

***Issue:***

What changes are needed to apply the Lean Six Sigma method in the professional bureaucracy?

***I. Review of Literature:***

***1. Definition of Professional Bureaucracy:***

Professional Bureaucracy consists of five parts which are the strategic summit, the hierarchical line, the operational center, the support functions and the technostructure.

This structure is based on the operational center which is composed of professionals who are highly qualified; they largely refer to the know-how. The former acquired the method of coordination during their initial training as a standardization of qualifications, which is, consequently, the role of the technostructure. The latter includes analysts who assist in organizing the work of the operational line<sup>1</sup>.

Professional bureaucracy responds uniquely to the needs of academic institutions, by directly dividing power from the operators to whom it gives considerable autonomy, freeing them even from the need to closely co-ordinate their activity with that of their colleagues, and with all the pressures and political activity which results from it<sup>2</sup>.

But in these same characteristics of democracy and autonomy reside the major problems of the professional bureaucracy because there is no boundaries outside of the profession; practically no control over the work and no means of correcting the deficiencies, on which the professionals themselves choose to be oblivious. In addition, they tend to overlook the essential problems of coordination, control and innovation that arise in these structures.

## **2.The Technostructure:**

Technostructure is a term coined by the economist **John Kenneth Galbraith** to describe the group of technicians within an enterprise (or an administrative body) with considerable influence and control on its economy<sup>3</sup>. It usually refers to managerial capitalism where the managers and other company leading administrators, scientists, or lawyers retain more power and influence than the shareholders in the decisional and directional process.

It is composed of experts, who design the work for the operational center, by planning methods, objectives or know-how. They train operators, but they do not do the work themselves. The role of the technostructure is to use techniques to make the work of others more effective. They are the engines of standardization in the organization.

The main role is to coordinate the work between operators through standardization, which can take the form of standardization of qualifications, procedures or results (each refer to a type of organizations).

For professional bureaucracy refers to the standardization of qualifications, that best fits the needs of this type of organization.

## **3.Six Sigma**

There is a growing trend towards the Six Sigma methodology, whose concepts are used in the higher education sector. The Greek letter sigma “ $\sigma$ ” designates the standard deviation and means in statistics "six times the standard deviation". This technique eliminates the risks in manufacturing processes and services up to 99.9997% quality output. The story of Six Sigma began in 1986 at Motorola, which had sought to implement a method of improving its manufacturing processes based on the philosophy of William Edwards Deming (Wheel of Quality). Six Sigma is a registered trademark of Motorola designating a structured management approach to improve process quality and efficiency. It is a method and a technique essentially based on the notion of measurement and statistical analyzes of data making it possible to compare the distribution of the obtained results with that of the desired results<sup>4</sup>.

*Board 1. The levels of sigma*

Quality level z	Number of non-compliance Per million opportunities
1	697 672
2	308 770
3	66 811
4	6 210
5	233
6	3,4

**Source** : Maurice PILLET , Six Sigma : Comment l'appliquer, Éditions d'Organisation, France, 2004, p3

#### **4. The Lean:**

Lean is a management method that aims to improve the performance of the organization through the training and involvement of all employees. The method makes it possible to define the ideal working conditions by integrating all the skills in the work processes, in order to add value and reduce waste.

The dual objective of the Lean management is to completely satisfy the customers of the company (which translates into turnover) and to guarantee the success of each employee (which translates into motivation and commitment). To do this, the Lean tradition insists on four fundamental principles<sup>5</sup>:

- **Understand what the customer likes to specify the value of the service or product**

Markets are competitive and are constantly evolving, tastes and uses are also in constant change. Lean's first stake is to develop customer listening by resolving complaints and experimenting with new offers for enhancing quality of the product, in order to solve customer problems in a totally reliable and sustainable manner.

- **Increase the level of just-in-time, i.e. reduce the time between the sales order and the delivery of the product or offer.**

To achieve this without increasing stocks, the challenge is to produce only what is requested, when it is requested and in just the right quantity. The Lean strives to reduce lead-time manufacturing by a set of techniques that allow drawing flows. These drawing flows create a structure of continuous progress without which point improvements are rarely perennial.

- **Stop at each flaw and solve the problem rather than bypass it.**

Putting a problem aside without processing it in order to continue moving forward will, on the one hand, generate many other difficulties downstream and on the other hand does not allow us to see the precise facts of the conditions that generated the problem. The roots of the problem would be used to solve it, and thus, to progress. Lean has developed several techniques to identify, report and treat problems where and when they arise with the operators themselves, in order to search for root causes and fundamentally solve the subjects. These practices ensure the quality of products and services by training agents in their work.

- **Involve operators in the improvement and redesign of their working environments**

Through continuous training in standards (agreements on how to work that generates the least waste) and the animation of the kaizen (progress in small steps), operators are encouraged to engage in the improvement of their proper work stations to eliminate ergonomic concerns and find ways to work more efficiently. The role of management is to support this improvement action on a day-to-day basis so that everyone in the company can, on the one hand, share the quality of the product offered to the client and, on the other hand, have the opportunity to realize its creativity in the work of production.

## ***II. Lean six sigma method:***

The Lean Six Sigma method is the combination of two methods of improving processes recognized for their effectiveness. The Six Sigma method was born within the Motorola Group. It is originally the result of a search for improving the quality of production processes. The Lean method was developed at Toyota plants in the 1970s to improve turnaround time, introduce Just-in-Time and reduce costs

This method consists of five fundamental steps, each of the letters in the acronym D.M.A.I.C. is the initial letter of the significant function of the corresponding step<sup>6</sup>.

### ***1. Define:***

Step D of the DMAIC approach is a crucial phase because it helps to understand the problem. For this, a database of production obtained by the company is indispensable as a starting point to be able to identify the problem.

## **2. Measure:**

The objective of the measurement phase is to understand and document the current state of the processes to be improved, to gather detailed information about customer needs, activities carried out and the tools to be applied during the measurement phase.

These tools are<sup>7</sup>:

- A. Describe the present process;
- B. Define customer needs in details;
- C. Define and understand the processes and outcomes they produce;
- D. Validation of the measurement system.

## **3. Analyze:**

Following the measurement step, it is necessary to study the extent of the defects, to investigate the probable causes of these defects, to formulate hypotheses and to carry out quantitative analyzes of the data using mathematical and statistical tools

## **4. Improvement:**

The improvement stage aims to propose solutions adapted to the problems, to the screen detect and analyze in the preceding steps.

## **5. Control:**

A control system is said to be controllable if it can be brought (in finite time) from an arbitrary initial state to a prescribed final state. And follow the predefined steps to before and ensure their proper operation.

## **6.DFSS (Design for Six Sigma):**

The DFSS methodology is used for the total design or re-design of a product or service. The expected Sigma level for a DFSS product or service is at least 4.5 (i.e. no more than about 1 defect per thousand opportunities), but it can reach 6 Sigma or even better depending on the product. The assurance of such a low level of defect when launching a product or service implies that customer expectations and needs (CTQs) must be well understood prior to the realization and implementation of a design<sup>8</sup>.

Successful DFSS programs can reduce unnecessary waste in planning and introducing products faster to the market. Unlike the DMAIC methodology, the phases or steps of DFSS are not universally recognized or even defined:

Each company or training organization defines them in its own way. One of the relatively well known DFSS methodologies is identified by the acronym DMADV. It maintains the same number of letters and phases, as well as a general approach similar to that of DMAIC. The five phases of the DMADV methodology are defined as follows:

Define, Measure, Analyze, Design and Check.

- Define project objectives and client requirements (internal and external VOC).
- Measure and determine client needs and specifications; also measure competition and industry.
- Analyze process options to meet customer needs.
- Design (in details) the process to meet the client's needs.
- Verify the design performance and suitability of the customer.

### ***III. Adjustments:***

The goal of implementing the Lean six sigma method in universities is to improve quality through procedures and a recognized quality improvement approach.

To implement the method based on a quality team that follows a hierarchy consisting of: Master Black belt, Black Belt, Green Belt, Yellow Belt (Each has its own responsibilities).

Adjustments to the structure of the professional bureaucracy are made using the tool of The Diagram of Causes and Effects, or Diagram of Ishikawa, or Diagram in Fishbones or 5M, is a tool developed by Kaoru Ishikawa in 1962. This diagram graphically represents the causes leading to an effect<sup>9</sup>. It is used as part of the search for cause of a problem when setting up a project.

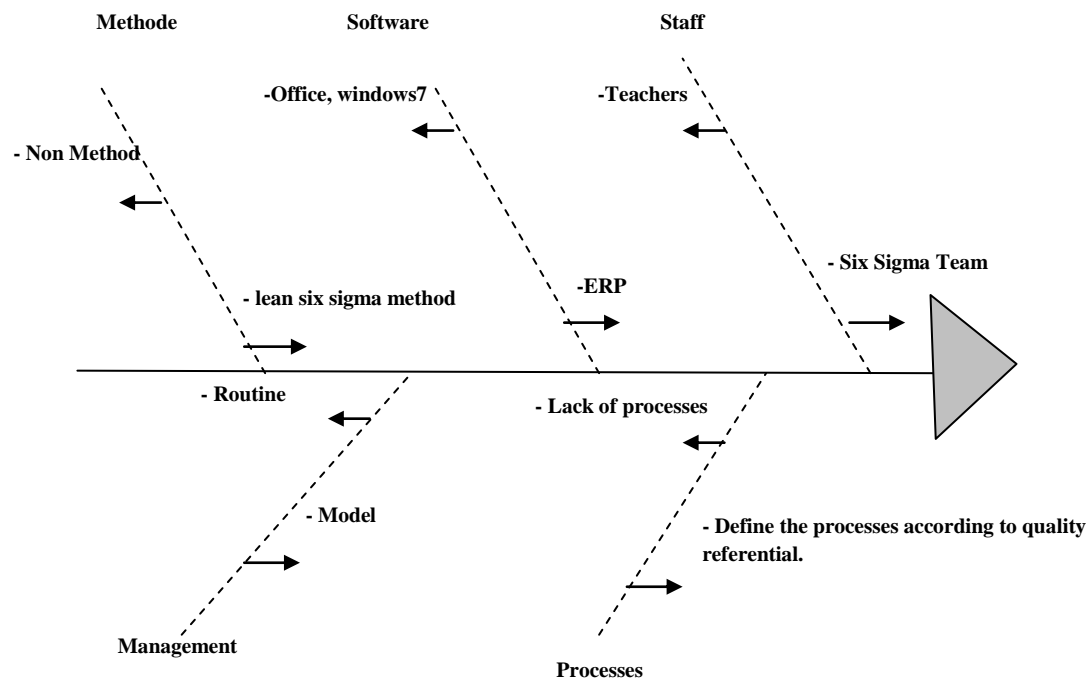
It allows us to detect the variables to be improved.

This diagram consists of the concepts of the 5 M:

1. Management: is the management style and what tools to be used.
2. Process: the processes that make up the organization and define how to work.
3. Equipment: equipment, machinery, computer hardware, software and technologies.

4. Method: the operating mode, the logic of the process and the working method.
5. Workforce: the skills that make up the organization and application to university

**Schema 1: Applying ISHIKAWA Model**



Source: prepared by the researcher.

This diagram represents the five main causes of non-quality according to the 5 M of Ishikawa principle. In our example the five Ms are:

- Management;
- Method;
- Staff;
- Process;
- Hardware.

**IV The model:**

**- Management:**

Professional bureaucracy is based on the standardization of qualifications. The latter is based on the skills of teachers to coordinate their work where the control is more and more



flexible; even though it is difficult to control teachers. To achieve this, the involvement of the quality team will make it possible to establish procedures that define standards to follow.

**- Method:**

Management in institutions of higher education is based on the competencies that manage its "standardization of competences". The overall result obtained is the result of know-how skills within the organization. The quest for quality requires precise scientific methods plus a know-how. The application of quality requires knowledge of quality techniques in order to reach an acceptable level. Therefore, a predefined method of quality is paramount for a good application. The lean six sigma method is one of the most recent methods and it is based on approaches that facilitate the understanding and application of quality<sup>10</sup>.

**- Staff:**

The personnel forming this type of organization are made up especially of teachers and administrative agents, each trained in relation to his field. This versatility of skills can be an asset if it is assimilated to the principles of LSS. Their introduction to the quality team makes it possible to broaden the impact of quality on the organization and decrease resistance to changes.

**- Process:**

The targeted processes are those that have a relationship with those predefined ones by the quality repository; as the primary goal of the Lean six sigma cell is to improve quality. Each domain is synonymous with a process<sup>11</sup>:

1. Training process;
2. Governance process;
3. Infrastructure process;
4. University life process;
5. Process relationship with socio-economic environment;
6. Cooperation process.

The whole process encompasses the services of higher education. These processes become the spearhead and guide of the quality cell.

**-Software:**

The material needed to properly conduct the quality project is the information systems, which are currently defined as the indispensable management tool.

The current information systems are integrated systems (ERP) that support the management of all the organization with a relational database that allows the transfer and sharing of information at the real time<sup>12</sup>, with the processing Data.

The absence of ERP reduces the performance of competencies within an organization.

**VI.Discussion:**

The application of the Lean Six Sigma method requires changes in the structure especially the part of the technostructure, one of the most important changes is the creation of a quality team which is inspired by its organization of Lean Six sigma, with different belt that represent hierarchical levels and levels of responsibility. This team will only be able to work with the input of processes that have the role of guiding the work of team members.

Coordination will be achieved through the standardization of qualifications and the standardization of procedures, which is based on the quality assurance standard.

Information systems are of paramount importance in cohesion and accomplishment of work; they allow a diffusion and a sharing of instantaneous information.

**Results:**

- 1- The Lean six sigma method is adapted to be applied to the professional bureaucracy;
- 2- The professional bureaucracy that is based on the operational center, to do the job, is to conceive what is not enough,
- 3- Lean six sigma method needs to be supported by procedures to be applied,
- 4- The quality assurance repository can be a platform for processes used in the model;
- 5- The quality assurance referential can be applied to the university if it is accompanied by processes that help in its implementation.
- 6- The different domains cited in the quality repository can be considered as processes on which the quality team can work.

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