

Evaluating the Process of Education Using Six Sigma in College of Administration and Economics at the University of Sulaimaniah

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Abstract

This study aims to use the six sigma in the Faculty of Administration and Economics at the University of Sulaimani, and clarify the importance of its application in the constant improvement of services and educational aspects and to identify the obstacles faced by the college when using this method in the academic year (2015-2016). The main aim is to apply the technique of six sigma on college of Administration and economics at university of Suleimanah and the aim of this research is to determine the range of six sigma for departments and find the value of six sigma according to Gender. The total number of students is (1709) students obtained bachelor's degree. The most important findings are that the Department of Economics is closer to the six sigma scale followed by the accounting department. The statistics and administration departments have the same result. It is also concluded that the females are closer to six sigma than males. The departments of Administration and Economics have the same range with Six Sigma technique for pre million 3.4 defective (about DPMO and Level of Sigma).

المستخلص

تسعى هذه الدراسة الى استخدام مقياس (six sigma) في كلية الادارة و الاقتصاد جامعة السليمانية ، وتوضيح اهمية تطبيقها لتطوير الخدمات بصورة مستمرة في الجوانب التعليمية ، و التعرف على المعوقات التي تواجهها الكلية عند استخدام هذا الاسلوب، فقد تم جمع المعلومات من وحدة التسجيل في الكلية للسنة الدراسية (2015-2016) ، وان عدد الكلي للطلبة يصل الى (1709) طالباً للحصول على شهادة البكالوريوس . واهم النتائج التي توصلت اليها ان قسم الاقتصاد اقرب من مقياس six

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sigma وبعد قسم المحاسبة ، والقسمين الاحصاء والادارة لهما نفس نتيجة، وحسب الجنس ان جنس الاناث يقترب اكثر من مقياس six sigma من الذكور .

Introduction:

Six Sigma is a method that provides organizations tools to improve the capability of their business processes. This increase in performance and decrease in process variation lead to defect reduction and improvement in profits, employee morale, and quality of products or services. Six Sigma qualities is a term generally used to indicate a process is well controlled (within process limits $\pm 3s$ from the center line in a control chart, and requirements/tolerance limits $\pm 6s$ from the center line).

The concept of Six Sigma was introduced by Motorola in the 1980s to improve their products and maintain quality. The core of Six Sigma lies in the continuous improvement process using the DMAIC (Define, Measure, Analyze, Improve, and Control) method. It has since then been adopted by many other companies to achieve their respective goals both in production of goods and in rendering services. Due to the success of this method, academic institutions attempted to adapt six sigma methodologies to improve the quality of education and services. These concepts have great potential for improving process efficiency and quality of higher education.

Aim of Research

The main aim of research is to apply the technique of six sigma on college Administration and economics at university of Sulaimaniah and the aim of this research is to:-

Determine the range of six sigma for departments and find the value of six sigma according to Gender.

Hypothesis test of this research

The departments of Administration and Economics have the same range with Six Sigma technique for pre million 3.4 defective (about DPMO (defects per million opportunities) and Level of Sigma).

Definition of Quality

Quality is one of the most important means and methods to improve education and raise the level of performance in the current era, which some thinkers call the era of quality. The definition of quality is no longer something to be substituted, it has become an urgent necessity dictated by the movement of contemporary life which can sum up the

importance of quality and adjusts the development of the administrative system in the educational institution in various subjects.

Mechanisms used to Achieve Quality

- Strategic planning includes asking world-class curriculum, and setting standards of quality equivalent to the corresponding international standards. It is to be applied to all programs of study at the university level in accordance to the convenience and effectiveness of its units, plans, practices, measurement of excellence, and performance tests.
- External calendar suggests the formation of an Academic Advisory Council for each faculty. Its group composed of deans, heads of Departments, and academics from different specialties and branches that have experience in the development of university education.
- Educational outcomes and evaluation program is used in preparation to train faculty members on how to prepare academic outcomes and to build a modern measuring instrument to help ensure the achievement of each sector of education and to develop a mechanism to measure the achievement of each sector.
- Academic Accreditation is employed by universities to ensure the quality of their educational programs. It relies on experienced experts to ensure quality standards in higher education for monetary analysis to improve performance.

Six Sigma

Student interest and the extent of his conviction and satisfaction with the given material, whether it is the scientific theory or applied, Satisfaction with the quality of students studying their scientific level, also the satisfaction of the instructor about services provided and the supplies available to the success of the process. This is considered the main factor in the success of the academic process. The satisfaction of the employees working in the academic sector is important, as they are complementary to the role required for the success of the whole process. This achieves a higher success rate for students and for all stages by reducing failure rates or completions to the minimum. When the figure is close to zero, one can say that the use of (six sigma) is approximately zero.

- That colleges and departments depend on information and facts rooted in building accurate databases.
- Focus on the development of human resources in ministries and institutions by focusing on training employees. Giving training

courses to help in the development of his work and linking theoretical scientific aspects by applying it on reality by linking theory and practice.

Methods of application of six sigma methodology

The six sigma methodology is working on the application of various ideas and not limited ones. It begins the understanding curriculums and teaching methods as well as achieving student satisfaction about the educational material, or the presentation of the scientific material, and the delivery of information. A successful strategy requires the collection of information and the use of methods for statistical purposes, spotting and fixing errors. There are three ways and methods for the application of six sigma methodology.

The first method consists of the following:

Study of a college or university setting and verifying the effectiveness of the private college business, departments and whether there are cases of student failure, however, Possession of a college or university technology necessary for the purpose of delivering the information and developing the ability of the student and Trying to get rid of the old teaching methods and improving for the better after a diagnosis of reality and attempting to move to higher levels of quality standards.

The second style: strategic development

It is one of the methods that offer multiple choices where it can be used either to explore the most important opportunities available to change or to define the weaknesses and prepare a holistic way. This method is considered a full study because it is not the sole factor in developing six sigma.

The third technique: Solving problems

These types of problems are really the best candidates for Six Sigma. The Six Sigma DMAIC methodology differs from conventional problem solving in one significant way. There is a requirement for proof of cause and effect before improvement action is taken. Proof is required because resources for improvement actions are limited in most organizations. Those limits preclude being able to implement improvement actions based on 100 hunches hoping that one hits the mark. Thus, discovering root causes is at the core of the methodology.

DMAIC	MODEL
Define	D
Measures	M
Analysis	A
Improve	I
Control	C

Process to improve existing products and search for improvement incremental (composite) increment improvement, touted as a strategy to improve (projects) breakthrough. It offers real improvements and tangible results, and we are working within the framework of contrast standards, cycle time, income, and design... etc.

Application steps of (six sigma) in Higher Education:

The application of (six sigma) goes through five sequential steps. Measurement, analysis, improves, control and definition of DMAIC methodology and can be illustrated as follows:

Definition:

Here the problem is defined and practically analyzed, as the product might need improvements.

Measurement:

measurement Is the identification of multiple variables and making the necessary measurements and recording the results and estimating the viability of the process for short and long ranges, and tools, Histogram, trend charts, deployment diagrams, Pareto charts, control charts, process capability measure.

Analysis:

The emergence and determination of the cause of the problem and diagnosing the variables that cause defects in the process with the use of appropriate statistical tools to identify the causes of the problem.

Improvement:

This phase includes error handling and performance improvement after diagnosing errors and identifying their causes and then helping the team of (six sigma) in developing the performance of the process and confirming that the proposed solution will match the quality objectives of the project development.

The control:

It includes the application of the solution and insuring that the solution is fixed with time in which operations are followed-up. Moreover, insuring that mistakes will not be repeated while continuing to develop

the work. Afterwards, the information must be given to senior management about the cases of success and failure rates for students.

Defective parts per million opportunities Analysis (DPMO)

a ratio of the number of defects (flaws) in 1 million opportunities when an item can contain more than one defect.

$$DPMO = \frac{1000000 \times \text{number of Defects}}{\text{number of units} \times \text{number of Defects opportunities per unit}}$$

Table (1)
explain the DPMO and level of Sigma

Corporate DPMO	Sigma	Corporate DPMO	Sigma	Corporate DPMO	Sigma
691,462	1	115,070	2.7	1,866	4.4
655,422	1.1	96,800	2.8	1,350	4.5
617,911	1.2	80,757	2.9	968	4.6
579,260	1.3	66,807	3	686	4.7
539,828	1.4	54,799	3.1	483	4.8
500,000	1.5	44,565	3.2	337	4.9
460,172	1.6	35,930	3.3	233	5
420,740	1.7	28,717	3.4	159	5.1
382,088	1.8	22,750	3.5	108	5.2
344,578	1.9	17,865	3.6	72	5.3
308,537	2	13,904	3.7	48	5.4
274,253	2.1	10,724	3.8	32	5.5
241,964	2.2	8,198	3.9	21	5.6
211,856	2.3	6,210	4	13	5.7
184,060	2.4	4,661	4.1	9	5.8
158,655	2.5	3,467	4.2	5	5.9
135,666	2.6	2,555	4.3	3.4	6

Source: Gupta, Praveen, 2004, Six Sigma Business Scorecard, Ensuring Performance for Profit, McGraw-Hill: 83

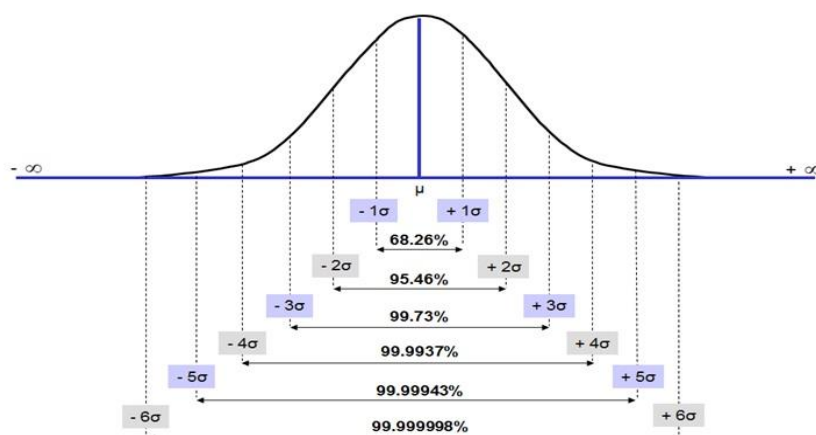


Fig (1)
explain Normal Curve
(100)

Application Part Statistical Analysis

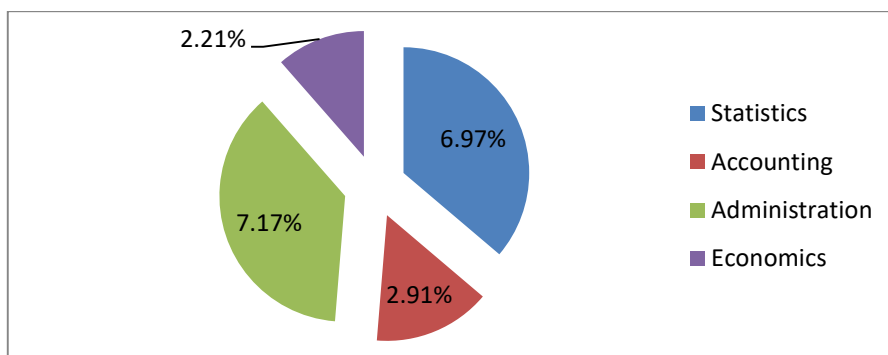
Through the application of the methodology, the researchers have collected data about number of students (passed & failed) from Administration and Economic school with its four departments (statistics, accounting, administration and economic). Use R Studio for Analysis. The numbers of passed and failed students in each department have been as follows:

Table (2)

represents the numbers of passed, failed and percentage of fail for students in college of Administration and Economics for departments

Departments	Stage	Total No of Student		Total Number of Success		Numbers of Fail		% of Fail
		Male	Female	Male	Female	Male	Female	
Statistics	1	31	52	27	50	4	2	6.97%
	2	54	98	48	93	6	5	
	3	28	61	25	59	3	2	
	4	26	66	22	63	4	3	
Accounting	1	60	54	56	54	4	0	2.91%
	2	44	55	43	55	1	0	
	3	60	48	58	47	2	1	
	4	60	32	57	31	3	1	
Administration	1	60	34	50	29	10	5	7.17%
	2	90	56	84	56	6	0	
	3	66	55	62	54	4	1	
	4	52	47	45	47	7	0	
Economics	1	39	54	37	54	2	0	2.21%
	2	68	46	65	46	3	0	
	3	55	55	53	54	2	1	
	4	40	51	40	50	0	1	

The table above gives information about Numbers of total students so number of success and fail students for each departments and stages, the most percentage of fail is (7.17%) for Administration department that is mean (92.93%) is success, the second order of fail is statistics department equal to (6.97%) that is mean (93.03%) is success, the third percentage of fail is accounting department is (2.91%) that is mean (97.09%) is success, last of fail is economics department is (2.21%) that is mean (97.79%) success. As represent in below Graph:

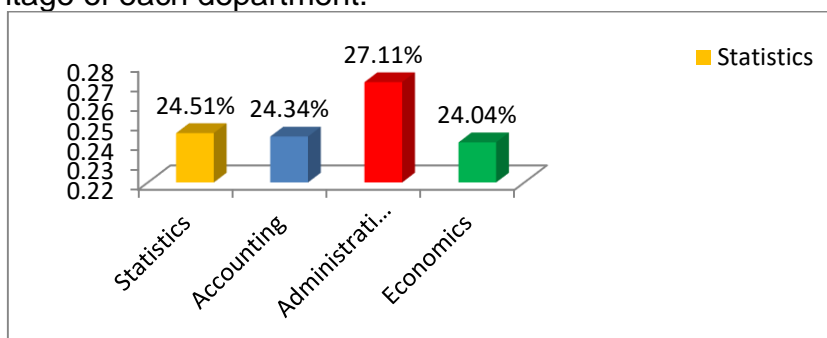


Graph (1)
represent percentage of fail of each departments

Table (3)
Represents the Number and percentage of Student for each department

Departments	Number of Student	Percentage
Statistics	416	24.51%
Accounting	413	24.34%
Administration	460	27.11%
Economics	408	24.04%

It can be seen in the table (3) that the number and percentage of student for each department, statistics department consist of 416 students and 24.51 percentage of college, the second department is accounting consisting of 413 students and 24.34 percentage of college, the third department is administration consists of 460 student and 27.11 percentage of college, the last department is economics consist of 408 students and 24.04 percentage of college, As shown in a graph percentage of each department.



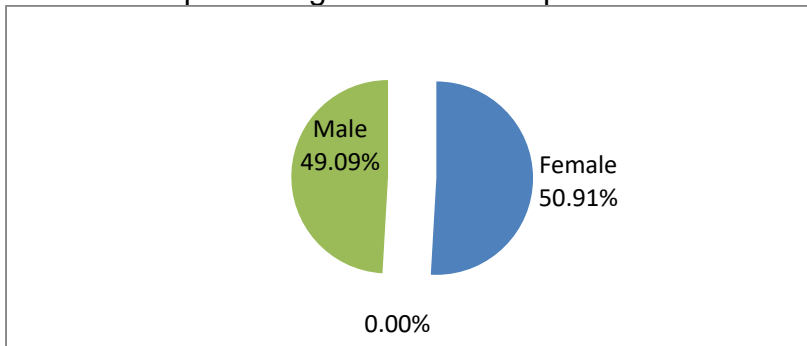
Graph (2)

represent percentage of student for each departments

Table (4)
Total Number of Student for Gender

Gender	Number of student	percentage
Female	864	50.91%
Male	833	49.09%

We can see from Table (4) the total female for college consisting of 864 and 50.91 percentage, and total male of college consist of 833 students and 49.09 percentage. As shown in pie chart below:



Graph (3)

represent percentage of Total of Gender for college

DPMO analysis

According to the DPMO formulas, we calculate the value of DPMO as follow .

Total Number of failed students in Statistics department is (29).

Total Number of students of Statistics department=416

Percentage of Failed students at Statistics department = $29/416 \cong 7\%$

Average of failed for statistics department = $0.07/10 = 0.007$

DPMO for statistics department = Average of defects * 1000000 = $0.007 * 1000000 = 7000$

To find sigma look at Table (1), sigma for statistics department=4

Table (5)
represent the value of DPMO for each of the department

Departments	DPMO	% of Success	Sigma
Statistics	7000	93	4
Accounting	3000	97	4.3
Administration	7200	92	4
Economics	2000	98	4.4

In table above calculates DPMO in general for all Departments. Percentageage of success for statistics department is 93 and DPMO is 7000 corresponding to sigma level of 4, percentageage of success for accounting department is 97 and DPMO is 3000 corresponding to sigma level of 4.3, percentageage of success for Administration department is 92 and DPMO is 7200 corresponding to sigma level of 4, percentageage of success for Economics department is 98 and DPMO is 2000 corresponding to sigma level of 4.4.

Table (6)
represent the value of DPMO for each of the department
during male and female and total of male and female

Departments	% of Success for male	DPMO for Male	Sigma	% of Success for female	DPMO for Female	Sigma
Statistics	88%	12230.22	3.7	96%	4332.13	4.1
Accounting	96%	4464.29	4.1	99%	1058.20	4.5
Administration	96%	4464.29	4.1	99%	1058.20	4.5
Economics	90%	10074.63	3.8	97%	3125.00	4.2
Total	93%	7485.38	3.93	97%	2597.403	4.29

In the table above the percentageage of success for male in statistics department is 88 and DPMO is 12230.22 corresponding to sigma level of 3.7, percentageage of success for male in Accounting department is 96 and DPMO is 4464.29 corresponding to sigma level of 4.1, percentageage of success for male in Administration department is 96 and DPMO is 4464.29 corresponding to sigma level of 4.1, percentageage of success for male in Economics department is 90 and DPMO is 10074.63 corresponding to sigma level of 3.8. so percentageage of success for female in statistics department is 96 and DPMO is 4332.13 corresponding to sigma level of 4.1, percentageage of success for female in Accounting department is 99 and DPMO is 1058.20 corresponding to sigma level of 4.5, percentageage of success

for female in Administration department is 99 and DPMO is 1058.20 corresponding to sigma level of 4.5, percentageage of success for female in Economics department is 97 and DPMO is 3125.00 corresponding to sigma level of 4.2.

Finally percentageage of success for total male is 93 and DPMO is 7485.38 corresponding to sigma level of 3.93, percentageage of success for total female is 97 and DPMO is 2597.403 corresponding to sigma level of 4.29.

Conclusions:

1. Six Sigma is a process that brings additional benefits and helps institutions to adopt best practices for assessing education process.
2. The most important findings are that the Department of Economics is closer to the six sigma scale, followed by the accounting department. The Statistics and Administration Departments have the same result. According to gender, females are closer to the six sigma scale than males.
3. It was concluded that the Department of Economics is close to the standard of Six Sigma, which is equal to 4.4, followed by the accounting Dept. having 4.3 six sigma, followed by the two departments of statistics and management, where the standard equals the lowest level and is equal 4 as show in table (5).
4. It has also been also concluded that the Female gender in both the Accounting and Management Departments has obtained the nearest degree of six sigma, which is equal to 4.5 compared to the female gender in the other departments, followed by female of the economics department which is 4.2 and the female of statistics department and equal to 4.1 as show in table (6).
5. In terms of male gender, the statistics department has the lowest value of 3.7, followed by the department of economics 3.8, and the administration and accounting departments obtained the highest value of six Sigma 4.1 each This is due to the fact that males work after official working hours as show in table (6).

Recommendations:

- 1- Apply six sigma in all faculties of the University of Sulaymaniyah as a system of control, and to reduce the negativities
- 2- Apply six sigma techniques on all college at university of Sulaymaniyah, to control all defective that caused low level in six sigma, and achieving high level of education is recommended.

- 3- The need to raise the level of education and solving negative aspects of the education process and by providing all the required requirements.
- 4- The Ministry of Higher Education's pay attention to implementing and following up the continuous improvement program.
- 5- Improve negative side of educations to make lift educations level, disposal all requirements for study.

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