

Improved quality of service processes using the logic of Six Sigma (Case study)Soleyman Iranzadeh¹, Kamran Sarhangi², Yagoub Nikzad³

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Abstract: Six Sigma is a powerful management tool. In order to make changes in the organization and also meet the needs of customers is essential. Six Sigma is not just a method but a perspective. In addition, Six Sigma is a tool for strategy formulation. In this study, the effect of applying six-sigma accuracy, reducing the number of customer complaints, saving cost, Savings in staff time Marand city gas company meter reading has been studied. Therefore the following four hypotheses have been proposed: 1- Applying Six Sigma to increase the accuracy of the meter readings are employees. 2 - Applying Six Sigma is to reduce the number of customer complaints. 3 - Applying Six Sigma saves costs. 4 - Applying Six Sigma saves time be. In order to collect information from the data of 1387 is used to Marand city Gas Company. Using SPSS software statistical hypotheses were analyzed and the following results were obtained: 1 - Applying Six Sigma to increase the accuracy of the meter reading staff was. 2 - Applying Six Sigma to reduce the number of customer complaints in the meter reading. 3 - Applying Six Sigma saves the cost of meter reading was. 4 - Applying Six Sigma saves staff time meter was read.

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Introduction

Despite the challenges of customer satisfaction and commercial conquest of competitive markets, the need for reliable products and services is increasingly more. Six Sigma methodologies is a tool for quality improvement. As we get closer to six sigma, inspection requirements and reduce test costs are lower, shorter production cycles and will provide better customer satisfaction. To achieve Six Sigma is said to be a target. It is a horizon that always the way towards greater excellence to our show (www.fekreno.org.com).

One way to improve in the third millennium, which can push the organization towards achieving excellence. Effective implementation of Six Sigma projects. Six Sigma, is a methodology to improve satisfaction the maximum value for customers by solving problems and interests through understanding customer needs important indicators of performance and operational processes and improve business processes and deals. So customer satisfaction through increased customer satisfaction. And trying to become loyal customers by reducing costs and improving quality is the most important six sigma projects. Six Sigma strategy, in fact, the deviation from the target can measure each Processors. (samuel, 1385, 32). However, experts believe that a significant portion of revenues related to services due to the intangible nature of services, but unfortunately it is. Process and the need for improvement in these areas compared

with the manufacturing sector has been much slower. Fortunately in recent years due to the rapid development of the service Process and the need for improvement in this area is evident. Six Sigma is a methodology that is primarily produced in the reduction of defects, cost and cycle time were able to quickly introduce the work place in the organizations to stabilize the production of Six Sigma successes and achievements in the production of small and large service organizations also noted that this methodology is. It can be stated that now dared to use Six Sigma in service to various reasons such as the difficulty in correcting or compensating for lack of service, customer satisfaction has caused adverse. The application of this methodology to the field with a much faster process than expand production (Venice, 1385,1).

English physicist Lord Kelvin defined the necessary measures to. Whenever we talk about what it could be measured in terms of numbers, we can say that we know something about the subject. Otherwise, our knowledge is incomplete and will not ever mature. "Without a way to measure progress is not possible.

Due to insufficiency of service of process and the difficulty in Marand city gas company. Numerous complaints from customers about the status of their clientele gas meter reading wrong and against the Company pending receipt of the sent Statements caused Processes and services delivered with serious difficulties with respect to the application of Six

Sigma techniques in the processes necessary to implement Six Sigma techniques Processes for improved service (meter reading) studied the gas company to Marand city through this to identify errors in the Statements equipment and manpower related to meter reading as well as recipes and ways to improve the assessment and control of six Sigma techniques will be presented by In other words, Six Sigma is a concept through which you can get a lot of valuable and distinct concepts and managerial experience to get integrated in the. Some of these concepts include systems thinking, continuous improvement, and knowledge management, customer friendly and activity-based management (Peter pand and Associates 1385, 96).

Six Sigma can be a powerful and comprehensive management tools to change and adapt to the demands of the customer call. Unlike other approaches to Six Sigma quality methods not only a vision, purpose, and it also contains symbols (www.iiend.com).

Applying Six Sigma methodology to reduce time to repair (Case study on behalf of CAR) in the paper by selecting one of the authorized agencies in the city of Shiraz, Iran Khodro Company has been trying Using the five stages of Six Sigma methodology - define, measure, analyze, improve and control techniques, such as the Charter, the failure mode and effects analysis, fish bone diagram to discover the main causes of the increase in service time and eventually solutions were proposed to improve the current situation. Thus the main objectives of the research: 1 - reduced repair times as much a day for each vehicle. 2 - Increase customer satisfaction by offering services that customers consider to be priorities. 3 - Increased revenue by accepting more car dealers every day (Mustafa Khawaja, 1383).

1 - Determination of Effect Applying Six Sigma The accuracy of the meter reading staff is.

2 - Determine the impact of Six Sigma is to reduce the number of customer complaints.

3 - The effect of applying Six Sigma saves costs.

4 - The effect is applying Six Sigma saves time.

Tools and Materials

The overall goal of this method is that the researcher can determine what method or methods to select Faster and more accurate response possible so he can assist in achieving that goal, and this is dependent on the nature of research and administrative facilities, The purpose of this research is based on the type of applied research is descriptive in nature and do field studies of specific features tailored which is the subject, To collect information about the Library - Six Sigma methods are used in order to explain the Six Sigma methodology and data that has been collected from various sources in a library And methods of

measurement as a comparison done by the first performance of the meter readings in 87 mining and then using the six sigma errors of the meter readings to identify and provide solutions and training the meter read 88 years from and then compare the performance of year 87 and 88 and have been able to do this.

Analysis of hypotheses: The meter reading method of analyzing performance data from 87 years to 88 years, with the implementation of Six Sigma results obtained data with the help of SPSS software and research hypotheses being normal initially identified using the Kolmogorov Smirnov and then compared using paired T-test and compared and evaluated and the results have been analyzed.

The first hypothesis test

The first hypothesis tests the accuracy of meter reading staff that year is divided into six two-month period And meter readings are shown in Table 87, using the SPSS software Smirnov Kolmogorov test on 87 years of data After 88 years on data done in 87 normal and 88 employees to carefully review and then we'll compare.

Applying Six Sigma to increase the accuracy of the meter readings are not employees [$H_0: \mu_x \leq \mu_0$ Applying Six Sigma to increase the accuracy of the meter reading staff is [$H_1: \mu_x > \mu_0$

Table (1-1) the accuracy of meter reading staff 87 years

Period	Year 87 (A1)
First Period	5
Second Period	2
Third Period	24
Fourth Period	67
Fifth Period	85
Sixth Period	71

Attention

A1 = accurate meter reading staff 87 years

Nonparametric test KS, A1 is normal.

NPar Tests

One-Sample Kolmogorov-Smirnov Test

Table (1-2) accurately Kolmogorov-Smirnov

	A1
N	6
Normal parameters ^a mean	42.3333
Std. deviation	3.63520E1
Most extreme differences Absolute	.251
Positive	.193
Negative	-.251
Kolmogorov-smirnov Z	.616
Asymp.sig.(2-tailed)	.843
a. Test distribution is Normal.	

The Table 1-2 shows the Kolmogorov-Smirnov normal.

Period	Year 88 (A2)
First Period	4
Second Period	9
Third Period	29
Fourth Period	79
Fifth Period	91
Sixth Period	93

Table (1-3) the accuracy of meter reading staff 88 years

Nonparametric test KS, A2 is normal. NPar Tests One-Sample Kolmogorov-Smirnov Test

	A2
N	6
Normal parameters ^a mean	50.8333
Std. deviation	
Most extreme differences Absolute	.251
Positive	.201
Negative	4.14845E1
Kolmogorov-smirnov Z	.616
Asymp.sig.(2-tailed)	.843
a. Test distribution is Normal.	

Table (1-4) accurately Kolmogorov-Smirnov

According to Table (1-4) shows the Kolmogorov-Smirnov normality.

After carefully reading the meter to employees 87 years and 88 years were examined in terms of normal we now turn to normal T-test for comparison between years 87 and 88 years will do.

T-TEST PAIRS=A2 WITH A1 (PAIRED) MISSING=ANALYSIS.

T-Test

Output in Table (1-5), respectively, from left to right, average, count, standard deviation and standard error of the sample shows.

Table (1-5) Paired sample statistics of double Accuracy

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 A2	50.8333	6	41.48454	16.93599
A1	42.3333	6	36.35198	14.84063

Paired Samples Statistics

Table (1-6) two paired-sample test accuracy

The output Table (1-6) Sig = .045 <0.05 after that H1 is accepted and approved.

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	Confidence Interval of the Difference 95%				
				Lower	Upper			
Pair A2 1 - A1	8.50000	7.81665	3.19113	.29693	16.70307	2.664	5	.045

Compare the meter reading staff 87 years before and 88 years after the work is seen in Table Applying Six Sigma to increase the accuracy of meter readings to staff.

The second hypothesis test

The second hypothesis test meter reading staff is reducing the number of customer complaints that year is divided into six two-month period and 87 years of meter reading is given in Table using spss software Kolmogorov Smirnov test on data 87 years and then on data 88 years done Evaluation of normality and then Reduce the number of customer complaints Staff In Years 87 and 88 will be compared.

Applying Six Sigma to reduce the number of customer complaints is not part of meter reading [H0: $\mu_x \leq \mu_0$

Applying Six Sigma to reduce the number of customer complaints is the meter reading. [H1: $\mu_x > \mu_0$

Table (2-1) reduced the number of customer complaints meter readings in 87

Period	Year 87 (D1)
First Period	131
Second Period	229
Third Period	123
Fourth Period	248
Fifth Period	183
Sixth Period	170

NPar Tests

One-Sample Kolmogorov-Smirnov Test

	D1
N	6
Normal parameters ^a mean	1.8067E2
Std. deviation	5.05595E1
Most extreme differences Absolute	.170
Positive	.170
Negative	-.164
Kolmogorov-smirnov Z	.417
Asymp.sig.(2-tailed)	.995
a. Test distribution is Normal.	

Kolmogorov Asmirnov number of complaints (2-2)

The Table 2-2 shows the Kolmogorov Asmirnov normal.

Period	Year 88 (D2)
First Period	133
Second Period	228
Third Period	128
Fourth Period	253
Fifth Period	185
Sixth Period	177

Table (2-3) reduced the number of customer complaints meter readings in 88

NPar Tests

One-Sample Kolmogorov-Smirnov Test

	D2
N	6
Normal parameters ^a mean	1.8400E2
Std. deviation	4.99680E1
Most extreme differences Absolute	.180
Positive	.180
Negative	-.144
Kolmogorov-smirnov Z	.440
Asymp.sig.(2-tailed)	.990
a. Test distribution is Normal.	

Table (2-4) Kolmogorov Smirnov number of complaints

According to Table (2-4) shows the Kolmogorov smirnov normal.

After reducing the number of customer complaints meter readings in 87 and 88 years were examined in terms of normal now turn to the T-test for comparison between years 87 and 88 years do

TEST PAIRS=D2 WITH D1 (PAIRED)
MISSING=ANALYSIS.

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error
Pair 1	D2	1.8400E2	6	49.96799	20.39935
	D1	1.8067E2	6	50.55954	20.64084

Table (2-5) hit two-paired samples of complaints Output in Table (2-5), respectively, from left to right, average, count, standard deviation and standard error of the sample shows.

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	Confidence Interval of the Difference 95%				
				Lower	Upper			
Pair 1 D2 - D1	3.33333	2.87518	1.17379	.31602	6.35065	2.840	5	.036

Table (2-6), two paired samples of complaints The output Table (2-6) Sig = .036 <0.05 so allegedly accepting H1 is approved.

With attention Compared to the reduction in the number of customer complaints meter reading 87 years before and 88 years after do the work Seen in the table applying Six Sigma to reduce the number of customer complaints is the meter reading.

The third hypothesis test

The third hypothesis test cost is the meter reading that year is divided into six two-month period and 87 years of meter reading is given in Table using spss software Kolmogorov Smirnov test on data 87 years and then on data 88 years done Evaluation of normality and then saving the cost of In Years 87 and 88 will be compared.

Applying Six Sigma saves on the cost of the meter is not read. [H0: $\mu x \leq \mu 0$

Applying Six Sigma saves on the cost of the meter is read. [H1: $\mu x > \mu 0$

Period	Year 87 (C1)
First Period	127
Second Period	227
Third Period	99
Fourth Period	181
Fifth Period	98
Sixth Period	102

Table (3-1) Meter reading costs 87 years NPar Tests

One-Sample Kolmogorov-Smirnov Test

	C1
N	6
Normal parameters ^a mean	1.3900E2
Std. deviation	5.34827E1
Most extreme differences Absolute	.255
Positive	.255
Negative	-.222
Kolmogorov-smirnov Z	.626
Asymp.sig.(2-tailed)	.828
a. Test distribution is Normal.	

Table (3-2) Kolmogorov Smirnov cost According to Table (3-2) shows the Kolmogorov Smirnov normal.

Period	Year 88 (C2)
First Period	127
Second Period	227
Third Period	99
Fourth Period	181
Fifth Period	98
Sixth Period	102

Table (3-3) Meter reading costs 88 years Nonparametric test K-S, C2 is normal NPar Tests

One-Sample Kolmogorov-Smirnov Test

	C2
N	6
Normal parameters ^a mean	1.2400E2
Std. deviation	4.96709E1
Most extreme differences Absolute	.246
Positive	.246
Negative	-.182
Kolmogorov-smirnov Z	.604
Asymp.sig.(2-tailed)	.859
a. Test distribution is Normal.	

Table (3-4) Kolmogorov Smirnov cost According to Table (3-4) shows the Kolmogorov normal Smirnov

After the cost of meter reading 87 years and 88 years were examined in terms of normal now the T-test to compare Year 87 and Year 88 will do.

T -TEST PAIRS=C2 WITH C1 (PAIRED)
MISSING=ANALYSIS.

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	C2	1.3900E2	6	53.48271	21.83422
	C1	1.2400E2	6	49.67092	20.27807

Table (3-5) hit a two-paired sample fee Output in Table (3-5), respectively, from left to right, average, count, standard deviation and standard error of the sample shows.

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	Confidence Interval of the Difference 95%				
				Lower	Upper			
Pair 1 C2 - C1	1.5000E1	6.35610	2.59487	8.32968	21.67032	5.781	5	.002

Table (3-6) two paired-sample test cost The output Table (3-6) Sig = .002 <0.05 after that H1 is accepted and approved.

Compare the cost of meter reading 87 years before and 88 years after the work can be seen in Table Application of Six Sigma is to reduce the cost of meter reading.

The fourth hypothesis test

The fourth hypothesis testing saves time meter reading that year is divided into six two-month period and 87 years of meter reading is given in Table using spss software Kolmogorov Smirnov test on data 87 years and then on data 88 years done Evaluation of normality and then saves time In Years 87 and 88 will be compared.

Applying Six Sigma saves when the meter reading is not. [H0: $\mu_x \leq \mu_0$

Applying Six Sigma Saves time the meter is read. [H1: $\mu_x > \mu_0$

Period	Year 87 (T1)
First Period	110
Second Period	121
Third Period	131
Fourth Period	119
Fifth Period	101
Sixth Period	96

Table (4-1) took the meter readings in 87

NPar Tests

One-Sample Kolmogorov-Smirnov Test

	T1
N	6
Normal parameters ^a mean	1.1300E2
Std. deviation	1.31605E1
Most extreme differences Absolute	.176
Positive	.152

Negative	-.176
Kolmogorov-smirnov Z	.431
Asymp.sig.(2-tailed)	.993
a. Test distribution is Normal.	

Table (4-2) Kolmogorov-Smirnov time The Table (4-2) shows the Kolmogorov Smirnov normal.

Period	Year 88 (T2)
First Period	100
Second Period	123
Third Period	120
Fourth Period	110
Fifth Period	94
Sixth Period	89

Table (4-3) took the meter readings in 88 NPar Tests

One-Sample Kolmogorov-Smirnov Test

	T2
N	6
Normal parameters ^a mean	1.0600E2
Std. deviation	1.39284E1
Most extreme differences Absolute	.176
Positive	.167
Negative	-.176
Kolmogorov-smirnov Z	.431
Asymp.sig.(2-tailed)	.992
a. Test distribution is Normal.	

Table (4-4) Kolmogorov-Smirnov time According to Table (4-4) shows the Kolmogorov-Smirnov normal.

After the time of meter reading 87 years and 88 years were examined in terms of normal now the T-test to compare Year 87 and Year 88 will do.

T-TEST PAIRS=T2 WITH T1 (PAIRED)

MISSING=ANALYSIS.

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	T2	1.0600E2	6	13.92839	5.68624
	T1	1.1300E2	6	13.16055	5.37277

Table (4-5) hit a two-sample test of time Output in Table (4-5), respectively, from left to right, average, count, standard deviation and standard error of the sample shows.

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	Confidence Interval of the Difference 95%				
				Lower	Upper			

Paired Samples Test

	Paired Differences				t	df	Sig. (2-tailed)	
	Mean	Std. Deviation	Std. Error Mean	Confidence Interval of the Difference 95%				
				Lower				Upper
Pair 1 T2 T1	-7.00000	4.69042	1.91485	-11.92229	-2.07771	-3.656	5	.015

Table (4-6), two paired-sample test of time

The output Table (4-6) Sig = .015 < 0.05 after that H1 is accepted and approved.

With attention Compared Part-time meter reading 87 years before and 88 years after do the work Seen in the table Applying Six Sigma to reduce the time the meter reading is.

The results:

After investigation and service process improvement using Six Sigma logic following results were obtained.

- 1 - Applying Six Sigma to increase the accuracy of the meter reading staff was.
- 2 - Applying Six Sigma to reduce the number of customer complaints in the meter reading.
- 3 - Applying Six Sigma saves cost in the meter reading.
- 4 - Applying Six Sigma saves staff cost in the meter reading.

Conclusion

Hypothesis tests show that the application of Six Sigma is to increase the precision of staff, reducing the number of customer complaints, save money and save time reading the meter is Marand city gas companies and to improve the meter reading process provides the following methods are proposed:

- 1 - Using IVR as Tabriz In the city of Marand In order to decrease not at home
- 2 - Providing timely counter alternative to replacement of defective meters were replaced and reduction meter and dial failure.
- 3 - Promote Quantification meter reader, compatible with subscriber growth.
- 4 - The quality meter reader, Training courses Meter Reading, Obtaining meter readings during the test work.
- 5 - Management of meter reader performance using reports Contour line, in order to decrease the difficulty and route.

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6 - Cyclic control of meter readings method of sample selection and re-reading meter.

7 - Replacement of meter reading and meter readers a path in terms of variety and job rotation.

8 - Send a file timely meter readings to a computer service center at least one day before the scheduled date of completion.

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