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**The Effect of Using Six Sigma Methodologies on the Quality of Health Service:
A Field Study At Prince Hashem Hospital /City of Aqaba**

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Abstract:

The objectives of the study tend to show the effect of using six-sigma methodology on the quality of health services in Prince Hashem Hospital. It studies population of all employees and service recipients. The sample of the study is all employees who are related to the total quality management. The unit of sampling and analysis is consisted of senior management and departments related to the overall quality in the hospital represented by the director general, deputy director, unit managers, and heads of departments. Correlational descriptive analytical method was used for data collection, analysis, and testing hypotheses. A questionnaire, consisted of (20) items, was used to collect information about study variables. A number of statistical tools and methods were also used such as the arithmetic mean, standard deviation, and canonical analysis. The results show the existence of the effect which is statistically significant at the level of significance $0.05 \leq \alpha$ standards for six-sigma (continuous improvement, customer focus, prevention, commitment and support of senior management) in the quality of health services. This study concludes that six sigma and quality of health services of the important topics and sensitive, especially in the present time, due to its impact on the reality and the future of the surveyed organizations. The study recommends the need to adequately support the study by senior management six sigma style and customer care through improving health service that satisfies their needs and desires.

Keywords: Six Sigma; Quality of Health Services; Prince Hashem Hospital

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Framework of the Study: Introduction

The philosophy of continuous improvement management aimed at developing inputs, processes and outputs continuous improvement which is the most important pillars of total quality management. It is the core concept of six sigma and in the light of the changing business environment, many companies are seeking to seize the opportunities to develop its business and operations are the six sigma methodology. This methodology is one of the most important ways that deal with discovery flaws and mistakes, as the increased competition between service organizations locally and internationally (Agusa et al, 2011). Therefore, it has been required to offer the best services to meet the needs and customer satisfaction, and it also to develop the suitable service sector. The great changes and different consumer tastes dramatically increases the intensity of competition and the quality of service a weapons competitiveness task that enables organizations to improve the services provided to customers. Consequently, the researcher studies the application of the selected sample of Prince Hashem Hospital in the city of Aqaba in order to determine the impact of Six Sigma methodology on the quality of health services and the development of the necessary recommendations.

The Problem of the Study

Given the importance of the health sector in the city of Aqaba / Jordan as for the sector of importance in people's lives, this study was designed to identify the level of quality provided by the health service in Prince Hashem Hospital located in the city of Aqaba / Jordan, and to identify the degree of six sigma application at Prince Hashem Hospital. This fact requires Prince Hashem Hospital located in the city of Aqaba to be interested of the standard of the six sigma's application to improve the quality of health services, and therein lays the problem with the drafting of the study through the next major question:

What is the impact of the application of six-sigma-methodology to improve the quality of health services in Prince Hashem Hospital located in Aqaba / Jordan?

The Importance of the Study

This study reveals the importance of the current study through the scientific theories:

Scientific interest: to identify the six sigma variables and their impact on improving the quality of health service level.

Practical significance: the results of this study will help health organizations to promote the application of six-sigma where to improve the quality of provided health service level.

The objectives of the study

The current study tries to achieve a number of objectives as follows:

- To determine the extent of the impact of six-sigma methodology to improve the quality of health services in Prince Hashem Hospital.
- To identify six-sigma methodology requirements at Prince Hashem Hospital.

Model Study

In the light of the elements of the problem and the objectives of the study, the public perception of the model study shows independent and dependent variables through the following form:

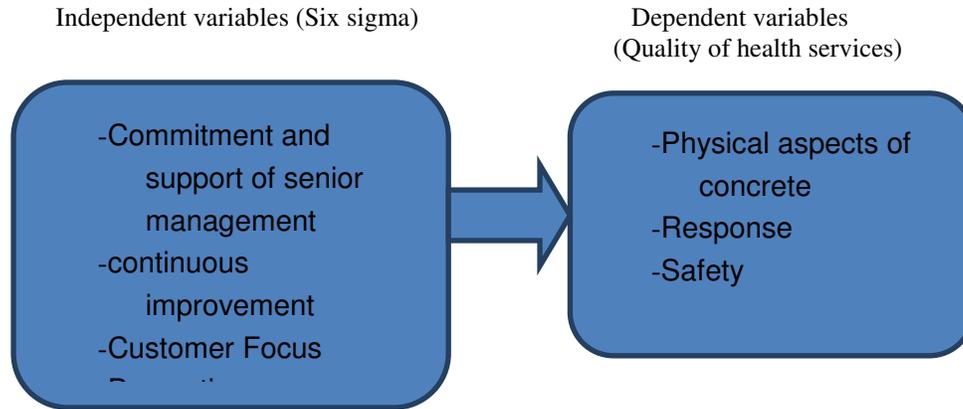


Figure (1)

Hypotheses of the Study

The First Major Hypothesis HO 1

There is a statistically significant effect of six-sigma (Commitment and support of senior management, continuous improvement, Customer Focus and Prevention) on the quality of health services in Prince Hashem Hospital/Aqaba at a level of significance of 0.05.

This give rise to the following sub-hypotheses:

Sub-first Hypothesis H01-1

There is a statistically significant effect of Commitment and support of senior management on the quality of health services in Prince Hashem Hospital in the city of Aqaba at a level of significance of 0.05.

Sub-second Hypothesis H01-2

There is a statistically significant effect of continuous improvement on quality of health services in Prince Hashem Hospital in the city of Aqaba at a level of significance of 0.05.

Sub-third Hypothesis H01-3

There is a statistically significant effect of *customer focus* on the quality of health services in Prince Hashem Hospital/Aqaba at a level of significance of 0.05.

Sub-fourth hypothesis H01-4:

There is a statistically significant effect of *prevention* on the quality of health services in Prince Hashem Hospital/Aqaba at a level of significance of 0.05.

Previous Studies

1. (Naimi, 2009) entitled advanced six sigma method to get to the lowest possible error ratio. This study aimed at learning about the importance of six -sigma in access to the least possible error in the event of their application better for the purpose of reducing the defects in the production or service sectors, with illustrative examples and practical applications through the process of testing.

2. (Abu Nahia et al., 2013) uses of six-sigma methodology to achieve internal audit quality status of the Palestinian universities in the Gaza Strip studying. The study aimed at showing the extent of the use of six sigma standards in achieving internal audit in the Palestinian universities in the Gaza Strip quality. The study concludes that six sigma standards to the Palestinian universities in the Gaza Strip are available significantly, and are committed to Palestinian universities by applying six sigma standards, with no significant correlation statistically between the use of six sigma standards and the achievement of audit quality at the level of significance ($\alpha \leq 0.05$).

3. (Alemam, 2003) notices that the gap SERVQUAL scale and measure actual performance SERVPERF months standards for quality of service, has been used gap SERVQUAL scale study found the order of the quality of health service dimensions in terms of importance from the viewpoint of customers as follows (reliability, responsiveness, safety, empathy, tangible aspects) and reached the presence of positive and statistically significant relationship between the quality of health service determinants independent variable and customer satisfaction for this service as the dependent variable

4. (Sherbini, 2006) reaches no significant relationship between the quality of health service and the administrative practices within the hospital dimensions.

5. (Gosnik, et al, 2010) find out successful factors for six sigma implementation in Slovenian manufacturing companies.

Their results showed that the problem with the Slovenian industrial companies is developing high quality products with attention to customer requirements. They add that the industrial companies do not have sufficient resources to implement six-sigma application. Their study indicates that the participation of the administration and training of personnel are one of the key factors for a successful six-sigma.

6. (Basil, 2012) entitled "Application of Lean Six Sigma to Optimize Admission Waiting Time at AL-Mowasah Hospital".

This study aims at applying six-sigma application to improve the waiting time as a sympathetic procedure in hospitals and it also shows a statement to what extent is six sigma standards committed. The study also identifies the level of patient satisfaction with the services provided and the impact of six sigma principles on patient satisfaction in the hospital. Finally, the most important result shows a trace of the use of the principles of six sigma in patient satisfaction.

7. (Agus and Hassan, 2011) entitled "Enhancing Production Performance and Customer Performance through Total Quality Management (TQM): Strategies for Competitive Advantage"

This study aimed at determining the impact of production performance and customer performance through a comprehensive quality of competitive advantage strategies. The study measures the relationship between the performance of a group of Malaysian companies manufacturing of production performance, the performance of the customer strategy, and total quality. The study shows a significant result that the used strategy and the total quality management are to support and highlight the production of high quality performance.

First: Six-sigma

Six sigma concept

Six sigma concept begins in the 80s where Motorola Company discovered the normal quality levels. At that time the company did not seal the requirements of its customers neither their expectations. Therefore, the company has experienced customers' loss which was caused by reliance on *Three-sigma* application. This application reflects an increase in the cost of products for the high cost of reform (Captain, 2001; Masa'deh, 2012).

Six sigma methodology aims to improve operations in the institutions by reducing the rates of errors leading to raise the level of customer satisfaction and reduce costs. This study allows organizations and enables them to improve significantly with respect to the basic structure and their operations, and through the values and monitor the activities of daily business, so as to reduce waste and the consumption of resources and to meet the client's needs (Harry et al, 2008).

The Successful Implementation of Six Sigma Methodology Requirements

1. Customer Focus 2. Support and the support of the administration 3. Personnel commitment and conviction methodology six sigma methodology for continuous improvement 4. An effective measurement system.

Obstacles to the Application of Six Sigma Methodology

1. Default data on improvement projects 2. Provide changing customer needs and expectations 3. Lack of skills needed on the part of some employees in improvement projects (Jodeh, 2012).

Second: The Quality of Health Service

The concept of quality of service has ever known (Kara et al, 2005; Masa'deh et al, 2015) as the comparison between customer expectations with actual performance of the service. Abordh (2007) clarified the concept of quality of service through the adoption of a new method called the Net mental method of analysis. This method is considered as one of the important methods where to predict the theoretical pattern of different relationships in order to determine the concept of the quality of the perceived service through accurate research results task that dealt with the concept and its relationship to some related concepts such as satisfaction, then use logical analysis to distinguish the concept of discrimination precise from the rest of the theoretical concepts review. This analysis concluded that the concept of the quality of the perceived service as follows:

- A relative concept varies from one person to another.
- Aware of the concept, not passionate.
- Are aware of this concept immediately after purchase and not before buying.
- It can be measured at the level of dealing one-time as well as on the level of relations more than once and dealing.

The Study Methodology

This chapter includes a detailed description of the procedures followed by the purpose of the study, which began identifying the research methodology and methods of data collection goals. It also describes the research community and the method of selecting the sample. Determine the procedures and steps to build a research tool, a description of the procedure, the implications of validity and reliability of the search tool, how to apply the respondents, how to respond to the study design tool are all included in this chapter. The presentation of statistical methods used in data processing, a description of the method, description of data collection and style correction gradient followed by answers.

Study Approach

The study is a descriptive and analytical approach that is appropriate to address the research theoretical literature. after a desk survey for studies and theoretical research and field and stand at the most important of which would constitute a tributary appropriate for this study, in addition to that it will be applied to identify the study as a way to collect the raw data from the study sample and analysis of exit the results contribute to a set of recommendations.

The Study Population

The study population consists of all workers who are in Prince Hashem Hospital.

The Study Sample

The study sample of workers is in the departments in the hospital and some of the reluctant patients to the hospital.

The Study Tool

A questionnaire was developed as a tool for the study, which was developed in proportion with the study and the nature of the variables and so by looking at previous studies and literature on the subject of study.

Stability Study Tool

The stability or the internal consistency of the instrument used in this study is to measure responses to paragraphs was assured using Cronbach equation alpha (Cronbach Alpha). The result is acceptable statistically if the value is greater than 0.70 (Sekaran and Bougie, 2009). In addition, the results showed that the coefficient values stability is acceptable.

Table 1. Cronbach's Alpha Values

Items		Cronbach's Alpha
Six sigma	Commitment and support of senior management Continuous improvement Customer Focus Prevention	.860
Quality of services	Physical aspects of concrete Response Safety	.757

As the above table shows, the stability values for the main variables of the study as the stability factor in a comprehensive questionnaire was 0.86. The independent variable Six Sigma either dependent variable quality of service health is 0.757. The Alpha Cronbach indicators on the suitability of the above study tool are generally high by a factor of stability and thus achieve the purposes of the study.

Results of the Special Six Sigma

The arithmetic mean is calculated. The standard deviation and arrangement of the answers of respondents to the study vertebrae that measure the Six Sigma in Prince Hashem Hospital tool the results were as follows:

Means and Standard Deviation of Six Sigma Dimensions Table 2.

six sigma	Mean	Std. Deviation	Rank
Commitment and support of senior management	2.46	.980	4
continuous improvement	2.69	1.121	3
Customer Focus	2.85	1.032	1
Prevention	2.73	1.091	2

Achieved variable customer focus the top center of my account was (2.85). The standard deviation is (1.032) which indicates that the customer focus in the hospital is high from the viewpoint of the sample level, has made the commitment and support of senior management variable central mathematically of (2.46) and standard deviation of (0.980).

Results of the Special Quality of the Health Services Field Study

The arithmetic mean is calculated, and the standard deviation and arrangement of the answers of respondents to the study vertebrae that measure the quality of health services in Prince Hashem Hospital tool the results were as follows:

Table 3. Means and Standard Deviation of Quality of Services Dimensions

quality of health services	Mean	Std. Deviation	Rank
Physical aspects of concrete	2.80	1.184	3
Response	2.89	1.331	2
Safety	2.91	1.116	1

Table indicates (3) that the service quality at Prince Hashem high hospital level, so from the standpoint of the respondents, as shown by the table that the effectiveness of each level after the service quality dimensions was a little different, it was the highest yet in terms of the level after safety, with a mean of (2.91) and a standard deviation of (1.116) and the level is high, and came after a response and a high level of reaching the middle arithmetic (2.89) and standard deviation (1.331), where he was the arithmetic mean of the post-physical aspects of the concrete (2.80) and standard deviation (1.184).

Results and Test Hypotheses

The First Major Hypothesis H01

-There is a statistically significant effect of Six Sigma (Commitment and support of senior management, continuous improvement, Customer Focus and Prevention) on Quality of health services in Prince Hashem Hospital in the city of Aqaba at a level of significance of 0.05.

Table 4 shows the results of multiple regression contrasts the impact of Six Sigma (Commitment and support of senior management, continuous improvement, Customer Focus and Prevention) on Quality of health services in Prince Hashem Hospital in the city of Aqaba (The dependent variable is the Quality of health services)

Table 4. Multiple Regression Results

Independent Variable	R	R Square	DF	Mean Square	F	β	T	Sig.	
Six sigma	.900	.810	Regression	4	15.866	79.905	.764	10.455	.000
			Residual	75	.199				
			Total	79					

Statistically significant ($\alpha \leq 0.05$)

The results of Table 4 shows the value of the coefficient of determination to be $R^2 = 0.810$. This means that the independent variable (Six sigma) explains what percentage of discrepancy (81%) is in the dependent variable (Quality of health services). Because the value of F is 79.905 at the significance level of <0.05 , we accept the hypothesis that there is a statistically significant effect ($0.05 \leq \alpha$) of Six Sigma on Quality of health services.

Sub-first Hypothesis H01-1

There is a statistically significant effect of Commitment and support of senior management on Quality of health services in Prince Hashem Hospital in the city of Aqaba at a level of significance of 0.05.

Table 5 shows the results of simple regression contrasts analysis of Commitment and support of senior management on Quality of health services (dependent variable is quality of health services).

Table 5. Simple Linear Regression between Commitment and Support of Senior Management and Quality Health of Services

Six sigma	R	R Square	DF	Mean Square	F	β	T	Sig.	
Commitment and support of senior management	.669	.448	Regression	1	35.086	63.247	.669	7.953	.000
			Residual	78	.555				
			Total	79					

The results of table 5 shows that the value of the coefficient of determination $R^2 = 0.448$. This explains the rate (45%) of the discrepancy in the dependent variable (the competitive performance). The value of F is 63.247 at a significance level of <0.05 , we accept the hypothesis that there is a statistically significant effect ($0.05 \leq \alpha$) to Commitment and support of senior management the Quality of health services.

Sub-third Hypothesis H01-2

There is a statistically significant effect of continuous improvement on Quality of health services in Prince Hashem Hospital in the city of Aqaba at a level of significance of 0.05.

Table 6 shows the results of simple regression contrasts the impact of continuous improvement on Quality of health services analysis (dependent variable is the quality of health services).

Table 6. Simple Linear Regression between Continuous Improvement and Quality Health of Services

Six sigma	R	R Square	DF	Mean Square	F	β	T	Sig.	
continuous improvement	.582	.339	Regression	1	26.567	40.013	.582	6.326	.000
			Residual	78	.664				
			Total	79					

Results of table 6 showed the value of the coefficient of determination to be $R^2 = 0.884$. This means that the independent variable continuous improvement explains what percentage of (34%) discrepancy is existent in the dependent variable (the Quality health of services). And because the value of $F = 40$ at a level significance <0.05 , we accept the hypothesis that there is a statistically significant effect ($0.05 \leq \alpha$) of continuous improvement on the Quality health of services.

Sub-third Hypothesis H01-3

No statistical effect of Customer Focus on the Quality health of services indication in Prince Hashem Hospital in the city of Aqaba at a level of significance of 0.05.

Table 7 shows the results of simple regression contrasts the influence of Customer Focus on the Quality health of services analysis (dependent variable is the quality health of services).

Table 7. Simple Linear Regression between Customer Focus and Quality Health of Services

Six sigma	R	R Square	DF		Mean Square	F	β	T	Sig.
Customer Focus	.415	.172	Regression	1	13.515	16.257	.415	4.032	.000
			Residual	78	.831				
			Total	79					

Results showed, through the table 7, the value of the coefficient of determination to be $R^2 = 0.17$. This means that the independent variable Customer Focus explains what percentage of (17%) discrepancy is present in the dependent variable (the Quality health of services). And because the value of $F = 16.26$ at a significance level of <0.05 , we accept the hypothesis that there is a statistically significant effect ($0.05 \leq \alpha$) of Customer Focus and Quality health of services.

Sub-third Hypothesis H01-3

No statistical effect of Prevention and Quality health of services indication in Prince Hashem Hospital in the city of Aqaba at a level of significance of 0.05.

Table 8 shows the results of simple regression contrasts the influence of Prevention and Quality health of services analysis (dependent variable is the quality health of services).

Table 8. Simple Linear Regression between Prevention and Quality Health of Services

Six sigma	R	R Square	DF		Mean Square	F	β	T	Sig.
Prevention	.894	.800	Regression	1	62.672	311.683	.894	17.655	.000
			Residual	78	.201				
			Total	79					

Results showed, through the table 8, the value of the coefficient of determination to be $R^2 = 0.800$. This means that the independent variable Prevention explains what percentage of (80%) discrepancy is present in the dependent variable (the competitive performance). And because the value of $F = 311.68$ at a significance level of <0.05 , we accept the hypothesis that there is a statistically significant effect ($0.05 \leq \alpha$) of Prevention and Quality health of services.

Conclusion

After the theoretical and empirical study reached the following results:

1. Demonstrated by the theoretical literature that six sigma and quality of health services of the important topics and sensitive, especially in the present time, due to its impact on the reality and the future of the surveyed organizations.
2. The results showed that the health of the first hypothesis, which eliminates the effect of the presence of a statistically significant at the level of significance ($0.05 \leq \alpha$ standards for six sigma (continuous improvement, customer focus, prevention, commitment and support of senior management) in the quality of health services.
3. The results proved the health of imposition which requires the existence of a statistically significant effect at the level of significance ($0.05 \leq \alpha$) for the commitment and support of top management in the quality of health services.
4. The results showed the health of the hypothesis which requires the existence of a statistically significant effect at the level of significance ($0.05 \leq \alpha$) continuous improvement in the quality of health services.
5. The results showed the health of the hypothesis which requires the existence of a statistically significant effect at the level of significance ($0.05 \leq \alpha$) to focus on customers in the quality of health services.
6. The results showed the health of the hypothesis which requires the existence of a statistically significant effect at the level of significance ($0.05 \leq \alpha$) prevention in the quality of health services.

Recommendations

1. The need for adequate support by the senior management six sigma method.
2. Customer care through improved health service that satisfy their needs and desires.
3. Focus on the performance of health service operations through identification of needs and expectations of customers and work on the improvement of the Continuity of operations in line with the needs and expectations.

4. Determine the defect in the mechanics of the application of Six Sigma Methodology in the institutions and determine the plans that focus on addressing. This imbalance and develop the performance.
5. Predict accurately the needs of clients and their attitudes towards the future pharmaceuticals companies.
6. Study recommend the needs to support the employees of these companies and create all favorable conditions to motivate them and sharpen their potential for creativity and excellence to achieve the competitive advantage of companies surveyed.
7. Applied the dimension competitive advantage that has been studied and appropriate with the nature and direction of the company's strategy and to achieve a competitive advantage.
8. The government should accelerate and skip the red tape to facilitate the necessary approvals for export operations, and give incentives to companies entering new overseas markets.

Finally, in respond to several researchers (e.g. Altamony et al, 2012; Shannak et al, 2012; Mirah and Masa'deh, 2014; Alenezi et al, 2015; AL-Syaidh et al, 2016), comparison research should be conducted among different sector in developed and developing countries as to extract the best practices such as in using six-sigma methodology on the quality of health services and then implement them appropriately.

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