

Using Six Sigma Approach to Improve Accounting Information Systems Performance

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Abstract

The study aimed at investigating the extent of applying six sigma criteria in the King Abdullah II awarded Jordanian private firms for excellence and its impact on improving accounting information systems performance. Data were collected from the surveyed firms by using a questionnaire designed specially for this purpose. The study revealed the existence of very high- high level of applying six sigma criteria in the King Abdullah II awarded Jordanian private firms; it also revealed that there was a significant correlation between six sigma criteria and the improvement of accounting information systems performance in these firms.

Keywords: Criteria, Six Sigma, Performance, Improvement, Accounting Information Systems.

1. Introduction

Six sigma is a commonly used approach in the field of quality management, where this approach has many benefits for organizations that have been able to apply successfully. The rapid progress in the business environment and increased competition led to a growing and evolving needs of information for the purposes of the decision-making process, therefore the performance of accounting information systems is of particular importance in the hierarchy of priorities. Accounting information system is one of the most important systems that provide the necessary information to enable management to take the right decisions, and reflects positively on the survival and growth of the organization and strengthen its competitive position.

Using six sigma methodology to improve the performance of accounting information systems help provide appropriate information to the extent required and the right time and with minimal costs. Accordingly, this research aims at investigating the extent of applying six sigma criteria in the King Abdullah II awarded Jordanian private firms for excellence and its impact on improving accounting information systems performance.

2. Study Problem

Under globalization and heightened competition, emerged the need for improving the performance of accounting information systems to provide appropriate information to the needs of the organization and its operations to assist management in many areas such as planning, control and decision-making.

Quality systems should be used to improve the performance levels of accounting information systems by increasing their ability to provide the necessary information for the requirements of the decision-making process; hence the study aims to answer the following questions: To what extent the King Abdullah II awarded Jordanian private firms for excellence apply six sigma criteria? Is the application of six sigma criteria affects the performance of accounting information systems in these firms?

3. Significance of the Study

The significance of the study arising from the importance of the issue of improving the performance of accounting information systems, where information has become a resource comparable to the natural and human resources. In addition to providing a new method to improve the performance of accounting information systems, which previous studies not addressed.

4. Objectives of the Study

This Study seeks to achieve the following objectives:

- a. Highlight the contents of the six sigma methodology.
- b. Identify the levels of application of six sigma criteria in the King Abdullah II awarded Jordanian private firms for excellence.
- c. Identify the relationship of six sigma criteria to improve the performance of accounting information systems and its impact on the performance of these systems in the King Abdullah II awarded Jordanian private firms.

5. Literature Review

Six Sigma originated at Motorola in the 1980s (Lin, Lee and Wu, 2009). The six sigma approach is primarily a methodology for improving the capability of business processes by using statistical methods to identify and decrease or eliminate process variation. Its goal is reduction of defects and improvements in profits, employee morale and product quality (Wang and Chen, 2010).

According to Harry and Schroeder (2000), Antony and Fergusson (2004), Hensley and Dobie (2005), and Cheng (2008), six sigma as a powerful management strategy has evolved from being exclusively about the original goal of a target of less than four failures or defects or errors per million opportunities, to encompass a broad range of approaches for incorporating quality into products and services from the early design and development stages and throughout their lifetimes. Breyfogle (1999, 1) believes that quality programs provide through six sigma more than just measuring rates of defects, implementation of this approach includes the integration of a wide range of tools and techniques across the stages of improving performance and thus improve profits as an ultimate objective.

Hayler and Nichols (2006) defined six sigma as “use of facts and data to reduce process variability, thereby enabling organizations to deliver consistent, high quality services to customers”. However, Antony and Coronado (2001) defined six sigma differently, “six sigma is business strategy used to improve business profitability, to improve the effectiveness and efficiency of all operations to meet customers’ needs and expectations”. In view of Linderman and colleagues (2003) six sigma is an organized and systematic method for strategic process improvement and new product and service development that relies on statistical methods and the scientific method to make dramatic reductions in customer defined defect rates.

As pointed out by Kwak and Anbari (2006), there are several benefits of six sigma, which includes; improved the net profits, improved HR processes, reduction in wastes, reduced failure rates, improved savings through cost reductions and reduction of packaging defects. Many studies also recognize the advantages of employing six sigma (Hahn, Hill, Hoerl and Zinkgraf, 1999; Hendricks

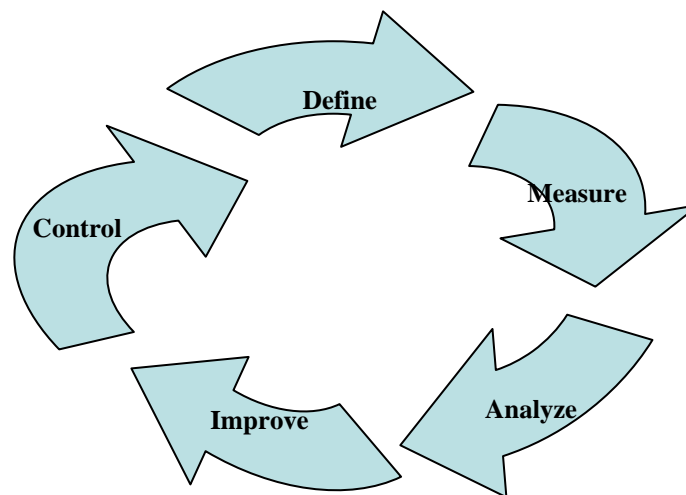
and Kelbaugh, 1998; Lanyon, 2003; Robinson, 2005) like improving the market share and building competitive advantage for a business. Pande and colleagues (2000, 4) noted that six sigma's primary role is to build new structures and adopt new applications designed for supporting improvement and securing the success of operation from beginning to the end.

The projects of six sigma are carried out with a systematic approach named six sigma route map through two key methodologies, a paradigm of statistical thinking is embodied in these methodologies, which are used as the basis for executing improvement projects (Siviy, Penn and Harper, 2005), i.e., DMAIC and DMADV, both of which were inspired by Deming's (Cheng, 2008). The use of DMAIC and DMADV improvement strategies coupled with the deployment of a structured set of quality tools (Kumar, Antony, Madu, Montgomery and Park, 2008).

Define-Measure-Analyze-Improve-Control a five-phase improvement cycle, which can be stated shortly as DMAIC (Goh and Xie, 2004, 236), is used to improve and optimize an existing business process and products (Siviy, Penn and Harper, 2005), while DMADV is used to design new products and processes and it consists of the following five steps i.e., Define-Measure-Analyze-Design-Verify.

Many authors have suggested applying the DAMAC methodology as the best way to implement six sigma in manufacturing and service sectors (Anthony, 2006; Ladani, Das, Cartwright, Yenknner and Ramzi, 2006; Chakrabarty and Tan, 2007; Antony, 2008). The five phases of the DAMAC methodology are shown in Figure 1.

Figure 1: Six Sigma Processes



In order to apply the concept of six sigma, the organization must take into account a set of elements or basic criteria, which was addressed in a lot of literature such as: (Harry, 1998; Sanders and Hild 2000; Henderson and Evans, 2000; Pande, Neuman and Cavanage, 2000; Dale, 2000; Eckes, 2000; Coronado and Antony, 2002; Pande and Holpp, 2002; Antony and Banuelas, 2002; Lazarus and Stamps, 2002; Bañuelas and Antony, 2003; Laosirihongthong, Rahman and Saykhun, 2006). In this study, the focus will be to the criteria that were common among most studies, namely: support and commitment of top management, training, organizational culture and Focus on the client.

The use of sigma six acquires its importance in improving the performance of accounting information systems through the essential role played by information in the process of decision-making, particularly in the context of globalization and heightened competition in the contemporary business environment, which made the performance of accounting information systems takes more attention in order to assess their success and their suitability for the needs of information users at all levels.

The literature provided many models to measure the performance of information systems of the best known and most widely used in the studies is the model provided by Delone & Mclean (1992), which included six factors to measure are: the quality of the system, quality of information, the use of the system, satisfaction of system users, the impact of the system on its users, and system impact on the performance of the organization.

In the literature related to improving performance there are many indications that show the improved levels of performance such as reducing costs, reducing errors, reduce cycle time, increase customer satisfaction, sales growth, increase revenue, and improve the level of product.

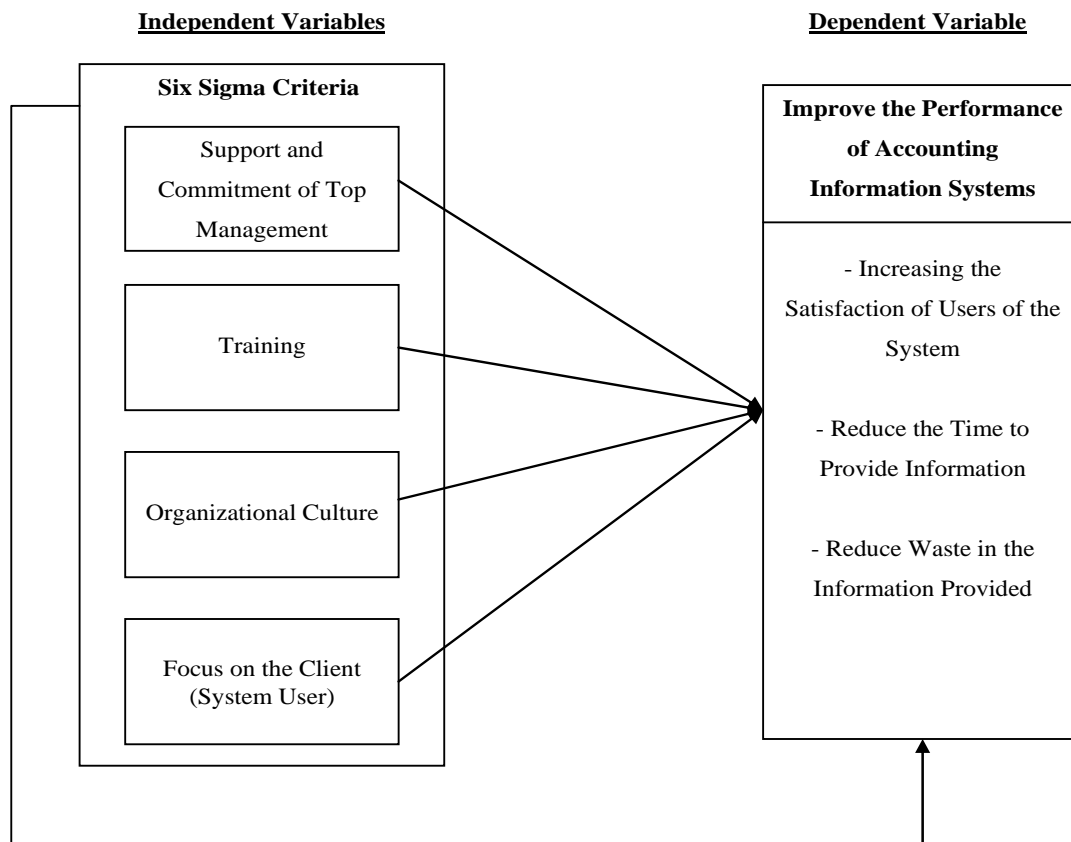
We consider that it can improve the performance of accounting information systems by increasing the satisfaction of users of the system, reduce the time to provide information, and reduce waste in the information provided.

6. Research Methodology

6.1. Research Model

Based on the research objectives and literature review, this paper has developed a model to be tested in the King Abdullah II awarded Jordanian firms for excellence in the private sector. Figure (2) shows the proposed model.

Figure 2: Proposed Research Model



6.2. Research Hypotheses

Based on the literature review, the researcher tests the following main hypothesis and the sub hypotheses:

- H1:** There is a significant relationship between the application of six sigma criteria and improve the performance of accounting information systems in the King Abdullah II awarded Jordanian firms for excellence in the private sector.
- H1a:** There is a significant relationship between the support and commitment of top management and improve the performance of accounting information systems in the King Abdullah II awarded Jordanian firms for excellence in the private sector.
- H1b:** There is a significant relationship between the training and improve the performance of accounting information systems in the King Abdullah II awarded Jordanian firms for excellence in the private sector.
- H1c:** There is a significant relationship between the organizational culture and improve the performance of accounting information systems in the King Abdullah II awarded Jordanian firms for excellence in the private sector.
- H1d:** There is a significant relationship between the focus on the client (system user) and improve the performance of accounting information systems in the King Abdullah II awarded Jordanian firms for excellence in the private sector.

6.3. Measuring Instrument

A three-part questionnaire was formed and delivered to participants in different ways; per e-mail, per fax or by hand. The questionnaire focused on 3 major areas: demographics of respondents, the application of six sigma criteria, and improve the performance of accounting information systems. A five-point Likert scale was used. Answers range between, highly agree, agree, somewhat agree, disagree, and highly disagree.

To assess the face validity of the questionnaire, it was handed to 5 academies from reputable business school in Jordan who checked the relevance and appropriates of the instrument to improve clarity and identify any unfamiliar or unclear wording and resolve any issue accordingly.

Cronbach's alpha reliability coefficient of the four independent variables and the dependent variable were obtained. The results indicate that Cronbach's alpha of the items measuring independent variables and the dependent variable is (0.96). And as Sekaran (2003) clarifies the Cronbach's alpha should be more than (0.60). Thus, the internal consistency of the measures used in this research is high.

6.4. Research Population and Sample

The study population consists of the King Abdullah II awarded Jordanian firms for excellence in the private sector, which is (18) firms at the time of making this study, the questionnaire was directed to (168) managers at different managerial levels (first line, middle and top management), (130) questionnaire from them were suitable for analysis resulting in a response rate of (77%).

6.5. Statistical Analysis

Statistical techniques were applied in the analysis by using the mean, standard deviation, and percentage, as well as simple and multiple regressions.

The application level and the effect are selected according to the value of the arithmetic mean of the respondents' answers as follows: 4.5- 5 very high, 3.67- less than 4.5 high, 2.34- less than 3.67 average, 1- less than 2.34 low, less than 1 is very low.

6.6. Study Limits

The study identified six sigma criteria and indicators which measure improving the performance of accounting information systems based on literature and previous relevant studies, where the adopted criteria and indicators which were common among most of these studies. The researcher believes that these criteria and indicators selected are appropriate degree of the most important aspects to be

measured, as well as suitability for the purposes of the study, therefore, there may be criteria and indicators have not dealt with in this study.

7. Data Analysis Results and Hypotheses Testing

7.1. Profile of the Respondents

Table (1) shows the vast majority of respondents were holders of the first university degree (bachelor degree) as a minimum (75%). In relation to managerial level, most respondents were distributed on top and middle levels (%68.5). In terms of work experience, most of the respondents have a long work experience; around (%63) have more than 10 years of experience, which refers to the ability of respondents to absorb the questions of the questionnaire and answer it properly. With regard to the number of training courses relevant to the overall quality, it was shown that around (67%) or nearly two thirds of respondents have more than 3 courses in this area, demonstrating their knowledge of the concept of TQM and its applications.

Table 1: Demographic Characteristics of Study Sample

Variable	Category	Repetitions	Percentage
Qualification	Less than bachelor	-	-
	Bachelor	98	%75.4
	Graduate	26	%20
	Professional certificate	6	%4.6
	Total	130	%100
Managerial level	Top management	36	%27.7
	Middle management	53	%40.8
	First line management	41	%31.5
	Total	130	%100
Years of experience in current work	Less than 5 years	8	%6.1
	5 -10 years	40	%30.8
	More than 10 years	82	%63.1
	Total	130	%100
Number of training courses related to TQM	Not applicable	-	-
	1-3 course	43	%33.1
	More than 3 courses	87	%66.9
	Total	130	%100

7.2. Descriptive Analysis

Descriptive Analysis was used to assess the results obtained from the questionnaires as listed in tables (2) and (3).

Table (2) shows the answers of respondents on statements related to the extent of the application of six sigma criteria. With regard to the criterion of the support and commitment of top management, the respondents believe there is a very high application of this criterion where the overall mean of this variable (4.64). In relation to the criterion of the training, the respondents believe that there is a high application of this criterion where the overall mean of this variable (4.19). As for the criterion of organizational culture, the respondents consider there is a very high application of this criterion where the overall mean of this variable (4.55). With respect to the criterion of the focus on the client (system user), the respondents believe that there is a high application of this criterion where the overall mean of this variable (4.31).

Table 2: Descriptive Statistics for: Application of Six Sigma Criteria

Items	Mean	Std-deviation	Application level
Support and Commitment of Top Management			
Management provides resources for quality applications and continuous improvement.	4.75	0.33	Very high
Management encourages employees to adhere to the application of quality and continuous improvement programs.	4.78	0.65	Very high
Management provides full support for the application of quality-related issues.	4.44	0.58	High
Management is planning for quality continuously.	4.38	0.82	High
Management is concerned about the follow-up quality programs.	4.68	0.24	Very high
Management believes the importance of using modern methods of quality applications.	4.80	0.73	Very high
Overall statistics	4.64	0.77	Very high
Training			
Quality management team trains staff on the quality programs adopted in the work periodically.	3.80	0.61	High
Sufficient funds are allocated for training programs related to quality issues.	4.77	0.49	Very high
The impact of training programs offered in the field of quality is evaluated on the performance of employees after implementation.	3.84	0.35	High
There are qualified instructors to train employees on the quality programs.	4.78	0.70	Very high
Employees are trained in statistical methods for quality measurement and control.	3.75	0.22	High
Overall statistics	4.19	0.38	High
Organizational Culture			
Employees are encouraged to cooperate and work as a team.	4.83	0.66	Very high
Employees are allowed to participate in the decision-making process.	3.98	0.31	High
There are means to facilitate direct contact between employees and their superiors.	4.86	0.59	Very high
Employees involved with management in solving the problems that face them.	4.81	0.44	Very high
There is the belief of the importance of the adoption and deployment of concepts of quality.	4.26	0.60	High
Overall statistics	4.55	0.53	Very high
Focus on the Client (System User)			
Strategic objectives for quality are adopted depends on the needs and desires of customers.	4.76	0.25	Very high
Customer satisfaction is measured and monitored on a regular basis.	3.83	0.67	High
The organization's mission focused on meeting customer needs and gain satisfaction.	3.94	0.46	High
Desires and needs of customers ranked first in the hierarchy of priorities when doing product design and development.	4.56	0.32	Very high
Customer complaints are given the utmost importance when doing the improvement and product development.	4.47	0.24	High
Overall statistics	4.31	0.612	High

Table (3) shows the answers of respondents on statements related to improving the performance of accounting information systems. Respondents believe that the application of six sigma methodology standards has a high impact on increasing user satisfaction of accounting information systems, where the overall mean (4.21) which refers to the importance of the relationship between the use of six sigma methodology and improve the performance of accounting information systems. Respondents also consider that the application of six sigma standards has a high impact on reducing the time it takes for the accounting information systems to provide the required information where the overall mean (4.38) this result reveals the important role played by using six sigma methodology to improve the performance of accounting information systems.

As for reducing waste in the information provided by the accounting information systems, respondents believe that the application of six sigma standards has a high impact on this area, since the overall mean (4.23) which also shows the great importance of the relationship between the use of six sigma methodology and improve the performance of accounting information systems.

Table 3: Descriptive Statistics for: Improving the Performance of Accounting Information Systems

Items	Mean	Std-deviation	Application level
Increase Satisfaction of Users of the Systems			
The application of six sigma criteria contributes to increase the ability of accounting information systems to provide the appropriate information necessary to the decision maker.	4.76	0.44	Very high
The application of six sigma criteria leads to greater satisfaction with the information provided by the accounting information systems.	4.14	0.71	High
The application of six sigma standards increases flexibility of the accounting information systems to meet the demands of the updated information.	3.95	0.51	High
The application of six sigma standards facilitates the accounting information systems to provide information that helps to meet the emergency and unexpected situations.	4.66	0.60	Very high
The application of six sigma standards helps to reduce errors in the information provided by the accounting information systems.	3.69	0.86	High
The application of six sigma standards contributes to the ease of access to information provided by the accounting information systems.	3.75	0.44	High
The application of six sigma standards helps accounting information systems to respond to all requests of users properly and compatible with their expectations.	4.55	0.57	Very high
Overall statistics	4.21	0.64	High
Reduce the Time to Provide Information			
The application of six sigma standards helps accounting information systems to reduce the cycle time necessary to provide the required information.	4.29	0.68	High
The application of six sigma standards makes the accounting information systems capable of reducing the waiting time of the user for information.	4.38	0.72	High
The application of six sigma standards encourages the accounting information systems on the use of information technology and modern means of communication which saves the time required to provide information.	4.53	0.62	Very high
The application of six sigma standards contributes to reducing the time required to provide the accounting information by helping to reduce errors in this information and the time it takes to correct them.	4.21	0.70	High
The application of six sigma standards enhances the possibility of accounting information systems for the adoption of new methods and innovative ways of working to reduce the time required to provide information to the user.	4.51	0.78	Very high
Overall statistics	4.38	0.61	High
Items	Mean	Std-deviation	Application level
Reduce Waste in the Information Provided			
The application of six sigma standards contributes to reducing the provision of accounting information which is not utilized in the decision-making process.	4.57	0.74	Very high
The application of six sigma standards helps to reduce the deviation between the information provided by the accounting information systems and those needed by the decision maker.	3.94	0.53	High
The application of six sigma standards increases the ability of accounting information systems to achieve a high degree of congruence between the information requested and the information provided.	4.56	0.56	Very high
The application of six sigma standards helps to reduce the provision of accounting information in excess of the needs of decision makers.	4.16	0.66	High
The application of six sigma standards helps accounting information systems to avoid information overload.	3.92	0.58	High
Overall statistics	4.23	0.48	High

8. Test of Hypotheses

The following represents the test of hypotheses results analysis based on the use of multiple and simple regressions.

H1: There is a significant relationship between the application of six sigma criteria and improve the performance of accounting information systems in the King Abdullah II awarded Jordanian firms for excellence in the private sector.

Based on the results of multiple regression analysis, results shown in table (4) proved that this hypothesis has been accepted since ($F=30.051$), and the significance level was ($p=0.000$), which means that there is a significant relationship between the application of six sigma criteria and improve the performance of accounting information systems.

Table 4: Results of Multiple Regression Analysis for Examining the Major Study Hypothesis

Model	B	Beta	T	Sig.
Constant	0.365		1.009	0.318
Support and Commitment of Top Management	0.178	0.198	2.092	0.048
Training	0.232	0.279	2.174	0.033
Organizational Culture	0.250	0.356	3.781	0.000
Focus on the Client (System User)	0.188	0.208	1.967	0.086
R	0.837			
R2	0.701			
F	30.051			
Sig.	0.000			

The major hypothesis is divided into four minor hypotheses, and the results of the analysis based on simple regression are shown in table (5) as follows:

H1a: There is a significant relationship between the support and commitment of top management and improve the performance of accounting information systems in the King Abdullah II awarded Jordanian firms for excellence in the private sector.

The result of the analysis is indicated that this hypothesis has been accepted since ($t=6.213$) and the significance level was ($p=0.000$) as shown in table (5). This result proves that there is a significant relationship between the support and commitment of top management and improve the performance of accounting information systems.

H1b: There is a significant relationship between the training and improve the performance of accounting information systems in the King Abdullah II awarded Jordanian firms for excellence in the private sector.

The results of analysis proved that the hypothesis has been accepted since ($t=5.631$) and the significance level was ($p=0.000$) as indicated in table (5). This result assures that there is a significant relationship between the training and improve the performance of accounting information systems.

H1c: There is a significant relationship between the organizational culture and improve the performance of accounting information systems in the King Abdullah II awarded Jordanian firms for excellence in the private sector.

Based on the results of the simple regression analysis, this hypothesis is accepted since it was found that the (t) value is (6.50), and the significance level was ($p=0.000$), which means that there is a significant relationship between the organizational culture and improve the performance of accounting information systems as indicated in table (5).

H1d: There is a significant relationship between the focus on the client (system user) and improve the performance of accounting information systems in the King Abdullah II awarded Jordanian firms for excellence in the private sector.

Referring to the analysis results indicated, in table (5), the hypothesis is accepted since ($t=5.379$) and the significance level was ($p=0.000$). This means that there is a significant relationship between the focus on the client (system user) and improve the performance of accounting information systems.

Table 5: Results of Simple Regression Analysis for Examining the Minor Study Hypotheses

Model	R	R ²	T	Sig.
Support and Commitment of Top Management	0.788	0.621	6.213	0.000
Training	0.604	0.365	5.631	0.000
Organizational Culture	0.669	0.448	6.50	0.000
Focus on the Client (System User)	0.622	0.387	5.379	0.000

9. Conclusion

The purpose of this study has been to explore both the application of six sigma criteria in the King Abdullah II awarded Jordanian private firms for excellence and its role in improving the performance of accounting information systems. The findings of this study have shown that these firms apply six sigma criteria at a very high- high level; six sigma criteria have a descending order in terms of upper application as follows: support and commitment of top management, organizational culture, focus on the client (system user), and training. The findings have also indicated that there is a significant positive relationship between the application of six sigma criteria (collectively and separately) and improve the performance of accounting information systems.

The implications of this study emphasize the importance of focusing on the use of six sigma methodology in the field of accounting information systems to improve the performance of these systems. The study also emphasizes the importance of holding workshops and training programs dealing with the application of six sigma methodology in the field of accounting information systems. Finally, additional research efforts needed to address other aspects of the relationship of the six sigma approach to accounting information systems.

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