Research Journal of Management Sciences _____ISSN 2319–1171
Vol. **3(12),** 1-14, December **(2014)** *Res. J. Management Sci.*

Six-Sigma Application in the Hotel Industry: Is It Effective for Performance Improvement?

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Available online at: www.isca.in, www.isca.me
Received 7th November 2014, revised 15th November 2014, accepted 30th November 2014

Abstract

Six-Sigma (6σ) is a quality improvement strategy that provides a clear roadmap for organizations to deliver nearly perfect products and services. After initial success in manufacturing organizations, Six-Sigma has gradually gained widespread application in service organizations, including hotels and lodging. Although the hotel industry has an increased interest in Six-Sigma implementation and many hotels have yielded tangible benefits from this approach, the literature is limited. Moreover, the relationship between Six-Sigma implementation and its performance improvement outcomes is a rarely examined subject in the hospitality context. Therefore, this study attempts to assess the effectiveness of Six-Sigma and examine its impacts on various performance measures of upscale hotels in Egypt, seeking for what values and benefits it brings to improve the overall performance. To achieve this objective, the researcher surveyed 123upscale hotels in Egypt. Data were analyzed using Statistical Package for Social Science (SPSS 18). The results indicated that only 31 percent of the respondent hotels are actively involved in a documented Six-Sigma project. A notable proportion of these hotels have less than three years experience with the Six-Sigma approach. This clearly illustrates that Six-Sigma is a relatively new approach within the Egyptian hotel industry. The findings indicated that Six-Sigma implementation is positively and significantly associated with the operational and competitive performance of the surveyed hotels. Hotels implementing Six-Sigma have achieved more benefits as compared to other hotels implementing other quality management programs (i.e. TQM and ISO 9001). Therefore, it seems advisable for Egyptian hotels to be involved in formal Six-Sigma projects in order to improve their overall performance.

Keywords: Six-Sigma, total quality management, hotel industry, upscale hotels, performance improvement, Egypt.

Introduction

In present strong competitive environment, the hotel industry needs to continuously ramp up its operations by improving the quality of products and service and devise competitive strategies to reduce operation costs and increase capacity. In order to improve their operations and enhance their performance, hotels across the world are actively engaged in a wide variety of quality improvement initiatives such as TQM and Six-Sigma[1]. Currently, Six-Sigma replaced TQM to become one of the most successful process improvement systems[2]. Six-Sigma originated at Motorola Inc. in the early 1980s with the aim of eliminating product defects, reducing quality costs and enhancing customer satisfaction[3].

The fundamental difference between Six-Sigma and other process improvement programs (such as TQM) is related to the ability of Six-Sigma in providing an organizational context that facilitates problem solving and exploration across the organization. While Six-Sigma programs have their roots in the quality movement, they are different from other quality programs due to their limited time-frame, measurable and quantifiable goals and the project structure[4, 5].

The principal components of the Six-Sigma as a quality improvement framework include a close understanding of customers' needs, the use of performance measures, an attentiveness on enhancing business processes, and ultimately the generation of tangible business results[1,6]. Six-Sigma is a process improvement methodology that allows companies to drastically improve their bottom line by designing and monitoring everyday business activities in ways that eliminate the causes of defects or mistakes in business processes by focusing on the outputs that are important to the customer satisfaction. To put it simply, it is a systematic approach to achieving continuous process improvements[7-9].

After initial success in manufacturing organizations, Six-Sigma has gradually gained traction in service organizations. Several studies have shown successful cases of Six-Sigma application in service organizations such as financial services[10], hospitals[11], food industry[12], education[13], supply chain management[2]and hotels and airlines[14]. The statement that service sector is fundamentally different in nature from manufacturing and that these differences contribute to the increased complexity of service quality is well accepted[15]. A key argument here is that service organizations have unique set of processes and metrics. As such, service organizations are not compelled to emulate the manufacturing model for Six-Sigma management system

because they function differently for the reason that the main core of it is based on customer requirements and swift responses from the customers. When service is provided, the customer immediately conveys satisfaction or dissatisfaction[16]. Moreover, the intangible nature of services and products makes the understanding of work process more difficult and the measurement of volatility makes data collection more difficult[17]. Thus, In a service process, the aim of Six-Sigma approach is to recognize and pinpoint how defects occur and then plan process improvements by reducing defects which will improve the overall customer experience as well as improve customer satisfaction[16].

Six-Sigma has been successfully introduced into many service organizations, including hotels and lodging[18]. For instance, Starwood Hotels and Resorts, one of the leading hotel chains, was one of the first hotels in the world that endeavored to espouse Six Sigma philosophy. In 2001, Starwood adopted Six-Sigma to develop innovative solutions that focus on the customer and to transfer these solutions throughout the global organization[19]. Recently, Starwood has successfully executed hundreds of Six-Sigma projects in areas involving productivity, customer interactions and evaluations, menu redesign, green room program, workplace safety, e-mail marketing and sales. When Six-Sigma was initiated at Starwood Hotels and Resorts, the company incurred $17 million in training costs. At the same time, the company reaped tangible of more $17 million. Since then, programs developed under Six-Sigma have delivered more than $100 million in profits to Starwood's bottom line[20]. Another Six-Sigma project at the Westin Turn berry Resort resulted in an 11.95% increase in incremental spending by customers and an increase in room revenue of more than 19%. A Six-Sigma project improved reservation systems and helped maximize the use of massage therapists and treatment rooms, increasing spa-related revenues from $145 per booking to $225 per booking[21].

Although hotels around the world have an increased interest in Six-Sigma implementation and many hotels have reported considerable financial and non-financial benefits as a result of Six-Sigma implementation, the literature is limited and the research of the relationship between Six-Sigma implementation and its performance improvement outcomes is a rarely examined subject in the hospitality context. Accordingly, research is needed to better understand the impact that Six-Sigma has on hotels performance improvement. In addition, only a few articles were found that dealt with the relationships between the vital components or practices for the successful application of Six-Sigma and performance. Even the existent studies are not well integrated, and the research is mostly anecdotal. Most of the articles reported that top management commitment is the main factor to Six-Sigma success. However, many other practices affecting Six-Sigma's success are important and need to be better documented. Therefore, this study attempts to assess the effectiveness of Six-Sigma and examine its impacts on various performance measures of upscale hotels in Egypt, seeking for what values and benefits it brings to improve the overall performance. In order to meet the overall objective of the study, the following specific research questions are included: i. To what extent are Egyptian hotels implementing Six-Sigma? ii. What are the critical success factors for the successful implementation of Six-Sigma in Egyptian hotel industry? iii. What are the key benefits achieved by Egyptian hotels by the implementation of Six-Sigma? iv. What are the fundamental differences in performance measures between hotels implementing Six-Sigma and those adopting other quality management systems?

The remainder of this paper is structured as follows. In the first section, a review of the previous theoretical and empirical research related to Six-Sigma is reviewed so as to provide a basis for this study. Next, the methodology, including the sample selection, data collection method and analysis, is presented. This is followed by the results from the present study together with a discussion of the findings based on the literature. Finally, the main concluding remarks as well as the limitations of this study are discussed.

Literature Review: Literally, Six-Sigma is a quality improvement framework that evolved over decades. Six-Sigma was initially developed by Motorola in the 1980s as a philosophy that employs a well-structured continuous improvement methodology to improve work processes, expand employees' skills and produce high-level strategic results. At the time, Motorola Inc. targeted an aggressive goal of 3.4 defects per million opportunities in any process or product. Motorola set this goal so that process variability is ±6 S.D. from the mean. This powerful breakthrough business improvement methodology has been exploited in almost every industry and many high profile organizations such as General Electric (GE), Motorola, Honeywell, Bombardier, ABB, Sony, to name a few from the long list[22]. Six-Sigma implies three themes: statistical measurement, management strategy and quality culture[23]. Six-Sigma is a measure of how far a process is from perfection using statistical measurement of quality level. It is a new management strategy that inspires quality innovation and total customer satisfaction. It is also a quality culture. It provides the correct way to do things right at the first time and to work efficiently by using data information. It also provides an atmosphere to solve many critical-to-quality problems through team efforts. Statistical representation of Six-Sigma describes quantitatively how a process is performing[24]. Six-Sigma today has evolved from just being a measurement of quality to a comprehensive business improvement strategy for a large number of companies all over the world[25].

The primary means to achieving Six-Sigma quality level is to eliminate the causes of quality or process related problems before they are transformed into defects. The focus of Six-Sigma is not on counting the defects in processes, but the number of opportunities within a process that could result in defects[22]. Six-Sigma strategy makes use of a series of well-

defined steps. This includes definition of the problem (D), measurement (M) of the problem (i.e. defects which are responsible for the problem), data analysis (A) to discover the root causes of the problem by paying close attention to key variables (Six Sigma thinking revolves around the equation Y = f(x)(i.e. analysis of defects), improvement (I) of processes to remove the root causes of defects and controlling (C) or monitoring processes to prevent the perennial problem[26]. The chart below is a demonstration of how DMAIC strategy is adopted to a Six-Sigma project. The operation is very strict, as the project will continually have the ability to tweak implementation at the end of each stage.

The successful implementation of Six-Sigma lies in its well-defined framework involving methodology applying different tools and techniques at different stages of the methodology. Tools and techniques are practical methods, skills, means or mechanisms that can be applied to particular tasks which foster positive change and improvements. Examples of Six-Sigma business strategies, tools, techniques, and principles are summarized in table-1.

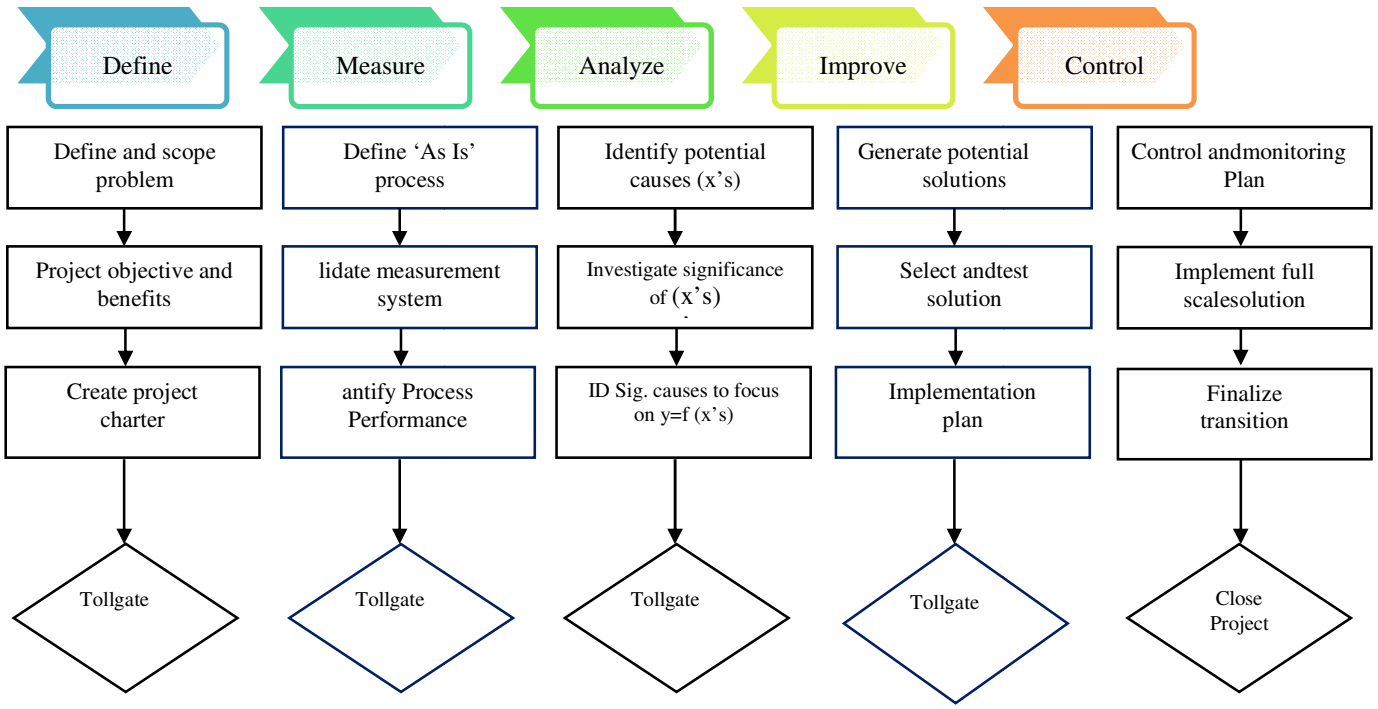

Figure-1
How DMAIC is applied to a Six-Sigma Project

Table-1
Six-Sigma Business Strategies, Principles, Tools and Techniques[28]

Six-Sigma business strategies and principles	Six-Sigma Tools and Techniques
Project Management	Statistical process control
Data-based decision making	Process capability analysis
Knowledge discovery	Measurement system analysis
Process control planning	Design of experiments
Data collection tools and techniques	Robust design
Variability reduction	Quality function deployment
Belt system (Master, Black, Green, Yellow)	Failure mode and effects analysis
DMAIC process	Regression analysis
Change management tools	Analysis of means and variances Root cause analysis and process mapping

The effective implementation of Six-Sigma is known to be dependent on several key elements or factors that can be identified as being critical to the successful implementation of Six-Sigma[15]. Undoubtedly, every organization's development of a Six-Sigma model is unique, however, there are factors common to every success story[29]. Literature has identified several key components which are considered critical for effective implementation. These include top management commitment, organization infrastructure, incorporating Six-Sigma into business's strategic plans, and organizational readiness to apply the underlying concepts of Six-Sigma[28,30,24,31]. Among the factors that were listed as key ingredients for successful implementation of Six-Sigma is education and training of workforce[32]. According to[28], a successful introduction and implementation of Six-Sigma requires adjustments to the culture of the organization and a change in employee attitudes. Other critical components or practices include continuous emphasis on data, measurement and precision. Developing and implementing a good measurement system (metrics) to ensure that process performance is continuously and accurately maintained is also reported as a key success factor for Six-Sigma[33].

Many authors have discussed the implementation of the right combination of tools (ranging from simple tools like histogram, Pareto charts, etc. to more complex ones like simulation, design of experiments and reliability analysis) as the most important key component to the successful implementation of Six-Sigma[28]. The same authors listed linking Six-Sigma to customers as critical to successful implementation of Six-Sigma. A more recent study by[34] also supported this finding. Other authors listed organizational infrastructure and resources as one of the key ingredients of Six-Sigma success[9]. An attempt to synthesize various critical factors given by practitioners was carried out, although thesefactors may vary from firm to firm, eventually it leads to the same goal i.e. effective implementation of Six-Sigma. These factors are illustrated below:

A performance measurement system should be developed prior to the Six-Sigma principle deployment. While there is a wide range of empirical research investigating the impacts of quality initiatives such as Total Quality Management (TQM) and ISO 9000 methodologies on corporate performance, there is very little research investigating the impact of Six-Sigma on corporate performance in its development[35]. Various researchers in literature have proposed ways and tools to measure business performance using sub-dimensions such as financial performance (market share, return on assets, return on investment, sales growth, asset turnover, etc.), operational performance(customer satisfaction, product quality, employee morale[36], innovation performance[37], competitiveness performance[38] and quality performance[39]. Table-2 summarizes the measurement of business performance that had been carried out by previous studies.

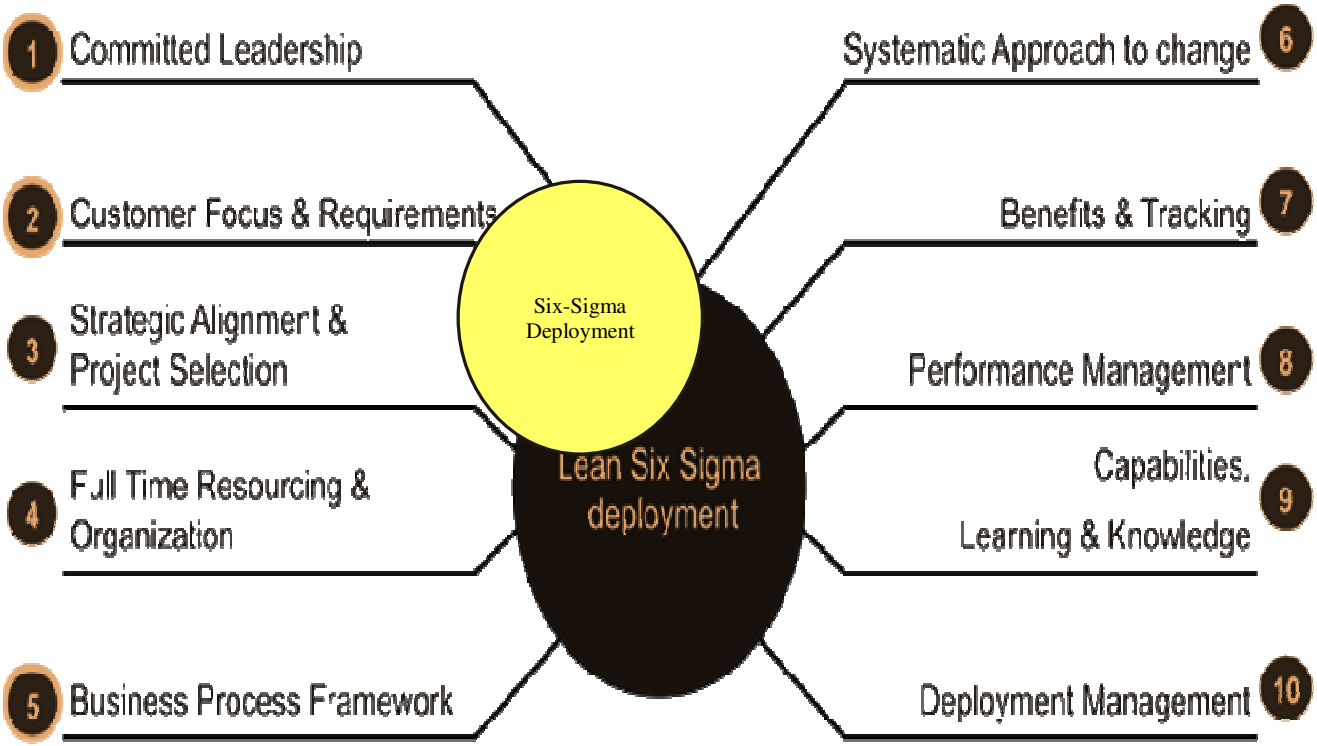

Figure-2
Six-Sigma Critical Success Factors

Table-2
Measurement of Business Performance

Performance Dimensions	Types of Measures
Financial Performance	Increase Profitability
	Cash flow (Liquidity)
	Increase operating revenues
	Reduce costs
	Return on investment (ROI)
	Increase sales and market share
Operational Performance	Customer satisfaction
	Customer relationships
	Improve strategic forecasting
	Improvement of service/product quality
	Improvement of internal process efficiency
Innovation Performance	Increase employee satisfaction
	Improve employee training
	Improve technology development
	Improve the new product/service
Competitiveness Performance	Process standardization
	Defect reduction
	A more effective service
	Competitive position
	Measures of the customer base
Quality Performance	Reliability, responsiveness
	Aesthetics/appearance
	Cleanliness/tidiness, comfort
	Friendliness, communication
	Courtesy, competence, access
	Security

Source: Adapted from (Atkinson and Brander-Brown, 2001)[40]

Some scholars and practitioners have examined the impact of Six-Sigma on financial and operational results[41]. Most of these studies reported that Six-Sigma practices have been positively related to financial and operating performance[35]. Significant main effects were found for cost savings, sales, and number of employees while significant main effects were not found for cash flow, asset turnover, return on assets (ROA), return on investment (ROI), and total assets. Other studies indicated that Six-Sigma management activities have been positively related to quality performance improvement, customer satisfaction and loyalty, and aggregate firm performance[32]. As indicated earlier Six-Sigma initiatives focus on reducing variability of the organizational processes and routines. In their pursuit for process improvement, firms improve their existing products/services to meet or exceed customers' expectation. Accordingly, at the early stage of Six-Sigma implementation, firms have the opportunity to enhance their customer base through either focusing on their existing customers or addressing the needs of new customers[42]. Six-Sigma initiatives do contribute to revitalized process management, improved quality and, finally, lead to corporate competitiveness[34].

Many articles on the impact analysis of operations performance focused on the overall bottom line impacts and did not indicate the thorough improvements in the operating areas. Little of the research stressed other important performance indicators do firms utilize to evaluate application results[43]. Accordingly,it is necessary to do a deeper and more detailed study in this area.

For the present study, multiple performance related measures have been used (namely, financial indicators, operational indicators, and competitiveness indicators) to examine the impact of Six-Sigma implementation on hotel performance. These measures represent the core ofhotel's long-term viability and they may influence the decision to adopt Six-Sigma investment, i.e. drive the decision to adopt, and may be the major targets of the adoption outcome. Consequently, the model below summarizes the theoretical basis of this study and represents base of the experimental model, which will be elaborated in the next section.

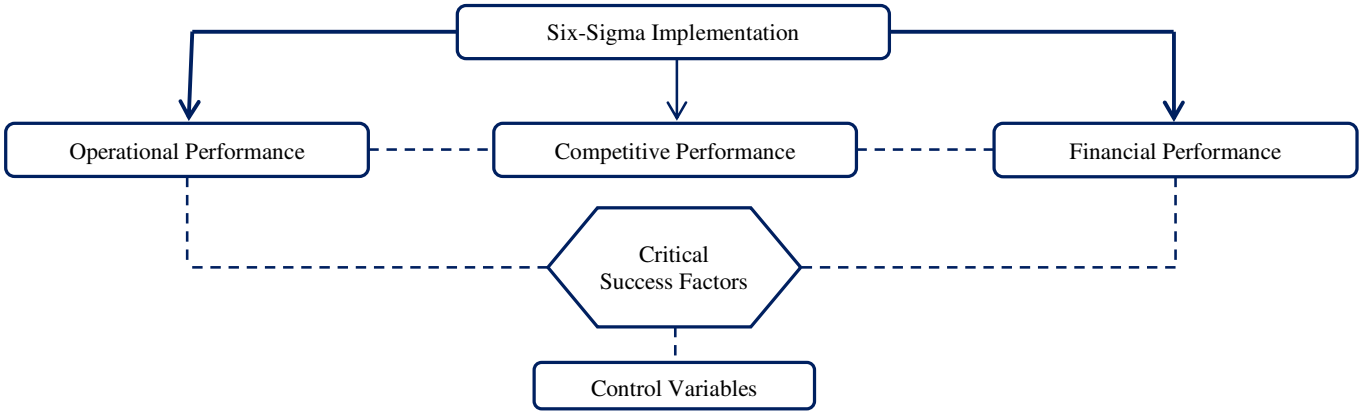

Figure-3
Research Proposed Model

Methodology

Population and Sample: As displayed in table-3, the population in this study is made up of 123upscale hotels currently carrying their business in Egypt(See table 3 for illustration).The population considered all upscale hotels listed in The Egyptian Hotel Guide for (2013)[44]. The selection of this category was due to the fact that it is the most suitable one for the study because such hotels are the most likely committed to quality initiatives since they might have more resources to afford these systems.

Table-3
Population and Sample of the Present Study

Region	No. of Mailed Questionnaires	No. of Valid Questionnaires	Response Rate
Greater Cairo	35	12	34%
Red Sea	32	9	28%
South Sinai	47	19	40%
Alexandria	9	5	55%
Total	123	45	36.5%

Data Collection Process: In May 2014, a draft survey was developed based on a comprehensive review of existing literature. It was decided to use five point Likert scales to measure the responses to each item. The survey was circulated to a panel of experts consisting of prominent academics and professionals in the field of quality management to capture their feedback as a part of a pilot survey. Their suggestions were incorporated and the wording of the questions was improved in order to make it more comprehensive and inter-item correlations were calculated separately to identify redundant items, those with a correlation coefficient smaller than 0.5 were eliminated from the survey. Thus, a total of 15 items for the Six-Sigma practices were retained in the final version of the survey. Furthermore, 13 items concerning the performance dimensions related to financial, operational, and competitiveness performance were also included in the survey. Cronbach's alpha was used to assess survey reliability. The reliability coefficient was 0.994, which is considered as acceptable reliability.

In principle, the final survey comprised three sections, each collecting a certain type of information. The first section included questions on the biographic and demographic information of the respondents. There were also some questions about the general profiles of the investigated hotels. The second section of the survey asked the respondents to identify if the hotels are implementing Six-Sigma currently or plan to use it in the next 24 months (This includes the key Six-Sigma metrics, tools and techniques in place). If so, the respondents were asked to rank the 10 key drivers needed for the successful deployment of Six-Sigma on a scale of 1-5 (where1 = least important and 5 most important. The third section of the survey asked the respondents to deliberate statements regarding the performance dimensions related to financial, operational, and competitiveness performance. The respondents were asked to indicate the impacts that Six-Sigma had on their performance on a Likert scale of 1 to 5(where 1= no benefit and 5 = excellent benefits).

Because of the research questions and size of the population, an e-mail survey appeared to be the most economical and appropriate method of data collection and unlike traditional survey methods, it is faster, cheaper, and delivers more data to pore over. In addition to the low-cost consideration, e-mail surveys give people flexibility and more time to answer questions. Therefore, a list of e-mail addresses for the target population was compiled. A reminder email was sent two weeks after the first mailings to non-respondent hotels. Initially, 47 surveys were received. However, two of the 47 surveys were not filled properly, resulting in 45 usable surveys with a response rate of 36.5%. This response rate can be considered satisfactory for this kind of survey[14].

Statistical Analysis: In the first examination of the data, descriptive statistics which include frequency distributions and cross-tabulations were computed and used to summarize data. The collected data have been classified and tabulated to be thoroughly analyzed using Statistical Package for Social Science (SPSS 18). The mean and standard deviation have been calculated to classify the sets and determine how homogenous or discrepant (inconsistent) the sample is, regarding all research variables. A bivariate correlation analysis was performed for the purpose of determining the empirical relationship between Six-Sigma practices with each other and with the measures of hotel performances. Moreover, a multiple linear regression analysis was used to figure out the relationship between Six-Sigma practices and hotel performance.

Results and Discussion

Sample Demographics: The first section of the survey asked the respondents to identify their biographical information. Of the respondents, 33 percent were quality managers. The other positions of the respondents were operation managers (29percent), assistant general managers (22percent), and other middle level managers (16percent). Most of the respondents (91percent) were male; and more than 50 percent (51 percent) of the respondents were aged between 31-40, followed by the age groups of 41-50 and 21-30which accounted for 38 percent and 11 percent respectively. Respondents were fairly well educated. All respondents held university degrees and more than half of the respondents (66percent) had received a formal education and training in hotel management. This indicates that the academic qualifications of respondents were relevant to their jobs. All the surveyed respondents had many years of work experience, with 53percent having worked in the hotel industry for at least ten years. There were also six questions about the general profiles of the surveyed hotels including type of hotel (local, joint venture, or part of multi-national chain), operation years,

average occupancy rate for the last year, the hotel capitalization, the hotel annual gross revenue, and the number of employees. These variables may also be termed as control variables, used in the later part of analysis to moderate the impact of Six-Sigma within the sample. Table-4 illustrates a descriptive summary of the general profiles of the surveyed hotels.

It can be gauged from the table that the surveyed hotels are generally large in scale, with more than 100 rooms in each property. As shown in table (4), more than half of the surveyed hotels were affiliated to hotel chains (62.2 percent), while 35.6 percent were joint-venture hotels. More than three-quarters (i.e. 77.8 percent) of the surveyed hotels have a capital more than 80 million L.E. The labor power of 38 hotels (84.4 percent of the sample) is within the range of 851-1200 employees, while 6.7 percent of them are within the range of 501-850 employees. Only four hotels (8.9 percent of the sample) employ more than 1200 employees. Hotels that employ less than 500 employees were not found. All the respondent hotels reap more than 30 million L.E as annual revenue. All the surveyed hotels are applying one or more formal quality management systems including TQM and ISO 9001. However, only 31 percent of these hotels were actively involved in a documented Six-Sigma project. Four hotels are planning to implement Six-Sigma in the near future. Although the roots of Six-Sigma as a quality strategy can be traced back to the beginning of the 1990s of the last century, the majority of Egyptian hotels implemented Six-Sigma in the last three years. A notable proportion (85.7 percent) of these hotels have less than three years experience with the Six-Sigma approach, 14.4 percent of these hotels has been involved with the Six-Sigma project for three to less than five years. The respondents were asked to identify the main reasons which prompted them to be involved in Six-Sigma projects. The results are illustrated in the Figure below.

It is obvious from the results that those hotels implementing Six-Sigma are aware of the fact that Six-Sigma is one of the most effective strategies to enhance product/service quality, improve internal processes and develop overall operational excellence. Moreover, the hotels which responded to the survey and were not engaged in implementing Six-Sigma were asked for reasons behind not implementing this initiative. As depicted in figure-5, the majority of the hotels were discouraged to implement Six-Sigma because they have quality systems in place and they perceive such systems to be adequate (57 percent). This was followed by other reasons such as lack of knowledge of the system, not sure if relevant, and no perceived benefits.

The survey also asked the respondents to identify the areas/ processes where in which Six-Sigma implementation took place. The results have made clear that hotels extensively applied Six-Sigma initiatives in all functional areas (the whole hotel) as shown in figure-6.

Table-4
General Profiles of the Surveyed Hotels

Attribute	**N= 45**	**%**	**Attribute**	**N= 45**	**%**
Type of hotel:			Average Occ. Rate for Last Year:		
Local	1	2.2	Less than 50%	3	6.7
Joint-venture	16	35.6	From 50% to less than 65%	35	77.7
Multi-national chain	28	62.2	More than 65%	7	15.6
Operation Years:			Hotel Annual Revenue:		
< 5 years	2	4.5	From 20- less than 30 million L.E	0	0.00
5- less than10 years	14	31.1	From 30- less than 40 million L.E	28	62.2
10- less than 15 years	23	51.1	From 40 to less than 50 million L.E	13	28.9
15 years and more	6	13.3	More than 50 million L.E	4	8.9
Hotel Capitalization:			Number of Employees:		
Less than 50 million L.E	0	0.00	less than 500 employees	0	0.0
From 50-less than 80 million L.E	10	22.2	501-850 employees	3	6.7
From 80- less than 100 million L.E	21	46.7	851-1200 employees	38	84.4
More than 100 million L.E	14	31.1	More than 1200 employees	4	8.9
Implementing Six-Sigma Techniques:			Duration of Implementation:		
Yes	14	31.1	< 1	0	0.00
No	31	68.9	1-less than 3 years	12	85.7
			3-less than 5 years	2	14.3
			> 5 years	0	0.00

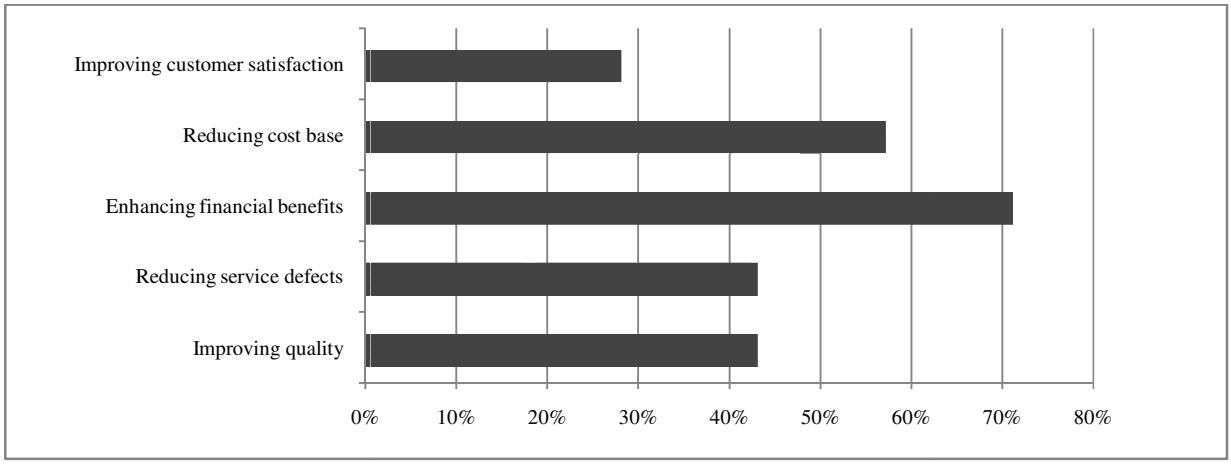

Figure-4
Reasons for Implementing Six-Sigma

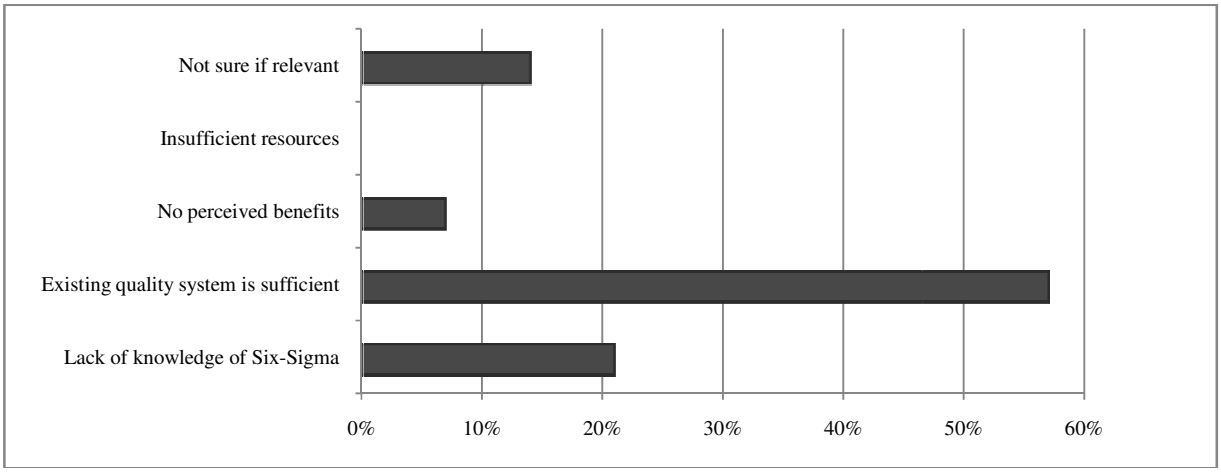

Figure-5
Reasons for not Implementing Six-Sigma by the Respondents

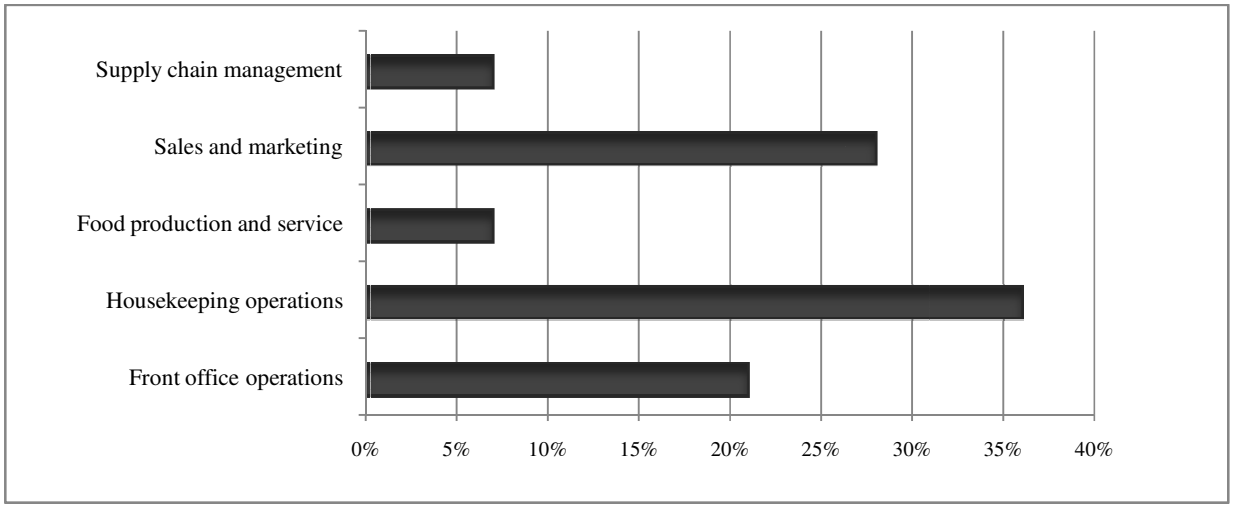

Figure-6
The Areas/ Processes Where Six-Sigma Took Place

Table-5 presents the key metrics commonly used by the hotels employing Six-Sigma. A metric is a specification or attribute against which the outputs of a process are compared. The results of the study revealed that the most commonly used Six-Sigma metrics is the number of customers' complaints. This metric is followed by defect rate and process capability. The least commonly used metrics were process yield and throughput yield. In fact, these two metrics (process yield and throughput yield) are of the fundamental metrics of Six-Sigma.

Table-5
The Key Used Six-Sigma Metrics

Six-Sigma Metrics	Mean	Std. Deviation
Number of customers' complains	3.64	1.524
Time to respond to customers' complaints	2.06	1.562
Defect rate	3.26	1.515
Process yield	1.09	.540
Process capability	3.23	1.577
Process cycle efficiency	2.09	1.319
Throughput yield	1.15	0.533

The respondents were asked to rank the 10 critical factors needed for the successful deployment of Six-Sigma on a scale of 1-5 (where1 = least important and 5 most important. Table-6 shows the results of the analysis showing the mean scores and standard deviation of each essential ingredient which are required for the successful deployment of Six-Sigma.

Table-6
Critical Success Factors for Six-Sigma Implementation

Ranking	Critical Success Factors	Mean	Std. Deviation
1	Project section and strategic alignment	3.87	0.834
2	Customer focus and requirements	4.64	1.151
3	Committed leadership	3.46	1.263
4	Capabilities, learning and knowledge	3.00	1.265
5	Full time resourcing and organization	3.59	1.121
6	Performance management	3.55	0.943
7	Business process framework	2.75	1.422
8	Benefits and tracking	4.08	0.641
9	Management of cultural change	4.30	0.733
10	Deployment management	3.67	1.528

Table-6 shows that project selection and linking Six-Sigma to business strategy is considered the most important factor to make the initiative successful. Ensuring that customer requirements are effectively managed and met by Six-Sigma project is another critical success factor identified by the respondents. The results also highlighted two critical success factors which are committed leadership, and capabilities, learning and knowledge. These findings are quite similar to the findings from other previous studies carried out in service organizations.

This section verifies the potential relationship between Six-Sigma implementation and the different performance variables measured. The respondents were asked to rate the impacts that Six-Sigma had on their performance on a Likert scale of 1 to 5(where 1= no benefit and 5 = excellent benefits). Table-7summarizes the key impacts gained from Six-Sigma implementation.

Performance measures of hotels that not implementing Six-Sigma were also recorded with respect to the variables mentioned in table-7. In the light of this comparison, it is clear that Six-Sigma hotels obtained significantly higher mean performance levels than Non-Six-Sigma hotels in all dimensions. These scores give an indication that hotels implementing Six-Sigma have achieved more benefits as compared to other hotels implementing other quality management programs (i.e. TQM and ISO 9001).Therefore, it seems advisable for these hotels to be actively involved in a formal Six-Sigma project in order to improve their overall performance. The areas that have experienced the greatest benefits are gaining sustainable competitive advantage, better service/product quality, reduction of operational and quality costs, and reduction of customers' complains. Six-Sigma projects, however, seem to have asymptotic implications on return on assets, return on investment, and market share when compared to other quality programs being applied by other hotels.

A multiple linear regression analysis was used to find out the relationship between the implementation of Six Sigma and hotel performance (Figure-7). The multiple linear regression analysis was applied based on the summated scales of the independent and dependent variables[45]. The first regression analysis examined the impact of the implementation of Six-Sigma (as the independent variable) on the operational performance of the hotels (the dependent variable). The second regression analysis examined the impact of the implementation of Six-Sigma and operational performance (independent variables) on the competitive performance of the hotels (dependent variable). Finally, the third regression analysis examined the impact of the implementation of Six-Sigma as well as operational performance and competitive performance (independent variables) on the financial performance of the hotels (dependent variable).

Table-7
A Comparison between the Performance Measures of the Surveyed Hotels

Performance Measures	Six-Sigma Hotels		Non-Six-Sigma Hotels	
	Mean	Std. Dev.	Mean	Std. Dev.
Operational Performance Indicators:				
Reduction of customers 'complains	3.54	0.733	2.78	0.940
Increase in customers retention rate	3.11	0.951	2.85	0.983
Reduction of staff turnover rate	3.27	1.258	2.36	1.098
Better product/service quality	3.78	0.847	3.00	1.350
Reduction in service delivery time	3.52	1.069	2.33	1.092
Competitive Performance Indicators:				
Reduction in operations/processes variability	3.38	0.594	2.35	0.683
Reduction in service defect rate	3.34	0.976	2.88	0.897
Sustainable competitive advantage	3.79	0.651	3.04	1.098
Financial Performance Indicators:				
Increase in profitability	3.53	1.131	3.04	0.864
Reduction of operational and quality costs	3.61	1.422	3.07	0.865
Improvement in sales and market share	3.33	1.512	3.00	0.743
Improvement in return on assets rate	2.21	0.609	2.14	0.876
Improvement in return on investment rate	2.08	1.038	2.03	0.568

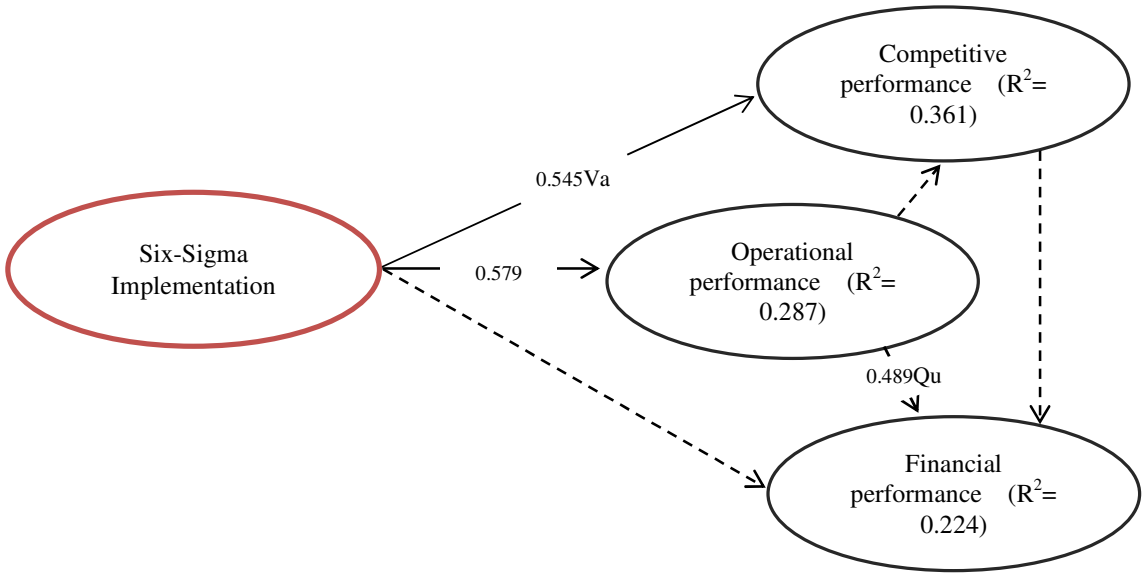

Figure-7
The Relationships between Six-Sigma Implementation and Hotel Performance

The findings presented in figure-7 show that the first regression analysis which examined the impact of the implementation of Six-Sigma (as the independent variable) on the operational performance of the hotels (the dependent variable) is statistically significant (p-value= 0.00 and R^2=0.287). The results show that operational performance is directly influenced by the implementation of Six-Sigma (β =0.579).The results also showed that second regression analysis which examined the impact of the implementation of Six-Sigma and operational performance (independent variables) on the competitive performance of the hotels (dependent variable) is statistically significant (p-value=0.00 and R^2= 0.361). The results show that competitive performance is directly influenced only by the implementation of Six-Sigma (β =0.545). By contrast, operational performance does not directly affect competitiveness performance, but indirectly through its significant correlation with the implementation of Six-Sigma. Finally, the results show that the third regression analysis which examined the impact of the implementation of Six-Sigma as well as operational performance and competitive performance (independent variables) on the financial performance of the hotels (dependent variable) is statistically significant (p-value=0.00 and R^2=0.224). The results show that the dependent variable financial performance is directly affected only by

operational performance (β =0.489). By contrast, the implementation of Six-Sigma and competitive performance does not affect financial performance directly, but do so indirectly through their significant correlation with operational performance.

In order to complement these results, the study also determined whether there is a significant difference among some demographic characteristics (control variables) on the implementation of Six-Sigma in upscale hotels in Egypt. The non-parametric tests (Wilcoxon Mann-Whitney and Kruskal-Wallis one-way analysis of variance) were used. Results are given in table-8.

Table-8
Relationship between the Research Control Variables and the Implementation of Six-Sigma

Control Variable	Statistical Test Used	*P Value*	Conclusion
Type of hotel	Wilcoxon Mann-Whitney	0.02	The implementation level is high with chain hotels when compared to the other types.
Operation years	Kruskal-Wallis	0.01	The implementation level is high with hotels running more than ten years.
Hotel capitalization	Wilcoxon Mann-Whitney	0.835	There is no significant difference between hotel capitalization and the implementation of Six-Sigma.
Average occ. rate	Wilcoxon Mann-Whitney	0.76	There is no significant difference between hotel occupancy rate and the implementation of Six-Sigma.
Hotel annual revenue	Kruskal-Wallis	0.26	There is no significant difference between hotel annual revenue and the implementation of Six-Sigma.
Number of employees	Kruskal-Wallis	0.210	There is no significant difference between number of hotel employees and the implementation of Six-Sigma.

As shown in table-8, hotel type exerts a statistically significant and positive effect on the decision to adopt Six-Sigma. It is supported with a path coefficient of *p*-value = 0.02. As expected, the implementation level is high with hotels running more than ten years. The path coefficient is *p*-value = 0.01.

Discussion: Several notable findings may be drawn from the results of this study which are related to various investigated issues. Not surprisingly, the vast majority of the investigated hotels in this study are large in scale in terms of number of available guestrooms, hotel capitalization, employment size, and annual revenue earned. Some scholars argued that the implementation of Six-Sigma is positively linked to firm size[14], since large companies have not only the required resource base, but also the skillful manpower and the competent management that able to advocate the new processes. Moreover, larger hotels are associated with larger market shares. Thus, for larger hotels the chance that adoption of Six-Sigma is extremely demanded is higher.

All the surveyed hotels have implemented a formal quality management system. However, only 31 percent of these hotels were actively involved in a documented Six-Sigma project. A notable proportion of these hotels has less than three years experience with the Six-Sigma approach. This clearly illustrates the point that Six-Sigma is a relatively new approach within the Egyptian hotel industry. These findings are quite similar to the findings from other previous studies that stated that it takes at least three years to be able to classify a firm as an experienced Six-Sigma firm[46].

Introducing Six-Sigma, as a powerful tool for performance improvement, in the Egyptian hotel industry involves several barriers that need to be addressed. These barriers include resistance to change and the desire to maintain the quality systems currently in place, lack of knowledge of the system, lack of adequate information about system relevance and lack of clarity about the expected benefits. Resistance to change was cited as a major impediment to the implementation of Six-Sigma in the hotel industry in Egypt. Resistance to change is a natural reaction that is usually created because of the vague points about the technical aspects of Six-Sigma. For these reasons, Six-Sigma implementation is not widely spread in Egyptian hotel industry. In the same context, some scholars have identified three key factors that cause resistance to adopt Six-Sigma, which are technical, individual, and organizational factors[47]. Accordingly, effective training and involvement programs should be designed in order to enhance and increase awareness about Six-Sigma among Egyptian hotels. Integrating the Six-Sigma culture into entire organizations by the commitment and involvement of top management can multiply the positive effects and make a significant impact at all levels.

The results have made clear that hotels extensively applied Six-Sigma initiatives in their entire operations. A number of hotels have applied Six-Sigma to the housekeeping processes in order to reduce the cost and time needed to clean the rooms and to improve employees' productivity ratios. This is in accordance with the results of Beiser study who reported that Six-Sigma

implementation in housekeeping departments could eliminate waste and increase efficiency[48]. Therefore, housekeeping seems to be an ideal department for Six-Sigma due to the need to manage a stock of cleaning supplies. The process of cleaning a hotel room is one that could be easily analyzed by way of value stream mapping. Other prominent areas where Six-Sigma was applied were sales and marketing and front office operations. These results clearly state that that Six-Sigma methodology is flexible enough to be applied throughout all hotel departments. In recent years, several hotels have considered using Six-Sigma to provide a better product or service, in a faster manner and with a lower cost than competitors. For example, Rylander and Provost suggested that hotels could integrate Six-Sigma methodology into sales and marketing processes for better customer service[49].

The results highlighted a number of critical success factors that largely affect the implementation of Six-Sigma. Project selection and linking Six-Sigma to business strategy is considered the most important factor to make the initiative successful. Many studies have shown that linking Six-Sigma to business strategy is one of the key success factors[8]. This is important, as there has to be alignment between the Six-Sigma projects and hotel strategic objectives and issues. This starts with top management identifying the top business issues the hotel faces relative to the competitive pressures. This would be aligned with the definition of Six-Sigma as an organized and systematic method for strategic improvement[2]. Ensuring that customer requirements are effectively managed and met by Six-Sigma project is another critical success factor identified by the respondents. This seems obvious since the principal components of the Six-Sigma, as a quality improvement framework, include a close understanding of customers' present and future needs[1, 6]. Accordingly, Six-Sigma will help hotels to achieve continuous quality improvements.

The results also highlighted two critical success factors which are committed leadership, and capabilities, learning and knowledge. Almost all the literature reviewed agreed that senior management involvement and support is a predictor of successful Six-Sigma implementation[28,30,24,31]. Only senior management, it is argued, can establish quality as top priority, restructure and influence the business culture for quality, and mobilize the financial and human resources necessary to support organizational learning[50]. Another important factor for the successful implementation of Six-Sigma is the development of a proper training program to make sure that managers and employees use and apply the Six-Sigma techniques effectively. In order to make Six-Sigma work, a proper training program should be developed to overcome fears of using rigorous statistical and quality tools[51]. These findings are quite similar to the findings from other previous studies carried out in service organizations[9, 34].

The results of the study indicated that deployment of Six-Sigma positively influence organizational performance. The benefits of adopting Six-Sigma were observed in hotels implementing Six-Sigma as compared to other hotels implementing other quality management initiatives (i.e., TQM and ISO 9001). The results of the study provide evidence that hotels that adopt Six-Sigma are strong performers. The clearest evidence of this was observed in the hotel operational performance where the sample Six-Sigma hotels outperformed their respective hotels on all performance measures. The results also showed that competitive performance is directly influenced only by the implementation of Six-Sigma. By contrast, operational performance does not directly affect competitiveness performance, but indirectly through its significant correlation with the implementation of Six-Sigma. Finally, the results showed that financial performance is directly affected only by operational performance. By contrast, the implementation of Six-Sigma and competitive performance does not affect financial performance directly, but do so indirectly through their significant correlation with operational performance. Thus, the results of this study concluded that there are statistically significant differences in the business performance levels of Six-Sigma implementers compared to other hotels which implementing other quality initiatives. These findings are in line with other studies which indicated a significant relationship between the introduction of Six-Sigma with both long-term and short-term business performances[35, 36, 38, 39]. On the other hand, many of the earlier studies stated that TQM is less visible in many service organizations than Six-Sigma[52, 53.54]. The successful implementation of Six-Sigma does indeed result in better business performance, as firms expect. The benefits come in the areas of cost reduction, increased market share, increased profit, and enhanced business competitiveness. In more detail, Yang (2010) stated that, only about one-fifth, or at best one-third, of the TQM programs have achieved significant or even tangible improvements in quality, productivity, competitiveness or financial results[55]. The areas that have experienced the greatest benefits are gaining sustainable competitive advantage, better service/product quality, reduction of operational and quality costs, and reduction of customers' complains. Six-Sigma projects, however, seem to have asymptotic implications on return on assets, return on investment, and market share when compared to other quality programs being applied by other hotels. Therefore, it seems advisable for these hotels to be actively involved in a formal Six-Sigma project in order to improve their overall performance.

Conclusions

Six-Sigma is a systematic quality approach, use of which leads to increase in profitability through improvement in all operations. Currently, Six-Sigma replaced TQM to become the focal of quality management and business excellence for nearly a quarter of a century. This study presents the results of a Six-Sigma survey carried out in the Egyptian hotel industry to explore the impacts of implementing Six-Sigma approach on upscale hotels in Egypt, seeking for what values and benefits it brings to improve the overall performance. To achieve this

objective, an e-mail survey was designed and mailed to 123 upscale hotels in Egypt. For future research, studies with a longitudinal nature should be considered to investigate the hotels before and after Six-Sigma implementation. Moreover, research on Six-Sigma implementation in other hotel categories will be of great benefits to Egyptian hotel industry as well as the Six-Sigma body of knowledge.

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