



## The Effect of Six Sigma on Organizational Performance: The Mediating Role of Innovation Culture

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Mohammed Saleh Alosani<sup>1,\*</sup>, Rushami Zien Yusoff<sup>2</sup>, Ali Musaed Alansi<sup>2</sup>

<sup>1</sup> Othman Yeop Abdullah Graduate School of Business, Universiti Utara Malaysia, 06010 UUM Sintok, Kedah, Malaysia

<sup>2</sup> School of Business Management, College of Business, Universiti Utara Malaysia, 06010 UUM Sintok, Kedah, Malaysia

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### ABSTRACT

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Improving organizational performance is the main objective of any organization. Six Sigma is one of the most important approaches to improve performance and sustain competitive advantage. This article reviewed the literature related to organizational performance and explains the potential impact of Six Sigma and innovation culture on organizational performance. Given that previous studies have reported inconclusive results, this paper tries to establish a mechanism to explain the role of Six Sigma in improving organizational performance. Therefore, based on the theoretical foundation and comprehensive review of previous literature, a research framework is proposed. This proposed framework is grounded in the implementation of Six Sigma projects; it also establishes that innovation culture can help organizations to achieve success in a turbulent business environment.

#### Keywords:

Six Sigma, innovation culture,  
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## 1. Introduction

In a turbulent and competitive business environment, organizations are confronted with many challenges as a result of pressure of competitors and increasing customer needs [1,2]. Thus, to keep up with this competitive dynamics, organizations have to adopt and employ continuous improvement practices that can improve organizational performance and sustain competitive advantage.

Continuous improvement practices are organized efforts that aim to apply new approaches to doing work in order to achieve desired improvements [3]. It is a dynamic and collective activity that organizations can use to modify work in pursuit of greater effectiveness [4]. Bhuiyan and Baghel [5] define continuous improvement as a culture of sustained improvements at all levels in an organization. They point out that Six Sigma, Kaizen and Lean Six Sigma are the most popular continuous improvement tools used by many organizations.

Six Sigma is one of the most effective methodologies for improving organizational performance. It has gained significant attention as a framework for continuous improvement. It facilitates

\* Corresponding author.

E-mail address: [alosani@gmail.com](mailto:alosani@gmail.com) (Mohammed Saleh Alosani)

identifying customers' requirements, and then, looking at the process capability. Additionally, Six Sigma drives corporate culture change and a shift toward achieving superior quality, which in turn, lead to a passion to enhance a culture of continuous improvement [6].

Enhancing appropriate culture in an organization is essential in order to allow individuals to generate new ideas which can contribute to improving processes, services and products [7]. According to Xerri and Brunetto [8], organizations can nurture an innovation culture through socialization of the workplace, which will reflect positively on the organization through the accomplishment of a good environmental response, besides enhancing competitive advantage and capabilities required to boost organizational performance [9].

## **2. Literature Review**

Six Sigma can help organizations to improve and sustain competitive advantage. It is considered as a comprehensive, focused and flexible system that assists organizations to maximize business success [10] and is a powerful approach to accomplish business process improvements in all organizations [11]. Six Sigma relies on establishing a supportive culture. Therefore, building an appropriate culture is essential for the successful implementation of Six Sigma initiatives, which in turn, will be reflected in improved organizational performance and the attainment of competitive advantage [9].

### **a. Organizational Performance**

Organizational performance is the key factor for successful businesses [12]. The performance of any organization depends largely on the employed techniques and tools, which should be flexible enough to accommodate change and achieve organizational goals.

According to Richard, Devinney, Yip and Johnson [13], organizational performance is considered as one of the most extensive and dependent variables used in organizational research; however, it also remains as one of the most obscure and loosely outlined constructs. Barney [14] pointed out that for enhanced organizational performance, efforts and assets must be coordinated to accomplish an organization's goals, and so long as those assets achieve value, the organization will continue to exist.

Management scholars have focused on organizational performance and identified it as a dependent variable [15]. Scholars who have analysed organizational performance definitions and used them in management research [16,17] have concluded that the meaning of performance can be different depending on the scholar's field of study, thus ranging from broader definitions to rather narrow definitions [18]. The narrower concept of organizational performance which focuses on financial performance or operational performance, has often been adopted by strategic management scholars [16,17], while the broader concept which emphasizes on organizational effectiveness has often been adopted by organizational scholars. However, there is a shortage of conceptualization to define the construct of performance [15]. Cameron [19] defines organizational performance as "a subjective construct anchored in values and preferences of the stakeholders". Gavrea, Ilies, and Stegerea [20] indicate that organizational performance means enhancing and raising the performance of the organization by focusing on continuous improvement. According to Aubry and Hobbs [21], this definition provides considerable possibility for adaptation to various organizational situations and the potential for recognizing several performance evaluation approaches that may exist simultaneously. This is also in tandem with the constructivist view that acknowledges the existence of various competing logic [21].

## **b. Six Sigma**

The origin of Six Sigma can be traced to Motorola Corporation in the 1980s. Since then, this approach has grown in popularity and many organizations have adopted it to achieve success [22].

Six Sigma is one of the powerful approaches to accomplish improvements in business processes in all organizations. According to Van Seaton [23], Six Sigma is a rigorous system of principles-based continuous improvement techniques, methods and statistical tools. Pande, Neuman and Cavanagh [24] claim that Six Sigma was developed to overcome disadvantages of total quality management. Similarly, Stamatis [25] indicates that Six Sigma is another approach to total quality management, which provides new and distinct practices and concepts in quality management [26]. It provides a unique organizational structure by sharing new techniques and tools with traditional quality management methods, which contribute to the reduction of variation in organizational processes [27].

## **c. Innovation Culture**

Innovation is a new paradigm for traditional management, strategy and practices [28]. This is because innovation enhances and encourages the adoption of new ideas or behavior in the organization [29], and can only be done when an organization applies this process in its business practices [30]. It will not therefore be easy to adopt and practice innovation without having an appropriate culture that can motivate the employees to innovate. As such, innovation culture is a key factor that an organization needs in its daily business activities [31].

According to Barney [32], culture has a powerful impact on the organization and its competitiveness. It is one of the most important elements that impacts on an organization's success. According to Kuratko and Welsch [33], organizational culture has a substantial role in the organization by shaping values, beliefs and commitment of employees to confront rivals and achieve the set objectives.

With regards to innovation culture, Gandotra [34] describes it as a daily practice of innovation activities. Streets and Boundary [35] describe it as a culture that can create new ideas, values and support. It is the ability to identify and develop new services and products and deliver them to the market.

According to Lin and Liu [36], innovation culture can be a supportive and an effective factor of organizational culture that positively impacts on creativity and innovation. Scott and Bruce [37] find that financial support and availability of time can be substantial resource elements that impact on innovation behavior. Furthermore, encouraging innovation behavior of the organization's members can lead to the development of ideas, which is a main driver for performance improvement [38].

## **d. Six Sigma and Organizational Performance**

The Six Sigma approach has emerged as a structured and systematic methodology to gain continuous improvement and is a never-ending journey [39]. It can be considered as a management system that assists organizations to achieve business excellence [40-42], improve organizational performance [43-45] and enhance financial performance [46,47].

Harry [48] asserts that Six Sigma can assist organizations to eliminate defects from products, transactions and processes [49], which can assist to enhance quality of products and services, impact positively on profitability, improve customer satisfaction, increase market share [50], improve effectiveness and efficiency of the organization [51] and enhance competitive advantage [50].

There are several evidences that implementation of Six Sigma has had a positive and significant impact on performance [52-55]. It has a role in handling customer complaints [56], improving performance [57], cost saving [24], increasing return on investments (Dorgan & Dowdy, 2004; 47), enhancing innovation [57] and reinforcing team goals [39].

Accordingly, Berdebes [58] highlights the organizations that use Six Sigma. He claims that these organizations spend less than five percent of their profit to resolve problems, decrease cost of poor quality and increase profits. Further, Chen, Chen and Hsia [59] indicate that the profit of General Electric increased by \$750 million in 1998 after implementing Six Sigma practices. Similarly, stock price of Motorola increased 21 percent in 2000 as a result of Six Sigma implementation [59]. Besides, Samsung could increase its sales within 24 months by nine percent and triple the profit to \$530 million [60]. On the other hand, some have argued that there is no significant impact on organizational performance [61,62], and the efficacy of Six-Sigma is questionable [63,64]. For instance, studies have shown that improvements attributed to Six Sigma could be due to a learning culture and some social factors [65], application of cooperative values [66] and shared vision [62], rather than a direct result of Six Sigma.

From the above studies regarding the relationship between Six Sigma and organizational performance, it can be clearly noticed that there is inconsistency in the results. Based on the above arguments and other supporting ones, the following hypothesis is proposed:

*Hypothesis 1: Six Sigma has a significant effect on organizational performance.*

#### **e. Six Sigma and Innovation Culture**

Six Sigma provides the tools to foster innovation in an organized way [67], which in turn, contributes to enhanced organizational performance [68,69]. Many authors have argued that successful implementation of Six Sigma relies hugely on establishing an appropriate culture [70-72].

Byrne, Lubowe and Blitz [73] analyzed the performance of innovation of many organizations that have adopted Six Sigma; they find that the most successful organizations are those that have intentionally included the principles of Six Sigma into their innovation program, employed it to enable breakthrough innovations and change the culture towards one that supports continual innovation. As such, innovation can be employed as a basis for investigating concepts that relate to Six Sigma [67]. In addition, Zu *et al.*, [26] examined the impact of different types of culture on implementation of Six Sigma and total quality management by using survey data collected from 226 US manufacturing plants and found the differential impact of culture on Six Sigma and TQM implementation. They suggest that implementation of Six Sigma and TQM must firstly take into account the cultural values emphasized in the organization, where these values have an impact on the implementation of such practices. These results are supported by Knapp [74] who reports that culture has an important role in Six Sigma implementation, where group culture has the effect of initiating a successful quality initiative which focuses on cohesion and flexibility. Davison and Al-Shaghana [75] investigated the factors that impact on quality culture development in 15 different types of organizations. The study concludes that Six Sigma organizations score higher levels on the tested factors compared to other organizations in the development of a quality culture.

On the other hand, Zu *et al.*, [26] point out there is a lack of studies that have investigated the influence of culture on Six Sigma [26], in spite of the significance of culture being recognized for the proper implementation of Six Sigma [76]. In addition, Johnstone, Pairedeau & Pettersson [77] indicate that Six Sigma may restrict the freedom desired for creating innovative ideas. This perspective is supported by Hindo [78] who claims that the implementation of Six Sigma

methodology at the 3M company has had a negative effect on innovation. The reason could be the inherently contradictory ambitions between innovation and improved process performance [77]. Additionally, Canato, Ravasi and Phillips [79] analyzed this case and indicated that the implementation of Six Sigma in 3M has contributed to the achievement of considerable success; however, people have begun to question Six Sigma as a new practice for 3M which has led to a negative impact on innovation. Similarly, structured improvement procedure of Six Sigma has been found to be negatively related to innovation, thus contributing to the Six Sigma-Innovation paradox [80] and severely limiting innovation [81].

To sum up, although successful implementation of Six Sigma is widely relied upon for establishing an appropriate organizational culture [70-72], there is wide acceptance that it contributes to the achievement of competitive advantage [82], and there are many success stories of Six Sigma enhancing organizational performance [83-86], there is a dearth of empirical studies in academic journals [27], especially in proving the impact of Six Sigma as an innovation approach. Studies that have investigated the influence of organizational culture on Six Sigma [26] are also lacking. Therefore, further research is still required to explore the correlation between Six Sigma and innovation as an approach for improving organizational performance and attaining competitive advantage [82]. Further, Schroeder *et al.*, [27] advocate the study of internal fit in the implementation of Six Sigma, exploring the kinds of organizations that can successfully employ Six Sigma and identifying required changes in culture and structure. Based on the above arguments and other supporting ones, the following hypothesis is proposed:

*Hypothesis 2: Six Sigma has a significant effect on Innovation culture.*

#### **f. Innovation Culture and Organizational Performance**

Innovation is one of fundamental factors that impacts on performance [87]. There is a wealth of evidence in the academic literature indicating a positive relationship between innovation and organizational performance [69,88-91]. On the other hand, some researchers have indicated that the relationship is not significant [92-94], while some other studies have found a negative link [95,96], and in some cases, no relationship between them [97,98].

As a part of organizational culture, an innovation culture can be encouraged through socialization of the workplace [8], and innovation capability of the organization assist to enhance environment response and gain a competitive advantage [9]. Barney [32] asserts that culture is one of the sources of sustained competitive advantage. He further explains that innovation culture can generate positive economic consequences and must be inimitable and rare.

Some studies have reported that innovation culture has a significant impact on innovation performance [99-101]. For example, Hurley [100] reports that the characteristics of innovation culture, such as participation, professional development, cooperation and support and power-sharing, have a substantial effect on the innovation rate of an organization. Similarly, Claver *et al.*, [99] indicate that innovation culture is the basis of innovation performance and technological innovation behavior, and has considerable effect on the organization's processes [102]. It facilitates the gaining and sustaining of competitive advantage by enhancing the focus on innovation and reinforcing receptiveness to new ideas [103,104]. Further, a powerful innovative culture contributes to building a successful brand and improving organizational performance [101], through product-program innovation [105]. Many other studies have reported that innovation culture has a positive and significant impact on organizational performance [106-108]. However, only a few studies have empirically investigated innovation culture and its impact on performance [106]. In addition, several

studies have shown different results [38], in that innovation culture does not directly enhance organizational performance of the company [109]. Based on the above arguments and other supporting ones, the following hypothesis is proposed:

*Hypothesis 3: Innovation culture has a significant effect on organizational performance.*

**g. The Rationality of the Expected Mediating Effect of Innovation Culture on the Six Sigma and Organizational Performance Relationship**

Innovation is a new paradigm for traditional management, strategy and practices [28]. This is because innovation enhances and encourages the adoption of new ideas or behavior which is considered as new practices in the organization [29], and can only be performed when an organization applies this process in its business practices [30]. However, it is not easy to adopt and practice innovation without having an appropriate culture that encourages the organization to innovate. As such, innovation culture is a key factor that organizations need for their daily business activities [31].

According to Pande, Neuman and Cavanagh [110], continuous improvement tools rely on innovation to search for new ideas for ongoing operations. Therefore, creating a culture for the organization and integrating it with innovation activities can contribute to improved performance and profitability [111], which in turn, can help organizations toward more stable and continuous improvements and doing things better [112]. These innovative organizations tend to encourage their leaders to conduct new improvement initiatives and provide the needed responsibilities and resources to carry out the initiatives [113], which reflect positively on knowledge and skills of both leaders and employees to meet the changing needs and requirements of customers [114]. Accordingly, successful implementation of Six Sigma depends hugely on establishing an appropriate organizational culture [115-118]. Bessant *et al.*, [116] clarify that continuous improvement practices do not always achieve appropriate success and are particularly difficult to sustain in the long-term. Therefore, they assert that creating a culture within the organization will help to produce innovation and sustained improvement. Similarly, Fryer, Antony and Douglas [119] state that successful implementation of continuous improvement projects are influenced by many factors, such as organization background, structure and culture. Thus, it is important to create and sustain a culture for the success of continuous improvement initiatives [115,118], including encouraging employees to generate ideas and suggest regular changes [120]. For this, it is necessary to design continuous improvement infrastructure and culture that can eliminate any obstacles and fear in employees' minds that may hinder them from producing ideas, proposing changes and sharing their knowledge with other employees [121].

Consequently, innovation culture has a vital role in the organization. It can facilitate successful implementation of improvement programs, which in turn, reflect positively in performance, or it can be a handicap to these programs [122]. Moreover, organizational culture has been recognized as a substantial component of organizational success [123]. When an organizational culture promotes the capacity of employees to innovate and handle risks, and assists and supports growth and development of the individual [124], then organizational culture can be described as an innovation culture, which becomes a vital organizational factor that promotes the knowledge base of the organization and accomplishes higher organizational performance [125]. Accordingly, many studies have considered organizational culture to be employed as a moderator variable in the achievement of better organizational performance [130]. Many other studies have used innovation culture as a mediator to investigate the relationship between various variables [125-129]. Therefore, due to

inconsistent results in the relationship between Six Sigma and organizational performance, this study employs innovation culture as a mediator to investigate its impact on other variables. Therefore, the following hypothesis is proposed:

*Hypothesis 4: Innovation culture mediates the relationship between Six Sigma and organizational performance.*

### 3. Conceptual Framework

A review of the literature has revealed that the effect of Six Sigma on organizational performance is still inconsistent. For that, this paper proposes a framework to resolve this inconsistency by employing innovation culture as a mechanism to better explain this relationship. This framework provides guidelines for future empirical investigation that aims to study the relationship between these variables and their effect on organizational performance.



Fig. 1. Proposed Conceptual Framework

### 4. Conclusion and Discussion

This paper is an endeavor to expand the boundaries of knowledge relating to Six Sigma and innovation culture and their effect on organizational performance. The proposed model of the research is unique and an original framework which could be used as a guideline and a reference to investigate the effect of Six Sigma and innovation culture on organizational performance. Adding innovation culture provides the originality to this model which contributes to better explain this relationship. Further, due to inconclusive results in previous studies, this framework is suggested to clarify and resolve this issue regarding the impact of Six Sigma on organizational performance.

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