

Success Factors and Benefits of Six Sigma Implementation in Hospitals: A Systematic Review

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Abstract

This review explores critical success factors of Six Sigma implementation in hospitals and identifies the benefits. Data sources and Methodology: Prior studies on Six Sigma (SS) totaling 100 were selected from more than 100 journals. These studies came from numerous databases and are classified based on the year of publication. Journal names with corresponding number of papers selected are reported. The review reveals 25 critical success factors (CSF) necessary in the implementation of Six Sigma, encompassing numerous aspects of an organization such as managerial, statistical, and technical aspects. Twenty benefits derived from SS's implementation are identified, including various improvements in terms of the organizations' processes, financial performance, and quality of service. The success of Six Sigma implementation depends on several critical factors, some of which are best considered before its introduction, while others must be addressed during the process itself. Other factors are external and should be considered during and after its implementation. Not all Six Sigma initiatives are successful nor result in great benefits. Therefore, organizations must analyze their need for Six Sigma projects and base their decisions on the availability/presence of the CSF. Organizations, including hospitals, can gain numerous benefits from Six Sigma implementation but must first evaluate Six Sigma's introduction and implementation against their abilities to achieve desired outcomes.

Keywords: Six Sigma, critical success factor, quality, hospital

1. Introduction

Six Sigma (SS) was introduced in the late 1980s at Motorola and applied by numerous pilot industrial organizations like General Electric, Du Pont, and Ford (Feng & Manuel, 2008) as well as American Express, Boeing, Johnson and Johnson, Texas Instruments, and Sony, among others (Nakhai and Neves, 2009). For Motorola, SS was an approach to foster improvements (Heavey, C. and Murphy, E., 2012). (Antony et al., 2007) pointed out that majority of service organizations in the United Kingdom practice SS. Many other studies reported acceptable levels of SS implementation by organizations in different countries. According to (Narula & Grover, 2013) sigma, a Greek letter, refers to standard deviation, and SS is a methodology used to reduce defects that any process encounters to less than 3.4 defects per one million opportunities. That is, all items produced in accordance with SS meet desired specifications (Dinesh, T. et al., 2013).

An integration of SS with quality was proposed by (Al Khamisi et al. 2018), otherwise known as Lean Six Sigma (LSS). Two major tasks are involved in the introduction of SS. First is to identify defects and variations in the manufacturing process. Second is to lessen these variations to its lowest level (Udayai, K. & Kumar, P. 2012), (Prasad & Prajapati, 2014) stated that SS refers to statistical tools that can be used by organizations for purposes of process measurements, analysis, improvement, and control. The ultimate objective of SS is to help produce high quality products.

Difference results of implementing SS have been presented in the literature such as cultural change, cost reduction, and customer retention (Ertürk, M., Tuerdi, M., & Wujiabudula, A. 2016), (Tjahjono et al. 2010) added that the scope of SS is expanded to cover issues like understanding customer needs, productivity enhancement, and organizational performance improvement. SS deployment has increased after the adoption of this methodology by General Electric (GE) in the mid-1990s (Nakhai and Neves, 2009). It was implemented in different domains such as banks (Salaheldin, S. I. & Abdelwahab, I. S., 2009), manufacturing companies (Gosnik, D., & Vujica-Herzog, N., 2010), home appliance companies retention (Ertürk, M., Tuerdi, M., & Wujiabudula, A. 2016), service organizations, (Antony et al., 2007), hospitals, and other healthcare settings. According to (Antony et al. 2007), the main purpose of SS implementation in service organizations is to identify the root causes of defects, so as to eliminate these defects to achieve the ultimate goal that is customer satisfaction.

Researchers studied SS in terms of its definition, techniques, benefits, critical success factors, obstacles, and its relationships

with other constructs. Some examples of these studies encompassed the impact of knowledge management on SS (Furterer, S. L., 2011) success factors of SS in hospitals (Hilton, R., Balla, M. & Sohal, A. S., 2008), the influence of SS on organizational performance (Ertürk, M., Tuerdi, M., & Wujiabudula, A., 2016), the use of SS to improve operations in hospitals (Van den Heuvel, J., Does, R. J., Bogers, A. & Berg, M., 2006), (Yeh, H. L., Lin, C. S., Su, C. T. & Wang, P. C., 2011), implementation of SS in service organizations (Antony, J., Jiju Antony, F., Kumar, M. & Rae Cho, B., 2007), integration of SS with ISO9001 (Marques, P., Requeijo, J., Saraiva, P. & Frazao-Guerreiro, F., 2013), the use of SS to improve quality of patient care (Antony, J., Palsuk, P., Gupta, S., Mishra, D. & Barach, P., 2018), (Celano, G., Costa, A., Fichera, S. and Tringali, G., 2012), implementation of SS in hospitals to reduce costs (Niemeijer et al., 2012), and the use of SS in cardiac medication administration to enhance quality of care (Elberfeld, A., Goodman, K. & Van Kooy, M., 2004).

With respect to findings in the literature, (Shanmugaraja, M., Nataraj, M. & Gunasekaran, N., 2013) stated that the implementation of SS is limited by the integration of SS and its critical success factors (CSFs). (Tjahjono, B., 2010) indicated that the main critical success factor of SS implementation is the commitment and involvement of top management. Examples of factors required to successfully adopt SS include customer and process focus, management by fact, clear objectives, and vision of top management (Caulcutt, R., 2001). According to (Shokri, A., Oglethorpe, D. & Nabhani, F., 2014), top management support and employees' acceptance to change are key CSFs of SS adoption. In some cases, the benefits of SS were not as it should be. For example, (Niemeijer et al., 2012) indicated that the implementation of LSS in a medical center in Netherlands did not improve the financial health of the center but transformed it to a process- rather than a problem-oriented center. Several CSFs necessary for SS implementation are elaborated in the following sections of this paper.

As a consequence of SS implementation, organizations are able to improve quality, reduce waste, reduce costs related to rework, and increase customer satisfaction and loyalty (Tjahjono, B., 2010). (Narula, V. & Grover, S., 2013) stated that General Electric (GE) invested 500 million US dollars in implementing SS and gained at least 2 billion US dollars as a result of its implementation. (Yeh, H. L., Lin, C. S., Su, C. T. & Wang, P. C., 2011) reported numerous benefits of SS implementation in healthcare such as medical process improvement, increased efficiency of process cycle, decreased days of stay in hospital, and increased competitiveness of hospitals. (Sahbaz, I. et al., 2014) confirmed that SS was used to help improve quality and performance of several processes in different healthcare departments. (Maleki, M., Riahi, L., Dashti, T. & Karbasian, S. 2014) revealed that reduced waiting time for surgeries was a primary result of implementing SS in hospitals. Heuvel (Van den Heuvel, J., Does, R. J., Bogers, A. & Berg, M., 2006) praised the implementation of SS for its contribution to innovative healthcare services. (Akifuddin, S. & Khatoun, F. 2015) confirmed that the application of SS in the healthcare sector improved hospital management and increased patients' satisfaction. (El-Eid, G., Kaddoum, R., Tamim, H. & Hitti, E. A. 2015) indicated that the application of SS in hospitals results in improved hospital discharge. Contrary to these results, (Kumar, M., Antony, J., Madu, C., Montgomery, D. & Park, S., 2008) suggested that SS is useful for processes related to goods, not services (De Carvalho, M., Ho, L. & Pinto, S., 2014) indicated that non-SS approaches have greater influence on quality rather than SS methodology.

Based on above results, this study cites the most reported CSFs and benefits of SS implementation in different industries, with an emphasis on healthcare settings. (Woodard, T. D., 2005) cited SS as the latest quality improvement initiative taken in hospitals to reduce variations and eliminate defects. In the same context, SS was regarded as one of the most important tools for quality improvement in the healthcare sector (Varkey, P., Reller, M. K. & Resar, R. K., 2007). The quality of healthcare has a special significance as compared to that of other types of services since healthcare services relate to the health of human beings (Sreedharan, V. R. & Raju, R., 2016). As such, this research's specific objectives are to identify the most common critical success factors of six sigma implementation and to determine the most important benefits of six sigma adoption in different organizations, particularly healthcare settings.

2. Methodology

To meet the objectives stated in the introduction, a systematic literature review, described as follows, was conducted using 100 studies previously published in more than 100 journals for the period from 2000 to 2018.

2.1 Research Strategy

In their systematic review of LSS, (Nonthaleerak, P. & Hendry, L., 2006) used a methodology involving three main steps: first, to collect papers from various databases; second, to classify papers based on specific criteria such as methodology, country of research, type of industry, and year of publication; and third, to group papers under certain specifications (such as the particular journals and types of methodologies) as a preliminary way to systematically analyze the papers. (Tjahjono, B., 2010) conducted a review of SS literature from 2004 to 2009. Their research methodology included the following steps: first, determining the appropriate databases and keywords and second, analyzing papers in terms of criteria such as definitions, implementation, tools, benefits, adoption, enablers, and links of SS with other disciplines.

(Nonthaleerak, P. & Hendry, L., 2006) reviewed more than two hundred papers using two major classifications of SS literature, with an emphasis on research contents and methods. The classification of research content underlined methodology focus (i.e.,

SS concepts, comparison, and enhancement) in addition to implementation focus (i.e., business type, CSFs, and business performance). (Ahmed, S., Manaf, N. H. & Islam, R., 2013) reviewed the literature on LSS to explore the application of this approach and determine the main effects of LSS on services delivered in healthcare settings. Their review discussed the benefits of using LSS, the healthcare processes where LSS can be applied, and the obstacles of LSS application in healthcare services. Based on the above studies, this systematic review of SS literature identifies the critical success factors of SS, together with the benefits derived from its implementation.

2.2 Criteria For Article Inclusion

Papers were included in this review based on their relevance to this review's objectives. Specifically, the papers selected mainly focused on SS or LSS. Papers on LSS were included in this review due to LSS's positive influence on healthcare quality improvement (DelliFraine, J. L., Langabeer, J. R. & Nembhard, I. M., 2010), (Trakulsunti, Y. and Antony, J., 2018), particularly when derived from SS methodology (Dumitrescu, C. D., Tent, I. D. & Dumitrescu, E. C. I., 2010). Papers used in this review were also limited to those published in refereed journals.

2.3 Studies Selected

The initial number of papers retrieved from numerous databases was 250 papers. Only 100 publications were used in this review in accordance with the stated inclusion criteria. Table 2 shows a list of authors with their studies' respective publication years from 2000 to 2018.

3. Results

The review reveals 25 critical success factors (CSF) necessary in the implementation of Six Sigma, encompassing numerous aspects of an organization such as managerial, statistical, and technical aspects. Twenty benefits derived from SS's implementation are identified, including various improvements in terms of the organizations' processes, financial performance, and quality of service.

3.1 CSFs of Six Sigma

Using a sample of 200 service organizations in the United Kingdom, Antony et al. (Antony, J., Jiju Antony, F., Kumar, M. & Rae Cho, B., 2007) explored the benefits, challenges, and CSFs of SS. Their results identified 13 critical factors necessary for the successful deployment of SS. Out of those CSFs, seven factors were ranked as very important. (Tjahjono, B., 2010) conducted a literature review to identify what SS is, what its applications, success factors, and obstacles are, and to determine the emerging trends of SS. They found some critical factors of SS implementation such as top management commitment, training, linkage between SS and information technology experience, and harmonization of human resource practices with SS.

(Narula, V. & Grover, S., 2013) indicated that other CSFs include commitment of top management, customer and process focus, faster completion of projects, clear measure of success, and the importance of infrastructure available for SS project leaders and workers. (Caulcutt, R., 2001) considered clear objectives and vision of top management, "green and black belts" (SS project leaders), and management by fact as some of the important factors required for SS adoption. (Alkubaisi, M., 2013) specified leadership, champions that are responsible for the development of SS, "green and black belts," as well as tools such as DMAIC (define, measure, analyze, improve, and control) and DMADV as principal requirements of SS implementation. (Habidin, N. & Yusof, S. R., 2013) identified three dimensions as key success factors of SS: strategic (top management role, a shared vision of the methodology and expectations, learning and training, and SS culture), tactical (dynamics of SS project selection, benchmarking, and continuous control), and operational (The DMAIC approach).

For (Shokri, A., Oglethorpe, D. & Nabhani, F., 2014), top management support and employees' acceptance of change positively enhance the successful implementation of SS. In a study conducted on Brazilian companies, (De Carvalho, M., Ho, L. & Pinto, S., 2014) suggested three CSFs of SS implementation, namely, organizational (commitment and resources), infrastructure-related (information systems and statistical tools), and human resource dimensions (internal factors related to employees such as their education and training, and external factors such as consultants). (Niemeijer et al., 2012) confirmed the importance of green and black belt leaders for SS implementation in hospitals due to the fact that the assessment of processes for improvement is a special skill not normally possessed by healthcare staff. (Habidin, N. & Yusof, S. R., 2013) explored CSFs of LSS in the automotive industry in Malaysia. Their findings showed that leadership and customer focus are the most critical success factors of LSS. Table 1 shows a list of CSFs found in the literature.

Table 1. Examples of CSFs of Six Sigma found in the literature

| No. | Crucial and very important CSFs of SS deployment | Author (s) |
|-----|--|---|
| 1 | Focus on customers and processes | Caulcutt (2001), Antony and Banuelas (2002), Woodard (2005), Van Den Heuvel et al. (2005), Nonthaleerak and Hendry (2006), Antony et al. (2007), Hilton et al. (2008), Nakhai and Neves (2009), Tjahjono et al. (2010), Allen et al. (2010), DelliFraine et al. (2010), AlSagheer et al. (2011), Mandahawi et al. (2011), Arumugam et al. (2012), Celano et al. (2012), Kapoor et al. (2012), Niemeijer et al. (2012), Habidin and Yusof (2013), Alkubaisi (2013), Narula and Grover (2013), Shokri et al. (2014), Öztürker et al. (2014), De Carvalho et al. (2014), Jacobs et al. (2015) and Varma and Ravi (2017), Trakulsunti and Antony (2018), Improta et al. (2018). |
| 2 | Harmonization of human resource practices with SS | |
| 3 | Linkage between SS and business strategy | |
| 4 | Linkage between SS and information technology experience | |
| 5 | Linkage between SS implementation and financial accountability | |
| 6 | Infrastructure for SS leaders and workers | |
| 8 | Top management commitment, support, and involvement | |
| 9 | Project management skills | |
| 10 | Six Sigma training and experience | |
| 11 | Understanding of SS methodology | |
| 12 | Clear measure of success | |
| 13 | Human resource practices (training, education, and incentives) | |
| 14 | Reduced levels of organizational structure | |
| 15 | Employees' acceptance of change and empowerment | |
| 16 | Effective organizational communication | |
| 17 | Employee recognition and team psychological safety | |
| 18 | "Green and black belt" leaders | |
| 19 | Clear objectives and vision of top management | |
| 20 | Access to expert knowledge of SS | |
| 21 | Shared vision of SS methodology and benefits | |
| 22 | Establishment of SS culture | |
| 23 | Benchmarking | |
| 24 | Financial resources | |
| 25 | Continuous control to ensure successful implementation of SS | |

3.2 Benefits of Six Sigma

Research on the application of SS revealed significant benefits that result from the adoption and implementation of this innovative approach by organizations in different sectors and specifically, healthcare. (Prasad, P. & Prajapati, D., 2014) underlined that the main focus of SS is to ensure quality of products and services at a specific target. (Swink, M. & Jacobs, B. W., 2012) assessed the impact of SS adoption on the financial performance of more than 400 firms and revealed SS adoption's important role in improving organizations' return on assets, indicating that positive impact came from reductions in indirect costs.

(Yeh, H. L., Lin, C. S., Su, C. T. & Wang, P. C., 2011) found that the application of SS in a hospital resulted in improved medical quality and competitiveness. (Feng, Q., & Manuel, C. M., 2008) reported some benefits of SS implementation in healthcare such as improvement of quality of care, reduction of medical errors, as well as improvement of patient satisfaction. Moreover, in their investigation of SS implementation in health organizations in the United States, the authors concluded that SS can be implemented in different departments within the organization in a project-oriented fashion to reduce the cycle time, improve flow of processes, and reduce medical errors. (Antony, J., Jiju Antony, F., Kumar, M. & Rae Cho, B., 2007) confirmed that SS results in enhanced processes that in turn trigger improvements in customer satisfaction, productivity, organizational profitability, and market share. Particularly, the authors identified that SS implementation in the healthcare sector results in improved radiology throughput and reduced cost of radiology. Another important benefit of SS implementation is a reduction in waiting time during surgeries (Maleki, M., Riahi, L., Dashti, T. & Karbasian, S. 2014).

One of the most significant benefits of SS implementation as determined by (Narula, V. & Grover, S., 2013) is the improvement of an organization's financial health. In a study conducted by Tan et al. (2014) on the implementation of

SS in LASIK Surgeries, SS resulted in a reduced rate of LASIK complications. According to (Hekmatpanah, M., Sadroddin, M., Shahbaz, S., Mokhtari, F. & Fadavinia, F., 2008), there is a positive and direct relationship between SS implementation and an organization's productivity. A main benefit of SS outlined by (Öztürker, C., et al. 2014) is the reduction of care complications in eye surgeries. (Allen, T. T., Tseng, S. H., Swanson, K. & McClay, M. A., 2010) confirmed that SS results in an enhanced hospital discharge process. (Mandahawi, N., Al-Araidah, O., Boran, A. & Khasawneh, M., 2011) investigated the application of LSS and found an improvement in the length of stay in the studied hospital. (Kuwaiti, A. A. & Subbarayalu, A. V., 2017) assessed the effect of using SS in reducing fall rates of patients in a medical center in Saudi Arabia. Their findings highlighted the importance of SS application in eliminating at least 70% of patient's fall rates. In terms of cost reduction, (Van den Heuvel, J., Does, R. J., Bogers, A. & Berg, M., 2006) indicated that the total savings of one hospital as a result of SS adoption was 1.4\$ in 2004.

According to (Zafiroopoulos, G., 2015), SS can be used to improve doctors' performance, service safety, and patients' needs. An important benefit of SS implementation in hospitals is an increase in the predictability of operations' start time (Fairbanks, C. B., 2007). (Trakulsunti & Antony, 2018) found that LSS process resulted in numerous benefits such as reduction of medication errors, improvement in patient satisfaction, and reduction in operational costs. In their study on a university hospital in Italy (Improta, G., Cesarelli, M., Montuori, P., Santillo, L. C. & Triassi, M., 2018) determined LSS to be an effective tool in reducing factors that affect the risk of healthcare-associated infections. Table 2 shows examples of benefits resulting from the application of SS. The table shows 20 benefits of SS application in hospitals related to hospitals, physicians, medical staff, patients, and processes.

Table 2. Examples of benefits of Six Sigma found in the literature

| No. | Benefits of SS application | Author (s) |
|-----|--|--|
| 1 | Improved quality of care | De Koning et al. (2005), van den Heuvel et al. (2006), Lee and Choi (2006), De Mast (2006), Antony et al. (2007), Hekmatpanah et al. (2008), Feng and Manuel (2008), Gowen III et al. (2008), Chen et al. (2008), Heckl and Moormann (2009), Nakhai and Neves (2009), Tjahjono et al. (2010), Allen et al. (2010), DelliFraine et al. (2010), Yeh et al. (2011), Mandahawi et al. (2011), Swinka and Jacobs (2012), Alkubaisi (2013), Narula and Grover (2013), Liberatore (2013), Maleki et al. (2014), Taner et al. (2014), Shokri et al. (2014), Prasad and Prajapati (2014), Öztürker et al. (2014), Ekinci et al. (2015), Sreedharan et al. (2015), Ertürk et al. (2016), Zafiroopoulos (2015), Varma and Ravi (2017) and Al Kuwaiti and Subbarayalu (2017), Trakulsunti and Antony (2018), Ahmed et al. (2018), Improta et al. (2018). |
| 2 | Increased competitiveness | |
| 3 | Reduced waiting time for surgeries | |
| 4 | Reduced costs | |
| 5 | Reduced medical and non-medical errors in healthcare | |
| 6 | Enhanced efficiency of physicians | |
| 7 | Improved patient satisfaction | |
| 8 | Enhanced data integrity | |
| 9 | Improved medical process | |
| 10 | Minimized waste | |
| 11 | Reduced length of stay in hospitals | |
| 12 | Reduced unnecessary movements | |
| 13 | Ensuring continuous improvement | |
| 14 | Increased rate of return on investment | |
| 15 | Increased satisfaction of patients, physician, and staff | |
| 16 | Improved financial health of organization | |
| 17 | Improved organizational productivity | |
| 18 | Improved business performance | |
| 19 | Improved process of hospital discharge | |
| 20 | Reduced fall rates of patients | |

4. Discussions

Quality was first studied as a process in the industrial domain by (Shewhart, W. A., 1931) in order to achieve three major goals, namely, minimization of inspections, determination of customer needs, and reduction of process variations (Varkey, P., Reller, M. K. & Resar, R. K., 2007). Consequent efforts in the same line can be classified under the category of quality improvement methodologies. There are many approaches that can be followed to improve quality; SS is one of these approaches (Chassin, R., 2008). However, implementing SS in organizations, and more specifically in hospitals, extends the concepts of SS to many other supplementary factors. In the same view, Varma and Ravi [58] defined SS as an approach that depends on a collection of numerous concepts such as managerial, statistical, and technical concepts. According (Celano, G.,

Costa, A., Fichera, S. & Tringali, G., 2012), SS was adopted early in the healthcare sector in the United States and Europe. (De la Lama et al., 2013) asserted that SS can be used to improve healthcare processes. Based on numerous cases of SS implementation, the authors concluded that the successful implementation of SS in the healthcare sector requires intensive organizational and financial efforts. The literature suggested many factors that represent CSFs of SS implementation. Regarding customers (i.e., patients), the literature identified CSFs that are patient-focused in order to ensure their safety and satisfaction. Meanwhile, hospital-related CSFs suggest management to be distinguished by commitment, support and involvement, with clear objectives and vision; as well as to build an organizational culture that disseminate SS as an improvement tool, introduce continuous control, benchmarking, a shared vision of SS methodology and benefits, and effective organizational communication. Management should pay extensive attention to harmonize human resource practices with SS methodology, linkage between SS and business strategy, as well as information technology experience and financial accountability. Other important factors revealed in the literature concern infrastructure and financial resources, along with access to expert knowledge of SS. Finally, there are several CSFs related to employees such as project management skills, SS training, and experience, acceptance of change, employee empowerment, and trained project leaders (e.g., green and black belt holders). As for the benefits of SS implementation, it is concluded that not all SS projects result in great benefits (Gosnik, D., & Vujica-Herzog, N., 2010). However, cultivating these CSFs maximizes the likelihood of a successful SS implementation. SS could mean process improvement (Marques, P., Requeijo, J., Saraiva, P. & Frazao-Guerreiro, F., 2013), through which hospitals can increase their competitiveness, quality of care, patient satisfaction, rate of return on investment, continuous improvement, satisfaction of physician and staff, and simultaneously reduce costs, waiting time for surgeries, medical and non-medical errors, length of stay in hospitals, unnecessary movements, waste, and fall rates of patients. Additionally, the application of SS in hospitals enhances efficiency of physicians, medical processes, organizational productivity, and business performance, and also improves the process of hospital discharge (Jacobs, B. W., Swink, M. & Linderman, K., 2015) found that organizations that have enhanced financial performance prior to SS application gained better results after its implementation. (Kapoor, A., Bhaskar, R. & Vo, A., 2012) indicated that a successful SS adoption in healthcare in a case study in India was achieved with the help of information technology applications such as electronic records.

The first step in adopting SS is to conduct a preliminary review of the organization's SS fitness in order to identify the extent to which the organization can improve its current level of quality. According to (Woodard, T. D., 2005), the implementation of SS is not a simple methodology particularly in hospitals; therefore, managers are called to accurately determine their hospitals' abilities to adopt such a methodology. (Alkubaisi, M., 2013) indicated that a cost-benefit analysis is required as an initial step of SS projects. The results of this study identified several CSFs of SS implementations, some of which gained much attention, specifically, management commitment and support. However, only a few studies identified the importance of surgeons' and physicians' support as a key factor of SS implementation in hospitals (Marques, P., Requeijo, J., Saraiva, P. & Frazao-Guerreiro, F., 2013). Numerous related topics of SS are outside the scope of this study such as SS tools (e.g., process map, Kano analysis, and Ishikawa diagram (Alkubaisi, M., 2013). (Metri, B. A., 2007) showed that SS can be applied at two levels: organization and project levels. The implementation level of SS is outside this study's scope. (Deniz, S., Efe, U., Cimen, M. & Tekin, Z., 2017) found that there are no differences between hospitals' and banks' managers in terms of their views about SS. Future research could study the topics just mentioned. Additionally, only a few studies investigated the diffusion of SS among local organizations. Hence, exploring this topic is of paramount importance to understand the status of SS implementation in hospitals and compare that to other organizations.

5. Conclusion

The success of Six Sigma implementation depends on several critical factors, some of which are best considered before its introduction, while others must be addressed during the process itself. Other factors are external and should be considered during and after its implementation. Not all Six Sigma initiatives are successful nor result in great benefits. Therefore, organizations must analyze their need for Six Sigma projects and base their decisions on the availability/presence of the CSF. Organizations, including hospitals, can gain numerous benefits from Six Sigma implementation but must first evaluate Six Sigma's introduction and implementation against their abilities to achieve desired outcomes

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