

## AN ASSESSMENT OF THE ADVANTAGES AND DISADVANTAGES OF SIX SIGMA

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### Abstract

*This study focuses on a comparison of Six Sigma's benefits and cons. For almost 30 years, Fortune 500 companies have relied on the Six Sigma technique to improve their processes. Some advantages and disadvantages of Six Sigma are discussed in the literature, and an online survey instrument developed from these discussions is utilised to probe more deeply into the aforementioned issues. This research was made possible with the help of 42 Six Sigma Master Black Belts and Black Belts from significant manufacturing organisations, as well as 15 academics with expertise in Six Sigma. For a report on the fundamental advantages and cons of Six Sigma, experts from major manufacturing businesses and institutions were questioned. Understanding restrictions and basic gaps and developing solutions is crucial to the sustainability of Six Sigma projects. The purpose of the research is to show prominent academics that they can help solve Six Sigma's problems by collaborating with business leaders.*

**Keywords** Six Sigma, Advantages and disadvantages, Research gaps

### 1. Introduction

Six Sigma is one of the most frequent approaches for optimising business processes, and numerous World Class firms have been employing it for the past 30 years (Antony et al., 2017). Six Sigma was created in the mid-1980s by Bill Smith, an engineer at Motorola. Numerous firms, have embraced Six Sigma since the 1990s. Millions of dollars in savings have been realised as a consequence.

The Six Sigma technique tries to discover

and eradicate the underlying reasons for flaws, blunders, or inaccuracies in manufacturing processes. SS focuses on essential operations which effect unacceptably high levels of errors as determined by consumers. To generate trustworthy goods, services, and processes, raise process averages, and minimize process variation, Six Sigma ideas can be employed.

With the intention of attaining strategic goals, Six Sigma is "an organised, parallel-meso framework to minimise variation in organisational processes by employing improvement specialists, a structured strategy, and performance metrics" (Schroeder et al. 2008) Statistics are backbone of SS approach. This data-driven strategy of issue solving often yields great financial returns. Since it covers both the "what" and "how," this definition of Six Sigma is among the most complete ones available.

The authors of this study identify problems with Six Sigma in the existing literature and conduct a survey investigation with a variety of SME, including SS Master Black Belts at major industrial engineering company. High-caliber academics and researchers involved in Six Sigma projects and/or teaching courses on the topic are contributing to this study.

### 2. Literature Review

This review identified advantage disadvantages and research gaps from various sources

## 2.1 Disadvantages of Six Sigma

Six Sigma was found to have a fairly high failure rate, which is consistent with previous organisational reform projects. For businesses eager to invest in Six Sigma projects, this initial restriction is seen as a significant research gap.

As an example, **Albliwi et al. (2014)** found that almost half of SS projects did not achieve their goals. Six Sigma, like many other efforts to enhance quality, has a strong beginning but eventually sputters. Thus, businesses lose interest and momentum and revert to previous practices.

According to **(Chakravorty, 2010)**, around 60% of all corporate Six Sigma programmes are unsuccessful. Approximately 70% of change management initiatives in organisations are thought to fail.

As a result of these setbacks, firms across a wide range of industries are reevaluating the scope of their Six Sigma initiatives. It is generally agreed that the method by itself cannot solve all of a company's problems **(Chakravorty, 2009)**.

As a result, there is a glaring knowledge vacuum on the causes of failures, and corrective tactics must be developed to reduce similar failures in the future.

The second drawback is the high initial cost of introducing Six Sigma inside a

company. Integrating Six Sigma into business culture may necessitate a generous initial asset **(Fursule et al., 2012)**. Many SMEs are deterred to adopt, design, and implement SS processes as a reason.

Third, if not implemented properly, Six Sigma has the potential to lower levels of customer satisfaction. Due to its detrimental effect on customer satisfaction, two major US multinationals abandoned their Six Sigma programmes **(Chakravorty, 2009)**.

SS's scientific and organised problem resolution's method throttle internal innovation and vision, which brings us to our sixth disadvantage. One school of thought contends that the rigorous, analytical nature of the Six Sigma methodology makes people inflexible **(Angel and Pritchard, 2008)**.

## 2.2 Advantages and gaps in study of six sigma

The advent of Big Data is largely attributable to Six Sigma studies. Big Data requires careful handling in order to be used effectively in a Six Sigma research. This initial information gap should get equal attention from top researchers and business leaders. There is a dearth of theoretical and empirical works that investigate the connection between Six Sigma and Big Data.

The second advantage and research gap of Six Sigma is that it often ignores external factors. When adopting Six Sigma, most businesses fail to consider ecological factors **(Muralidharan, 2015)**. Strategies and techniques that focus on reducing,

recycling, and reusing are gaining popularity as a way for businesses to lessen their negative impact on the environment while potentially saving money on premiums of insurance and taxes. It highlights the requirement for an essentially novel type of manufacturing organisation to balance the growing demand for premium goods with the requirement for sustainable economic growth and environmental responsibility.

### 2.3 Research Questions

- How many Green and Yellow Belts are needed to implement LSS in a small to medium enterprise (SME) environment?
- How can SMEs get benefit from Six Sigma projects? According to research (Alexander et al.,2018)

### 3. Methods

Information was gathered using a Google online survey sent to universities, production companies, and researchers with published journals/research/study on SS. The survey selected as the preferred technique of collecting data because of its lower budget and respondents' skill to self-administer the questionnaire in a standardised fashion. Google Forms, an intuitive and user-friendly tool, was employed in the creation of the survey, and an online spreadsheet was used to gather the data.

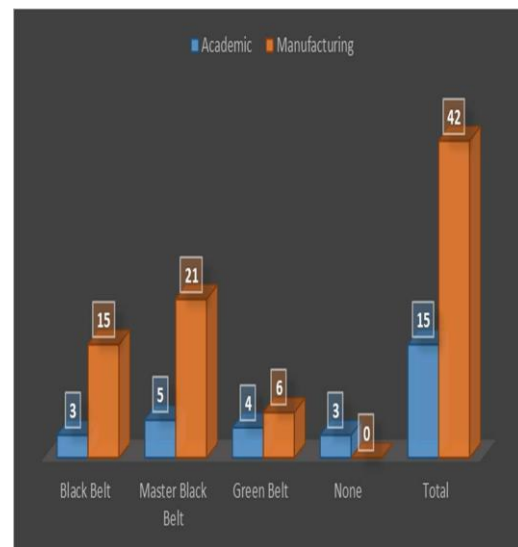
57 individuals responded to the email with a link to the online survey, comprising 42 Six Sigma Master Black Belts and Black Belts from important manufacturing businesses and 15 academics.

Figures 1 and 2 demonstrate how the

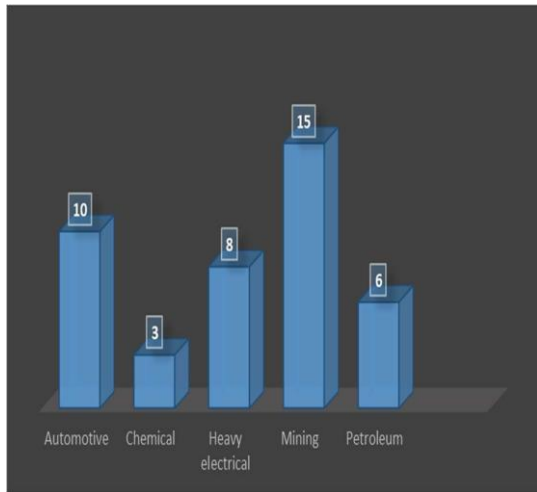
respondent characteristics are scattered in reference to Table 1. Figure 2's distribution of respondents demonstrates that the bulk of participants belongs mining, automotive, heavy electrical, petro-chemical sectors. Personalities unique to each firm.

**Table 1. Participant profiles related to Six Sigma knowledge**

	Academic	Manufacturing	Total
Six Sigma Belt			
Black Belt	3	15	18
Master Black Belt	5	21	26
Green Belt	4	6	10
None	3	0	3
Total	15	42	57



**Figure 1 shows participant profiles**



**Figure 2 distribution of participant profiles related company wise**

#### 4. Result

A number of experts in the industry and academic sectors have highlighted Six Sigma's primary shortcomings, which are outlined in Tables II. To examine potential variations in opinion among Six Sigma experts, an independent sample Mann and Whitney (1947) U test was performed. Because the two samples are separate and categorical, this test may be used. The observations are separate because distinct persons took part in each sample group. Tables II summarise the most important findings reached by both sets of specialists (manufacturing industry professionals and distinguished academics/research scientists). There was a large gap in opinion between academics and businesspeople on two limits ( $p < 0.05$ ). The key benefits and drawbacks indicated by manufacturing and academic experts were quite similar, with just a few modest changes in ranks. For instance, practitioners of Six Sigma in industry were more convinced than academics and researchers that the benefits would overcome the difficulties of implementing it.

**Table 2 Key conclusions from both categories of expertise (from manufacturing businesses and eminent academics and researchers)**

	Mean scores of experts from academics	Mean scores of experts from industry	Mann-Whitney U test (Asymp. Sig.)
The failure rate of Six Sigma initiatives like any other organizational change initiatives is very high	4.48	4.31	0.6760
The initial cost of implementing Six Sigma in an organization is very high	4.04	4.48	0.3480
Six Sigma, if not implemented properly, may have a negative impact on customer satisfaction	5.20	5.39	0.3250
Poor implementation of Six Sigma can have a negative impact on employee satisfaction	5.84	5.82	0.9260
Six Sigma as a structured and disciplined approach to problem solving may stifle the employee creativity and innovation	2.60	2.87	0.5790
The benefits due to Six Sigma implementation for companies are minimal with respect to the efforts	2.12	1.75	0.041**
The technical limitations of Six Sigma like 1.5 $\sigma$ shift needs to be addressed to instill confidence in organizations to implement Six Sigma	4.28	4.16	0.6630
Variance reduction should not be the only goal of Six Sigma implementation	6.20	5.93	0.8900
Six Sigma is TQM on steroids	3.56	2.98	0.2430
Non-standardization of curriculum	4.76	4.03	0.023**
Integration of Six Sigma with Big Data can bring superior results to many organizations in the future	6.16	6.2	0.5770
Green and Six Sigma are complementary to each other and their integration would be beneficial to many companies	5.56	5.59	0.7550
Integration of Six Sigma and Industry 4.0 is not fully explored yet and it will be one of the next big emerging topics	6.00	5.67	0.2760
Six Sigma in small- and medium-sized enterprises and micro-enterprises are very challenging but could be very rewarding if implemented properly	6.32	6.13	0.8560

#### Advantages of Adoption of Six Sigma

#### 5. Conclusion

It was interesting to see that the mean ratings for two topics—the Advantages of Adoption of Six Sigma and the lack of uniformity in the Six Sigma program—seemed to differ across academics and industry people. There were also large discrepancies in the respondents' average

judgments of several benefits and drawbacks. It is recommended that more samples be acquired from the industry and academic sectors for future studies. The authors want to include many SMEs in the next study so that they may compare the restrictions faced by big and SMEs (manufacturing). Future research will expand the study's scope to include public and nonprofit organisations, giving the authors a more complete picture of Six Sigma's potential and existing patterns across a wide range of sectors.

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