WEP Warwick Evans Publishing

International Journal of Global Economics and Management

ISSN: 3005-9690 (Print), ISSN: 3005-8090 (Online) | Volume 4, Number 1, Year 2024
DOI: https://doi.org/10.62051/ijgem.v4n1.36
Journal homepage: https://wepub.org/index.php/IJGEM/index

The Application of Six Sigma Management Theory in Service Industry

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ABSTRACT

Since it was first introduced by Motorola in the late 20th century, Six Sigma management theory has risen rapidly and become a key strategy for many enterprises to improve quality management and core competitiveness. Based on the definition and connotation of six Sigma, this paper sorts out and summarizes the specific application of six Sigma management theory and method in the industry, and focuses on the research and application of six Sigma management theory in the service industry. Through the above analysis, Six Sigma has achieved remarkable results in improving service quality and customer satisfaction, but it also faces some challenges.

KEYWORDS

Six Sigma; The service industry; Quality management; DMAIC; Service quality

1. INTRODUCTION

1.1. The Origin of Six Sigma

As early as the 1970s, the rapid growth of Japanese companies caught the dominant American companies off guard, causing widespread suspicion and resentment. This phenomenon immediately triggered the deep concern of the American society, after in-depth research, people found that the extreme emphasis on quality management of Japanese enterprises is the core element of its rapid development. They actively adopt and practice Deming's total quality management concept, which improves product quality while significantly reducing production costs. As Crosby, a leading figure in quality management, stresses, "There is no extra cost to quality, and getting the job right the first time is the most economical way [1]." Inspired by this, American enterprises have gradually realized the importance of quality management, and total quality management has gradually become the focus of the industry. In the pursuit of quality management, American enterprises continue to explore, and finally gave birth to a new management concept - Six Sigma management [2].

1.2. The Development of Six Sigma

Six Sigma management theory was first proposed by Motorola. In 1986, Motorola was faced with serious quality problems and market competition pressure, in order to seek solutions, the company began to deeply study and practice Six Sigma management theory. The core idea of this theory is to improve customer satisfaction and enterprise competitiveness by reducing the defect rate in products and services. In the mid-1990s, General Electric (GE) began to promote Six Sigma management theory. GE believes that Six Sigma is not only a method of quality management, but also a means of

strategic management [3]. Through the introduction of Six Sigma, GE has achieved significant productivity gains, cost reductions and improved customer satisfaction. GE's successful practice has made Six Sigma management theory widely concerned and applied in the world. With the successful practice of GE and other enterprises, Six Sigma management theory has had a profound impact on the world. More and more enterprises begin to introduce six Sigma theory to improve their quality management level, increase production efficiency and reduce costs. Six Sigma theory has also gradually penetrated into other fields, such as supply chain management and human resource management, and has become a comprehensive management concept and method [4].

1.3. The Definition and Connotation of Six Sigma

The word "sigma" comes from the statistical term sigma [5], which describes the degree to which individuals in a population deviate from the mean. At present, in the field of quality management, it is used to indicate the level of quality control, such as control at the level of 3σ, which means that the product is at least 99.73% qualified; If controlled at the level of six sigma, this quality level means that 99.99966% of the processes and outputs are free of defects, which means that only 3.4 of a million things are defective [6]. At present, Six Sigma management method has evolved into a method of process and product quality improvement based on statistical technology, and has evolved into the concept of organization pursuing fine management. The basic connotation of Six Sigma management is to improve customer satisfaction and reduce the resource cost of the organization [7]. It emphasizes the management of the whole organization from the perspective of operation, not just the quality of a single product, service or process, and the organization should consider quality issues from the standpoint of customers, adopt scientific methods, and pursue "defectless" quality in all fields of operation. To greatly reduce costs and improve competitiveness [8]. In other words, the current six Sigma is not only a data on the product situation or production process, but also a management system to achieve the best state in order to continuously improve the performance of the organization, and can achieve a goal of continuous perfection. The management of Six Sigma focuses on customers and promotes the improvement of enterprise performance by improving customer satisfaction and reducing resource costs. Secondly, this management method focuses on data and facts and makes decisions based on digital data. Through these to greatly improve the quality of products and production process, and then can bring considerable benefits for enterprises.

1.4. DMAIC Process for Six Sigma

The DMAIC process of Six Sigma is a systematic method of continuous improvement, and its main contents are Define, Measure, Analyze, Improve and Control [8], which is the five stages of the implementation process.

1.5. The Role and Status of Quality Management

Six Sigma management theory plays an important role in quality management. As a set of data-driven, structured and systematic management methods, it continuously identifies, analyzes and solves key problems in the enterprise operation process through DMAIC process to achieve significant quality improvement and cost reduction. Six Sigma emphasizes not only the in-depth analysis and application of data, but also the collaboration and communication of cross-functional teams, as well as a customer-centric corporate culture of excellence. These characteristics make Six Sigma a key tool for enterprises to improve quality management level and enhance market competitiveness. In today's rapidly changing market environment, Six Sigma management theory has become an integral part of enterprises to achieve continuous improvement and continuous success.

2. INDUSTRIAL APPLICATION STATUS OF SIX SIGMA

2.1. Overview of Applications Worldwide

Six Sigma management theory covers a wide range of industries, such as Motorola, General Electric and other companies in the production process to achieve significant quality improvement and cost reduction, Six Sigma is not only widely used in the manufacturing industry, but also in the service industry, financial industry and other fields have achieved significant results. For example, banks and telecom operators have improved service quality and reduced operating costs by implementing six Sigma management. Six Sigma management theory has also been widely applied by large enterprises: most of the world's top 500 enterprises, such as Maersk, Motorola, Invensys Group, GE, Whirlpool, and Emerson, have successfully implemented Six Sigma management method [9]. By applying Six Sigma, these companies have not only improved product quality, but also reduced operating costs and cycles, achieving continuous improvement and operational excellence. In China, the application of Six Sigma management theory began in 2000. Haier Group, TCL Group, Amoi Xiaxin Electronics and other top 100 companies in China have introduced Six Sigma to optimize their production processes and improve their quality, thus enhancing their competitiveness.

2.2. The Role of Six Sigma In Promoting Industrial Development

Six Sigma management theory has played an extremely important role in promoting the development of the industry, and its precise data analysis technology and the persistent pursuit of continuous process optimization have ensured a significant improvement in the quality of products and services, thus winning the wide recognition of the market and the long-term trust of consumers. Six Sigma not only helps enterprises to reduce production costs, by reducing waste and improving efficiency, but also enables enterprises to provide higher quality products and services at lower costs, enhancing their competitiveness in the market. At the same time, the innovative spirit and cross-departmental teamwork advocated by Six Sigma have promoted the sharing of knowledge and technological innovation within the enterprise, promoted the rapid development and application of new products, and injected new vitality into the upgrading and development of the industry. This pursuit of excellence, continuous improvement of the corporate culture, has gone beyond the boundaries of a single industry, widely used in electronics, chemical, service and other fields, has become an important force to promote the entire industry to a higher level of development.

3. THE APPLICATION OF SIX SIGMA IN THE SERVICE FIELD

3.1. Research Status of Six Sigma in Service Industry

Six Sigma was coined by Bill Smith, an engineer at Motorola, in the 1980s, when the concept gained widespread application with the rise of "total quality management" (TQM). Subsequently, General Electric Company combined the idea of "Six Sigma" with the implementation of "TQM", through the study of "TQM" process, proposed a series of process optimization tools and methods, and gradually formed a complete set of "TQM" system, which promoted the development of "Six Sigma". Javad Mehrabi (2012) combined the theory and practical application of Lean Six Sigma to enhance teachers' teaching responsibility and improve their teaching quality [10]. Ayadi Youssouf, Chaib Rachid and Verzea Ion (2014) applied the Lean Six Sigma idea to the operation and maintenance improvement of industrial systems, thereby making operation and maintenance strategy and service constantly adapt to technological updates and changes, and improving the overall market competitiveness of the company [11]. Shen Weiqun (2017) applied Lean Six Sigma in the service process of the library, established a framework for optimizing the service process of the library, improved the service process through DMAIC, value flow chart and other methods, and predicted the value process of the future library service process [12]. M. Sokovic, D. Pavletic,S, Fakin. On the basis of lean Six Sigma

theory, appropriate tools were selected to optimize the process design of compressor shell, and the optimization results were confirmed and analyzed [13]. Zhang Xiaolin (2020) used the DMAIC model of six Sigma management to improve the test method of the power module in order to solve the problems in the development and testing of the power module, thus effectively improving the test efficiency and quality and achieving the expected purpose [14]. Through investigation and research, Zhu Xueqing and Ge Yang (2020) found that the application of Six Sigma DMAIC can significantly improve the management process of consumable materials in the catheter chamber, thus greatly improving the utilization rate and quality of consumable materials [15]. In the process of intelligence development and use, Ning Zhao et al. (2021) apply Six Sigma DMAIC method to analyze intelligence, which can reduce unnecessary connections and enhance the sharing and use of intelligence, thereby improving the production efficiency and utilization rate of intelligence and improving the service quality of intelligence [16]. Liu Zhengjun et al. (2021) adopted DMAIC method to define, measure, analyze, improve and control the budget evaluation index to solve the problem of the budget evaluation index of manufacturing enterprises, so as to improve the quality of the budget evaluation index of manufacturing enterprises [17]. Zhang Cheng et al. (2021) applied the Lean Six Sigma method to the outpatient service of general hospitals, and the service indicators such as outpatient visit time, waiting time, drug taking time, and patient satisfaction were significantly improved, and the patient service satisfaction was significantly improved, thus obtaining a set of service process suitable for promotion and application in the outpatient service of general hospitals [18]. Li Chuanbo (2022) applied the DMAIC improvement process theory of six Sigma to study self-proposition management in the initial examination of master's student enrollment, found the key factors of quality, proposed corresponding improvement measures, and improved the quality of self-proposition in many aspects [19]. Qian Fangzhou (2023) began by explaining the definition of service quality and the similarities between call center service quality and service quality of other industries, sought for the rational application of Lean Six Sigma, formulated a service quality improvement plan suitable for this call center project, and then made data analysis and comparison to evaluate the effectiveness of the implementation process of the plan [20].

3.2. The Specific Application of Six Sigma in the Service Industry

As a methodology for management excellence and continuous improvement, Six Sigma has also demonstrated its unique value and potential in the service industry. In the hotel service industry, brand hotels such as Home and Hanting face the problem of declining customer satisfaction. By introducing Six Sigma management, the hotel has conducted a comprehensive review of the service process. Through the DMAIC (Define, measure, analyze, improve, control) process, the hotel has identified the key links of customer loss. Through the collection and analysis of customer feedback data, it is found that the main problems are incomplete room cleaning and poor reception service attitude. In response to these problems, the hotel has taken a series of improvement measures such as strengthening staff training, introducing new clean technologies and establishing customer feedback systems. After several months of hard work, customer satisfaction increased significantly, and the hotel performance also improved; In the fast food industry, McDonald's and KFC are faced with the problem of excessively long customer waiting time, which affects customer experience and turnover. Through Six Sigma management, fast food restaurants have conducted in-depth analysis on the ordering, production and distribution processes, and found that there are bottlenecks in the ordering system, resulting in excessively long customer waiting time. To this end, fast food restaurants have introduced new ordering systems and express checkout equipment, and optimized staffing and meal preparation processes. These measures have greatly reduced customer waiting time and improved customer satisfaction and turnover; In financial services, Citibank and jpmorgan Chase face high customer complaint rates and cumbersome business processes. Through Six Sigma management, the bank has comprehensively sorted out and optimized the business process. By collecting and analyzing customer complaint data, the bank has identified the key link of the problem. The bank has adopted the DMAIC process improvement method to optimize the business process. For example, it has

introduced an automated loan approval system and streamlined the account opening process. These measures not only reduce the customer complaint rate, but also improve the efficiency of banking services and customer satisfaction; Fedex, in the logistics industry, faces delays in package delivery and high loss rates. Through the introduction of Six Sigma management, the logistics company made an in-depth analysis of the distribution process and found that the main problems were unreasonable distribution routes, uneven quality of distribution personnel and imperfect information system. To this end, logistics companies take measures to optimize the distribution route, strengthen the training of distribution personnel and introduce advanced information management system. These measures greatly improve the efficiency of parcel distribution, reduce the parcel loss rate and improve customer satisfaction. In retail, Wal-Mart and Carrefour use Six Sigma to optimize inventory management and customer service; Through the introduction of six Sigma management theories and methods, many service industries have had similar experiences with the above cases, AT&T and Verizon in telecommunications have improved the quality of network services, Amazon and eBay in online services have improved website performance and customer service through Six Sigma, and education services and public services have also improved the quality of courses and the efficiency of service processes through Six Sigma.

3.3. Opportunities and Challenges

Six Sigma provides a structured and data-driven approach to optimize and improve service processes to enhance customer satisfaction, service reliability and efficiency. Through the DMAIC (Define, Measure, Analyze, Improve, Control) methodology, service companies are able to systematically identify and address bottlenecks and deficiencies in their services, thereby enhancing their competitiveness. However, the Six Sigma management method also faces many challenges. Due to the complexity and diversity in the service industry, the implementation of Six Sigma needs higher flexibility and adaptability. At the same time, the service quality and customer experience that are difficult to quantify in the service industry also bring certain difficulties to the application of Six Sigma. Therefore, when applying six Sigma, service enterprises need to combine their own characteristics and industry rules, flexibly adjust strategies and methods to give full play to the advantages of Six Sigma.

4. CONCLUSION

Since it was first introduced by MOTOROLA in the late 20th century, Six Sigma management theory has risen rapidly and become a key strategy for many enterprises to improve quality management and core competitiveness. Based on the definition and connotation of six Sigma, this paper sorts out and summarizes the specific application of six Sigma management theory and method in the industry, and focuses on the research and application of six Sigma management theory in the service industry. Through the above analysis, Six Sigma has achieved remarkable results in improving service quality and customer satisfaction, but it also faces some challenges.

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