Six Sigma in the UK service organisations: results from a pilot survey

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Abstract *Six Sigma is now increasingly applied to a variety of processes ranging from manufacturing to service and variegated transactional processes. Six Sigma has been proved to be a rigorous pursuit of the reduction of process variation and defect rate in all critical business processes to achieve breakthrough improvements in process performance that generates significant savings to the bottom line of an organisation. The paper begins with a simple comparative study between manufacturing and service processes from the Six Sigma application perspective. The paper then presents the results of a pilot survey carried out in the UK service organisations to understand the status of Six Sigma. The paper finally reports the essential ingredients which are required for the successful deployment of Six Sigma in the service sector.*

Introduction

The popularity of Six Sigma as a means of improving the quality of service and customer satisfaction is growing exponentially in the last couple of years in the UK service industry. Six Sigma offers a disciplined approach to improve service effectiveness (i.e. meeting the desirable attributes of a service) and service efficiency (i.e. time and costs). Six Sigma is the relentless and rigorous pursuit of the reduction of non-value added activities and variation in core service processes to achieve continuous and breakthrough improvements in service performance that impact the bottom line results of an organisation. The focus is not on counting the defects in processes, but, rather on the number of opportunities that could result in defects (Antony and Banuelas, 2001). In other words, we need to clearly define the ways a service could fail prior to determining the sigma quality level (SQL) of the given service process. A defect in the context of Six Sigma is defined as "anything that does not meet the customer requirements" (Adams *et al.*, 2003). For example, in a call centre, the following opportunities could result in defects which ultimately cause customer dissatisfaction and hence lost customers:

- the accuracy of information provided by the CSR to the customer;
- the number of abandoned calls;
- the waiting time to get hold of an available CSR;
- the manner in which the customer is greeted by the CSR;
- time taken to resolve the problem once the data are entered in the system;
- time taken to send out the requested follow-up material;
- politeness, eagerness to help the customer on the other end of the telephone line; and
- the manner in which the call is ended, etc.

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Six Sigma methodology has a major role to play under these circumstances to pinpoint the major problem areas and devise powerful strategies to tackle such problems which improve the customer experience. The focus must be on the following key issues.

- What core processes in our business are critical to meeting customer needs and expectations?
- What are the critical-to-quality (CTQ) characteristics in our core processes and how do we define and measure defects in these characteristics?
- Why do such defects occur in our processes and at what frequency do they occur?
- What is the impact of such defects on customer satisfaction?
- What strategies should be developed and implemented to prevent the occurrence of such defects?

Benefits of Six Sigma in the service industry

Service-oriented businesses adopting Six Sigma business strategy will have the following benefits:

- improved cross-functional teamwork across the entire organisation;
- transformation of organizational culture from fire-fighting mode to fire-prevention mode;
- increased employee morale;
- reduced number of non-value added steps in critical business processes through systematic elimination, leading to faster delivery of service;
- reduced cost of poor quality (COPQ) (costs associated with late delivery, customer complaints, costs associated with misdirected problem solving, etc.);
- increased awareness of various problem solving tools and techniques, leading to greater job satisfaction for employees;
- improved consistency level of service through systematic reduction of variability in processes; and
- effective management decisions due to reliance on data and facts rather than assumptions and gut-feelings.

Six Sigma applications: manufacturing vs service sector

Most literature on quality management and improvement philosophies are originally designed to improve product quality in the manufacturing sector. However, many quality gurus and specialists had advocated that the key principles of quality management could be implemented successfully in the service sector as well (Deming, 1986; Feigenbaum, 1983; Ishikawa, 1985). In this section, we will briefly compare the manufacturing and service applications of Six Sigma. In the manufacturing sector, it is quite common to have some sort of measurements in place, which provides an indicator of process performance and product quality. In service industry, measurement is often an overlooked area and therefore, improvement of quality is not adequately addressed by many service-oriented businesses. In the manufacturing processes, it is quite common to have process maps before a Six Sigma project is initiated. The use of flowcharts and process maps are uncommon in many service processes. In the

manufacturing industries, the measurement system analysis (repeatability and reproducibility study) is explicitly defined, whereas in service industries, the measurement system analysis is often a more general problem of data quality and integrity. The data from non-manufacturing processes follow non-normality and such non-normality situations can be mitigated through the effective use of data-transformation techniques (e.g. Box-Cox transformation). Service processes are subjected to more noise or uncontrollable factors compared to manufacturing processes. Human behavioural characteristics, such as friendliness, eagerness to help, honesty, etc. are thought to have major influence on service processes which determine the quality of service provided to customers. In service processes, the emphasis must be on timeliness characteristics (e.g. delivery time) and service non-conformity characteristics (proportion of customer complaints every month, number of billing errors, etc.).

Research methodology and data collection

In this study, a total of 200 well-designed questionnaires were sent to service organisations based in the UK. The list of companies was obtained from FAME database. The response rate from the pilot study was about 14 per cent (i.e. a sample size of 28 companies). However, the data from only 23 companies were useful for the analysis. The following are the objectives of this pilot study.

- What is the status of Six Sigma in the UK service organisations? (This includes the key metrics used, savings generated on average from the projects, number of Black Belts and Green Belts actively engaged in the Six Sigma program, etc.)
- What are the common statistical and non-statistical tools and techniques employed by service companies in their Six Sigma projects?
- What are the key drivers for the implementation of Six Sigma in the UK service organisations?

For this pilot survey, it was decided to use mail and self-administered questionnaire (postal survey) as the data collection instrument. The advantages of this approach to data collection are (Nueman, 2003; Sarantakos, 1998):

- inexpensive;
- results are produced quickly;
- questionnaires are completed in the respondents' convenience;
- anonymity is greatly assured; and
- respondents are at liberty to provide objective views on sensitive issues, etc.

The first part of the questionnaire was designed to collect fundamental information such as the type of service industry, size of the company, the position of the respondent in the company, whether the company is applying Six Sigma, whether the company has a quality department, whether the company has a formal quality management system in place, number of projects being completed in a year, six sigma metrics used within the company, financial savings generated from Six Sigma projects, etc. The second part of the questionnaire consists of 40 variables or statements, which were extracted from the published literature of leading Six Sigma practitioners and academics (Breyfogle *et al.*, 2001; Eckes, 2000; Harry and Schroeder, 2000; Pande *et al.*, 2000; Smith *et al.*, 2003; Snee and Hoerl, 2003). The 40 variables were grouped under

13 critical success factors (CSFs) using the affinity diagram tool. The type of industries participated in the survey include transport, banking, utilities, insurance, hospitality, financial services, training and consultancy, etc. Most of the respondents came from large companies with more than 1,000 employees (80 per cent). The distribution of the respondents to the questionnaire was black belts (35 per cent), project champions (28 per cent), general managers/directors (18 per cent), quality managers (12 per cent) and others (7 per cent). It was also observed that more than 80 per cent of all the companies participated in the survey have implemented a formal documented quality management system. About 70 per cent of the companies involved in the study has less than three years experience with the Six Sigma initiative, 23 per cent of the companies has been involved with the Six Sigma program for three to five years. For over five years 7 per cent of the companies claimed to have been using Six Sigma.

The results of the analysis have revealed that 60 per cent of the companies had their core processes operating between 3 and 3.5 sigma capability levels. About 15 per cent of the respondents claimed to have their core processes operating between 3.5 and 4 sigma capability levels. The remaining 25 per cent of the respondents were not unsure of the sigma capability levels of their core processes. The most common metrics used by the organisations employing Six Sigma include:

(1) COPQ;
(2) defect rate;
(3) time to respond to customers' complaints;
(4) number of customer complaints;
(5) process yield; and
(6) process capability, etc.

The most commonly used tools and techniques in the service organisations are:

- brainstorming;
- process mapping;
- affinity diagrams;
- root cause analysis;
- control charts;
- benchmarking;
- pareto analysis; and
- change management tools (GE work-out, CAP), etc.

The least commonly used tools and techniques include:

- quality function deployment;
- Hoshin-Kanri (policy deployment);
- Kano Model;
- design of experiments;
- statistical process control; and
- Poka-Yoke (mistake proofing), etc.

The respondents were asked why they were implementing Six Sigma. The most common responses are shown in Figure 1.

Essential ingredients for the successful deployment of Six Sigma

The respondents were asked to rank the 13 CSFs on a scale of 1-5 (1 = least important, 2 = less important, 3 = important, 4 = very important and 5 = crucial). Table I 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.

The most CSF (mean score of more than four) for the effective deployment of a Six Sigma program from the pilot study are highlighted (in italics) in Table I. The analysis of the study has shown that linking Six Sigma to business strategy is the most critical success factor. This would be aligned with Mikel Harry's definition of Six Sigma as a breakthrough improvement business strategy. Six Sigma creates a sense of urgency by emphasising rapid completion of projects in four to six months (Snee and Hoerl, 2003). Therefore, it was not surprising that "project management skills" was rated very high. Many studies in total quality management (TQM) have shown that "customer focus" is one of the key ethos and therefore, Quality should begin and end with customers (Dale, 1994; Oakland, 2003; Tsang and Antony, 2001). Most service organisations also define quality in terms of customer satisfaction (Rust and Oliver, 1994) and therefore their customer-oriented approach to quality.

Project selection and prioritisation criteria

The selection of right projects in a Six Sigma program is a major factor in the early success and long-term acceptance within any organisation. According to Adams *et al.* (2003), "doing black belt training before project identification is the classic – getting the cart before the horse". The project selection process should be listening to three important voices: the voice of the process, the voice of the customer and the voice of the strategic business goals. The following guidelines may be used to select Six Sigma projects.

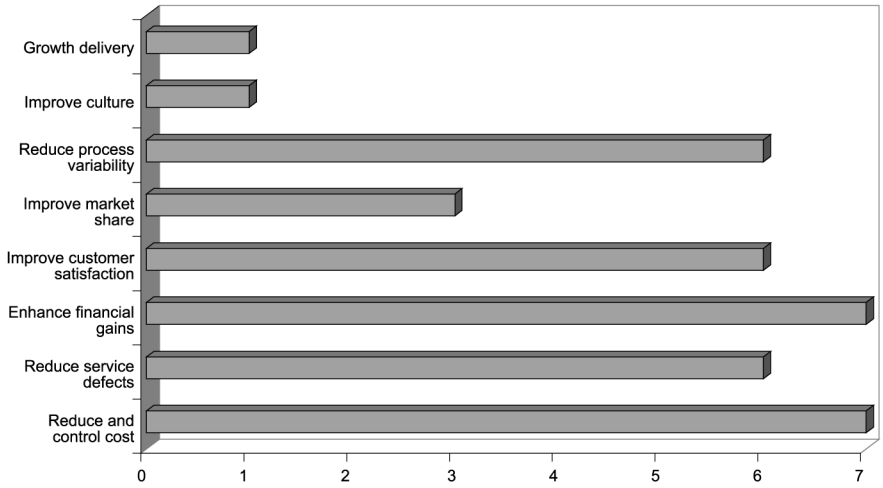

Figure 1.
Reasons for applying Six Sigma

Ranking	CSFs	Mean	Standard deviation
1	*Linking Six Sigma to business strategy*	*4.55*	*0.6852*
2	*Customer focus*	*4.40*	*0.6583*
3	*Project management skills*	*4.40*	*0.5164*
4	*Executive leadership and senior management commitment*	*4.22*	*0.7208*
5	*Organizational infrastructure*	*4.15*	*0.5297*
6	*Project selection and prioritisation*	*4.05*	*0.7246*
7	Management of cultural change	3.70	0.8346
8	Integration of six sigma with financial accountability	3.50	0.8233
9	Understanding the DMAIC methodology	3.15	0.6162
10	Training and education	3.10	0.5789
11	Project tracking and reviews	3.02	0.7865
12	Incentive program	2.96	0.4534
13	Company-wide commitment	2.85	0.2349

Table I.
CSF for Six Sigma deployment

(1) Linkage to strategic business plan and organizational goals.

(2) Sense of urgency – how important is the proposed project for improving your overall business performance (both financial improvement and service process performance improvement)?

(3) Select projects which are doable in less than six months. If the project scope is broader, the time to completion increases, the cost of the project deployment will increase. This would lead to frustration among the key players due to lack of progress, diversion of manpower away from other activities, delay in realisation of financial benefits, etc.

(4) Project objectives must be clear, succinct, specific, achievable, realistic and measurable.

(5) Establish project selection criteria – the following criteria may be considered during the project selection process:

- impact on customer needs and expectations;
- financial impact on the bottom-line;
- duration of the projects considered;
- resources required for projects under consideration;
- expertise and skills required to carry out the projects;
- probability of success of projects under consideration; and
- risk involved in projects, etc.

(6) Projects have the support and approval of senior management.

(7) Define project deliverables in terms of their impact on one or more critical characteristics in the service such as CTQ, critical-to-cost or critical-to-delivery.

(8) Projects must be selected based on realistic and good metrics (DPMO, SQL, Capability Indices, etc.).

The respondents of service companies were asked about their project selection and prioritisation criteria. The following factors were considered by the respondents in selecting the right projects:

- impact of the project on bottom-line;
- impact of the project on customer satisfaction;
- cost involved in running the project;
- COPQ;
- alignment of strategic business goals and objectives;
- risk involved in the project; and
- level of expertise required for project, etc.

Conclusions and further research

Six Sigma is a business strategy and a systematic methodology, use of which leads to breakthrough in profitability through quantum gains in service quality, product performance, productivity and customer satisfaction. Today Six Sigma has been considered as a strategic approach to achieve excellence in operations and service performance through the effective utilization of statistical and non-statistical tools and techniques. Six Sigma in service industry (especially in healthcare and financial service sectors), is rapidly emerging as the new wave of change in Six Sigma. This paper presents the results of a Six Sigma pilot survey carried out in the UK service industry. A total of 40 variables, consisting of 13 CSFs, were considered in the study. This study was carried out with some boundaries such as the number of companies, available resources, time constraints and so on. Because of limited budget and time constraints, a postal survey was carried out for this study. However, semi-structured interviews with employees in the companies would have enabled us to have a deeper insight into the practice of Six Sigma business strategy. According to Gillham (2000), the scaled questions have disadvantages because respondents often do not use the whole scale, whatever response they tick, we do not know why a particular response was chosen. The next step of this research would be to carry out a number of semi-structured interviews with people at different levels of Six Sigma knowledge and expertise.

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