

Six Sigma Measurement in a Service Organisation

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ABSTRACT

Six sigma was developed in manufacturing industry and provides a structured approach to business improvement focusing on customers' needs, data collection and analysis. Recently six sigma has become popular in service organisations with some high profile success stories being reported e.g. GE Capital. We report research into the implementation of six sigma in an Australian financial institution. We explain how the performance management system was developed and used. The organisation has committed significant resources to the six sigma program and have addressed many of the critical issues for successful implementation. An integrated approach was used to develop the performance measurement system alongside a workflow system. Current results indicate that the six sigma program is likely to achieve its objectives.

Keywords: Six Sigma, Service Organisation, Case Study, Performance Measurement

INTRODUCTION

Six sigma was developed in manufacturing industry and provides a structured approach to business improvement with a focus on customers' needs, data collection and analysis. In recent years six sigma has become popular in service organisations with some high profile success stories being reported e.g. GE Capital, American Express and Bank of America. Implementing six sigma in service organisations can be challenging because of the intangible and variable nature of many service processes (Fitzsimmons and Fitzsimmons (2006). In this paper we report on the implementation of six sigma in an Australian financial service organisation, which we call organisation X. Organisation X has made a significant investment in six sigma and has sought to make six sigma activities part of their work culture. In particular, they have worked hard to develop a performance measurement system to manage six sigma initiatives and to evaluate its effectiveness.

The development and operation of this measurement system is the focus of the research reported in this paper. The broad objective of this paper is to understand better the process of implementing a six sigma program in an organisation that is highly committed to this approach. A case study approach was used for the methodology. Data was collected through interviews with senior managers involved in the six sigma program and also through examination of six sigma documentation. The case study results are compared with published literature and suggestions are made for further research in organisation X. The paper starts with a review of relevant literature, the case study findings follow in a results section, discussion of the findings and conclusions follow in a combined section. The authors are grateful for the generous access to information provided to them by the management of organisation X.

LITERATURE REVIEW

The literature review will explain briefly the six sigma approach to improvement, and as the focus of this paper is on performance measurement, relevant literature in this area will also be reviewed. There is a growing body of research that addresses the reasons why improvement programs fail or succeed (e.g. Beer 2003). In addition, literature pertaining to this area will be reviewed.

According to Evans and Lindsay (2005), Bill Smith, a reliability engineer at Motorola is credited with originating the concept of six sigma during the mid 1980s. The concept was further refined and publicised by Motorola, mainly from a manufacturing perspective (Harry n.d.). The central idea of the six sigma

approach is to design processes, or improve existing processes, to obtain very high process capability and hence defect rates that are close to zero. A six sigma target defect rate of 3.4 defects per million components/incidents is often cited. Evans and Lindsay (2005 pp. 479-484) provide a detailed explanation of how this figure is obtained. General Electric (GE), under the leadership of CEO Jack Walsh was the organisation that arguably did most to popularise six sigma (Raisinghani et al. 2005). Six sigma has undergone various developments since its inception but still has a statistical focus. As Raisinghani et al. (2005) points out it is difficult to define six sigma in simple terms. In part this is probably due to the fact that six sigma is not controlled and developed by a central body, like for example ISO 9000 is.

The DMAIC (Define, Measure, Analyse, Improve and Control) methodology is used to structure six sigma improvement projects. There are various analysis tools to aid problem identification and improvement e.g. pareto analysis, and root cause analysis. Like other approaches to business improvement e.g. TQM and ISO 9000, six sigma has a strong customer focus, and contains key concepts related to strategy, organisational change, training and setting stretch objectives (Evans & Lindsay 2005, p. 133). Perhaps the most fascinating and successful development in six sigma has been the introduction of the 'belt' system used in training i.e. green belt, black belt and master black belt – presumably an idea copied from martial arts.

One well published variant of six sigma is lean six sigma; in which lean principles (see Hines, Holwe & Rich 2004 for a review of the lean approach) have been combined with the six sigma approach (Arnheiter & Maleyeff 2005; Basu & Wright 2003). Although advocates of lean six sigma claim benefits there seems to be little empirical research that has been carried out to test their claims.

In recent years six sigma has become popular with service organisations e.g. GE Capital, American Express and Bank of America with some organisations reporting considerable savings (Evans & Lindsay 2005). Antony (2004) reports on a survey of six sigma in UK service organizations and argues that six sigma offers a disciplined approach to improve service effectiveness. Antony suggested a number of benefits arise from implementing six sigma in service industries. The survey results rank the importance of various functions of six sigma deployment. The three top ranking aspects were: i) linking six sigma to strategy, ii) having customer focus and iii) strong project management skills.

Performance measurement is an important component of improvement methodologies particularly in six sigma programs. According to a review by Marr and Schiuma (2003) business performance measurement is a topic of increasing interest both to business managers and academics. A major challenge has been the design of a comprehensive performance measurement framework for an organisation – rather than a disconnected collection of measures. Rouse and Putterill (2003) present a good review of the literature in this area. The Balanced Scorecard (Kaplan and Norton 1992, 1996) is arguably the most well know measurement framework (Marr & Schiuma 2003) and has been widely used in industry. The balanced scorecard approach broke new ground by departing from the obsessive concentration on financials to advocate having measures in four key areas namely: financial, customer, internal business and innovation and learning.

Interesting work has been done by Neeley and colleagues (Neely, Adams and Crowe 2001) on a model they call the 'the performance prism'. Designing suitable measures at the micro level (individual metrics) is challenging. A range of issues need to be considered when selecting appropriate measures e.g. consistency of measurement, timing, frequency, cost of data collection and vulnerability to falsification and error. In their usage measures can be linked to various kinds of rewards and so can have a significant impact on employee behaviour. The power of performance measures to influence behaviour, sometimes unwanted behaviour, has been graphically illustrated in the classic article by Kerr (1995). The intangible nature of many services makes performance measurement particularly challenging (Silvestro et al. 1990).

There is currently much interest in identifying factors that lead the success or failure of improvement programs. Much of the published work on this topic in the operations area has been directed towards TQM programs. However given the similarity between all of the main improvement approaches it is likely that the learning from the TQM area can be related to six sigma programs. There has been some research on critical success factors for six sigma implementation. For example, Coronado and Antony (2002) in their UK investigation identified eleven critical success factors i.e. management involvement and commitment, cultural change, communication, organisational infrastructure, training, linking six sigma to business strategy and to customers, suppliers and to HRM, understanding tools and techniques, project management skills, and project prioritisation and selection.

The above list is not unlike similar research into TQM except employee involvement is usually included as an important factor in TQM studies. Some writers, such as Beer (2003), argue that the main factor contributing to the unsuccessful implementation of improvement programs is not the technical nature of the program itself, but poor implementation by management. Beer presents four propositions related to managements' role that are required for effective TQM implementation. The propositions relate to senior managements' role in developing commitment to TQM, following up their initial commitment with appropriate action and facilitating honest discussion and learning about TQM effectiveness. He argues that these management capabilities should exist in all subunits of an organisation in order for successful TQM transformation to take place. Beer's argument suggests that a widespread change in the way things are done in an organisation is usually needed i.e. a culture change, for large-scale improvement initiatives like six sigma to be successful.

METHODOLOGY

Five face-to-face semi-structured in-depth interviews were undertaken with key management personnel who were the drivers of the Six Sigma quality improvement program. Semi-structured interviews were determined to be the most appropriate methodology as it allowed exploration a number of issues at length. A question guide was constructed around the research aims. A series of 10 questions were asked of the interviewees. The objective was to explore a number of key issues in relation to service measurement. Primarily this was concerned with how organisation X approached the task of measuring quality within the Six Sigma - Define, Measure, Analyse, Improve and Control (DMAIC) framework.

The interviews were all digitally recorded and transcribed. Content analysis was undertaken on the interview transcripts, which involved analysing, evaluating, interpreting and contrasting the information collected by theme and across interviewees. The content analysis enabled qualitative linking of the key issues that surfaced from each interview with the research aims, in addition to assisting interpretation of Organisation X's approach to service measurement.

Organisation X's approach to its quality program and measurement is extremely advanced. A suite of 500 quality reports are produced by the organisation on a monthly basis. These reports track the quality of each process within the organisation. The data collected during the interviews were supported by an examination of these quality reports to develop a fuller understanding of the organisation's approach to performance measurement and corroborate the descriptions of the formal measurement systems given by the managers during the interviews. This source therefore served as a means of triangulation.

RESULTS

Organisation X is a financial services organisation operating internationally. It offers customers choices in personal and corporate superannuation, margin lending, share broking, managed funds and investment platforms. The six sigma program had been running for two years and was seen as a development of a TQM program started three years earlier. Considerable funds had been allocated to the six sigma program

(over \$50 million) with an expected yearly return of approximately \$15 million. Company X also committed significant human resources to the six sigma program. The program was headed by a company executive and supported by the Head of Operations and the Head of Quality. There was a small change management team of 3 full-time staff and a project team consisting of 18 project managers and 18 process analysts. A number of the team members were green belts, there was no resident black belt. An external black belt consultant was used to undertake periodic reviews.

Program Objectives

The main reasons given for implementing six sigma were:

- 1) To reduce the cost of poor quality.

Cost was a big driver. We have a large volume of transactions and therefore the cost of quality is enormous. Re-work costs the business a considerable amount of money. Re-work transactions typically cost around 5 to 10 times more than a clean transaction would. We realised that big cost savings could be achieved by eliminating the poor quality transactions and that's a massive saving.
(Interview with Manager B)

- 2) To improve customer experience.
- 3) To make quality a culture within the organisation.

Improving customer experience

It's important that the business takes quality from the customers' perspective. It's the customer that counts. At the outset (5 years ago) I think that we unnecessarily limited the scope to be mainly internally driven inefficiency, rather than taking it from end to end, from the time it starts with the customer to where it ends with the customer. (Interview with Manager A)

Improving customers' experience was a major driver of the program and was based on research and a belief that a good service experience would lead to repeat business. Consequently quality from the customers' perspective became a strategic theme of the organisation and the following three objectives were developed:

- 1) Making it easy for customers to invest
- 2) Getting it right, first time, every time
- 3) Making our customers feel valued

The framework for the six sigma program focused on customers' needs and had three key themes:

- 1) Ask once – this is about ensuring that if a customer has any queries or questions then the organisation can answer them with first call resolution in mind
- 2) Touch once – this is about ensuring that customer applications and customer information is processed correctly the first time, on the first touch by the organisation
- 3) Touch never – straight through processing in which customer applications are sent from the desktop for processing in real time. This was the preferred approach where possible and cost effective.

Making a quality culture

Our quality program was originally really limited to a quality process improvement team. However, what I saw was a nice little unit and program with all the right skills, but it wasn't a culture. I wanted to make it a culture. (Interview with Manager A)

When the six sigma program was introduced into the organisation it was limited in scope to the quality process improvement team; an elite team who worked on specialist projects. This team had all the right skills however the management team realised that a culture of improvement had not permeated beyond this team into the organisation. The management team also noticed that defects were often only identified at the end of a process.

Manager C noted that management guru Deming emphasized that quality should be built into processes, rather than checking it at the end. The management realised that if significant change was to be made staff more generally needed to become involved in the program. Consequently the program was extended beyond the operations focused improvement team to product management, design and technology.

Emphasis was placed on quality starting and ending with the customer. One strategy used to achieve this was to engender the six sigma approach in almost everything the organisation did, right through to marketing. An unusual but successful strategy used was to employ the idea of viral marketing to change culture within the organisation. Management identified employees at all levels and in different departments in the organisation who were considered to be influential. These employees were encouraged to actively promote the goodwill of the quality program in their day-to-day work roles.

Performance Measurement

A lot of firms go and recruit their black belts and green belts and then say go forth and improve, but the don't actually have any baseline of what is the current level of quality. (Interview with manager A)

The management team realised in the early stages of setting up the quality improvement program that having a sound approach to performance measurement would be critical. This was based on the belief that in order to be able to improve processes an organisation needed to implement solid baseline measurement. This would help to select appropriate projects and assess the effectiveness of improvement activities.

Organisation X needed to be able to quantify the efficiency and effectiveness of the organisations actions. The consensus was that it did not make sense to look at industry benchmarks as the organisation had unique processes. There had been extensive debate on how to define particular measures. At the outset of the quality program fortnightly meetings were held with key stakeholders in the organisation to tease out what metrics would enable the organisation to develop information which would be useful for the six sigma program and also for key decision makers within the business. Metrics were developed to assist with the in tracking the performance of the overall improvement program, quality and the customer experience.

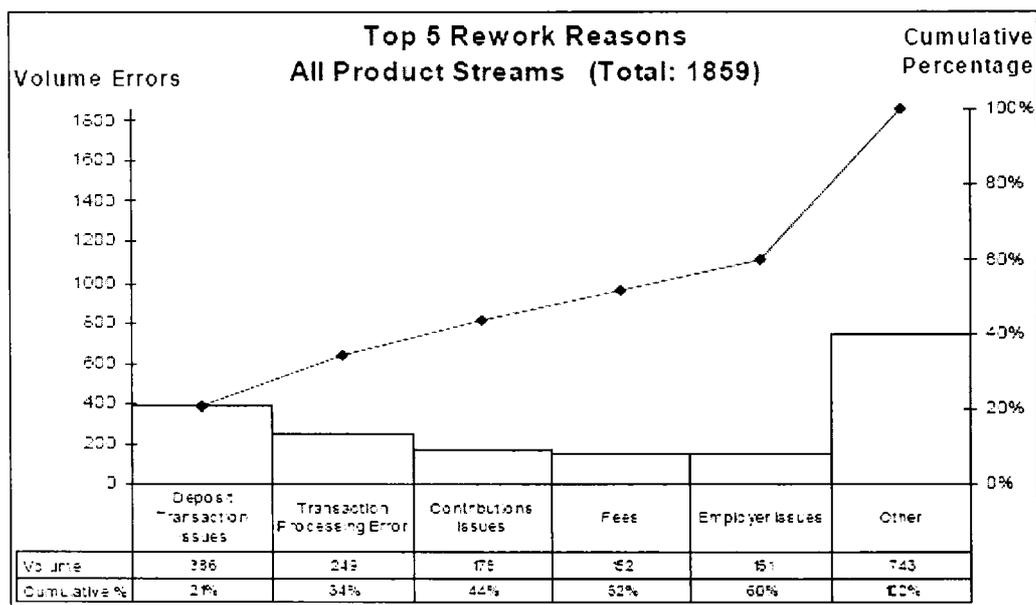
In terms of quality a range of metrics were developed around key processes to track errors causes by product type and by error category, an example is shown in Figure 1. Additional metrics for example, workflow volumes, capacity and complexity indicators, were used to assess aspects of quality costs.

In terms of measuring customer experience, the management group determined that service delivery performance was what the organisation was judged on and therefore this should be the primary focus for measurement. Having transactions completed 'quickly' was found to be a key customer requirement. This consideration led to an examination of customers' service expectations and the development of appropriate service standards.

The approach to measurement was one of continuous review and improvement. It was pointed out that the performance measurements had changed significantly over time. As the organisation gained a better understanding of its markets and customer groups this knowledge was used to improve the effectiveness

of the performance measurement system. It was better to start with something that worked rather than a perfect measurement system.

Figure 1 Example of graphical output



The Workflow System (WFS)

A major task was to capture relevant information and measure the performance of the various processes. To do this the organisation set about building a workflow system (WFS) that would enable information on process performance to be captured. This system has enabled the organisation to measure how many transactions have been processed, how much time is being spent processing transactions and how many times transactions are 'touched' by employees. The workflow system enabled collection of data in various formats that support the objectives of the performance measurement system.

One of the key ways the WFS has been facilitated for dealing with mailed correspondence was through the formation of an alliance with the national postal organisation. Mail sent to organisation X by customers is scanned and given an identification code within the postal system. The postal system interfaces with organisation X's WFS to enable tracking and monitoring of transactions throughout processing. The alliance involved setting up a service level agreement with the postal organisation and establishing work prioritisation protocols.

The WFS allows company X to organise work efficiently and make good use of their resources. Work is distributed to the right employees; complex tasks to specialists and easier tasks to the less skilled. It was pointed out industry research had estimated that 60% of operations expenses were due to the poor organisation of work. So the WFS brought improvements in customer service performance, quality and enabled better capacity management.

Process mapping of all product lines has been undertaken using a process-mapping tool. Each business unit is responsible for ensuring that their processes are updated and maintained on the organisations

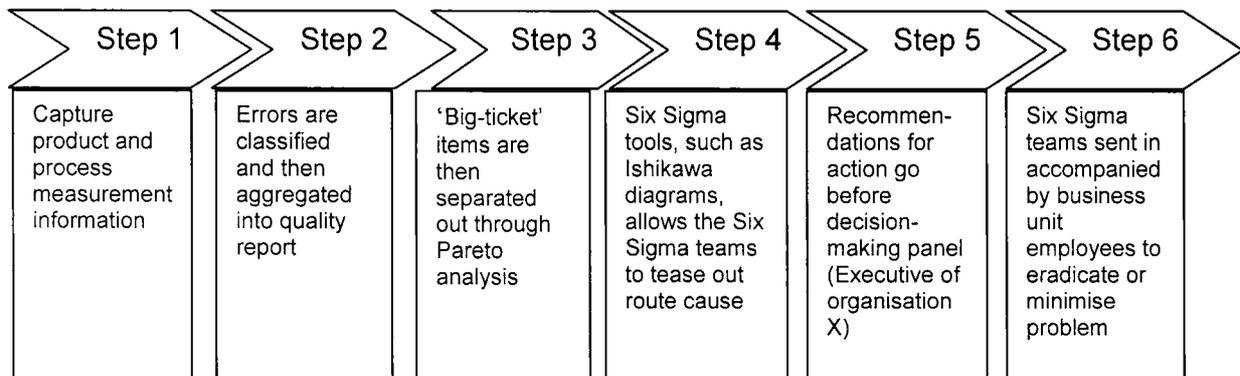
intranet homepage. The process mapping system also enables simulation of the effects of process changes to be undertaken.

Performances of processes are measured electronically by product, transaction type and by operator. This allows the organisation to quantify efficiency and effectiveness of its processes. The following types of metrics are measured: delivery speed, cost/productivity, capacity, complexity, volume of work, process indicators, service performance and quality. Each of these measures has a number of sub-metrics each with a precise definition. There were approximately 25 of these sub-metrics in operation. Sophisticated graphics are compiled from measurements. For example, one graph examined showed transaction volumes and percentage rework (broken into internally caused rework and externally caused rework) on a monthly basis over a 12 month period; another showed a Pareto analysis of the top five reasons for rework for all product streams combined. It was evident that the measurement system and the process mapping together play an important role in process improvement.

Measurement Aids Root Cause Analysis

Quality reports produced on a monthly and quarterly bases provided information for the improvement teams to perform root cause analysis. Root cause analysis is undertaken using a series of six sigma tools such as Ishikawa diagrams and Pareto analysis. Once a root cause of a problem (e.g. customer service, quality etc) is identified recommendations are sent to a decision making panel of executives who decide on whether a solution warrants resourcing. Decisions are made on the basis of ease of implementation and effectiveness of the solution. This process is show in Figure 2. After improvements have been made (Figure 2, step 6) data is collected on the changed process to confirm that the planned improvement has been achieved.

Figure 2 Six sigma improvement process



Challenges to Measurement and Improvement

Implementing an effective measurement and improvement system was not without significant challenges. The three senior managers interviewed all cited the nature of service operations as a significant challenge. The following comment illustrates the nature of the difficulty:

I think the challenge is that in a manufacturing process if its not high quality you see it pretty quickly. For example, if you are making a car and the car has a fault and does not work I think the tangibility of the product makes that defect pretty damn obvious. Where as with financial services, you don't

really have a tangible product produced at the end, or the process to stop a defect before the customer receives the service". (Interview with Manager A)

DISCUSSION AND CONCLUSIONS

It is evident that Organisation X has put significant resources into their six sigma program and has approached its development in a systematic way. The organisations approach places an emphasis on customer experience, which was largely influenced by management's key learning's from Jack Welsh's implementation of six sigma at General Electric.

A number of observations can be made about the organisations approach to change management. It was understood by management that a change of work culture was needed and this was resourced by a change management team. Various strategies such as the viral marketing approach within the organization were also effective in bringing about change.

Management recognised that aspects of their business were unique and did not rely on a benchmarking approach. Over the relatively short time since the six sigma program was started management has clearly been actively involved in leading the change and providing what seems to be quite adequate financial and human resources. The literature suggests that this pro-active approach is likely to lead to success. Deming (1986) emphasised the importance of understanding your own business and the importance of constancy of purpose to a long-term program.

Zbaracki (1998) pointed out that rhetoric early in a change management program is appropriate but this rhetoric needs to be backed with appropriate action as a program proceeds. The level of resourcing and evidence of the progress made in implementing systems shows commitment and progress well beyond rhetoric. Generally therefore the data collected suggest that the organisations have conducted change management along the lines suggested in the literature (e.g by Beer 2003, Coronado & Antony 2002). Information would need to be obtained from a wider group of employees in the organisation to assess specific aspects of the change process more fully as the employee view presented here is that of senior management.

The findings confirm previous literature (e.g. Silvestro 1990) that measuring performance in a service organisations can be a more challenging than in manufacturing organisations. Some of the reasons were:

- The inherent variations that comes with many service processes
- The intangibility of financial service transactions, described by one manager as a bunch of electrons
- The difficulty for service organisations to obtain accurate objective data and the unavoidable reliance on some subjective data
- The time, cost and complexity associated with defining performance metrics
- The complexity of setting up a performance measurement system

It was pointed out that some of the operations had similar characteristics to manufacturing e.g. there were some highly repetitive high volume processes that were to a large extent automated. The management's view was that it is more challenging to set up a performance measurement system in a service setting but not impossible.

In respect to how organisations should set up a performance measurement system, management at organisation X shared the views of Neely, Gregory and Platts (1995) that there is no universal approach. Organisation X took a pragmatic approach, setting up baseline measures first and then refining the system as they gained experience of its performance. It was likely that the management had a good understanding

of the balanced scorecard approach but they did not try to build a perfect system to start with based on this or any other model. Management pointed out that their current model was still being improved.

An important aspect on organisations approach to the measurement in the context of the six sigma program was the consideration given to integrating the measurement system with the new workflow system. The workflow system and the measurement system were related in a symbiotic way – measurement was needed to assess and improve workflow performance and the workflow system needed to be designed in a way that supported cost effective measurement.

As explained in the literature review, a core idea of six sigma is to reduce defects to almost zero. Management pointed out that this was not always the main goal. They explained that not being able to achieve a quality target of 3.4 defects per million opportunities in services had nothing to do with not being able to analyse the root cause of a problem. They argued that what is more important is the cost trade off - does improvement lead to significant benefits? Also the cost of pursuing a six sigma target would probably be prohibitive. While the organisation has not found the perfect model for six sigma, the current performance measurement system provides confidence to management that the business is spending money in the right area, which is confirmed in efficiency gains. Organisation X has the ability to look at data output from processes and say, firstly what benefit will improving this process bring to the customer and secondly, what benefit will this bring to the organisation?

The six sigma program is relatively new and although there is good evidence that significant improvements have been made in process more time is probably required to evaluate its overall impact on the organisation. A number of issues raised in the research warrant further investigation. For example carrying out a more detailed investigation of culture change process or soliciting the views of a broader group of employees (in different functions, at different levels) in the organisation on the six sigma program. Limitations of the research are acknowledged. This was essentially a senior management view, although supplemented by key documentation. It is accepted that generalisation of results from a single case can be problematic.

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