

A Methodology to Support Six Sigma Implementation in SMEs as eLearning

Runchana Sinthavalai

Department of Industrial Engineering, Faculty of Engineering,
Prince of Songkla University, Hatyai, Songkhla 90112
runchana.s@psu.ac.th

Abstract

This study is concerned with the development and evaluation of Six Sigma implementation in SMEs. The model in this study is intended as a methodology to support the applications in SMEs. SMEs have limitations when employing the Six Sigma programme due to the limited time, cost and effort, and other barriers from SME characteristics (e.g. organisation culture, structure and strategies). Therefore, SMEs need a methodology to guide and facilitate the implementation of Six Sigma, particularly in the proper way, which might not be the full system of Six Sigma. To overcome with the costs of hiring the consultancy and training, which is the high investment costs in Six Sigma implementation, self-learning is an alternative solution for SMEs. Hence, the proposed system has been developed as the web-based system. Through eLearning, employees in SMEs can learn and get started to employ Six Sigma in their organizations.

1. Introduction

1.1 Study Background

Since the beginning of the 1990s, the Six Sigma initiative has been introduced and practiced as a QMS, which makes use of a collection of quality management and

statistical tools (Antony and Banuelas, 2002; Eckes, 2001; Goh and Xie, 2004). Rather than focusing on simply improving quality, the Six Sigma initiative focuses on improving profitability and achieving strategic objectives (Eckes, 2001; Pande *et al.*, 2002). Although Six Sigma has been employed broadly in many organisations, there are some myths and facts about Six Sigma that need a more rigorous study. From a comprehensive review of literature (e.g. Antony, 2004¹; Antony, 2004²; Antony and Fergusson, 2004; Snee and Hoerl, 2003; Wessel and Burcher, 2004), six crucial criticisms of Six Sigma applications have been summarised:

- Applied only in manufacturing;
- Requiring massive training;
- Requiring complicated and difficult statistics;
- Being a new quality programme;
- Bothering routine work, and;
- Working only in large organisations.

Thus, these aspects limit the applications of Six Sigma in only some types of organisation. Particularly, these discourage the applications in SMEs.

Pfeifer *et al.* (2004) stated that Six Sigma will play a role for SMEs as a competitive criterion in the future. This is supported by Wessel and Burcher (2004); they proposed that SMEs need to go towards an improved approach for quality and the Six Sigma initiative is a good choice. Since many large

organisations employ Six Sigma as QMS, it is a logical consequence that large organisations would encourage their suppliers, which are most likely SMEs, to apply the well-proven QMS or Six Sigma. However, there are barriers to Six Sigma implementation in SMEs, as can be concluded for significant aspects:

- High investment costs;
- A lot of effort required;
- Full-time effort required, and;
- Inefficient teamwork.

These barriers need to be overcome. Thus, there is the consideration to study and research the applications of the Six Sigma initiative in SMEs and to design a methodology to support Six Sigma in such enterprises. The introduced system will consider the possibility of implementing Six Sigma in SMEs.

1.2 System Objectives

The objective of this study is to develop a methodology to support the applications of Six Sigma initiatives in SMEs. Several barriers that make SMEs very difficult to implement Six Sigma tend to be under the umbrella of management support. The author has been convinced that the management acceptance and commitment can change any factors to positively support the Six Sigma applications. Then, to gain management acceptance, the study focuses on what management considers mostly when making the decision for launching any initiatives, namely the financial perspective and the disruption of other existing systems. In the financial perspective, money to hire consultants, extra staff or highly educated-employees, to setup new a training system, infrastructures or even wages to pay for employees that are away from regular jobs to initiate a new system are examples of the expenses when employing a new initiative. For the disruptions when launching the new initiatives, the extra work, new training

curriculum, establishing infrastructures are examples. As a result, this study has promised to guide a Six Sigma implementation under the SMEs' constraints and to avoid big investments, big changes or disruptions to an organisation.

Thus, solutions for implementing Six Sigma in SMEs have been proposed as follows:

- *Avoiding complicated system*, e.g. providing simple explanation terms, adopting only some parts, disciplines, tools or methods;
- *Solving cost constraints*, e.g. avoiding the external training and consultants by providing the coaching system, self-learning or internal-training material;
- *Avoiding extra time or more loads*, e.g. integrating Six Sigma activities as part of regular jobs, no external training course.

Consequently, these perspectives have been developed as a system. It could be said that the system provides the modified Six Sigma disciplines and comprehensive content to support Six Sigma applications in SMEs. The key distinct features provided by the system can be summarised as:

- Being a knowledge hub for learning Six Sigma and its supporting issues;
- Being a one-stop shop to bring together information and knowledge about Six Sigma implementation and other supporting issues;
- Providing simple explanation terms for Six Sigma concepts and disciplines - avoiding statistical and theoretical terms;
- Guiding the simple and visible approaches, steps and methodologies to implement Six Sigma;
- Highlighting the insights of how Six Sigma is relevant to regular operations; for example, guiding how to set Six Sigma projects from

regular operations, proposing the habitual problems, using process-based knowledge maps, linking to performance measurement;

- Adopting internal training and self-learning systems to an organisation by providing the material to support these systems.

2. System Platform

The technologies to support the system might range from an advanced assembly of software to the hardware infrastructure. Additionally, technology might be only one or a combination of several key technologies. However, one of the objectives of this system is to provide support and applications to SMEs. Therefore, simple implementation and low resource demand, particularly time and cost, are important in designing the system. The compatibility to use these artificial intelligent tools in SMEs is also significantly considered. In addition, Offsey (1997) noted that executives are aware of the disruption to other current systems when introducing new technology. Thus, these key factors constrain the selection of technology to support the system designed. Due to several characteristics whereby Intranet can recover these factors and several benefits that it enables the users and developer to achieve, Intranet or Internet technology is chosen to be the platform of the PC-based system for this study.

2.1 Intranet and Internet

Internet and intranet are two technologies that are compatible with the system proposed in the study for some key reasons. Firstly, they allow for natural expansion; secondly they are flexible and easy use; thirdly they allow in-house development; fourthly they minimise the cost of developing the compatible system; and fifthly they enhance employees' participation

and commitment. Internet enables people to access organizational information and knowledge located in a variety of sources (Dash, 1998). With a combination of online publishing, document repositories, e-mail links, discussion groups, search engines, collaborative applications, conferencing, and the web browser, Internet and intranet seem to be the flexible and effective platform system. (Meso and Smith, 2000; Sarkar, 2000). Offsey (1997) supported that Intranet technologies can dramatically lower the barriers for sharing information and knowledge.

In SMEs, Intranet and Internet seem to be popular, particularly for simple tasks such as sharing documents or document publishing. Information and knowledge can be shared, displayed and accessed across a simple common interface. To address this purpose in the system designed, some Internet applications are proposed. For example, online publishing and document repositories support document and knowledge inventories and knowledge re-use. Also, some functions that are useful to accomplish the Six Sigma activities, such as standard documents for completing a Six Sigma project, Six Sigma training guide, online-performance data, quality tool and technique guidelines, process maps, and so on are proposed in the system. In other words, the online-knowledge repositories can trigger the understanding of Six Sigma initiatives, and facilitate the Six Sigma applications. As a result of this system, the novices can use the system to become practitioners, while the practitioners can use the system to share knowledge and create new ones.

However, in SMEs, only some Internet applications are suitable due to the compatibility to the organisational working style, environment, and ability to invest. For example, the collaborative applications, such as conferencing, web board, discussion groups, and messenger or e-mail links might

not be necessary to a small organisation since individuals can communicate and facilitate knowledge sharing through face-to-face meetings. Thus, the design of system elements or functions needs to consider this issue as well.

2.2 Web Applications

Since a PC-based system for this study is designed to run on a platform of Intranet or Internet, the system needs to be designed as a Web application. Subsequently, an organisation can decide whether to run the web applications for *Internet* that has worldwide access, *Intranet* that is accessible within the organisational boundary, or a *PC-stand alone system* that runs the application on one PC.

To identify the differences between the web-based system designed and other available Six Sigma web sites, the author proposes the critical issues as follows.

- Typically, other available Six Sigma web sites are commercial web sites, which have a goal to advertise their products, such as Six Sigma training courses, consultancy, and books. These websites attempt to provide product information or product propaganda. It is difficult to find any web sites that give details about how to start, implement and deploy the Six Sigma programme. Contrarily, the system designed attempts to provide guidelines and roadmaps for organisations to initiate and implement the Six Sigma programme.
- Normally, the available Six Sigma web sites provide only Six Sigma issues. They hardly integrate other related issues to Six Sigma implementation. The web-based system attempts to be a comprehensive model that provides knowledge about other relevant issues,

such as supporting tools and techniques, performance measurement, basic statistics, project management, habitual problems in organisations, and so on. In other words, the system designed attempts to be a one-stop shop to bring together information and knowledge about Six Sigma implementation and other supporting issues.

- SMEs are the target group for the design of this system. Therefore, Six Sigma guidelines and applications in this system are considered for the compatibility and suitability for implementation in SMEs. In other words, Six Sigma in the web-system is modified for SME applications, whereas other available websites do not consider this issue.
- The system attempts to provide some supporting functions that facilitate the Six Sigma activities. Some computer programmes, such as those for performance data collection and presentation, project record and review are example modules that attempt to develop information and knowledge to support the Six Sigma implementation. The system keeps running to provoke the Six Sigma activities, store important information and knowledge, and then support the selection of Six Sigma projects, consequently pushing the Six Sigma programme to run continuously. In fact, even if the organisations would not run a Six Sigma programme, these modules can support the process operations. In other points of view, these are the modules to accomplish dynamic data for the dynamic websites, whereas the typical websites do not contribute in this respect.

In addition, as considering the system as self-learning or eLearning for SMEs, the system attempts to provide the simple explanation and the content also emphasises practical applications rather than theoretical explanation.

3. System Overview

This system attempts to be “*Six Sigma in a box*” which will be tailored to the organisation and adapted to the organisation’s business processes. Within this is a tool box of guidelines and techniques to launch the Six Sigma implementation in an organisation. Rather than attending Six Sigma training courses, hiring Six Sigma consultants or investing in some luxury Six Sigma initiatives, “Six Sigma in a box” is a summary of the easy access and understandable initiatives, tools and steps in driving Six Sigma implementation. It could be seen as the approach to eLearning in order to support the self-learning and getting started.

3.1 What is in the system?

This system attempts to contain less-technical information on Six Sigma and focuses on practical tips to implement the Six Sigma system in SMEs. There are two key sections: section one- Six Sigma content and deployment issues and section two-supporting issues. The first section gives an overview of Six Sigma and also supports “gearing up and adapting Six Sigma to an organisation”. The second section considers tools for implementing the Six Sigma system and other supporting issues.

To the first section, the system provides an overview of the essentials of Six Sigma and the modified deployment guidance. This is an attempt to present simple and practical approaches, rather than the theoretical and advanced concepts. It is aimed to be applicable and accessible to SME

implementation. This section is the guideline solution for recovering Six Sigma myths, especially the high investment cost for training, too advanced statistical approaches, complicated system, and unsuitability for SMEs. In short, the system provides the guideline issue of launching Six Sigma, and enables people to organise the team and accomplish the training system. The author has been convinced that the clear understanding and insight into how Six Sigma is basically relevant to people’s jobs can lead to the acceptance and commitment to Six Sigma programme.

The second section provides critical supporting issues; tools and techniques, performance measures, habitual problems and process maps. These issues are crucial for contributing to the Six Sigma implementation. Tools and techniques are key mechanisms to run the Six Sigma methodology. Habitual problems and performance measurement are helpful to identify opportunities for future improvement projects. These allow people to focus on the areas of weakness. Finally, process maps are typically used for communication, documentation and visual analysis. It enables people to consider the current operations’ process; thus, it helps to steer and improve the processes and encourage the transparency of the organisation’s activities (Pfeifer *et al*, 2004). Some companies might overlook the importance of these issues or do not consider them properly. The principles and examples in the system are helpful as a guide on how to use or set these issues.

3.2 Who can use this system?

All those involved in Six Sigma should benefit from this system. The system attempts to provide an overall focus for Six Sigma and highlight key benefits for executives. Six Sigma leader (or Master back belt) can learn the deployment process

and knowledge that is required to launch and run the Six Sigma initiative. The system members (Black belt and Green belt) can deepen knowledge about the Six Sigma initiative, its applications and the relevance to their processes in order to understand their roles and responsibilities in the Six Sigma deployment.

This system is not a cookbook. The content and many issues in the system are provided as an example or guidelines. When each organisation implements, it still needs to customise its approach based on their unique situation.

5. Conclusion

The system proposed in this study has been designed to supply the assumption that SMEs can develop Six Sigma concept if they have a methodology to guide and facilitate the implementation of the concept in the proper way.

A methodology or system designed in this study focus on how to deploy Six Sigma implementation to fit with SME conditions and then develop the system to support the practical implementation. Thus, the design of supporting software is the focusing approach through the eLearning method in order to provoke the self-learning for SMEs.

The development of this system is an attempt to provide a comprehensive system. The relevant and useful issues (e.g. quality tools and techniques, performance measures, and process map) are integrated in this system. It could be argued that an organisation, even one not implementing Six Sigma initiative, would benefit from implementing this system.

6. References

- Antony, J. (2004). "Six Sigma in the UK service organizations: results from a pilot survey", *Managerial Auditing Journal*, Vol.19, No.8, pp1006-1013.
- Antony, J. (2004). "Some pros and cons of Six Sigma: an academic perspective", *The TQM Magazine*, Vol.16, No.4, pp 303-306.
- Antony, J. and Banuelas, R. (2002). "Key ingredients for the effective implementation of Six Sigma program", *Measuring Business Excellence Journal*, Vol.6, No.4, pp 20-27.
- Antony, J., and Fergusson, C. (2004). "Six Sigma in the software industry: results from a pilot study", *Managerial Auditing Journal*, Vol.19 No.8, pp 1025-1032.
- Eckes, G. (2001). *The Six Sigma revolution: How General Electric and Others Turned Process into Profits*, Canada, John Willey & Sons, ISBN 047138822x.
- Eckes, G. (2003). *Six Sigma For Everyone*, Canada, John Willey & Sons, ISBN 9749167759.
- Goh, T.N., and Xie, M. (2004). "Improving on the Six Sigma paradigm", *The TQM Magazine*, Vol.16, No.4, pp 235-240.
- Pande, P.S., Neuman, R.P., and Cavanagh, R.R. (2002). *The Six Sigma Way; Team Field Book, An implementation guide for process improvement teams*, New York, McGraw Hill, ISBN 007137314-4.
- Pande, P. and Holpp., L. (2002). *What is Six Sigma*, New York, McGraw-Hill.
- Dash, J. (1998). "Tuning technology into tech knowledge", *Software Magazine*. Feb, 1998.
- Meso, P. and Smith R. (2000). "A resource-based view of organizational knowledge management systems",

- Journal Of Knowledge Management*.
4(3). Pp224-234.
- Offsey, S., (1997), “Knowledge Management: Linking People to Knowledge for Bottom Line Results”, *Journal of Knowledge Management*, Vol.1 No.2, pp.113-122.
- Pfeifer, T. Reissiger, W. and Canales, C. (2004), “Integrating Six Sigma with quality management system”, *The TQM Magazine*, Vol.16 No. 4, pp.241-249.
- Sarkar,C. (2000). “Knowledge Management: A cautionary Tale”, *Journal of Business Innovation*.
<http://www.agilebrain.com/km.html>.
- Snee, R. D. and Hoerl, R. W. (2003), *Leading Six Sigma*, Prentice Hall, NJ.
- Wessel, G. and Burcher, P. (2004), “Six Sigma for small and medium-sized enterprises”, *The TQM Magazine*, Vol.16 No.4, pp.264-272.