SIX SIGMA FRAMEWORKS: AN ANALYSIS BASED ON ROGERS' DIFFUSION OF INNOVATION THEORY

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Abstrak: This paper attempt to analyze frameworks related to Six Sigma and Lean Six Sigma. The basis of analysis the frameworks is the diffusion of innovation theory. Several criteria was used to analyze the frameworks e.g. relative advantage, compatibility, complexity, trialability, observability, communication channels, nature of the social system/culture and extent of change agent. Based on framework analysis, there is only one framework fits to Rogers' theory on diffusion of innovation. The framework is a Lean Six Sigma framework which consists elements such owner/manager commitment and involvement, employee involvement, training, culture change and external support. Even though the elements have similarity to other Six Sigma frameworks but they put more attention on culture change and external support. Generally speaking, the culture change and external support are the most important elements to the implementation of Six Sigma or other soft approaches particularly for small organizations.

Keywords: Critical Success Factors, Six Sigma, SME

INTRODUCTION

Six Sigma as TQM concept has a strong customer focus, and contains key concepts related to strategy, organizational change, training and setting stretch objectives (Evans & Lindsay, 2005). 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. This concept was first introduced by Motorola Company in the mid 1980s. After several years, many researchers or organizations combines Six Sigma with other improvement programs such as Lean Manufacturing.

The majority of Six Sigma implementation found in large manufacturing organizations. Nowadays, this concept is also found implemented in service and government sectors. However, it can be said that organizations implemented this concepts are still dominated by large organizations which have good resource and technology in place.

To implement the six sigma concept, an implementation framework is needed to provide guidance in particular if the organizations are limited in fund. After extensive investigations from literatures, particularly from Six Sigma and quality management journals, there are few frameworks developed by international researchers to implement Six Sigma focused on both large and small organizations. The Six Sigma and Lean Six Sigma frameworks/models along with the analysis based on Diffusion of Innovation Theory will be discussed in the following sections.

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SIX SIGMA AND LEAN SIX SIGMA FRAMEWORKS/MODELS

There are three frameworks for implementing Six Sigma has been found in the literatures (Chang, 2002; Park, 2005; Burton & Sams, 2005), and two frameworks for implementing Lean Six Sigma (Amar & Davis, 2010; Furterer, 2004). They are briefly described below.

Chang developed his framework mainly based on MBNQA (Malcolm Baldrige National Quality Award) model which contained TQM elements such as strategic planning, leadership, process management, human resource, education and training, quality tools, customer management, supplier management and information and analysis. He claimed those elements as critical factors for SMEs to adopt Six Sigma and assembled them into his framework follow the MAIC (measure-analyse-improve-control) steps. The weakness of Chang's framework is no discussion about culture or consideration on limitations of SMEs when he developed his framework. He did not explain how to bring these factors into implementation. For instance, education and training under Six Sigma projects, he did not suggest what the best training type for SME. The SME may be impossible to follow the common training scheme of Six Sigma (green belt, black belt, etc.) because they have limitation in fund.

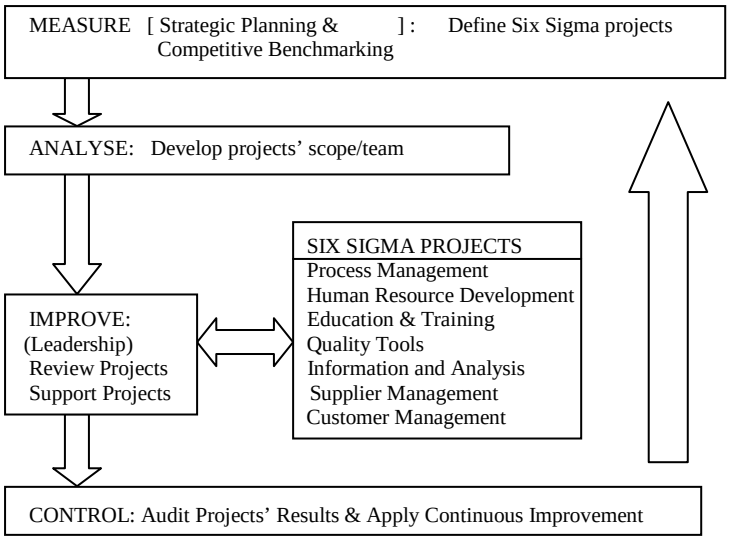

Figure 1. Six Sigma framework for SMEs

Source: Adopted from Chang (2002, p. 152)

Another framework, developed by Park (2005), is believed to be more suitable to large organizations. However, there is no explanation to justify of those elements are appropriate, since it is based on his experience as a consultant. It can be said that this is a generic model of Six Sigma and needs to change in a way to give a clear guidance to SMEs in implementing the concept.

A framework developed by Burton & Sams (2005) appears to be more suitable to the small and medium enterprises. They initiated a Six Sigma pilot project as the first stage when SMEs plan to implement this concept. The purpose of the pilot project is to demonstrate the applicability of its concept and as a way to turn their skeptics to the new improvement concept adoption.

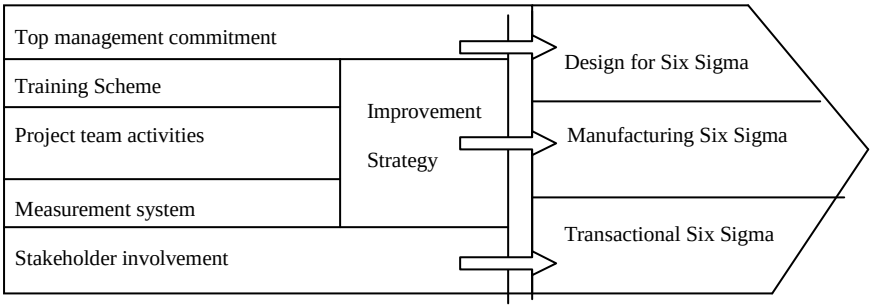

Figure 2. Park's Six Sigma framework

Source: Adopted from Park (2005, p. 30)

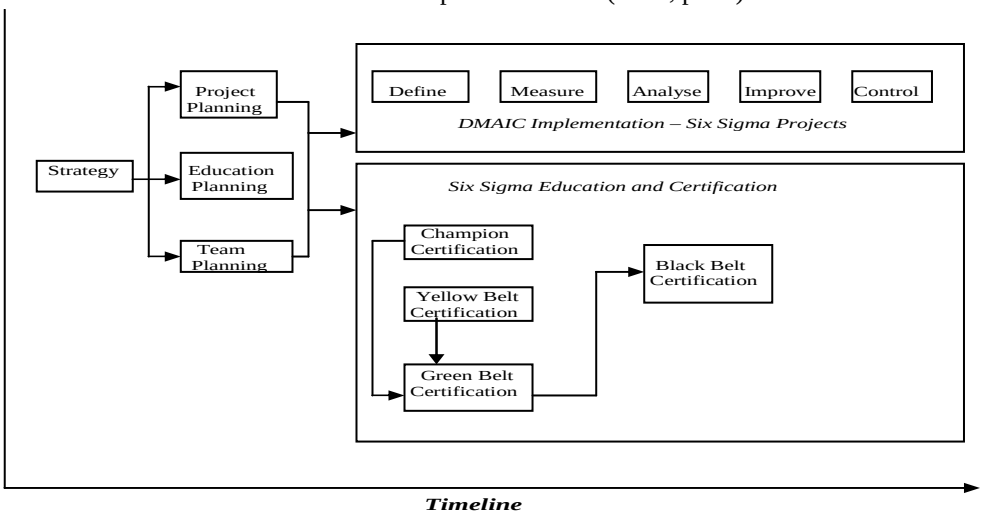

Figure 3. Six Sigma implementation framework for SMEs

Source: Adopted from Burton and Sams (2005, p. 38)

Burton and Sams' framework, however, places education and certification as an important aspect for the Six Sigma teams. It can be argued that certification can not assure the success of Six Sigma implementation. The most important is Six Sigma teams should have enough understanding to use basic and advanced quality tools to solve organizational problems. It is not difficult task since these basic and advanced tools of Six Sigma are not new tools; they have used in the TQM or other improvement programs in the past.

A Lean Six Sigma framework developed by Furterer (2004) is probably as the one framework that develops based on needs local government to implement those concepts. This framework together with its elements was developed from the literature and from her experience as a consultant. It can be seen that majority of her framework's elements were referred to the Quality Award e.g. Business Excellence Model and MBNQA. Thus, the case study of her research was denoted the application of some of Lean Six Sigma tools to solve existing problem in the Government agency. However, this can not be used as a justification that her framework can work well. It needs to install all the elements of her proposed framework and measure the current performance of the Government agency. This is the way to validate the framework, justify whether the framework works or need to be improved. Furthermore, the element of training and education is not explicitly used in her

framework. As found in several literatures, training is important and critical to the implementation of Lean Six Sigma and should be put as a factor in her framework.

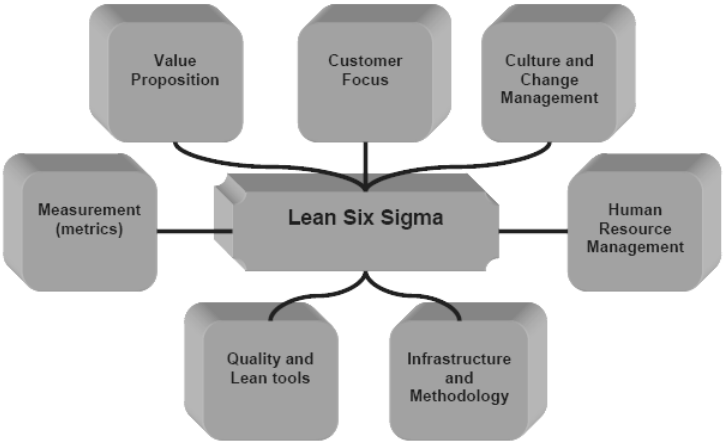

Figure 4. Lean Six Sigma framework

Source: Adopted from Furterer (2004, p. 41)

Meanwhile, Amar and Davis (2010) have developed a Lean Six Sigma framework specifically for Indonesian SMEs context. The framework can be seen in Figure 5.

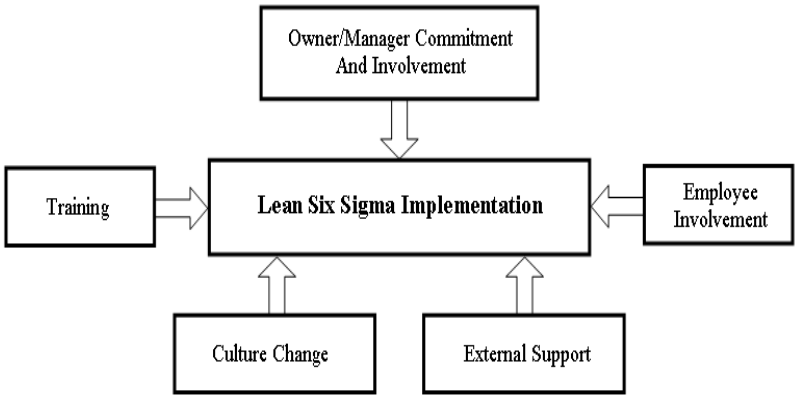

Figure 5. Lean Six Sigma framework for SMEs

Source: Adopted from Amar and Davis (2010, p. 190)

The elements of the framework are owner/manager commitment and involvement, employee involvement, training, culture change and external support. Some of these elements have also been used by others. For instance, Antony et.al (2005), Coronado and Antony (2002), Park (2003), Schon (2006) and Yusof (2000) have used these elements in their TQM and Six Sigma studies. Management commitment towards innovation also features as a key factor in diffusion of innovation studies conducted by Bradford and Florin (2003) and Rogers (2003).

ANALYSIS OF THE SIX SIGMA AND LEAN SIX SIGMA FRAMEWORKS

The Rogers' Theory emphasized on several variables which influences the adoption of innovation e.g. relative advantage, compatibility, less complexity, trialability, observability, communication channels, nature of the social system/culture and extent of change agent. Generally speaking, the innovation (it can be an approach or a concept) should consider the criteria in order to be successfully implemented.

The author will examine the existing frameworks using those criteria to determine the adoption success innovations. The examination is based on whether the authors/researchers of the previous studies have discussed or having similar thought to Rogers' idea as presented below.

Table 1. Examination of existing frameworks based on Rogers' idea on diffusion of innovation

Framework	Rogers' criteria (Diffusion of Innovation)							
	relative advantage	compatibility	complexity	trialability	observability	communication channels	nature of the social system/ culture	extent of change agent
Chang								
Park							✓	
Burton & Sams				✓			✓	✓
Furterer	✓					✓	✓	
Amar & Davis	✓	✓		✓	✓	✓	✓	✓

Source: adapted from Amar and Davis (2008)

From Table 1, Amar and Davis' framework seem to be the best framework among others. The framework highlighted the need of change agent, for instance Government or other parties related to SMEs, in order to support the implementation of new concept/approach. It is believed that the presence of change agent will help in cultural change of the organization. Meanwhile, the support from external will overcome the complexity of implementing the concept e.g training provision, consultation and etcetera.

CONCLUDING REMARKS

Examination of the existing frameworks using Rogers' theory shows that almost no framework completely fits to Rogers' idea. Amar and Davis' framework seem to be the best framework among others and put attention on the need of external support and change agent. The framework consists of important elements such as owner/manager commitment and involvement, employee involvement, training, culture change and external support.

Further study should think the possibility to test the framework for validity purpose. Test can be in a form of implementing the simple tools or techniques to solve the existing problem in sample organizations.

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