PRELIMINARY STUDY ON A SIX SIGMA FRAMEWORK FOR INDONESIAN SMES

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ABSTRACT

In Indonesia, Six Sigma deployment is in its infant stage and most of the Six Sigma applications have been with the joint venture companies driven by non-Indonesian partners. One of the reasons for this is the relatively small portion of large organisations in the Indonesian economy. More than 99% of all registered companies in Indonesia are small and medium enterprises (SMEs) which employ 99.5% of the entire workforce. Despite the fact that SMEs employ the majority of the Indonesian work force, their contribution to the GDP is less than 60% and their share in export is less 10%; a result which appears to be due to low productivity and poor quality of products and services.

Some of the typical challenges being faced by the Indonesian SMEs include lack of training and quality awareness at all levels, poor communication and coordination, and lack of commitment by upper management. Other challenges include lack of knowledge of modern production and quality control methods. These problems were recognised by the Indonesian Government that initiated a productivity and quality improvement program as part of the Japan/ASEAN TQM Project in 1995.

Using the experiences gained from the TQM implementation, in this paper the authors discuss and analyse Six Sigma applications to the Indonesian SMEs.

Keywords: Six Sigma, Small and Medium Enterprises, Indonesia

1. INTRODUCTION

In today's highly cost-driven global market conditions, most companies either large or small and medium scale face two major challenges: increased customer demands in regard to quality of products and services, and competition without borders. Moreover, customers now view quality as a fundamental measure of their total perception of products or services as well as of the company, delivery and maintenance network that provides and supports it (Feigenbaum & Feigenbaum, 2005). Thus, in this competitive era, a company's success mostly depends on its ability to perform well in areas such as quality, cost, and on time delivery. Without doubt, superiority in terms of a product or service is still an extremely important element that positively contributes to generating sales and hence strengthens the position of a company in its chosen market (Deming, 1986).

In Indonesia, SMEs are the most important sector and make up almost 100% of all registered companies (Central Bureau of Statistics, 2005). Furthermore, the SMEs provide employment to 99.5% of the entire work force. Despite the high numbers of SMEs in Indonesia, their share in export is below 10 %, lower than other countries (Joe, 2004 ; Hall,

2002). In accordance with these facts, Badrinath (1994) concluded that SMEs could only be efficient exporters if they were given the right kind of advice and assistance.

With the aim of improving SMEs' competitiveness in the global market, The National Standardization Agency of Indonesia together with other ASEAN countries similar agency and Ministry of Trade and Industry (MITI) of Japan promulgated a Total Quality Management initiative for ASEAN countries. This project called the Japan/ASEAN TQM Project which conducted in 1995-2000. According to the National Standardization Agency of Indonesia report, early enthusiasm towards the TQM initiative was encouraging. However, it appeared that the enthusiasm faded quickly and the program did not deliver the expected results during the implementation phase. This appears to be in line with the experiences of TQM failure in other parts of the world. As Harari (1993) claimed that -- based on the independent research conducted by consulting firms Arthur D. Little, Ernst & Young, Rath & Strong, McKinsey & Co. and A.T. Kearney – only 20 up to 30% of TQM implementations in the USA and Europe have resulted in significant tangible improvements in quality, productivity, competitiveness or financial returns. Because of the less successful of TQM implementation in many countries, its made many organizations looking for a robust initiative or methodology to drive company success.

In the 1980s, when the Six Sigma methodology was first used by large American manufacturing companies including Motorola and Allied Signal, its main emphasis was based on reduction of defects in production. According to Akpolat (2004), Six Sigma has evolved and has become one of the most commonly used business improvement concepts that "... not only improves the quality of products and services but also achieves quantifiable bottom-line results, improves management style and communication and increases both customer and employee satisfaction ..."

It the authors' view that Six Sigma can be customised to suit the Indonesian SMEs requirements and help overcome the problems faced in the past with the not so successful TQM implementations. First, this paper analyses the characteristics of the Indonesian SMEs and their current quality management practices. Then, it introduces guidelines for the customisation of a generic Six Sigma framework for the Indonesian SMEs. Some suggestion for future research has also been included in the last section.

2. CHARACTERISTICS OF THE INDONESIAN SMEs

When defining the SMEs, several factors including number of employees, company assets and ownership, sales turnover and capital are usually taken into consideration. What falls into the category of SME may vary from one country to another. In Indonesia, the criteria defined by the Indonesian Bureau of Statistics and Central Bank of Indonesia the definition include number of employees, sales turnover, asset and ownership (Table 1).

As backbone of an economy, SMEs play an important role almost in every country as they employ the majority of the workforce and contribute significantly to a country's economic growth. For instance, Taiwanese and Korean SMEs contributions country's total export were almost 40 % in 2002. In Japan, SMEs share on country' export is up to 40% (UN, 2003). Despite the fact that Indonesia has high number of SMEs, Hall (2002) summarised profile of SMEs in East Asia/APEC countries which is stated that SME exports figures in those countries ranges about 5% or less (Indonesia) to around 40% (Korea) of total exports in 2002.

Table 1. Definition of SMEs

Criteria	Small Industry	Medium Industry
Asset	= IDR. 200 million (US$ 22,000) excluding land & building	= IDR. 5 billion (US$ 561,000) for industrial sector = IDR. 600 million (US $ 67,000) excluding land & building and excluding non-industrial sector manufacturing
Annual sales	= IDR. 1 billion (US $ 112,000)	= IDR. 3 billion (US $ 336,000)
Ownership	Owned by Indonesian citizen, it's independent, not a subsidiary of another company or a branch of a business, owned, controlled or affiliated directly or indirectly to a medium or large enterprise	Must be owned by an Indonesian citizen
And/Or :		
Number of employee	Below 20 employees	20 - 99 employees

(Source: Rudjito, summarized from Central Bureau of Statistics, Central Bank of Indonesia)

Table 2. Comparison of key indicators of SMEs in big five ASEAN countries

Country	Number of SMEs from total industry (%)	SME workforce as % of total employment
Indonesia	98	88
Malaysia	84	39
Philippines	99	66
Singapore	91	52
Thailand	96	76

* Non-agricultural SMEs, Malaysia and Thailand are manufacturing sector only
Source: Asasen *et al* in "A proposed ASEAN policy blueprint for SME development 2004-2014"

According to a report prepared by the Ministry of Industry and Trade in 2002, there are several reasons why Indonesian SMEs perform poorly in regard to their export contribution. Lack of attention to customer expectations and limited availability of skilled personnel appear to be common across all SMEs. Lack of knowledge of modern production technologies and quality control techniques as well as poor product quality have been also identified by other researcher (Urata, 2000) to be a common cause in SMEs.

Other reasons identified by Ministry of Cooperatives and SMEs (2004) in their Strategic Plan for the period of 2000 - 2004 included:

- Low quality of products
- Limitation of skilled personnel
- Poor accessibility to market
- Poor accessibility to financial sources
- Lack of modern production technology and other managerial skills
- Lack of management and technical training

3. TQM IN INDONESIAN SMEs

Number of publications regarding TQM implementations in Indonesia is very limited. Some of the few available case studies and reports are discussed below:

Munthe (1996) studied TQM practices in Asia Pacific region. The extensive study also included the five Indonesian organisations both large and small, from manufacturing and service sectors. The surveyed companies were Tranka Cable, Panghegar Hotel, Krakatau Steel, Indocement and National Gobel Electronics. The survey questionnaire was based on the six elements including *management commitment, organization of system, education and training, worker participation, leadership, and awareness and dissemination of information.* According to the findings, leadership and management commitment were weak in all surveyed firms. The elements organization of system, education and training, and worker participation were managed differently by the surveyed organisations due to the nature of their industry, size and location. In general, large organisations scored higher results in these three elements

Country reports published as part the Japan/ASEAN TQM Project also provide useful information about the TQM implementation in Indonesia and ASEAN region. The main objective of this project was to facilitate the implementation and promotion of TQM activities in the ASEAN countries (Onitsuka, 1999). The two selected Indonesian SMEs for this project included PT. Teranga Kita and PT. Bakrie Tosanjaya. During the project execution phase, both companies were supported and guided by Japanese experts using the handbooks that were specifically designed for the SMEs in the ASEAN region (UNIDO, 2001).

Some of the major achievements from this TQM implementation project during the period 1995-99 for both Indonesian companies were standardisation (of process documentation), implementation of quality control techniques and safety control measures. Despite these positive results, it appeared that both companies had problems with the realisation of other TQM elements. For instance, Quality Control Circle (QCC) activities were weak in both companies. More importantly, there was no evidence of any improvements in the critical areas including customer satisfaction, profit, staff absenteeism and other items that usually benefit from TQM implementations.

Since 2000, the National Standardization Agency of Indonesia was tasked to lead the Japan/ASEAN TQM Project implementation in Indonesia. The Agency ran a number of activities including seminars, workshops and training sessions, and also collected information from participating companies about their TQM journey. Agency's report for the period 2000-04 indicated that most companies had difficulties with implementing TQM. Some of the common problems reported were low quality awareness at management and staff levels, lack of management commitment, poor communication and coordination as well as lack of training (Ritonga, 2005). Unfortunately, there are no further and detailed scientific analysis about root causes of the problems associated with TQM implementations in Indonesian SMEs. The literature is also very limited about the possible solutions for these problems.

Ghobadian and Gallear (1997) suggested that the implementation methodology of TQM in SMEs should be different from large organisations by taking into account the specific characteristics of the SMEs. These characteristics may include organizational structures, policies and procedures, staff values and behaviours. Most SMEs, for instance, have a flat organisational structure and typically use an ad-hoc approach with a low degree of standardization. The quality of management and company culture are greatly dominated by the owner's or manager's own leadership style and values. Other characteristics usually include simplified control systems, limited resources including funds for training, and limited contacts with customers and vendors.

4. SIX SIGMA FOR INDONESIAN SMEs

Currently, there is a common belief among many researchers and practitioners that Six Sigma implementation in SMEs can deliver similar benefits as seen with larger organizations (Spanyi & Wurtzel, 2005; Harry & Crawford, 2004; Keller, 2004). This view, of course, refers to the fact that Six Sigma must be customised to suit the needs and characteristics of the SMEs. On the other hand, many people believe that the often reported high deployment cost may be the main hurdle for Six Sigma implementation in the SMEs. In the late 1990s, similar concerns were also raised by many people when TQM was to be implemented in SMEs.

In the past few years, the popularity of Six Sigma increased significantly and there have been also many books and academic papers published about Six Sigma. However, most of these publications refer to Six Sigma implementations in large organisations. Like TQM, number of publications about Six Sigma applications to SMEs is very limited. There is practically no publication available to date about the Six Sigma application to Indonesian SMEs. This paper is intended to provide new ideas of Six Sigma implementation from Indonesian SMEs viewpoint and generate further interest in this field.

One of the recently published academic studies about Six Sigma implementation in SMEs was undertaken by Chang (2002) who introduced a framework consisting of several critical success factors (CSF) based on the TQM concept and the US American MBNQA model. He suggested that SMEs should implement the proposed framework using the Six Sigma improvement methodology *Measure-Analyse-Improve-Control* (MAIC). This framework makes sense as the business improvement concepts TQM, MBNQA and Six Sigma have many similarities between them. For instance, both TQM and Six Sigma share the same continuous improvement methodology based on the PDCA cycle and make use of similar problem-solving and process improvement tools. Both Six Sigma and MBNQA utilise data, measurement and information from processes. But, on the other hand the three concepts also differ greatly in some aspects. For instance, one of the main differences between Six Sigma and TQM is the fact that Six Sigma relies on project management. While TQM practically did not make any use of project management, most Six Sigma savings come from the so-called breakthrough projects lead by a specifically trained taskforce (Black Belts and Green Belts). Aligning these projects with company's goals and objectives is a major advantage of the Six Sigma methodology compared with other improvement concepts or models. Unfortunately, these aspects have not been given sufficient consideration in Chang's report.

In authors' opinion, development of a Six Sigma framework for SMEs should follow the large organisations and then customise it to suit SMEs needs and characteristics. A critical part of this research is to first identify the factors or elements which are responsible for the successful Six Sigma implementation in a large organisation and then customise them to suit to Indonesian SMEs in particular. Figure 5 illustrates such a framework for Six Sigma that has been successfully adopted by many large organisations including GE, Sony and SunRice (Akpolat, 2005 ; Pyzdek, 2000 ; Antony & Banuelas, 2002). The framework is divided into five core modules: *Strategy, People, Projects, Methodology,* and *Tools*. Each module has a number of sub-categories or elements which may also interact with each other. Categories and their interactions are described as follows.

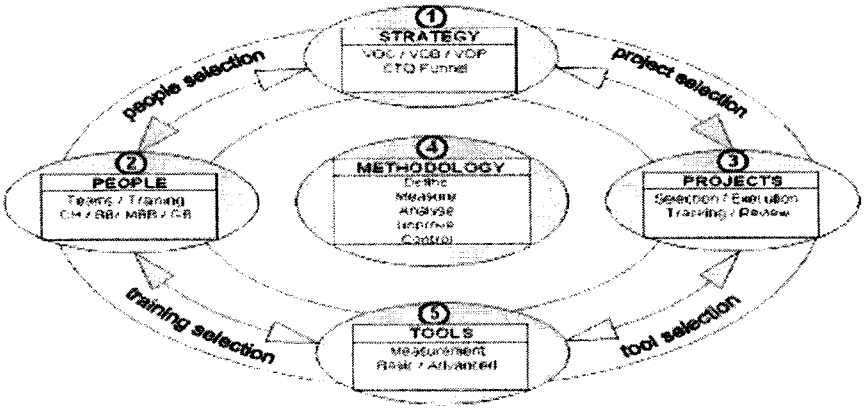

Figure 1. Six Sigma framework

Module 1: Strategy

One of main strength of this framework is that Six Sigma activities are directly aligned with the strategy of the company. This happens through the analysis of the Voice-of-the-Customers (VOC), the Voice-of-the-Business (VOB), and the Voice-of-the Process and identification of the Critical-to-Quality areas (CTQs) which ultimately become the target of the improvement project lead by the Black Belts and Green Belts. In authors' view, this strategic alignment of improvement activities is what makes Six Sigma so different from TQM for instance and less prone to the criticism of lacking management commitment. The strategic component is possibly also the most powerful argument for Six Sigma implementation and gets the buy-in from top management. It is the authors' belief that the strategic component can be utilised in similar way by large and small organisations regardless of their size or demographic differences. If appropriate guidance and assistance provided, there is no plausible reason why SMEs in Indonesia (or anywhere else in the world) should not be able to use the strategic analysis module of the Six Sigma framework.

Module 2: People

One of the typical criticisms of TQM implementations in Indonesian SMEs and most likely in other countries too was that staff did not have sufficient time for improvement activities due to their daily work tasks. Expensive and long training sessions were also criticised by many SMEs due to resource limitations.

Like TQM, Six Sigma is a methodology that utilises teams to achieve continuous improvements in the processes. However, there are some significant differences between TQM and Six Sigma in this aspect. TQM teams for instance (i.e. Quality Control Circles) are usually permanent and horizontal (consisting of several staff working in the same work area) while Six Sigma teams are non-permanent (i.e. virtual) and vertical. Six Sigma project teams are virtual teams as they only exist for the duration of a project and dissolve after the project is completed. Six Sigma teams are also vertical teams as they consist of people from various management and staff levels.

Unlike TQM teams and their continuous improvement activities, selecting Six Sigma projects and their appropriate teams is a top-down process and also linked to company's goals and objectives. Despite these differences between TQM and Six Sigma, it is still a major problem for SMEs due to limited resources to make staff available for continuous improvement activities. However, if one considers the fact that Six Sigma teams are non-

permanent and directly managed by staff from upper management, it should be easier for SMEs to acknowledge the benefits of these teams and allocate appropriate resources for limited duration of a project. It is also highly recommended to use part-time rather than full-time Black Belts and Green Belts in the SMEs.

Training is another area that is directly affected by resource limitations of a smaller company. It is true that most SMEs spend less money for training and staff development. It is also true that some Six Sigma training courses can be quite expensive. The authors recommend two solutions to overcome these hurdles:

Firstly, the training can be broken down into two or three smaller courses. For instance, instead of using a typical 4-weeks full Black Belt training course, Six Sigma fundamentals can be thought in just one week. After this 1-week training, BBs can immediately start on their projects which might be less complex and usually deliver quick results. This is also commonly referred to as 'low-hanging fruits' projects. During this first implementation step, BBs usually gain more experience with the Six Sigma project methodology and also achieve some hard cost savings through their projects. As part of the following second or third step, they could then continue their Six Sigma education and move up to the more advanced tools and techniques and tackle more complex problems.

The second solution refers to the fact that Six Sigma deployment in SMEs differs from most large organisations in its scale and number of people trained or involved. Due to resource limitations, SMEs can only utilise a limited number of Black Belts and Green Belts. However, this does not necessary mean that it will be less successful. In authors' view, commitment and involvement from top management seems to be more crucial than percentage of staff trained or directly involved in Six Sigma activities.

Module 3: Projects

A Six Sigma project is the vehicle used by Six Sigma teams to improve a process. These projects are directly linked to organizational goals and objectives. Some of the critical issues associated with the Six Sigma projects are: project selection, project definition, execution, tracking, and review of projects. In most cases, a number of pre-set criteria will be used during project selection. Some of these criteria might be more generic in nature and include for instance the urgency of improvements, resource availability, impact on customers, process ownership, data availability and bottom line impact. After selecting the right project, the DMAIC methodology is used by the Six Sigma teams to execute the project. Regular project reviews and a project tracking system will ensure that projects are carried out successfully.

During the implementation of the recommended Six Sigma framework in SMEs, the *Projects* module does not require a special customisation due to its clearly defined five steps project management methodology. However, regardless of the size of an organisation, the selection of a Six Sigma project and allocation of personnel (BBs and GBs, and other employees) requires special attention and carefully defined criteria reflecting companies' business priorities.

Module 4: Methodology

Like TQM, the methodology used by Six Sigma to achieve process improvements is based on the well-known PDCA cycle. The execution of a typical Six Sigma project follows a five steps methodology called DMAIC (Define, Measure, Analyse, Improve, and Control) methodology. A project usually starts with the *Define* phase during which the need for improvement is identified, project requirements are defined and project resources allocated. In the following *Measure* phase, performance of the process is measured to pinpoint problem sources and areas for improvement. During the *Analyse* phase the root causes of problems or

critical factors for improvement are identified while in the *Improve* phase best problem solutions or actions for improvement are selected and implemented. Finally, the *Control* phase is used to ensure that improved process conditions are stable, and knowledge gained from the project is shared within the company. As mentioned under module 3, the DMAIC project management methodology is simple in its nature and does not require customisation to suit SMEs.

Module 5: Tools

Most of the tools and techniques used by Six Sigma teams are not much different from other improvement programs including TQM, LEAN and Business Process Management. However, similar to the solutions recommended for Six Sigma training under module 2, the use of tools should be customised to suit the SMEs. This can be done by dividing the toolbox into three parts:

a) Mandatory Six Sigma foundation tools and forms to be used in all projects,
b) Basic statistical tools to be used for analysis of simpler problems, and
c) Advanced statistical tools to be used for analysis of complex problems and situations.

As mentioned under module 2, training of BBs and GBs regarding the use of these tools can be done in a multi-step process which will not only cause less disruption to the daily work tasks but also reduce the cost of training.

5. CONCLUSION AND FUTURE RESEARCH

In Indonesia, SMEs play an important role in the economy by employing 99.5% of the entire work force. This large work force absorption comes from the fact that 99% of all registered companies in Indonesia fall into the category of small and medium enterprises. Despite being an important sector of employment, Indonesian SMEs' contribution to country's economy and the export seems relatively low. According to many researchers, the weakness of the Indonesian SMEs in international competition results from a multi-dimensional problem. Some of the common causes include lack of management commitment, low level quality awareness, insufficient quality control activities, and poor communication.

Despite the Indonesian Government's effort to improve the situation through the participation at the Japan/ASEAN TQM project launched in 1995, reported benefits gained from this project after 10 years seem relatively low. Based on the lessons learned from the Japan/ASEAN TQM project and other TQM implementations as well as the successful Six Sigma applications to large organisations around the world, the authors developed a Six Sigma framework suitable for SMEs. Future research will attempt to concentrate on customization of this Six Sigma framework to suit Indonesian SMEs. The implementation of this framework will be tested in several SMEs in Indonesia.

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