CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Right from the olden days, mankind has been experiencing competition in several fields. Time and again, mankind adopted various strategies and tackled the impact of competition (Kumar et al., 2006; Raymond and Bergeron, 2008; Eng, 2011; Parast, 2011). Yet the task of facing the competition became a major challenge when the competitive era emerged in the world during 1980s (Kumar et al., 2006; Oprime et al 2011; Awuah and Amal, 2011). During this period, globalization of local markets of several countries occurred. As a result, several players entered into the local markets of several countries creating high intensity of competition which the mankind had experienced never before (Winch and Bianchi, 2006; Subrahmanya, 2007; Oprime et al., 2011; Hilletofth et al., 2011; Rundh, 2011; Todd and Javalgi, 2007). On foreseeing and sensing this high intensity of competition, researchers and practitioners developed numerous manufacturing management models (Wang and Chen, 2010). Some of them include Total Quality Management (TQM), Business Process Re-engineering (BPR) and Kaizen (O’Kane et al., 2007; Parast, 2011).

Till recently, there was an impression that only the large size organizations bring wealth and prosperity to the societies. Of late, this kind of impression has been vanishing. Rather there has been an enunciation that Small and Medium Enterprises (SMEs) do play vital roles in bringing wealth
and prosperity to the societies (Beaver and Hutchings, 2005; Prater and Ghosh, 2006; Todd and Javalgi, 2007; Chiware and Dick, 2008; Singh et al., 2008; Kale et al., 2010; Malik and Nilakant, 2011). This is due to the main reason that, modern large size companies increasingly outsource their activities to the SMEs (Antony et al., 2005; Subrahmanya, 2007). The prosperity of these large size organizations is ensured only if their performance is equated with that of SMEs to whom their activities are outsourced (Raymond and Uwizeyemungu, 2007). This situation warrants the application of manufacturing management models in SMEs too (Hocho and Champion, 2011).

Implementing manufacturing management models in SMEs may be challenging as the researchers have found out that SMEs are currently being managed in a non-scientific manner (Temtime et al., 2003; Thomas et al., 2009; Gnanaraj et al., 2010; Malik and Nilakant, 2011). The contemporary manufacturing management models are largely suited for implementation in scientifically managed large size organizations (Antony et al., 2005; Kureshi et al., 2010). This finding, which is largely discernible in literature arena indicates that significant researches on applying manufacturing management models in SMEs need to be pursued so that they contribute towards the wealth generation of societies (Hill and Wright, 2001; Thomas et al., 2009; Kale et al., 2010). This thesis reports a doctoral work which was carried out to begin a research in this direction by examining the application of Lean Six Sigma in SMEs.

During the recent years, Lean concepts have been found to aid large size organizations for acquiring competitive strength by adopting waste reduction and value addition approaches (Naslund, 2008; Pepper and Speeding, 2010; So and Sun, 2010; Yang et al., 2011; Pool et al., 2011; Badurdeen, 2011). Simultaneously, Six Sigma concepts have been applied in
large size organizations to achieve higher degree of quality through the attainment of six sigma level performance (Antony et al., 2005; Shah et al., 2009; Wiele et al., 2010; Braunscheidel, 2011). On seeing the power of Lean and Six Sigma concepts, the efforts to address them under the terminology called ‘Lean Six Sigma’ began during 1990s (Furterer and Elshennawy, 2005). A few researches reported in the literature have mentioned that Lean Six Sigma facilitates defect free and uninterrupted production. Besides, Lean Six Sigma leads to the adoption of disciplined approach while solving the problems and this facilitates the organization to achieve higher degree of competitiveness (Kumar et al., 2006; Thomas et al., 2009; Gnanaraj et al., 2010). Due to the enhanced roles of SMEs in the contemporary organizational scenario, the power of applying Lean Six Sigma in SMEs needs to be researched. This research task needs to be carried out carefully, as like several models, Lean Six Sigma is tailor-made to suit scientifically managed larger size organizations. Such a practical application oriented research should rest on the strong literature foundation. In this context, the doctoral work presented in this thesis was carried out by conducting a literature survey.

During the beginning phase of the doctoral work being reported in this thesis, literature survey was conducted from two perspectives. In the first perspective, the researches conducted on SMEs were surveyed. From the second perspective, the application of Lean manufacturing, Six Sigma and Lean Six Sigma was surveyed in literature arena. The first primary finding of this survey was that, the contemporary SMEs are suffering from several deficiencies. The second primary finding was that, no model to implement Lean Six Sigma in SMEs by overcoming these deficiencies has so far been reported. In order to fill this research and practice gap, a model named as DOLADMAICS (stands for Deficiency Overcoming Lean Anchored Define Measure Analyse Improve Control Stabilize) has been contributed by conducting this doctoral work. DOLADMAICS has been designed to
facilitate the implementation of Lean Six Sigma in contemporary SMEs in five levels. After designing the DOLADMAICS model, its first and second levels were subjected to implementation studies. The first level of DOLADMAICS model is set to sensitize the SMEs towards implementing Lean Six Sigma. The second level of DOLADMAICS model has been designed to Orientate the SMEs towards the implementation of Lean Six Sigma. The details of these activities carried out during this doctoral work are presented in this thesis.

1.2 PROBLEM DEFINITION

Of late, large size organizations have been increasingly outsourcing their activities to SMEs. Hence, the importance of SMEs in wealth generation and societal development is significantly realised. In consequence to this development, Governments of several countries support the efficient running and development of SMEs. In line with this development, researchers have also been studying the nature of working of SMEs. These researchers have found that the nature of working of SMEs in different countries varies from each other. Yet, the concerning observation is that, several deficient characteristics of SMEs are commonly visible in global scenario.

Some of the deficient characteristics prevailing in contemporary SMEs are ‘poor management skills’, ‘inadequate training imparted to the employees’, ‘lack of planning’ and ‘insufficient usage of Information Technology’ (IT). These deficiencies will prevent the successful implementation of Lean Six Sigma as this model is suitable for implementation in deficient free organizations. This situation reveals the fact that, the deficient characteristics prevailing in SMEs need to be overcome for the successful implementation of Lean Six Sigma. In literature arena, so far, two papers reporting the implementation of Lean Six Sigma in SMEs have appeared. The models presented in these papers are not capable of
overcoming the deficiencies prevailing in contemporary SMEs so as to successfully implement Lean Six Sigma in them. Therefore, the absence of a model that is tailor-made to implement Lean Six Sigma in contemporary SMEs by overcoming the deficiencies prevailing in them prevents from adopting competitive strategies which are required to be competitive in global scenario.

1.3 OBJECTIVES OF THE DOCTORAL WORK

The following were the objectives of this doctoral work:

- To study the principles of Lean Six Sigma.
- To study the benefits of implementing Lean Six Sigma in organizations.
- To study the procedure of implementing Lean Six Sigma in organizations.
- To study the environment prevailing in SMEs.
- To design a model for facilitating the implementation of Lean Six Sigma in SMEs.
- To study the practicality of designed model in three SMEs.
- To draw the inferences from the implementation experiences.
- To refine the model, if required, according to the implementation experiences gained.

During the doctoral work being reported in this thesis, efforts were exerted to achieve the above objectives. While exerting these efforts, the
DOLADMAICS model was designed and subjected to implementation studies in three SMEs.

1.4 RESEARCH METHODOLOGY

The research methodology followed to carry out the doctoral work reported in this thesis is pictorially depicted in Figure 1.1. As shown, during the beginning phase of this doctoral work, literature survey was carried out. Using the information and knowledge gathered from this literature survey, the DOLADMAICS model could be designed. The first and second levels of

![Diagram of research methodology]

**Figure 1.1 Research methodology**

DOLADMAICS model were subjected to implementation studies in two SMEs. In another SME, the implementation study on only the first level of DOLADMAICS model was conducted. Finally the impact of DOLADMAICS
model on sensitizing and orienting the SMEs towards implementing Lean Six Sigma was evaluated.

1.5 CHAPTER ORGANIZATION

This thesis has been organized in seven chapters. This organization is depicted in Figure 1.2. After this introduction chapter, the literature survey carried out in the beginning phase of this doctoral work is elaborately presented in the second chapter. In the third chapter, the principles and rationales behind designing the DOLADMAICS model are described. In fourth and fifth chapters, the experiences of conducting implementation study on the first and second levels of DOLADMAICS model in two SMEs are

![Chapter organization diagram]

**Figure 1.2 Chapter organization**
illustrated. In the sixth chapter, the results of conducting the implementation study on first two levels of DOLADMAICS model are discussed. In this chapter, an implementation study on DOLADMAICS model, which had to be stopped after completing the first level of DOLADMAICS model, is also reported. On the whole, in this chapter, the challenges of implementing DOLADMAICS model in contemporary SMEs are appraised. The thesis is concluded in the seventh chapter. In this chapter, the doctoral work is summarized. Besides, the contributions of the doctoral work are enumerated. Further, the avenues for carrying out future researches on implementing DOLADMAICS model in SMEs are also indicated in this chapter.

1.6 CONCLUSION

During the recent years, the world has been focusing on the development of SMEs (Bhatta et al., 2008; Lin et al., 2011; Awuah and Amal, 2011; Kureshi et al., 2011). Meanwhile, the world has been looking at Lean Six Sigma concept as an enabler of bringing prosperity to organizations. Hence, it is preferred that Lean Six Sigma is applied in SMEs. However, contemporary SMEs are suffering from several deficiencies which make unsuitable for implementing Lean Six Sigma concept immediately in them. This situation indicated the need of developing a model that could overcome the deficiencies prevailing in contemporary SMEs and implement Lean Six Sigma concept for achieving prosperity. In order to fulfill this need, in the doctoral work reported in this thesis, the DOLADMAICS model has been contributed. DOLADMAICS model is designed to enable a SME to implement Lean Six Sigma in five levels. During this doctoral work, the working of first and second levels of DOLADMAICS model was investigated by conducting implementation studies in SMEs. The details of these works and the information and knowledge gained by carrying out them are described in the following chapters of this thesis.