CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF RESEARCH

Companies face stiff competition and need to manage increasing product complexities, shorter time to market, newer technologies. Given these changes, companies are trying to improve business processes with the use of effective project management techniques. Project management is a complex task. Project managers are on the lookout for efficient project management tools to suit specific needs and realistic problems. The most popular methods for project planning and management are based on a network diagram such as Program Evaluation and Review Technique (PERT) and the Critical Path Method (CPM). These tools and their extensions did not consider number of factors which are important for real-life project management. Development of improved tools and techniques to manage manufacturing projects needs attention.

1.2 MOTIVATION FOR THIS RESEARCH

The shift from the classical bureaucratic structures in the manufacturing industries to "lean, mean, flat" organizations is underway. Project Management (PM) approach is drawing increased attention in manufacturing management in recent years and it forms an essential decision making aides it suits the current trend and characteristics of manufacturing (Badiru 1996). Literature survey has shown increasing rate of embrace of network techniques in manufacturing settings (Dereyck and Herrroelen 1997,
Harhalakis 1989, Bowman 1995, Abdul-Nour et al 1998). The existing methods for managing manufacturing projects have been successful in off-line planning and scheduling, it is difficult to dynamically monitor and control the progress of the project and to model resource constraints because information is loosely coupled. Researchers attempt to explore newer methods for managing projects.

Simulation is a powerful technique for solving a wide variety of problems (Bank et al 1998). The application of simulation is so general that it would be hard to point out disciplines or systems to which it has not been applied (Deo 2000, Slawomir and Peter 2008). The spreadsheet simulation was suggested for solving management science and operations research problems by Bodily (1986). Spread sheet provide a natural interface for model building are easy to use in terms of inputs. Petri nets are effective tool for modeling discrete event system. Their essential advantage is the possibility of mapping concurrency, synchronism and hierarchism of modeled system, solutions and report generations and allow users to perform what if analysis. Petri nets have been applied successfully in the areas of Performance evaluation, communication protocols, legal systems, and decision making models (Murata 1989) Petri nets offer many advantages to project managers (Kumanan et al 2000, 2001). The Power of Petri nets in managing projects are to be explored. Literature review reveals there is increased use of stochastic optimization algorithms called metaheuristics intended to be the last resort before giving up and using random or brute-force search. Such algorithms are used for problems where you don't know how to find a good solution, but if shown a candidate solution, you can give it a grade. The algorithmic family includes genetic algorithms, hill-climbing, simulated annealing, ant colony optimization, particle swarm optimization, and so on (Drezet and Tecquerd 2003). Valls et al (2003) and Zhang et al (2005) attempted the use of some Metaheuristics for solving resource allocation problem. The application of metaheuristics in managing projects needs attention.
Resource leveling procedures are aimed to get the even usage of resources and to avoid high peak or very low resource requirements. Many researchers have focused on resource leveling procedures (Burgess and Kilebrew 1962, Sheng-Li et al 2006). Based on the problem characteristics, the code scheme, genetic operators and algorithm structure needs attention. Resource allocation procedures are aimed to get the shortest project schedule by allocating the available limited resources to project activities.

Managing multiple projects is a complex task. It involves the integration of varieties of resources and schedules. The researchers have proposed many tools and techniques for single project scheduling. Mathematical programming and heuristics are limited in application. Most of the techniques developed in the past favored scheduling a single project or multiproject represented single project (Bowers et al (1996), Badiru (1996), Hsing-Pei kao et al (2006) Recent literature shows multi-project management has become prevalent and its solution methodology needs attention.

1.3 SCOPE OF THIS RESEARCH WORK

The scheme of this research work is shown in Figure 1. 1 The work is focused on the following

- Identification of issues and challenges in managing manufacturing projects.
- Application and investigation on use of modeling, simulation and analysis
- Development of methodologies for resource leveling of projects
- Development of methodologies for resource allocation of projects
- Development of methodologies for scheduling of multi projects.
Figure 1.1 Proposed Scheme of Research
1.4 ORGANIZATION OF THESIS

Literature survey is presented in the domains of project management functions and challenging issues of managing projects in Chapter 2. The managing manufacturing projects using simulation is presented in Chapter 3. The development of proposed Memetic algorithm (MA), Particle Swarm Optimization (PSO) algorithm for resource leveling is presented in Chapter 4. The development of proposed Genetic algorithm (GA), Memetic algorithm and Bacteria Forging Optimization Algorithm (BFO) for resource allocation is presented in Chapter 5. The development of proposed Heuristic, Genetic and Memetic algorithms for managing multi project is presented in Chapter 6. Chapter 7 summarizes the contributions of this research.