1.1. Overview of Production Planning and Control

Production planning and control has been emerged as a tool to achieve production objectives such as delivering the required quantity of good quality products at the right place in the right time. The complexity of production is increased due to the increase in the specific environmental complexities. Anticipation of future and maintenance of optimal conditions are very critical to modern business firm. Selection of the best course of action needs special models, which led to the development of new planning methods. Matching the supply – demand gaps in the economic and efficient sense necessitate versatile methods of production. The capacity issues combined with the competition has resulted in newer production planning and control (PPC) systems.

Early decades of twentieth century witnessed emergence of the re-order point system based inventory planning and batch production to meet the production requirements based on rough estimates. Increased offerings due to competition and changes in the customer specific orders necessitated separation of production planning and control systems. The technological advances resulted in customer specific tooling and flexible production. Better technology back up helped to plan for the short term and for the smaller volumes.

In the last seventy five years, the Production Planning and Control (PPC) systems have managed to develop from very rudimentary systems to reasonable levels
of sophistication. With the development in planning tools and applications, the use of computers and information systems in this area, the present PPC systems are used to manage planning and control of complex production systems in an effective way. The changes in the manufacturing system design and the supply chains structures combined with the market forces raise newer challenges for the planning and control functions. The use of machines, technology and IT in the area of office automation and accounting have taken place in large firms to a great extent, but the same cannot be said about the use of PPC in small and medium enterprises (SMEs).

1.2. Use of PPC in Industries

Alford & Beatty (1951) defined PPC as a system that comprises of planning, routing, scheduling, dispatching and follow up functions in the production process in such a way that the movement of the materials, the performance of the machines and the operation of the labour are directed and controlled to ensure both the quality and the quantity adhering to the time and the place. Ray Wild (1980) defined production planning as the determination, acquisition and arrangement of all the facilities necessary for the production. Berry et al (1992) and Shrader et al. (1989) established that the mismatch between market requirements and process choice affects the firm performance.

![Production Planning and Scheduling System](Ref: Everett & Ebert 1989)

**Figure 1.1** Production Planning and Scheduling System (Ref: Everett & Ebert 1989)
Chen et al. (2008) classified Manufacturing Planning and Control system (MPC) approaches into two: the system approach and the quantitative approach. The system approach includes the methods such as materials requirement planning, period batch control, manufacturing resource planning, enterprise resource planning, just in time production and optimized production technology. The quantitative approach includes re-order point systems, statistical inventory control and aggregate production planning. Research on the work sophistication practices shows that adequate PPC systems are established for high technology applications (Chen 2008). Systematic and developed practices are common with those firms that follow learning, innovation and advanced manufacturing technology.

Deployment of PPC is explained by the model shown in figure 1.1. Matching the rough cut capacity planning with master production schedule is very difficult. The current PPC application fields are classified according to the complexity of operations. Just in time (JIT) is suitable for repetitive or flow manufacturing environments, especially for the Flexible Manufacturing System (FMS) or Cellular manufacturing, where aggregate demand is stabilized. PERT/CPM is suitable for the production of large one-off item over an extended period of time. Constraint Based Scheduling (CBS) is used where bottlenecks are present (Everett & Ebert 1989).

1.3. Linking PPC Methods with Manufacturing Environment and Market

Manufacturing environment is classified from jobbing to continuous according to the demand, rate of production and complexity. High fashion garments and customer focused capital equipments necessitate labour intensive and flexible production facility. In flow production such as automotive manufacturing, large volumes of standard products are produced in small batches with almost stable demand condition (Dangayach & Deshmukh 2001). Small or medium volume of production is economically justified by batching the production process (Newman & Sridharan 1996). Highly customized capital intensive items are made by offering large scale inputs in a coordinated fashion. Such type of production is termed as complex production.

Master production schedules are prepared on the basis of manufacturing system criteria such as Assemble to Order (ATO), Make to Order (MTO) or Make to Stock
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(MTS) with slight exception on Engineer to Order (ETO) (Berry et al. 1992; Porter et al. 1999). Jonsson et al. (2003) pointed out the difficulty of making a single fit between one single production planning system and one manufacturing environment. A good planning and control system within a short span is found invalid due to changes in market directions (Newman & Sridharan 1996; Persona et al. 2004).

Business firms are driven by the market forces and therefore they have to choose suitable forecasting, production planning and scheduling systems. Even when large, medium, small and micro firms deal with the same product they have different capacities and follow different production planning and scheduling systems. For a large firm with short to medium term planning of the nearly steady state of demand, Materials Requirement Planning (MRP) and finite scheduler are found useful. For the same firm project planning schedulers are suitable for product launch/ pre launch options (Persona et al. 2004). Firm specific cases of this sort are not much explored and empirical evidences are rare. Most of the research findings are related to large firms and their subsidiaries.

1.4. Features of PPC in the Small and Large Firm Contexts.

Large business firms are centrally organized and managed by a group of managers in a well-maintained and controlled fashion (Singh et al. 2007). Small and medium enterprises (SMEs) are owned by small owners or entrepreneurs, and are managed with limited resources. Planning systems for big businesses are established at the corporate level. They have appropriate systems for planning and controlling the individual business units. For SMEs, the planning systems often encompass the firm as a whole (Uddin & Saeed 2010). Planning systems in SMEs usually de-emphasize the need of written documentation and formal procedures (Lyles et al. 1993). These firms try to maintain and leverage flexibility by keeping their systems and plans less structured and rigid. Unpredictable lead times and highly variable shop floor routings limit the usage of planning and control in make to order type SMEs (O’Regan & Ghobadian 2002).

Empirical studies of MRP and JIT have been largely available since 1990s (Agarwal 1985; Salaheldin et al. 1998 and Fullerton et al. 2001). The application of MRP increased productivity, lowered inventory level, shortened lead time and improved market forecasting (Agarwal 1985; Hitt 2002). But the application of MRP is limited to large firms as MRP required computer assistance, which remained a limitation to SMEs, where
intuitive methods are more common. Implementation of MRP necessitates error free forecasts for the preparation of master production schedule and management initiative to change the mindset of people. It is not easy for small firms to digest these concepts quickly (Fransoo et al. 1994). Large firms consider innovation and training as vital but these are of little use in small firms (Islam & Karim 2011). Very few case studies dealing with improvement of PPC in the small firm context is available.

1.5. Relevance of SMEs.

SMEs are not the miniature of large firms. They are very different type of organizations with their own peculiar problems. Small business firms are characterized by the high level of dependence on the owner/manager, ease of starting up business, freedom to operate with owner’s capital, simple organization structures, ease of innovation and adaptability to the changes in environment (Zhang 1995). SMEs invite attention in the modern business environment due to its contribution for making changes in the social and attitudinal engineering (Kalpande et al. 2010). SMEs contributed 66 per cent of the total employment and 55 per cent of the total revenues of the private sector in the European Union. In Malaysia, Small and Medium Industries accounted 92.6 per cent of the whole manufacturing firms and created 42.6 percent of employment (Islam & Karim 2011). United States Small Business Administration Reports (USSBA) says that over 50 per cent of employment and 45 per cent of wages paid are contributed by SMEs.

In the middle of 1990s, the business world witnessed major setbacks in the large firm sector and most commercial banks and donor agencies such as ADB, World Bank, UNDP etc have started initiatives for promoting the SMEs (Reddy 2008). Cagliano (2001) has identified the reason for less work published in the area linking manufacturing practice with SME performance. First reason is because operations management research assumed equal importance for manufacturing practices applied to both small and large firms. Secondly the SME literature emphasized more importance to technical and technological skills than planning and controlling. Islam & Karim (2011) observed that the Malaysian SMEs performed in a better way than large firms due to the characteristics such as better customer relations, Government support, less formalities
and good human relations. It is also reported that Malaysian SMEs are linked in a better manner to the socio economic fabric of the region than large firms.

Demographics such as key person’s age, education, experience, skills and formal education influence SME performance (Bhutta et al. 2008). Learning is the core function to promote small business growth, but formal learning is seldom practiced (Zhang 1995). Governments are realizing the worth of promoting knowledge acquisition and innovation in SMEs (Islam & Karim 2011). Introduction, growth and survival of SMEs depend on the entrepreneurial abilities and capabilities of the owner/manager (Ritchie 2005). Reluctance to change is the main barrier to the adoption of new learning practices (Keskin 2006). Market orientation helps SME to gain excellent market information and processing abilities (Pelham 2000). Keskin (2006) reported that the market orientation is positively related to SME performance. SMEs should be innovative to respond effectively to counter the limitations such as limited resources, high rate of uncertainty and demand fluctuation (Keskin 2006). Learning in SMEs is firm-specific, work-based and reactive in nature (Badger 2001).

In India, SMEs accounted 95 per cent of industrial units and 40 per cent value addition in manufacturing sector and contributed 6.29 per cent to the GDP (Singh et al. 2008). Because of limited resources, SMEs are not able to devote time and resource to evolve production planning and control strategies for sustainable growth (Singh 2010). In India, globalization and developments in Information Technology made radical changes in business but the benefits are very less utilized by the small sector firms (Todd et al. 2007). To become competitive and to respond effectively to the increased competition from new entrants, SMEs should use better production planning and control methods and information processing (Todd et al. 2007, Singh et al. 2010; Sharma 1996).

Saini et al., (2008); Singh et al. (2010) and Todd et al. (2007) pointed out the strengths and weaknesses of Indian SMEs as follows:

The strengths of the SMEs:

1) The flexibility due to the absence of a formal organizational structure and the ability to respond quickly to the demand of the customers and market conditions.
2) Intended strategy, incrementalism and realized strategy are all enabled by a well
organized leadership.

The weaknesses of the SMEs:

1) Cost leadership is not possible due to the lack of capital.

2) Many owner-managers prioritize the survival and the independence above the
growth and the development.

3) SMEs are more labour intensive than large firms so that manpower planning is
difficult.

4) Lower economies of scale

Todd & Javalgi (2007) have reported that the employment and the export growth
of Indian SMEs indicated steady growth. In India the challenges faced by SMEs (such as
inadequate telecommunication networks, stringent rules and regulations made by
government, discouraging political and socio-cultural elements etc) have changed very
much favoring the industry (Todd & Javalgi 2007). Liberalization policy after 1991
stopped the protection for Indian SMEs from external competition. The ASIAN treaty
and membership in WTO indicate that Indian SMEs are no longer protected, at the same
time they are exposed to immense export opportunities abroad (Todd & Javalgi 2007).
Industry specific challenges necessitate proactive measures for improved production
planning and control. Firm specific challenges like raising capital is easy due to better
single window facilities by government agencies and banks. Better consultancy, training
and R&D facilities are available. Entrepreneurial mindset and views of the key persons
and employees go on changing due to competition.

1.6. PPC Usage in India and Abroad

PPC system study raises some fundamental questions. The first is how to
develop multiple PPC systems that aids different manufacturing environments. The
second is the matching of PPC system with the appropriate manufacturing environment.
Studies focused largely on well established firm due to the availability of measurable
quantitative data (Jonsson & Matsson 2003). Tailor made PPC system packages are
widely used. Many firms use PPC systems without examining their suitability with the manufacturing environment (Newman & Sridharan 1996).

MRP system users performed well in a steady state of demand with small variations. Firms dealing with make to stock and make to order environment performed well with uniform demand. The situation changed in the case of volatile demand and firms managed with Re-Order-Point (ROP) systems. SMEs operating as job shops are more comfortable with using ROP and MRP systems. Indian SMEs operating in the domestic market and prefer ROP systems (Singh et al. 2007). In the case of international and export markets, demand prediction is easier and sophisticated methods are used.

High forecast errors have resulted in increased expenditure and loss of competitiveness. Studies indicate more dissatisfaction with complex forecasting methods than simple models (Wacker et al. 1998). Complex models did not increase accuracy beyond a limit, and they cost more. Combining several simple models improved the forecast accuracy but such methods are inconvenient (Lobo & Nair 1990). Switching over to formal/statistical forecasting methods by small firms is often resisted by the traditional practitioners. Lack of management support, relevant data and knowledge base resulted in unfit forecasting practice (Smith et al. 1996). Sharma et al. (2006) observed that less than 2 per cent SME owner/managers of Northern India were using computers for forecasting.

Studies conducted among the SMEs of Ireland, US, UK, Pakistan, Australia, Ghana, India and Korea revealed that the key person’s characteristics such as cultural differences, race, gender, age, experience and longevity influence managerial decision making and the quality of PPC activities (Beaver & Prince 2002; Bhutta et al. 2008; Boohene et al. 2008). Karami (2006) observed that age, education and experience of the CEO significantly influence the implementation of planning decisions.

1.7. The Research Problem

In large and modern industries, there exists a well-developed professional management system. For the industries of small, unorganized and non-certified sector,
such systems are very rare. Many of such firms are lacking scientific and systematic methods, without which, resulting in poor performance.

Thus the problem is to study the use of forecasting, planning and control by selected small and medium enterprises to find and suggest alternatives for improving the use of forecasting, planning and control in SMEs.

Following research questions were proposed with respect to SMEs:

1. Are forecasting, planning and control important to firm performance and what are their linkages?
2. What are the factors, which influence the use of forecasting, planning and control?
3. How do the above factors, as viewed by key persons of the firms influence the usage of forecasting, planning and controlling to improve its performance?
4. What conclusions/ generalizations can be drawn and the steps can be taken to increase the use of PPC in SME to improve firm performance?

1.8. Steps Followed in the Study

1. Formulate the model and framework suitable for the study based on the literature review and the consultation with experts.
2. Identify the firms belonging to SME in a particular geographic area specified, which are representative of product type, ownership/ management type and exhibiting different types of demand characteristics and select a suitable sample.
3. Design and test a questionnaire and use it for conducting the survey.
4. From the encoded and tabulated data, identify and interpret the relationship between the factors selected and PPC elements used.
5. Use case studies to check the findings and for throwing light on improvements possible.
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The steps followed are illustrated by means of the figure 1.2, as given below:

**Figure 1.2 Steps followed in the Study**

1.9. Structure of the Thesis

This thesis is organized in the following manner: The second chapter is devoted to the review of literature. The third chapter deals with the study of forecasting and its linkage with planning, controlling and firm performance. The fourth and fifth chapters discuss the effect of planning and control respectively on the firm performance. The chapter six focuses on the analysis of the combined influence of forecasting, planning and controlling and the other variables on firm performance and on one another. The seventh chapter is the presentation of case studies. The last chapter of the thesis presents the limitations of the study, the summary, the conclusion and the scope for further research. The references are listed at the end.

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