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# **LINKING THE AWARENESS OF MODERN PPC TECHNIQUES WITH THE PERCEIVED USEFULNESS OF FORECASTING: EMPIRICAL FINDINGS FROM INDIAN SMES**

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**ABSTRACT:** This paper explores the forecasting practices of the selected Indian Small and Medium Enterprises. A model and framework is developed to link the awareness of modern PPC techniques with the perceived usefulness. The model was empirically tested using the data collected from a questionnaire schedule administered among the selected Small and Medium Enterprises. It is observed that the perceived use of forecasting, influence Small and Medium Enterprises performance. Reasons for the low level usage of forecasting and its implications are discussed in the paper. The paper ends with the suggestions for improving the usage of forecasting and Small and Medium Enterprises performance.

**Keywords:** PPC, Forecasting, Perceived Usefulness, SMEs.

## **1. INTRODUCTION**

In a dynamic and competitive environment, production firms need to satisfy their customers and promoters by keeping on high level of performance [5]. Small and Medium Enterprises operate with less resources and managerial expertise, at the same time such firms need to operate in a more flexible manner and be more reactive to market changes [4]. The use of modern Production Planning and Control techniques in Small and Medium Enterprises is reported to be poor [7]. In Small and Medium Enterprises, owner /manager's qualities influence firm performance because of the high level of autonomy hold by them and because of the skill, managerial competencies, education and risk taking of the key persons [6].

## **2. OBJECTIVE OF THIS PAPER AND ORGANIZATION OF THE ARTICLES**

This paper explores the extent of use of modern PPC techniques in Small and Medium Enterprises and

link it with the forecasting practices followed. Research can contribute to improved forecast usage and firm performance. A survey is conducted among 382 Small and Medium Enterprises. Attention given to modern Production Planning and Control techniques are rated using standard indicators. Linkage between the attitude towards modern Production Planning and Control techniques and perceived usefulness of forecasting is analyzed using a structural equation model. Alternatives for improving the present forecasting practices in Small and Medium Enterprises are identified. Two case studies are discussed in the light these. First, we provide a literature review of the firm performance and other variables in the Small and Medium Enterprise context. Next section, we describe the framework and design of the survey. Results are discussed then and the paper ends with some findings and conclusions.

### 3. CHARACTERISTICS OF SMEs

Small and Medium Enterprises are characterized by limited customer base, operating in competitive and turbulent markets [4], less control or influence over the markets [4] and scarcity of resources [8]. Competitive advantage of Small and Medium Enterprises depends on IT infrastructure, cultural dimensions and strategic use of forecasting planning and control methods. Research highlights the poor management of Small and Medium Enterprises in many countries [2] and [3].

### 4. DESIGN OF THE SURVEY INSTRUMENT

[8] Proposed a model for exploring the competencies of Indian Small and Medium Enterprises and to link them with Small and Medium Enterprise performance. With some changes made to the model proposed by [8], we propose a research model, for linking the Production Planning and Control strategies with firm performance, as shown in figure 1.

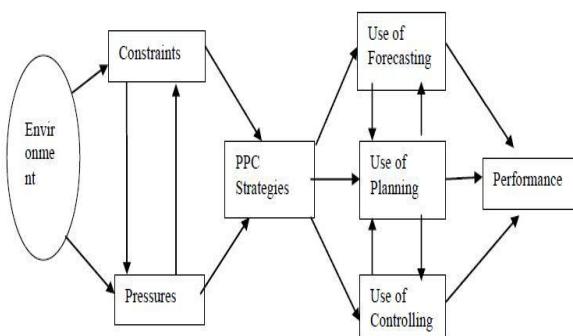


FIGURE 1. MODEL LINKING PPC USAGE AND SME PERFORMANCE

In this study, the firm's exposure and attitude towards the worth of modern PPC techniques are linked with the perceived usefulness of Forecasting. Two Structural Equation Models were developed and tested. Theory of Planned Behaviour (TPB) assumed that the perceptions influenced intentions which in turn influenced the actual behaviour of the individual [1]. Perceptions are linked with actions in the following manner:

Perceptions → Intentions → Actual Behavior

This work explores the linkage between the use of forecasting and SME Performance. Also the perception that the positive intention to use modern forecasting tools result in better use of forecasting is tested using a model formed. The models used in this study are shown in figure 2a and figure 2b.

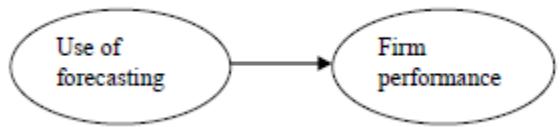


FIGURE 2a. MODEL LINKING THE USE OF FORECASTING AND FIRM PERFORMANCE

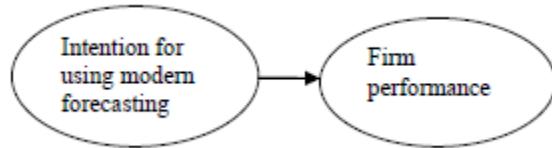


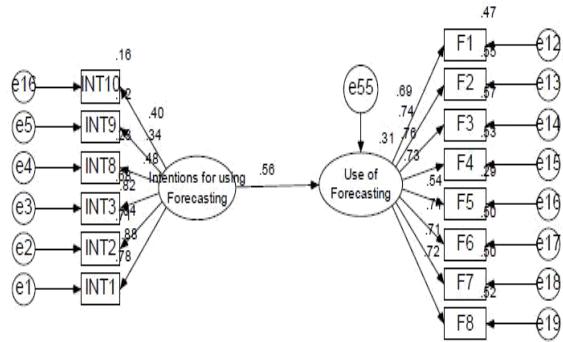
FIGURE 2b. MODEL LINKING THE INTENTION FOR USING MODERN FORECASTING TOOLS AND USE OF FORECASTING

Questionnaire is designed with standard indicators. For measuring the use of forecasting, eight indicators (used by [9]) were used. For measuring the awareness of modern Production Planning and Control methods, six indicators (explained in figure 1) were used. Face validity, reliability and construct validity were established by standard methods.

The data has been collected from the key persons of the respondent SMEs. The list of registered members of Small and Medium Enterprise Association of Kerala is selected as the sampling frame. As random sampling is not applicable because of the non willingness to cooperate by the firms, data was collected by cluster cum convenience sampling. Respondents were directly approached and the data was collected using enumerator assisted questionnaire schedule. Content validity of the questionnaire was ensured from similar works done. Reliability of the items was ensured from Cronbach alpha values.

##### **5. LINKING THE ATTITUDE TOWARDS MODERN PPC TECHNIQUES AND PERCEIVED USEFULNESS OF FORECASTING**

Structural model used to test the linkage between intentions for using modern Production Planning and Control techniques with the use of forecasting practice is illustrated in figure 2. Structural Equation Model is found valid with a chi-square value of 178.32 significant at .001 level. Incremental fit indices like Comparative Fit Index, Normed Fit Index and Trucker Lewis Index are above .9. Root Mean Square Error Approximation value is found .059. These measured values indicate good model fit. From the Structural Equation Model it is understood that the awareness of modern forecasting methods results in better use of forecasting.



**FIGURE 2. STANDARDIZED LOADINGS OF THE MODEL LINKING AWARENESS OF PRODUCTION PLANNING AND CONTROL WITH USE OF FORECASTING**

Note: INT1 –Awareness of Modern Production Planning and Control techniques, INT2 – Level of use of modern techniques, INT3 – Extent of use of Forecasting, INT8 – Importance of forecasting, INT9 – Importance of Planning, INT 10—Importance of Control. F1—Simplicity, F2 – Understandability, F3 – Ease of Use, F4 – Effectiveness, F5 –Comprehensiveness, F6 – Timeliness, F7 – Accuracy, F8 – Overall Satisfaction

### 5.1 Attention given to Modern Production Planning and Control Techniques

Extent of use of modern Production Planning and Control techniques in production, HR and budgeting were measured using a five point Likert's scale. Frequency of use of modern techniques in Finance, Marketing, HR and Materials were also collected. Importance given to Forecasting, Planning and Controlling were also measured. Table 1 explains the mean scores. All indicators recorded a reliability value (Cronbach's alpha) above .7. One sample t- test (shown in table 2) show the difference between mean values and national level bench marks (scores above 3, Ref: [8]. Use of modern Production Planning and Control techniques score above national level. Perceived importance of forecasting, planning and controlling was found significantly higher than the minimum expected level.

**TABLE 1. AWARENESS OF MODERN PRODUCTION PLANNING AND CONTROL TECHNIQUES**

Sample Size N = 382	Mean	SD
Awareness of modern PPC techniques	2.38	1.05
Usage of modern techniques of PPC	2.96	1.22
Use of modern PPC in Marketing, Production, Finance, HR etc)	2.97	.91
Importance given to Forecasting, Planning and Control	3.92	.53

TABLE 2. T- TEST RESULTS OF THE USE OF PRODUCTION PLANNING AND CONTROL

Test value 3	t	df	Sig. (2-
Awareness of modern techniques	-11.501	381	.000
Usage of modern techniques	-.669	381	.504
Use of forecasting in different fields	-.563	381	.574
Importance of Forecasting, Planning and Control	34.154	381	.000

## 6. MANAGEMENT OF FORECASTING BY THE FIRM

Individual, committee and salesmen forecasting were grouped as lower order models [9] and moving average, regression, smoothing and market survey were classified as higher order models. 176 firms used lower order forecasting methods, while 206 firms used higher order forecasting methods. Reasons for using forecasting were explored. To improve planning ranked top with mean score of 3.52 followed by the need to gain competitive advantage (mean 3.46). Need for cost reduction ranked third (mean 3.37) and need to avoid risk ranked fourth (mean 3.35). Reason for not using higher order forecasting were also ranked and is shown in figure 3. Lack of awareness and low initiative by the firm were identified as the chief reasons.

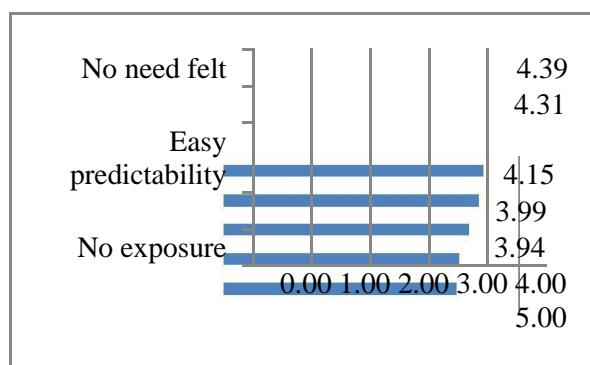


FIGURE 3. REASON FOR NOT USING HIGHER ORDER FORECASTING BY THE SMALL AND MEDIUM ENTERPRISES

Restricting factors which cause the firm to stick on to the lower order forecast models were also explored.

Responses are shown in figure 4. The planning formalization is adequate but inventory management is poor. Also the use of planning instruments is very poor.

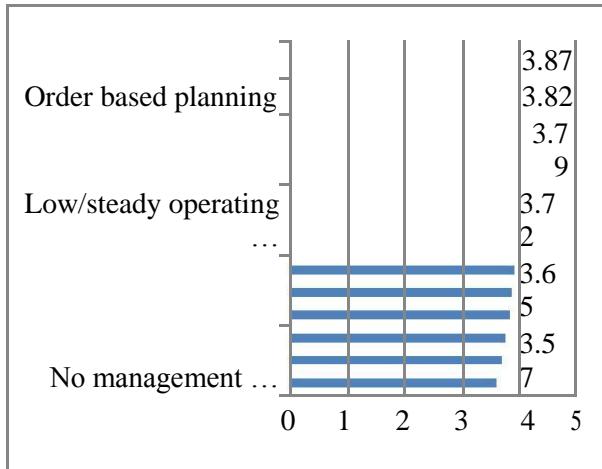


FIGURE 4. RESTRICTING FACTORS FOR THE LOWER ORDER FORECASTING USERS

It is inferred that the lack of need felt, easy predictability, lower operating volumes, lack of initiative and knowledge are restricting the implementation of Production Planning and Control in Small and Medium Enterprises.

## 7. CASE STUDIES

Forecasting practices of two Small and Medium Enterprises are described in this section. Analysis of each firm is done separately. In the end solutions were listed.

### 7.1 Case Study of Firm A

Firm A is a medium sector firm involved in the manufacture of rubber sheets (1500 tones capacity in a year) and is managed by the owner. The firm is ISO certified and is having staff strength of 42. The key person is having 15 years of experience in the field. Owner is a graduate. Forecasting used by the firm is judgmental based on experience.

Problems faced by the firm C are identified as follows:

- Manual and highly subjective forecasting method led to an erroneous forecasting.
- Conventional approach in designing the bill of materials.
- No integration of forecasting, production planning and supply planning.
- Shop floor control is unable to react to the frequent changes in production plans.

Firm's forecasting is by means of trial and error methods. For evaluating the firm's forecasting method, actual forecast was compared against four artificial forecasts (a 3 month moving average, a 6 month moving average, an exponential smoothing and one based on Holt-Winters method respectively). Moving averages are not suitable as evident from high values of Mean Absolute Deviation (22.9) and Mean Absolute Percentage Error (23.55) respectively. Forecast made by the firm is also report high values of Mean Absolute Deviation and Mean Absolute Percentage Error. Exponential Smoothing method is somewhat good (Mean Absolute Deviation: 8.75, Mean Absolute Percentage Error: 8.73). Winters model is found best suited with almost perfect suit with the firm's demand data (Mean Absolute Deviation: .37).

Case study shows that the firm's forecasting is not apt and is managing with less efficient judgmental forecasting.

Awareness of modern Production Planning and Control is positively correlated with the use of forecasting. Awareness of modern forecasting tools is positively correlated with the use of forecasting. This means the firms having better awareness

## **7.2 Case Study of Firm B**

The firm B is involved in the bottling and selling of carbon dioxide gas to satisfy the domestic needs of aerated soft drink producers. This firm is a small sized company with permanent staff strength of 20 and a few contract workers. The manager is a graduate with 10 years experience. The product is highly seasonal and the production schedule is further complicated by the constraints of the major raw material supplier. The management staff in charge of sales prepares the forecasts, after getting the concurrence of the senior manager. During the busy working periods, a moving average is used to forecast production and to reap the benefit from the competitive situation.

Major problems found from the study of the firm B are listed below:

- The firm is not able to manage the uneven demand effectively.
- Even though the firm is highly satisfied with the usefulness of forecasting, the high level of subjectivity and crude methods resulted in improper planning.
- Lack of formal practices and standardization resulted in more ambiguities.

Recommendations for improving the performance of the firm B are listed as follows:

- Use computerized data base and IT enabled tools to manage regular customers.
- Forecasting is to be improved for managing the uneven market forces effectively.

## **8. CONCLUSION AND IMPLICATIONS OF THE STUDY**

This study revealed some crucial implications to the small and medium industry and academia. Small and Medium Enterprises should develop specific competencies, especially in the IT infrastructure and usage of modern management techniques after analyzing business environment. Even though many of them were equipped with strategies for managing local needs, most of the strategies used were crude and subjective (for the majority of firms covered under the study; exceptions were there). To develop competencies for cost reduction, quality improvement and to fulfill delivery commitments, Small and Medium Enterprises need some external inputs.

Important findings from the study are summarized of modern tools are likely to succeed in the business. as follows:

- Awareness and use of modern Production Planning and Control techniques by the Small and Medium Enterprises is not up to the mark.
- Small and Medium Enterprises use of modern Production Planning and Control techniques in finance and marketing is satisfactory, but it is much lower in HR and materials management.
- Lack of management initiative, no need felt, lack of knowledge and lack of exposure limits the firms from using modern Production Planning and Control techniques.
- Small and Medium Enterprises are having enough competencies to manage in the local level, but need to update their practice of modern techniques to compete in the global level.

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