
UNIT 4 NEED AND IMPORTANCE FORECASTING

Objectives

After going through this unit you should be able to:

- understand the concept of forecasting as applicable in production/operations management
- appreciate its need
- understand the length of future period of forecast as is related to the decision situation/purpose for which it is used.

Structure

- 4.1 Introduction
- 4.2 Concept of Forecast
- 4.3 Need of Forecast in Production/Operations Management
- 4.4 General Steps in the Forecasting Process
- 4.5 Importance and Application of Forecast in Production/Operations Management
- 4.6 Summary
- 4.7 Self-Assessment Exercises
- 4.8 Further Readings

4.1 INTRODUCTION

Every individual is interested in the future. Some with respect to themselves. Some with respect to others-their near or dear ones. Some with respect to their opponents. Few are just curious. Others need to prepare themselves (PLAN) for contingencies likely to happen in future if known before hand. It is interesting to note that don't know about future exactly. For example: People save for future to take care of contingencies like serious illness, likely heavy expenses, to provide for their families and children in case of their sudden death etc. These contingencies might not occur, or when they occur, the magnitude may be such that total savings may not be sufficient. That means, if it is ACCURATELY known before hand, than the PLANS can be prepared and implemented to BETTER take care of contingencies.

The same problem is faced by managers and decision makers in their respective field of operation. Because it takes time to complete an action, if this is sufficiently long, then after the action in complete, the purpose of action may not exist.

Example: To-day realise as a manager that the demand of your product is much more than the total production of all producers taken together. You decide to setup another plant to increase the production so that you can take advantage of huge demand supply gap. It will take several years for the plant to be effected and start production. By then high demand gap may not exist-either demand has fallen or other producers have already started producing more. So by the time your plant is complete, it not useful for the purpose it was effected. If you could have known about this situation earlier, then you would have started construction of plant so as to be completed TODAY, then it would have served the purpose for which it was erected.

Every manager would LIKE to know exact nature of future events to accordingly take action (PLAN) when sufficient time is in hand to implement the plan. The effectiveness of his plan depends upon the level of accuracy with which future events are known to him. But every manager plans for future irrespective of the fact whether future events are EXACTLY known or not. That implies, he does try to FORECAST future to the best of his Ability, Judgement and Experience.



4.2 CONCEPT OF FORECAST

Usually forecasting and predicting are used interchangeably in general usage. Adam and Ebert in their book Production and operation management have defined and distinguished the two as follows:

Forecasting: "Is a process of estimating a future event by casting forward past data. The past data are systematically combined in a predetermined way to obtained the estimate of the future".

Prediction: "Is a process of estimating a future event based on subjective considerations other than just past data; these subjective considerations need not be combined in a predetermined way".

Thus forecast is an estimate of future values of certain specified indicators relating to a decisional/planning situation. In some situations forecast regarding single indicator is sufficient, where as, in some other situations forecast regarding several indicators is necessary. The number of indicators and the degree of detail required in the forecast depends on the intended use of the forecast.

How much far in future? This is subject to the situation. It should be sufficiently in advance so as to leave enough time in the hands of the decision maker to take a decision/ ' plan and to put that plan operational by the time forecasted situation occurs.

Thus

Forecast (Time in future) \geq Time taken for preparation of plan
+ Time taken to implement the plan

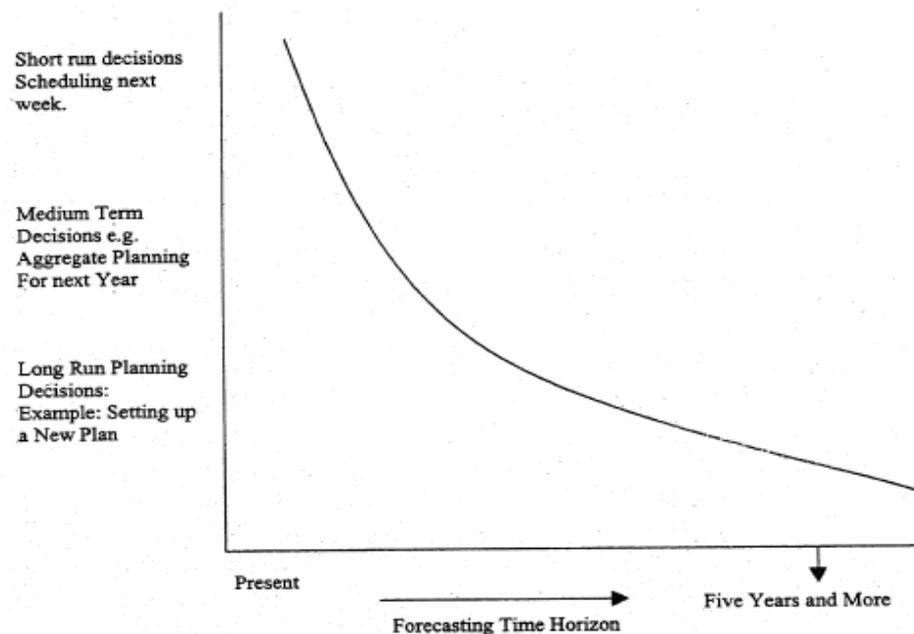


Figure: 4.1 Forecast Time Horizon Indication for Various Categories of Decision Situations
(Adapted from Production and Operations Management, Adam and Ebert)

What methodology is to be used for projecting the past data into future? - depends on :

- Type of past data
- Pattern of past data
- Time horizon of forecast

This method of projecting the past into future is termed as FORECASTING MODEL. A large many statistical forecasting models are available suitable to different decisions. These models are discussed in detail in UNIT-5 and UNIT-6.



4.3 NEED OF FORECAST IN PRODUCTION / OPERATIONS MANAGEMENT

There are two basic reasons for the need of forecast in any field more so in production / operation management.

1) Purpose - Any action/plan is contemplated/devised in the PRESENT to take care of some contingency accruing out-of a situation/condition or set of conditions set in future. These future conditions offer a purpose/target to be achieved so as to take advantage of or to minimize the impact of (if the forseen conditions are adverse in nature) these fixture conditions.

An action or a plan can not be taken/divised in void-without any purpose/objective/target. Any plan or action is to achieve 'something'. This 'something' is a derived function of future condition (s).

Example: The action/plan to set up an additional plant to increase production capacity. How much increased production and what should be the size of the new plant is dependent on future demand supply gap. To take advantage of this future demand-supply gap, a target of increased production is arrived at. To achieve this target a plan is prepared and put into action.

2) Time - To prepare a plan, to organise resources for its implementation, to implement; and complete the plan; all these need time as a resource. Some situations need very little time; some other situations need several years of time. Therefore, if future forecast is available in advance, appropriate actions can be planned and implemented 'intime'.

Example: Consider the same example discussed earlier -to take advantage of future demand - supply gap;

- a) Plan or decision is to be taken. Through exploration several alternatives are considered and one of them choosen. In the above case, the alternative choosen is setup an additional plant'. This takes time suppose this is t1.
- b) Location of the additional plant is to be choosen. This again takes time. Suppose this is Q.
- c)
 - i) Technology negotiations if any have to be conducted.
 - ii) Land purchase negotiations, acquisition activities i.e. registration etc. have to be completed.
 - iii) Permissions and clearnces from various authorities as required under the law have to be applied for and obtained.
 - iv) Provision for adequate finances is to be made. Suppose all this takes time t3.
- d) Actual errection, construction, testing is to be completed and commercial production is to be started.

Suppose this takes time 0.

Thus minimum time required to plan and implement is= $t_1+t_2+t_3+t_4$

If as and when a situation arises, and planning and action can be completed immediately-without taking any time; perhaps forecasting would not be needed at all,

Activity A

What is the distinction between forecasting and planners? How can organizations become confused one forecasting when this distinction is not clear?

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4.4 GENERAL STEPS IN THE FORECASTING PROCESS

The general steps in the forecasting process are as follows:

- 1) **Identify the General Need.** For example: in the present manufacturing business, unfulfilled demand might have been observed. The manufacturer may have a feeling, "Why not expand production?" This should constitute the identification of general need. Still, the manufacturer does not know for certain whether expansion is really a wise decision? How much to expand? When to expand?
- 2) **Select the Period (Time Horizon) of Forecast:** Considering the same example: General estimate regarding time taken to erect the plant. And beyond that the usual plant life. Thus, in this case long term forecast is needed. The long term' can be defined appropriately for each situation. In this case, if we consider time for plant erection to be roughly 3 years-then we need a forecast spanning 5-10 years beyond 3 years. That means a forecast covering a period of 5 years starting three years from now.
- 3) **Select the Indicators Relevant to the Need:** Depending upon the product or product line, one or more of the following may be identified:
 - i) Industry Sales.
 - ii) Competitors (collective) present and projected capacity.
 - iii) Population projection (in case product is directly related to the population).
 - iv) Income levels.
 - v) Economic development etc.
- 4) **Select the Forecast Model to be Used:** For this, knowledge of various forecasting models, in which situations these are applicable, how reliable each one of them is; what type of data is required. On these considerations; one or more models can be
- 5) **Data Collection:** with reference to various indicators identified –collect data from various appropriate sources –data which is compatible with the model(s) selected in steps(4).Data should also go back that much in past , which meets the requirements of the model.
- 6) **Prepare Forecast:** Apply the model using the data collected the value of the forecast.
- 7) **Evaluate:** The forecast obtained through any of the model should not be used , as it is , blindly. It should be evaluated in terms of ‘confidence interval’ –usually all good forecast models have methods of calculating upper value within which the given forecast is expected to remain with certain specified level of probability .It can also be evaluated from logical point of view whether the value obtained is logically feasible? It can also be evaluated against some related variable or phenomenon. Thus , it is possible , some times advisable to modify the statistically forecasted’ value based on evaluation.

Activity B

Define the term qualitative forecasting and quantitative forecasting. How often your organization use forecasting techniques and which one?

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4.5 IMPORTANCE AND APPLICATIONS OF FORECASTS IN PRODUCTION/OPERATIONS MANAGEMENT

Importance of forecast lies in its ability to help the managers /planners to help them take better actions regarding future and also to help to help them in discharging their functions more effectively. How does it help?



A manager invariably continues to discharge his functions-forecast or no forecast. When a forecast is available:

- 1) The manager is comparatively better informed so as to set up his objectives more clearly.
- 2) His thinking, and generation and choice of alternatives becomes more focused.
- 3) Because sufficient time is available, it is possible to organise and implement his actions in a more effective way.

The importance is directly proportional to:

[Results of an action based on forecast] -[Results of an action for the same situation without any forecast].

If the difference is positive and large then the importance is more, otherwise it is not important.

Importance of forecast and of ability of used statistical forecasting techniques to generate reliable/accurate forecasts, are directly related. If in general forecasts are not accurate i.e. quantum of forecast error is more; then difference of results of actions as discussed above may not be relevant. Because both become unreliable.

Forecast Error can be explained as:

Forecast Error = [value forecast value actually happening]

The more sophisticated models of forecast often provide forecast with smaller error but cost of development of the model, forecasting and maintaining tends to be high. There has to be a tradeoff between choice of model and the cost. The following figure clearly explains this trade off:

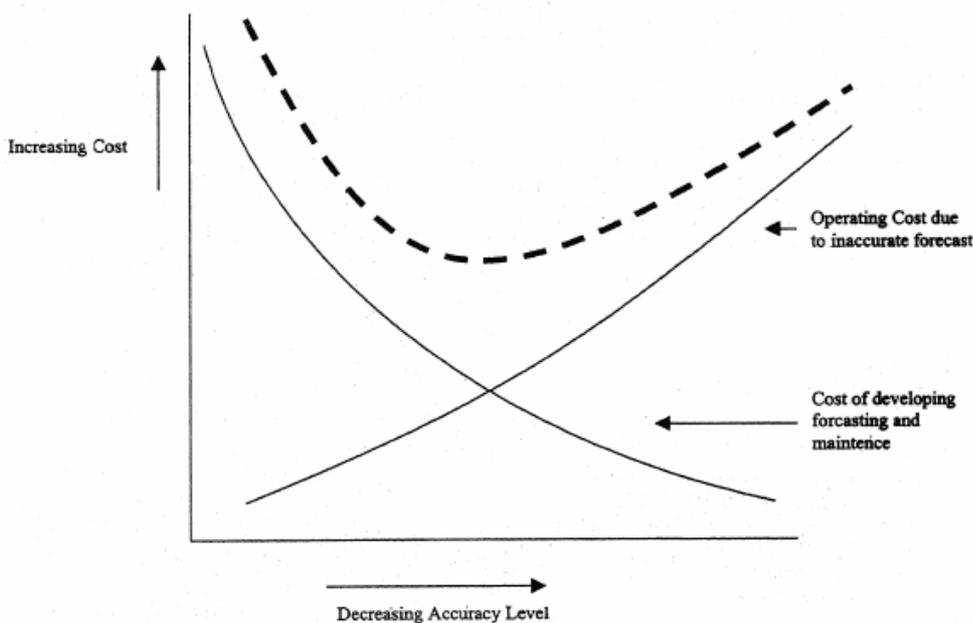


Figure: 4.2 Cost and Accuracy Tradeoff in Choice of Forecasting Models

(Adapted from Production and Operations Management, Adam and Ebert)

[John C. Chambers, Satinder K Mullick and Donald D. Smith, in, "How to choose the right forecasting technique". Harvard Business Review, Vol. 49 No.4 (July-August 1971) as given in charts in the book, -Quantitative Techniques For Business Decisions by Charles A. Gallagher, and Hugu J. Watson;] have given description of various forecasting models and rated them from poor to excellent. By proper choice, suited to the purpose, good to excellent results in forecast can be achieved.



Table 4.1: Some Typical Applications of Forecasting in Production/Operations Management

Application	Some Indicators	Time Span
1. New Plant for Production expansion	Long term Demand Long term production Capacity of all producers etc.	5 or more years some times may be less
2. Seasonal Production Planning.	Demand Cycles, preferable from one peak to another peak	Usually 6 months-2 years
3. Capital Planning	Long term money market trends. Interest rate trends	Usually one or more years
4. Intermediate Operations Planning	Intermediate demand shift in preferences	Upto about 2 years
5. Short run production Adjustment	short-term demand short term material/input protections	about 6 weeks.
6. Scheduling Production	Order position, Emergency orders	Usually 1 week
7. Product Development	Long term sales trend specifically decline Stage. Technological Developments in related fields	2 years and more depends on usual time taken in product development

Adapted From: Levin Richards L., Curtis P. McLaughlin, Rudolph P. Lamone, and John F. Koontz, Production/Operations Management. Tata McGraw Hill Publishing Co. Limited P. 319.

Activity C

With respect of your own organisation find out the application of forecasting. Identify the areas where the forecasting techniques are applied and the areas when the techniques can be applied.

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4.6 SUMMARY

As part of introduction, the role played by forecast in day to day life of individuals and how forecast is of interest to the manager in his job functioning has been discussed. If better/accurate forecast is available the manager can perform his job functions relating to planning etc. quite efficiently. He does perform; all these functions even when the forecast are not available.

The concept of forecast has been defined and differentiated from prediction. It has been emphasised that forecasting process requires projecting the past data through predetermined method of mathematical manipulation.. Deciding about time horizon of forecast has also been explained through graph presented in figure 4.1.

Need of forecast in Production/Operations management with respect to purpose and time has been explained. General' process of forecasting along with the steps explained.

The concept of importance and the magnitude of forecast error have been explained. Trade' off between choice of sophisticated model i.e.; high level of accuracy and cost of forecasting have been discussed. Finally through t5ble presentation-some typical uses of forecast have been explained.



4.7 SELF-ASSESSMENT EXERCISES

- 1) Discuss as to how forecasting can be helpful to production manager in improving-his job functioning?
- 2) Does production manager need forecast in all his job functions? Give examples in either case.
- 3) Explain- why a trade off between cost of forecast and the accuracy level should be considered?
- 4) Explain the general process of forecasting.
- 5) Discuss the concept of 'forecasting error'. It every forecasting method is prone to error - than what is the rational of using forecasting?
- 6) Discuss how time horizon of forecast is related to level of decision. Given examples.

4.8 FURTHER READINGS

- 1) Levin Richards I., Curtis P. McLaughlin, Rudolph P. Lamone, and John F. Kottas, *Production/Operations Management*. Tata McGraw Hill Publishing Co. Limited.
- 2) Evert E. Adam, Jr. and Ronald J. Ebert. *Production and Operations Management*. Prentice Hall of India Private Limited.
- 3) John E. Biegel, *Production Control-A Quantitative Approach*, Prentice Hall of India Private Limited.