
UNIT 2 DEMAND AND SUPPLY FORECASTING: METHODS AND TECHNIQUES

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2.0 OBJECTIVES

After reading this Unit, you should be able to understand the:

- need for forecasting manpower demand and supply in hospitality industry,
- types of forecasts for manpower demand and supply,
- methodologies of manpower demand and supply forecasting at the **macro** and micro levels, and
- database required for manpower demand and supply forecasting at the macro and micro levels.

2.1 INTRODUCTION

In spite of the universally accepted idea that a tourist not just buys the tourism product but also in a way buys the service skills and qualities of a wide range of humans working in hotels and other allied fields and in return who would contribute to the total holiday experience of tourists, In many countries, we see that the growth and development of tourism is adversely affected either due to lack of trained human resources or poor quality in service and so on. The reasons for this is rightly assessed by **Tom Baum (1993)** who has pointed out that there is a **"tendency to develop human resource policies, initiatives and remedial programmes that are reactive to what is currently happening rather than proactive to what is likely to occur."** He further stresses that, **"as a general axiom, effective human resource strategies require considerable lead time in order to support tourism development and, ideally, should be in place well before the bulldozers and diggers move in"**.

This brings to fore the issue of manpower forecasting of both demand as well as supply. In this Unit we will discuss the various issues related to demand and supply forecasting at a conceptual level which you will find useful for application in the hospitality sector.

2.2 MANPOWER FORECASTS: NEEDS AND OBJECTIVES

In the context of manpower forecasting there are some conceptual issues which need elaboration. The primary issue relates to manpower demand. The other issues concern the manpower forecasts, need for manpower forecasts and types of forecasts.

2.2.1 Conceptual Issues

In manpower literature, one finds it's difficult to differentiate between the words 'demand', 'need', 'requirements', 'projections', '**estimates**' and 'forecasts'. Some use these terms as synonymous while others use them in distinct senses.

'Demand', from the economists' angle, is a schedule of relationships between quantities of that particular category of manpower demanded and a series of possible wage rates, i.e., manpower demanded varies with the wage rates – more at a lower wage rate than at a higher one.

'Need' refers to the number of people required to provide an ideal level of service. What is ideal is never achieved, because of structural, technological and other constraints.

'Requirements' are the functional composition of employment that will be necessary to produce goods and services within a specified timeframe to achieve social, **cultural**, economic and technological targets.

'**Projections**'/predict the outcome of spontaneous forces, i.e., the outcome which is expected in the normal course of events and in the absence of external stimulus. They are mathematical extensions of 'data on' manpower into the future whereas 'estimates' are educated guesses based on experience.

'Forecasts', on the other hand, refer to a prediction of the outcome when normal course of events are influenced and altered by external forces. Forecasts usually take into account both the projections and the estimates. For example, forecasts at the macro level could result in a statement of what would happen if economic growth was deliberately manipulated by government policy.

2.2.2 Objectives of Manpower Forecasts

The basic rationale for making manpower forecasts is the long gestation lags in the production of skilled professional people. Manpower forecasts made well in advance, facilitate planning of **education/training** is the effort to ensure that manpower required are available at the time when they are needed. As we see the trend today, most of the hotels have their training schools imparting training to personnel at work at different levels.

The second major reason is the observed imperfections in the labour market. Markets for manpower with long lead-time for production are characterised by cobweb cycles, because of long lags in the supply side and short lags, on the demand side. In the event supply is not planned to meet the requirement, cobweb cycles in the labour market may ultimately lead to distortions in occupation-education correspondence, the fallout of which could either result in huge educated unemployment or with people taking up occupations for which they are not adequately prepared'or both. Manpower forecasts, it is expected, would facilitate correction of labour market distortions.

The third major reason is that in the short-run at least, elasticities of substitution among various skills have been observed to be either zero or near zero. Production of goods and services, therefore, requires various categories of skilled manpower in fixed proportion. Shortage of any skilled category of manpower, in such a situation would adversely affect the production of goods and services within the economy. Manpower forecasts would help avoid such a situation by facilitating anticipation of skill shortages and planning skill supplies accordingly.

The need for manpower forecasts in hospitality is essentially linked with the overall development and growth of this industry at both macro as well as micro levels. A variety of issues are to be addressed in this regard keeping in view the characteristics of the industry that need to be tackled in a coherent way. Both, the public and the private sector have to act in a coordinated manner or else face a decline.

2.3 TYPES OF MANPOWER FORECASTS: MACRO AND MICRO FORECASTING

Having understood the objectives of manpower forecasts one needs to know that manpower forecasts could be categorised differently, depending on the purpose for which forecasts are made. Some of the major types of forecasts are briefly described here.

1) Short-Term Forecasts

Short-term forecasts are very useful at the micro-level or we can also say, company level, e.g., a chain hotel makes financial statement for its expenditures keeping in view both the on going projects and the projects in the pipeline. The financial provisions have to be made for both the expected and unexpected expenditures. Short-term forecasts are usually made for a period not exceeding two years aiming to facilitate estimation of financial provision for **wages/salaries** in the **programmes/projects** initiated.

2) Medium-Term Forecasts

For most countries medium term is about two to five years – the horizon for planning. Medium term forecasts are **useful** in those offices which are concerned with advising ministers or preparing contingency plans to meet the 'twists and turns of economic circumstances or international events'.

3) Long-Term Forecasts

Forecasts for a period more than five years are considered as long-term forecasts. These forecasts are useful in educational planning, particularly relating to the highly skilled professional categories of manpower. They are also **useful** in the preparation of corporate plans incorporating productivity changes, technological changes and major organisational developments. For example, The Macro Level Planning in Indian hospitality sector discussed in Unit 1 gives you an idea **about** long-term forecasts.

4) Policy Conditional Forecasts

Policy conditional manpower forecasts are those which are determined by the policy towards the factors which influence the demand for manpower. Such manpower forecasts may be based on a rule of thumb, or on professional judgement, or on an explicitly specified model or any combination of the three.

5) Optimising Forecasts

Optimising manpower forecasts are those which are obtained as solutions to an optimising model in which numbers demanded of various categories of manpower are so determined that either the end benefits are maximised, or cost of resources used in achieving a pre-determined end objective is minimised.

6) Macro and Micro Forecasts

You have read about micro and macro level **planning** in Unit 1. Here we are talking about micro and macro forecasts. For two reasons it is important to make a distinction between them. First, the end purposes of the two types of forecasts are different. Second, the methodologies employed and database used are different. It is, however, possible that **micro** forecasts, if properly planned, might ultimately lead to macro forecasts but not vice-versa.

Macro forecasts are done usually at the national, **industry/sector** and **region/state** levels whereas **Micro forecasts** are made at the enterprise or department level. **Macro manpower forecasts** are used for planning, education and training facilities as well as to make decisions regarding choice and location of industries for development whereas **Micro manpower forecasts** are needed primarily for planning recruitment, promotion, training and counselling in accordance with the plan for the development of enterprise or department concerned. Forecasts at this level are, therefore, required to be in greater **details** as well as precise. The micro forecasts are usually expressed in terms of numbers required for each occupation, source and stage of recruitment, and scheduling of training.

2.4 MACRO FORECASTING

Manpower demand forecasting techniques can be broadly summarised into five categories:

- Employers Opinion Method
- Normative Method
- Component Method
- International Comparisons Method
- Mediterranean Regional Project (MRP) Method

1) Employers Opinion Method

Under this method employers are asked to give their assessment of future manpower needs in different categories in their respective establishments. Aggregating over all employers and making allowance for death, retirement, migration and occupational mobility, it is then possible to arrive at future manpower demand by skill category. This method has been useful in the case of forecasting highly skilled professional category of manpower as well as in making short-term manpower forecasts.

However, while making short-term manpower forecasts one may observe some constraints. For instance, the technique assumes that employers are capable of making such forecasts. It might be true in the case of large corporate sector establishments with well-staffed personnel divisions. Likewise, the use of technique implies that manpower demand forecasts made by employers are linked to the production levels of their respective establishments. In an opinion survey, this is rarely done. Finally, even if the manpower forecasts are linked to production levels, employer's expectations of production levels are never realised with the same degree of accuracy in an **oligopolistic** situation, because of stiff competition and market imperfections. In other words, where the market for goods and services are characterised by stiff competition, employer's forecasts of manpower cannot be aggregated.

2) Normative Method

Normative method uses norms for employing manpower to produce goods and services. The norms are usually expressed as ratios between manpower employed and the volume (or value) of goods and services produced. These ratios are based on either the existing situation or the desirable situation, e.g., hotel staff-guest ratio, tourist guide-tourist ratio and so on.

As an illustration of the method, using employment-output norm, as a first step, the norm is evolved for a base year. Next, output projection is obtained for the target year. Then, the base year employment-output norm is applied to the target year's estimated output to obtain employment forecasts in the target year.

This approach, however, has two basic limitations: One is that the method assumes that the norms are stable over a period of time. This can be overcome, if it is also possible to predict changes in the norms as between the base year and target year. The other limitation is that it uses a uniform norm for all components of a production process or for all regions within country. This limitation can again be overcome by using different norms for different components or regions; which is the component method.

3) Component Method

In the component method requirements of any category of manpower are further subdivided into various components and then a separate norm appropriate to each component is used in arriving at a forecast of manpower requirements for each component. Forecasts for all the components are then aggregated to arrive at an estimate of future manpower requirements for the manpower category concerned.

For instance, in the case of hospitality, instead of using an overall norm such as the hotel staff-guest ratio, the requirements of **trained/skilled** chefs are sub-divided into four components:

Chefs required in 5-star deluxe and 5-star hotels,

- Chefs required in **4-star** category hotels,
- Chefs required in **3, 2** and 1-star hotels, and

Chefs required in supplementary accommodation units.

4) MRP Method

The **MRP** Method is very comprehensive as it is designed to forecast manpower requirements by educational categories so that the forecasts are rendered directly relevant to educational planning exercises. Primarily, there are five steps involved in forecasting manpower requirements by education. The first step is to arrive at the largest year projections of GDP – exogenously determined by an economic plan in the case of planned economies.

The second step involves the estimation of **sectoral** contributions to GDP in the target year by major sectors such as agriculture, manufacturing, transport and communication, trade and commerce, and services.

At the third step, sector specific average employment-output ratios are applied to **sectoral** composition of GDP in the target year to arrive at estimates of employment in the target year by sector.

Sectoral forecasts of employment thus obtained for the target year are then distributed among a number of mutually exclusive occupational categories using either the base year or any desirable sector-occupation distributions.

At the final step, occupational structure of manpower forecasts relating to the target year are translated into educational structure by applying a standard measure of the level of formal **education/training** required to successfully perform the tasks specified under each occupational title. This procedure gives the net manpower needs – net of replacement needs. **Allowances** are then made for death, **retirement**, **migration** and occupational mobility to estimate the replacement needs by the target year. Net manpower needs and the replacement manpower needs by education will together then yield the total manpower needs by education. The forecasts thus obtained are conditional on the achievement of GDP in the target year.

2.5 MICRO FORECASTING

As you know that micro forecasting is done at the enterprises or company level. Hence, it involves estimation of manpower needs for a specified or anticipated workload structure. There are essentially three steps involved in the process:

- Evolving manning norms based on an analysis of workload structure,
- Forecasting Workloads,
- Relating Workloads to manning norms.

1) Evolving Manning Norms

It starts with taking a comprehensive view of the work of an organisation which is first divided into functions. The functions are then sub-divided into tasks and work groups associated with each task are then identified. In respect of each workgroup, number of positions, their job descriptions and required performance level for each position are **analysed**. Based on this analysis as well as existing workload patterns, a set of desirable manning norms for the organisation as a whole are worked out. However, in certain cases as it may be true for hospitality industry.

2) Forecasting Workloads

In cases where 'work' consists of a single type of activity, then the total output is a measure of the amount of work and where 'work' consists of a variety of tasks – the relative magnitudes of which vary with time, then one way is to predict workload of each task separately and aggregate the workloads of all tasks to arrive at a forecast of total workload. In these cases these tasks may be interrelated but where the tasks are all not correlated, one can use either of the two statistical techniques: Principal Component Analysis and Factor Analysis.

Principal Component Analysis is a descriptive technique which finds linear transformation of numerous tasks into a smaller number of indices (Principal Components) such that:

- the indices are all uncorrelated among themselves, and
- all the indices together summarise the information contained among the numerous tasks.

Principal Components are then projected to arrive at forecasts of workloads.

Factor Analysis, the aim of which is similar to that of Principal Component Analysis, uses a sophisticated statistical model. Here, **some** small number of factors are identified which have the potential to explain the behaviour of the numerous tasks. Then predicting the behaviour of individual factors, it is possible to arrive at forecasts of workload under each tasks and hence the forecast of total workload.

3) Relating Workload to Manning Norms

If workload 'W' can be forecast by the methods discussed in the previous section, and productivity of workers 'P' – given as the ratio of workload to workers – can be estimated based on historical data **and/or** appriori information on factors affecting productivity, then manpower forecasts in terms of numbers required in future can be obtained as

$$\text{Number required in future} = \frac{W}{P}$$

2.6 MANPOWER FORECASTING TECHNIQUES

The process of estimating manpower demand for hospitality industry consists of four steps:

- an approach,
- a basic factor,
- a method, and
- a technique.

i) Approach

There are eight possible approaches:

- | | |
|--------------------|------------------|
| 1) Subjective | 2) Objective |
| 3) Global | 4) Component |
| 5) Techno-economic | 6) Non-economic |
| 7) Deterministic | 8) Probabilistic |

The order in which they are mentioned **suggests the** formation of four groups, each of which comprises two mutually exclusive approaches, **e.g.**, (i) Subjective or Objective, (ii) Global or Component, etc. The groups, between themselves, are not quite mutually exclusive.

A subjective approach to manpower demand estimation uses intuition, impression or judgement. Opposed to this, the objective approach tries to justify the estimate of demand on the basis of certain factors or logical explanations.

A global approach would try to estimate **manpower** demand as an overall figure, directly for the entire problem under consideration, whereas a component approach would first estimate the demand for segments of the problem and then aggregate it. The **techno-economic** approach combines the technological, economic and organisational considerations mentioned earlier, whereas the non-economic approach utilises only socio-political and other considerations.

ii) Basic Factor

A basic factor means a variable to which manpower demand can be related. The choice depends upon the number of considerations which together constitute the multi-dimensional framework of the particular problem facing us.

iii) Methods

According to Gareth Steiner, methods are useful in forecasting what will occur and what should occur?

According to Steiner, what is more significant than the time element is the way in which the change takes place. Thus, he has focussed on the need for different kinds of feedback.

iv) Techniques

In this context, therefore, one can outline a few **specific** techniques of manpower demand forecasting.

a) Subjective

The forecast here is made on the basis of estimates by experienced people whose experience has taught them what types of changes are important and the rates of change involved. Implicitly, however, subjective techniques involve subjective estimation of **workload** and manpower utilisation and their rate of change. The obvious advantage with

this technique is that no data collection is required and intangible factors like social opinion, fashion, **etc.** can be built in. However, forecasts based entirely on subjective assessment are unlikely to give very good results. But if mixed with objective techniques these subjective estimates can prove to be useful.

b) **Time Series Analysis**

The time series extrapolation is a good method where it is sometimes not possible to take an overall view of a group of staff, to base a forecast on estimates for workload and manpower **utilisation**.

There are four elements of the time series method:

Trend (T_1)

Cyclical effect (C_1)

Seasonal effect (S_1)

Random effect (R_1)

These being multiplicative, we can get

$$V_1 = T_1 \times C_1 \times S_1 \times R_1$$

Projections or extrapolations can be done on the basis of moving averages or exponential smoothing.

Accuracy of Techniques

No method of forecasting can be entirely without error. Some changes are unique (such as new legislation or a decision to close down an establishment) and hence are more or less unpredictable as to timing. Such errors are due to these unique changes which are unavoidable. In hospitality industry also, it is not always possible to forecast human resource demands accurately. The demand varies with the tourist traffic flow. The tourist traffic flow increases or decreases depending upon both predictable and unpredictable situations. For example, it is expected that tourists will arrive during a special sports event such as Olympics or Commonwealth games but sudden riots or natural calamities bring down tourist flow and it can't be taken into account when one is forecasting human resource demand.

Taking the above factors into consideration, a corporate approach to manpower planning is to be developed. In doing so certain **key considerations** such as the **following** emerge:

- a) What positions and individuals are to be included in the planning effort? A simple rule of thumb is to include all positions which are critical to corporate performance and profits **and/or** pose recruitment problems.
- b) What is the appropriate manpower-planning horizon? Experience shows that it can extend **upto** 4 or 5 years. Beyond 5 years, technical manpower forecasts have doubtful value due to pervasive **imponderables** and unpredictables in the environment. Within the planning period, there should be a formal method of review and assessment at least once every year.
- c) With what business factors will manpower need be related? For a tour operating company, it could be tour packages, for tourist transporter, it could be the number of cars and coaches. For a retailer, it could be the rupee value of sales. To be useful, the predictor should meet at least two requirements:
 - i) it should be directly related to the essential nature of the business;
 - ii) changes in the selected factor be proportional to changes in the manpower required.

2.7 MANPOWER SUPPLY FORECASTING

In the previous section, we have discussed about demand forecasting for manpower. Besides, one must also know the important issues related to the other side of the coin, i.e., supply forecasting while referring to supply forecasting in hospitality we often treat the terms like manpower and labour force as synonyms. But one can find a subtle distinction, i.e., while labour force includes all the persons in the population who are economically active, manpower is only the **skilled** component of labour force. Manpower supply is, therefore, the totality of manpower employed and manpower unemployed but seeking jobs. We need to understand it at both macro and micro level.

At the macro level there are two methods of estimation of manpower supply: one is known as the 'direct method' and the other is termed as the indirect method.

1) **Direct Method**

Direct method relies on a census count of persons belonging to the category of manpower for which supply is being estimated. Census count can be usually obtained from the Population Census. The primary limitation of the direct method is that the census counts are **infrequent**. For example, in the Indian context Population Censuses are decadal. For inter censal years there is no information. Also, because census are infrequent, they cannot be used in any meaningful trend forecasting exercise. This apart, censuses are known to be subject to enumeration biases, such as, under count, misreporting and classification biases. In view of these limitations, researchers in the field of manpower have been resorting to indirect method.

2) **Indirect Method**

Under the indirect method institutional estimation of manpower involves the following steps:

Estimating active life span,

- Determining base period,

Forecasting annual institutional out-turn,

Obtaining cumulated out-turn adjusted for attrition, and

Estimating manpower supply.

a) **Estimating active life span**

Active life span is defined as the span of life over which an individual is active in any given profession or occupation. Two parameters are used for estimating average active life span of any occupation estimates of two parameters, namely:

- average age at entry into the occupation, and
- average age at retirement from the occupation.

Average age at entry into an occupation depends on the time taken by an average individual to complete the relevant education **programme/skill** training. For example, if one completes the higher secondary education at 17 years, average duration of engineering collegiate education is 4 years and average duration of tourism education is 5 years, then, active age at entry into engineering occupation will be 21 years. Likewise, average age at entry into profession will be 22 years. Assuming an average age of 65 at retirement for engineers and hotel professionals, active life span of engineers will be from 21 years of age to 65 years of age. Similarly, for hotel professionals it will be from 22 years of age to 65 years of age.

b) Determining base period

Manpower stock as of a target date comprises of manpower of **all** vintages starting from the persons who have just entered to those who are on the verge of retirement. Hence, base period can be determined by subtracting the number of years in the active life span from the target year. For example, assuming an active life span of 34 years for engineers (from 21 to 65 years of age) and the target data as 2000 A.D., the base year will be 1966 (i.e., 2000-34).

c) Forecasting annual institutional out-turn

To start with, past trends in enrolments are extrapolated to cover the target date, using suitable trend forecasting methods. The forecasts of enrolments thus obtained are then converted into forecasts of out-turn, with the help of observed trends in annual rates of completion of the educational level concerned.

d) Estimating attrition rate

Attrition in the manpower supply, relevant to any category of education, may be caused by the following four factors:

- Death
- Retirement
- Migration
- Occupational mobility

The joint effect of these four factors is termed as the attrition rate. Among these four factors, impact of occupational mobility is very difficult to estimate. In view of this, attrition rate is usually taken to mean, i.e. the joint effect of death, retirement and migration only.

e) Obtaining cumulated out-turn adjusted for attrition

Given the base year manpower supply (SO), manpower supply in the first year after the base year (S1) is determined as

$$S1 = SO \frac{(1 - a)}{100} + Y1$$

Where

a = attrition rate and

Y1 = Institutional out-turn in the first year after the base year.

Manpower supply in the second year (S2) after the base year will be

$$S2 = S1 \frac{(1 - a)}{100} + Y2$$

where Y2 is the institutional out-turn in the second year after base year. Using this commutation process, manpower supply in the target year (which is say 't' years after the base year) will be

$$St = St - 1 \frac{(1 - a)}{100} + Yt$$

Where St - 1 is the manpower supply in the year prior to the target year.

f) Estimating manpower supply

Cumulated out-turn adjusted for attrition, obtained in the manner outlined above, indicates the total number of persons in the population with the requisite education/training. Manpower supply, on the other hand, is the labour-force component of the cumulated and adjusted out-turn. Further, adjustments to cumulated and adjusted out-turn is therefore, warranted to account for withdrawals from the labour force in respect of persons with the requisite education/training as outlined below:

$$\text{Manpower Supply in the target year} = \frac{\text{Cumulated out-turn adjusted for attrition}}{\text{Labour force participation rate}} \times$$

Micro level manpower supply, in hospitality industry comprises of external and internal supplies.

External Supply Forecasting

External supply arises primarily through recruitment which is necessarily meant to augment internal supply. Another minor source of external supply is through seconding (or deputing) personnel from other organisations which takes place largely among government departments. Hence, given the recruitment policy it is easy to predict the external supply.

Internal Supply Forecasting

Internal supply within an organisation is governed by two factors:

- Wastage – the out-movement from the organisation caused by voluntary resignation, death or retirement.
- Internal movement resulting from transfers and promotion.

Manpower flows generated by these two factors are of course inter-related. Forecasting internal supply is, therefore, crucially dependent on analysis of wastage and internal movements, with a view to obtain estimates of wastage and patterns of internal movements.

2.8 SUPPLY FORECASTING TECHNIQUES

Analysis of Wastage

A crude method of estimating is termed as the British Institute of Management (BIM) index which expresses wastage as a percentage of staff in position, i.e.:

$$\text{Annual Manpower Wastage} = \frac{\text{Manpower leaving in a year}}{\text{Average manpower in position}} \times 100$$

The BIM formula has many disadvantages, for example, it takes no cognisance of the characteristics of manpower — crucial among them being the length of service and skill. Further, it is difficult to assess the operational and financial implications of any given rate of wastage based on BIM formula. Also, it does not provide any meaningful indication for manpower planning.

Stability Index

An alternative method which takes into account the length of service of the persons leaving the organisation, termed as 'stability index', measures the complement of wastage rate (i.e., rate of retention) as:

$$\frac{\text{Manpower with one year service at time } t}{\text{Manpower in position at time } t - 1} \times 100$$

This method indicates only the percentage of manpower who stayed with the organisation for one year. It does not directly measure the extent of wastage. Also, it gives equal weightage to persons who left the organisation with less than one year's service and with **more than one** year's service. This method is, therefore, not very useful for manpower supply forecasting.

Modified Stability Index

Modified stability index, which is also referred to as **Bowey's** stability index includes everybody employed in the organisation and gives due weightage to varying lengths of service. In simple terms, **Bowey's** stability index may be expressed as:

$$\frac{\text{Total length of service of manpower employed at the time of analysis}}{\text{Total possible length of service had there been no manpower wastage}} \times 100$$

This method is useful in analysing the extent of wastage in terms of length of **service**. However, as in the case of stability index it is not very helpful in manpower supply forecasting.

Cohort Analysis

Manpower cohort in an organisation is a group of staff who are more or less homogenous and who joined the organisation at the same time. Graphical presentation of leavers (those leaving the organisation at each point of time from the date of joining to the date by which the entire cohort would have disappeared) resembles **Figure I** below:

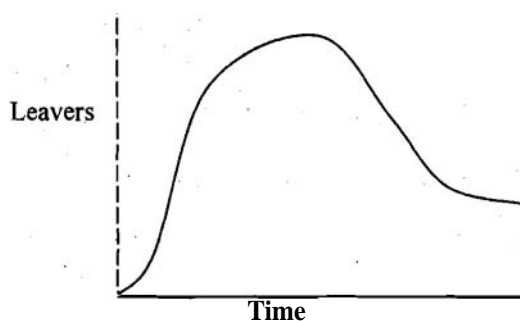


Figure I

In each cohort the peak of leaving occurs shortly after joining **when either** the manpower leaving realises that the job is not suitable to them or the employers find out that the leavers are not suitable to the organisation. The peak is, however, determined by the nature of job, work environment and career prospects within the organisation. The objective of manpower planning is to see that the peak of leavers does not arise early in the life of a cohort.

A slight transformation of **Figure I** by plotting cumulative percentage of **leavers** in the cohort on the vertical axis and logarithm of time on the horizontal axis the curve in **Figure I** becomes a straight line as in **Figure II**.

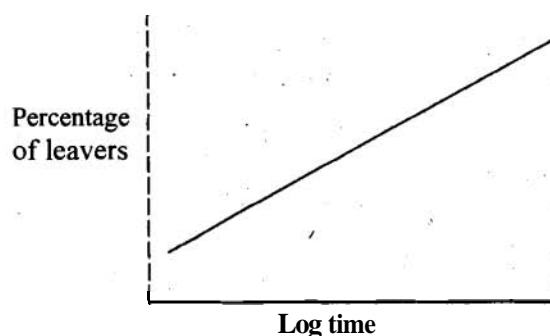


Figure II

In statistical terminology, the transformation effected above is termed as the **log-normal** transformation.

Using this curve, then forecasts of percentage of total leavers of a particular cohort at any future date can be made through extrapolation. Cohort analysis is thus very useful in analysing and forecasting wastage of specific groups of manpower who have similar characteristics and also joined at a particular time of the year such as management trainees, trainee escorts and computer professionals, etc.

There are, however, some disadvantages. First, forecasting exercise requires information on year-wise wastage from a cohort. If there are many cohorts it may not be a very easy task. Second, for a meaningful analysis of wastage each leaver must be related to the concerned cohort and the cohort size must be known. In the absence of computerised personnel information system, this may not be all that easy. Third, if the manpower is relatively stable as is the case in government jobs or public sector organisations which assure job security – the length of time over which a cohort must be followed can be too unwieldy to attempt any reliable forecasts.

Census Method

Some of the problems of cohort method can be overcome by using the census method. Under the census method a snapshot of the total situation is taken at a particular point of time or over a short period of time and data on leavers with completed length of service is obtained. Based on such data, it is possible to estimate – with the help of standard statistical techniques – the proportion of manpower joining at a given point of time that will survive to a specified length of service. For example, based on the census method it is possible to estimate proportion of manpower joining the service (say) in 1990 that will complete 10 years of service.

Forecasting of Internal Movements

A very useful method of analysing and forecasting internal movements is the **Markov Chain Model**. It calls for the estimation of transition probabilities relevant to each vertical and horizontal movement. A simple version of the model, without bringing in the complications of the probability theory involved, is illustrated here in adequate detail for any manpower planner or a personnel manager to judge the utility of the model in the context of micro level manpower planning.

The illustration assumes a simple organisation with a three grade structure: A, B and C. Also, the possible length of service is divided into three groups: 0-3 years, 3-10 years and more than 10 years (10+ years).

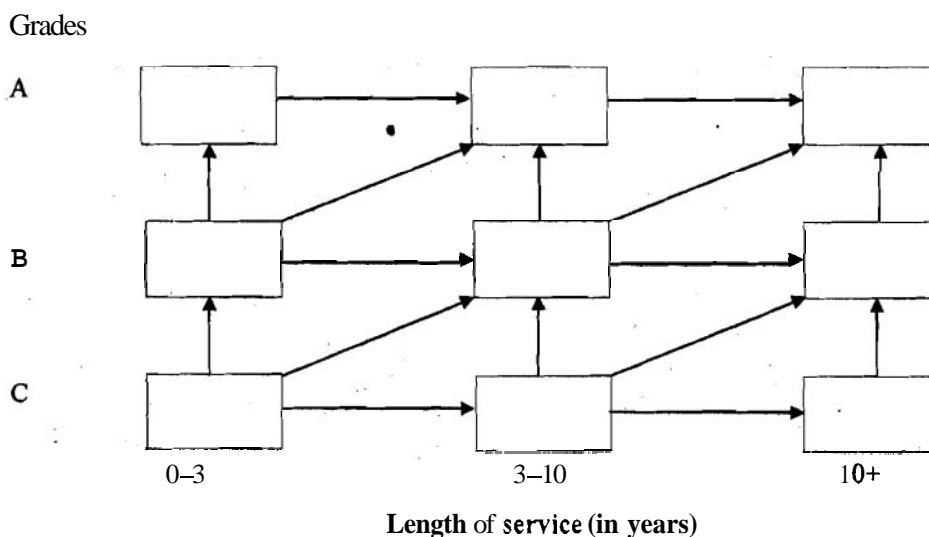


Figure III

Figure III above is graphic representation of the **Markov Chain Model**. In this, grade C is the entry level position, grade B are no further lateral entry levels in the organisation. Thus, recruitment to higher levels is entirely through promotion – like in a government department. Further, a person entering at grade C level has several options. He or she may get promoted to grade B or even grade A within the first 3 years depending on his or her performance. Alternatively, he or she may get promoted to higher levels in the next 3 to 10 years or only after 10 years. In the extreme case of bad worker, however he or she may retire as a worker in grade C only. At each grade and length of service, the worker has also the option to leave the organisation.

If systematic personnel records are available, it will be easier to estimate the percentage of manpower in each **grade/length** of service group who moved along the different arrows in **Figure III**. As an illustration again, the percentages – regarded as transition probabilities – who moved along different arrows can be shown as in the **Table-1** below:

Table-1: Markov Chain Probability Matrix

		(Percentages)								
		C			B			A		
		0-3	3-10	10+	0-3	3-10	10+	0-3	3-10	10+
C	0-3	40								
	3-10	10	50							
	10+	5	10	70						
B	0-3	4			55					
	3-10	7	10		10	60				
	10+	1	6		5	10	70			
A	0-3				1			70		
	3-10	1	1		3	10		10	75	
	10+	2	3		6	5		5	5	70
Wastage		30	20	30	20	15	30	15	20	30
Total		100	100	100	100	100	100	100	100	100

The most difficult task in the use of **Markov Chain Model** is the estimation of transition probabilities. Once the estimates of transition probabilities are made they can be applied to any intake of fresh batch of recruits to forecast internal supplies as well as wastage (or leavers) by grade and length of service. It is also not essential to keep transition probabilities constant in forecasting future supplies. They can be varied through deliberate intervention, if there is a priori information on the likely magnitudes of transition probabilities reflecting future recruitment, promotion and transfer policies.

2.9 DATA BASE FOR MANPOWER FORECASTING

Data base has a crucial role to play in demand and supply forecasting of manpower in hospitality industry, as it determines the methodologies that can be adopted and methodological refinements that can be effected.

Keeping this in view, data requirements for **manpower demand forecasting** can be discussed at macro and micro levels separately.

1) Data Base for Forecasting Demand at Macro Level

For macro forecasting it would be ideal to have comparable data on the following items over a period of years in the past.

- **Population Statistics:** Data on population of the country by age, sex, education, economic activity status, migration, marital status, region, and rural-urban

- **Data on Economic Parameters:** Economic parameters on which data are required on time-series basis are inputs, output, capital, investment, wages, productivity, value added and depreciation by industry; consumption, savings and expenditure on health by income strata of population in rural and urban areas of each region.
- **Information on Technologies:** Details about existing technologies are needed by industry specifying the implications of each technology for employment generation and investment. Similar information is also needed on emerging technologies by industry.

2) Database for Forecasting Demand at Micro Level

At this level, one may realise the importance of Manpower Information System (MIS) with following modules:

- **Personal Data Module:** Identification particulars, educational particulars, educational qualifications, privileges, if any, such as, military training, handicapped, scheduled castes/schedules tribes, etc.
- **Recruitment Module:** Date of recruitment, grading in aptitude tests, grading in leadership tests, overall grading, job preferences and choices, if any.
- **Job Experience Module:** Placement history, grade promotions, tasks performed gradewise, significant contributions, etc.
- **Performance Appraisal Module:** Performance appraisal at each job held, job experience evaluated with the background of job description, communication rating, rating of inter-personal relationships, rating of behaviours in a group, commitment of corporate goals, etc.
- **Training and Development Module:** Nature of training received at each level, individual's evaluation of effectiveness of training, individual assessment of training needs vis-à-vis jobs currently being performed, etc.
- **Training and Development Module:** Nature of training received at each level, individual's evaluation of effectiveness of training, individual assessment of training needs vis-a-vis jobs currently being performed, etc.
- **Miscellaneous Module:** Record of compensation and benefits received, health status, information relating to personal problems which calls for the attention by the authorities, security needs, etc.

MIS is developed on the basis of personnel history records of each individual employee within the enterprise or company and is updated every year.

Data base requirements for supply forecasting can also be discussed at the macro and micro level.

For **Macro Supply Forecasting** data are received on the following aspects.

i) Age at Entry and Age at Exit

Data on age at entry and age at exit are required by category of manpower. In respect of jobs in the civil services, defence services and most of the other salaried jobs age at entry and exit are predetermined. **In case of professional and manpower that do not pass through any formal education, where it is difficult to obtain required information, average observed age at entry and exit may be treated as prescribed.**

ii) Annual Enrolment and Out-turn

Data on annual enrolment and out-turn relating to all courses in the formal and informal **education/training** system are usually published. Where there are gaps, **surveys** may be conducted to obtain complete data through records.

iii) Attrition Rates

Attrition rates are not readily available for most of the categories of manpower. They need to be compiled on the basis of pattern of retirement, migration and mortality.

iv) Retirement

In the case of government job the prescribed age at retirement is 58 years. Other salaried jobs may permit continuing in employment **upto 60** years of age. **Only** in the case of professional categories of manpower there is a possibility of remaining professionally active even beyond **60** years of age. In all cases, however, age at exit from the relevant occupation may be treated as retirement age.

v) Migration and Morality

There is no published source of information on migration by education. Specific studies are needed covering Indian migrants settled in other countries to ascertain the magnitude and other characteristics of migrants by education.

Decennial Population Censuses and the mortality information compiled by the actuarial scientists in insurance companies are good sources of information for analysing mortality patterns and for estimating the mortality components of attrition rate.

For **Micro Supply Forecasting** one can depend upon internal supply of data for forecasting, as external supply is determined by factors extraneous to the company or enterprise concerned. Internal supply forecasting calls for a detailed Manpower Information System (MIS) at the level of company or enterprise. MIS is developed on the basis of personal history records of each individual employee and is updated every year. MIS may comprise of the following modules:

- **Personal Data Module:** Identification particulars, educational particulars, educational qualifications, privileges, if any, such as, military training, handicapped, scheduled **castes/schedules** tribes, etc.
- **Recruitment Module:** Date of recruitment, grading in aptitude tests, grading in leadership tests, overall grading, job preferences and choices, if any.
- **Job Experience Module:** Placement history, grade promotions, tasks performed grade wise, significant contribution, etc.
- **Performance Appraisal Module:** Performance appraisal at each job held, job experience evaluated with the background of job description, communication rating of inter-personal relationships, rating of behaviours; in a group, commitment corporate goals, etc.
- **Training and Development Module:** Nature of training received at each level, individual's evaluation of effectiveness of training, currently being performed, **etc.**
- **Miscellaneous Module:** **Record** of compensation and benefits received, health status, information relating to personal problem **which** calls for the attention by the authorities, security needs, etc.

Check Your Progress

1) Explain how "demand", "need" and "requirement" differ from each other.

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2) Explain the database for Micro Forecasting.

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3) What are different types of Manpower **Forécasts**?

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4) What are the dimensions of manpower supply?

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5) How would you determine Base Period?

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6) Describe the Internal Supply Forecasting for Micro Forecasting?

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2.10 LETUSSUMUP

On the theoretical plane, manpower demand implies functional or technological requirements of manpower that will be necessary to perform a given task whereas manpower supply forecast deals with skilled component of labour force. Manpower demand **fóreca**st works with the rationale of long gestation lags in the production of skilled professional people as well as to counter the influence of labour market influences which is quite related to the hospitality industry.

The objectives and methodologies of both – manpower demand and supply forecasting can be dealt at macro and micro level. The macro demand forecasts are required to be comprehensive indicating and facilitating appropriate action. Thus, methodologies used here are complex and often expensive because **of** the nature of techniques used and develop and maintain data base required. However, we see micro level demand forecast are exercised at a **hotel/group** level wherein forecasts are .required for planning **recruitment**, promotion and training. For this every **large/middle** size hotel need to develop a well planned Manpower Information System (MIS) to record the personal history of each employee.

While forecasting manpower supply a hotel can take into account four distinct dimensions, **i.e.**, stock and flow, quality and quantity, occupation and education and macro and micro dimension methods and techniques adopted will vary for each dimension. For instance, at the macro level, we have discussed two methods of making manpower forecasting, **i.e.**, **Direct** method relying on census count of all persons and Indirect method estimating manpower supply by cumulating economically active component of institutional turnover for the relevant period after making adjustments for all factors carving manpower attrition.

Whether it is manpower demand forecasting or manpower supply forecasting a sound database is required to be readily available to generate the needed data. In the later Units you will also learn about the new Resource Information Systems.

2.11 CLUES TO ANSWER

Check Your Progress

- 1) **'Demand'** for a particular category of manpower, from the economists angle, is a schedule of relationships between quantities of that particular category of manpower demanded and a series of possible wage rates.

'Need' refers to the number of people required to provide an ideal level of service. What is ideal is never achieved, because of structural, technological and other constraints.

'Requirements' are then the functional composition of employment that will be necessary to produce goods and services within the framework of social, cultural, economic and technological targets (or constraints) specified.

Read **Sec. 2.2** to answer in detail.

- 2) For micro forecasting a well-defined Manpower Information System (MIS) is needed at the enterprise or company level. MIS may have the following module:
- i) Personal Data Module
 - ii) Recruitment Module
 - iii) Job Experience Module
 - iv) Performance Appraisal Module
 - v) Training and Development Module
 - vi) Miscellaneous Module

Read carefully **Sec. 2.5** and answer in detail.

- 3) The different types of Manpower Forecasts are:

- i) Short-term forecasts
- ii) Medium-term forecasts
- iii) Long-term forecasts
- iv) Policy conditional forecasts
- v) Onlookers forecasts
- vi) Optimising forecasts
- vii) Macro and micro forecasts.

Study **Sec. 2.6** to explain the above.

- 4) In the literature on manpower planning the following four dimensions of manpower supply are clearly discernible:

- i) Stock and flow,
- ii) Quantity and quality,
- iii) Occupation and education, and
- iv) Macro and micro.

Read **Sec. 2.7** to answer in detail.

- 5) Manpower stock as of a target data comprises of manpower of all vintages, starting from the persons who have just entered to those who are on the verge of retirement. Hence, base period can be determined by subtracting the number of years in the active life span from the target year.

- 6) Inter Supply Forecasting methods are:

- a) Analysis of wastage
- b) Stability index
- c) Modified stability index
- d) Cohort Analysis
- e) Census method
- f) Analysis of internal movements
- g) Markov Chain Model.