
UNIT 4 METHODS AND TECHNIQUES FOR SUPPLY MANAGEMENT

Objectives

After going through this unit, you will be able to:

- 1 the concept and dimension of manpower supply,
- 1 the various methods of manpower supply in an organisation — internal as well external, and
- 1 the different techniques to supply of HR within an organisation.

Structure

- 4.1 Introduction
- 4.2 Human Resource Inventory
 - 4.2.1 Age Distribution
 - 4.2.2 Skills Inventory
 - 4.2.3 Length of Service
- 4.3 Factors Affecting Internal Levels
 - 4.3.1 Reasons for Increase in Employee Groups
 - 4.3.2 Reasons for Decrease in Employee Groups
- 4.4 Employee Turnover Analysis
- 4.5 The Cohort Method
- 4.6 The Census Method
- 4.7 Markov Chain
- 4.8 Renewal Models
- 4.9 Summary
- 4.10 Self-Assessment Questions
- 4.11 Further Readings

4.1 INTRODUCTION

HR demand analysis provides the Manager with the means of estimating the number of kind of employees that will be required. The next logical step is to determine whether it will be able to procure the required number of personnel. This information is supplied by supply forecasting. Supply forecasting measures the number of people likely to be available from within and outside an organisation; after making allowance for absenteeism; internal movement and promotion, wastage and change in hours and conditions of work.

Reasons for supply forecast are the following:

- a) Helps quantify number of people and positions likely to be available in future to achieve objectives;
- b) Helps clarify the staff mixes that will exist in future;
- c) Assess staff level in different parts of organisation;

- d) Prevent shortage of people where they are needed most; and
- e) Monitor future conditions with legal requirement for job reservations.

Forecasting the internal supply human resources is an important activity in manpower planning. Human resource planners need to look at the sources of supply and evaluate them through in-depth studies to ensure that suitable strategies are evolved to meet business demands. For the purposes of discussion, the supply source will be divided into two categories, viz.:

A – Internal supply

B – External supply

In this chapter, the salient features of internal supply are discussed along with the techniques used to evaluate and study the same.

One of the obvious sources of manpower supply is the internal group of employees. It is essential to understand and evaluate this internal group in order to assess its possibilities in meeting future business demand. Studies on this source of supply are therefore focussed on evaluating internal circumstances, possible changes in its character and complexion, and the impact on their availability in future.

4.2 HUMAN RESOURCE INVENTORY

As a first step, it is essential to categorise the existing employees into various groups. The extent to which such segmentation is done will depend on how the planners intend to actually utilise the data. It needs to be kept in mind that a lot of data that may get generated could be of “like to know” type rather than “need to know” type. It is, therefore, essential to decide what type of studies the planners wish to undertake with relevance to their practical usage in the planning process. The stratification of the existing population can be done in several manners, some of which are as follows:

- Categorisation by age. One can study average age, average distribution, minimum and maximum age etc., by job categories, functions, skills, qualifications etc.
- Segmentation of employees by functions, job groups, departments, skills, location etc.
- Categorisation by gender i.e. male and female, ethnic groups, religion, language etc.
- Segmentation by performance levels.
- Segmentation by organisational hierarchy, i.e. staff, junior management, middle management, senior management, etc.
- Segmentation by salary groups.

It will thus be seen that the same work group can be broken up in several different types of segments, depending on the purpose for which such segmentation is done. In this section, a few important categorisations are discussed, along with their direct application to the planning process.

4.2.1 Age Distribution

Segmentation of existing employees by age is a useful technique to understand the characteristics of the internal supply. It provides considerable information about future levels of supplies and their quality, apart from being a good diagnostic tool in problem analysis. A study of the age distribution, can be done for either the whole organisation or for each function separately, or for various skills depending on the application of the study.

Some of the applications of this exercise are in:

- Understanding the exact wastage due to normal retirement. This will indicate the level of shrinkage in each work group that is likely to take place during the plan period.
- Learning potential and the adaptability of the work group. The younger the work group, the higher the probability of their adapting to new methods. Though such an assumption cannot always be hundred per cent accurate and therefore cannot be applied to all situations and segments, but all the same it has a good probability of being right, if it is tested over a period of time.
- Comparing the average age of fresh recruits with the average age of the organisation, one can perhaps, draw some inferences on the rate of growth of the employees thus reflecting on the promotion policies of the enterprise.
- Comparing various work groups will indicate the comparative growth rates, levels of fresh intake, stagnation, frustrations, etc.

It should be understood that data on age distribution alone is of very little significance, unless it is supplemented with employee turnover, performance levels, salary groups, etc. However, mapping age distribution amongst various other applications has tremendous use in decisions related to voluntary separation plans, in the devising of education roadmaps, review of promotion policies, working out pension and other retirement benefits, etc.

4.2.2 Skills Inventory

Taking an inventory of skills and knowledge is another method of evaluating the stock of human resources in an organisation. This gives information on the qualitative aspects of human resources and provides an insight into redeployment possibilities, promotions, transfers, the gap between future needs and the level of current skills, etc. Such an inventory becomes an essential input for the assessment of the training needs and recruitment strategies of an organisation.

In order to obtain a fuller understanding of manpower characteristics, the skills and knowledge inventory has to be superimposed with data on employee turnover and performance evaluations to get a complete understanding of the characteristics of manpower. When such an exercise is carried out, useful analysis and conclusions are obtained, some of which are:

- Turnover analysis along with skills inventory may give indications of the likelihood of the shortage of certain skills in the future and also provides possible indications of the supply position in the market.
- Performance ratings and skills inventory can together give excellent insight into the validity of managerial perceptions on the *why* and *how* of performance trends. It enables the enterprise to draw appropriate training strategies and determine the quality of personnel to be hired in future, since desired qualifications can be determined on the basis of performance of the current recruits.
- Matching the skills and knowledge inventory of employees with their job descriptions can indicate where over-qualified or under-qualified personnel are employed in the organisation, thus helping planners to evolve redeployment strategies and review hiring practices and policies.

4.2.3 Length of Service

Another method of mapping a human resource inventory is by the length of service of the employees. This can be done in a format similar to Exhibit 1 – instead of age, the

breakdown of the workforce would then be by length of service. It could also be done by job category, department, location, etc., for the entire workforce, depending on the use to which the data is to be put.

If supplemented with other information, such data can highlight an organisation's ability to retain employees by job categories, department, skills, etc. This also provides a good insight into recruitment methods and procedures, the organisation's ability to retain employees etc. During growth in a particular year an enterprise may hire a considerable number of employees leading to a reduction in the average length of service in that year. Similarly, curtailment of the workforce might lead to a large number of older employees opting for voluntary retirement, thus reducing the average length of service.

4.3 FACTORS AFFECTING INTERNAL LEVELS

A human resource planner needs to consider the various factors that influence the levels of human resource inventory of an enterprise. In order to understand these factors clearly, a model is shown in Exhibit 1. As a sample case, take a small segment of an organisation, say a small job group and consider two broad factors:

- Why or how this job group will increase in size?
- Why or how this job group will decrease in size?

These two factors are discussed here to develop a basic understanding of the question.

4.3.1 Reasons for Increase in Employee Groups

Promotions In

One of the obvious methods for increasing the level of the existing work group is through promotion of employees from within. Planners consider this aspect to assess the number of likely entrants into a particular job level and it is therefore important to study the trends of past promotions and, evaluate the feeder stock to assess its potential for promotion, training needs, etc. Other aspects of employee feeder groups, such as their retention analyses, age and performance profiles, skills and knowledge profiles should also be studied. It is always desirable to fill positions from within through internal promotions. Depending on the needs, one can plan strategies to work on the feeder groups to facilitate promotions.

Some organisations follow a policy of promotion by time-scale irrespective of the needs of the organisation. This is an undesirable method of promotions. If such a system exists in an enterprise, planners should, during the planning cycle itself, assess the number of employees that will be promoted due to the lapse of time and put in special efforts to ensure that employees are adequately trained before they move up.

Redeployment In

Redeployment is another method of filling in positions in a group. Redeployment strategies can be adopted by an enterprise to utilise excess employees of one job group to fill in the gaps of another. Such redeployment strategies have to be carefully chalked out, considering the actual redeployability of employees, the investments that will have to be made in order to provide training to make these employees effective in the new job, etc. One will also have to consider issues related to implications on industrial relations, salary, benefits structure and other such factors.

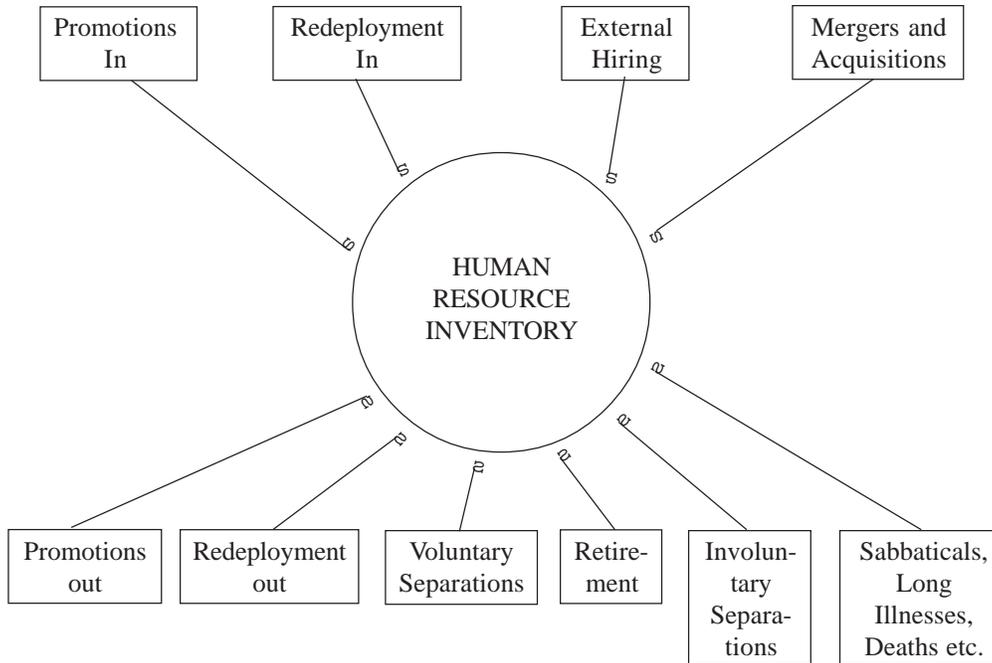
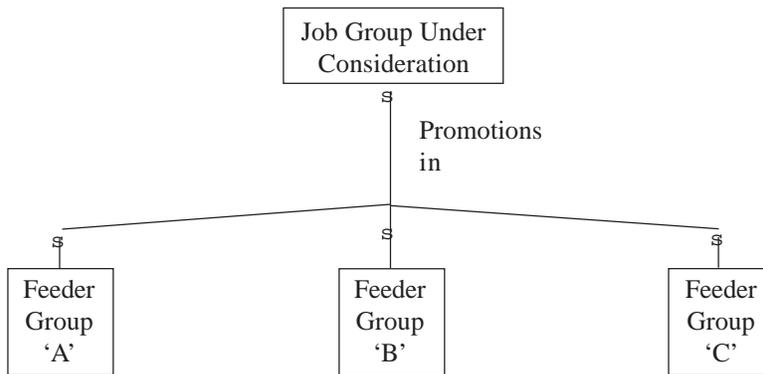


Exhibit 2: Promotion Channels (Inwards)



External Hiring

Planners proposing external hiring have to consider issues of the supply position, lead time to hire, lead time to induct, time to provide core training, the ability of the enterprise to retain new employees, the wastage rate for at least the first twenty four months, the ability of the enterprise to attract right talents, etc. It is, however, always preferable to fill the gap between demand and supply through internal promotions and redeployments as far as possible, before resorting to external hiring.

Mergers and Acquisitions

Mergers and acquisitions also affect the human resource supply and may increase stock levels.

4.3.2 Reasons for Decrease in Employment Groups Promotions Out

Promotions out to other job levels is a reason for depletion in a particular work group. Planners must consider the trend of “promotions out” in the past, and possibilities future losses.

Exhibit 3 illustrates that for a particular job group, there could be more than one group of jobs serving as a receiving group. Planners, therefore, have to first assess the demands of the receiving group and the promotability from the feeder group and thus arrive at an analysis of what is likely to be the loss due to out-bound promotions.

Exhibit 3: Promotion Channels

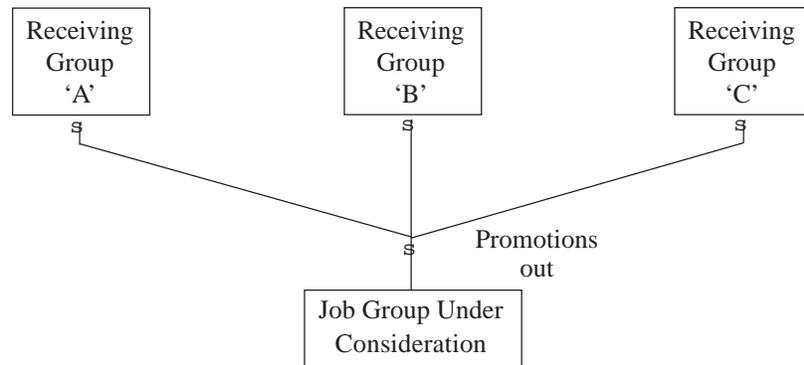


Exhibit 3 illustrates an example of feeder and receiving groups in relation to a group of jobs that exists in a typical sales and marketing environment.

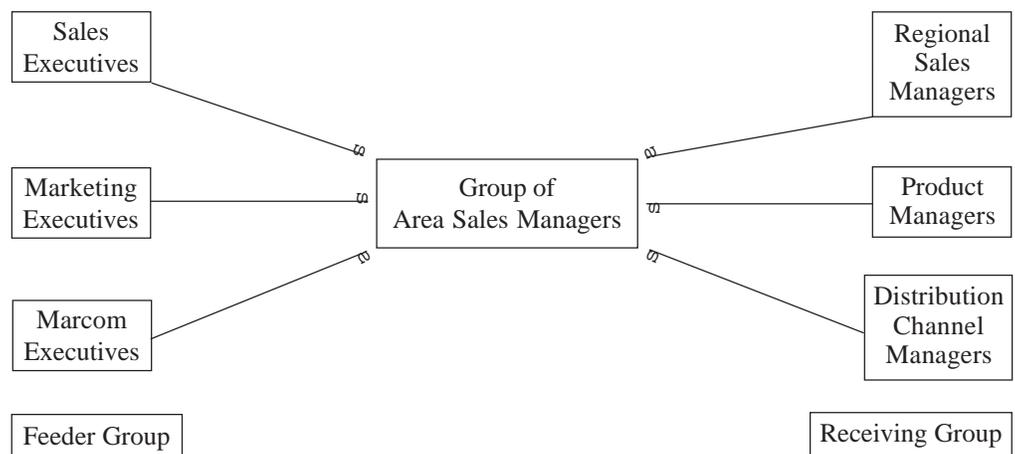
The excess employees of a particular job group can be decreased through conscious implementation of the redeployment strategy. Such a strategy should always be implemented with caution and care and after consideration of the various issues specified earlier in the “redeployment in” section in this unit.

Voluntary Separations

Voluntary separations are primarily a result of employees resigning from the services of a company for various reasons. In this unit a detailed discussion on employee turnover is available, which will give a fairly good insight on the handling of reduction of employee turnover.

Voluntary separations may also arise due to employees opting for early retirement or because of voluntary separation plans announced by the enterprise. While announcing such plans the organisation must make an assessment of their likely fall-out. Depending on how the scheme is designed, the percentage of loss from a particular group can be assessed and the enterprise must therefore design schemes taking into consideration the age and service profiles of the target groups, that is, those groups from where the enterprise expects maximum separations to take place.

Exhibit 4: Feeder and Receiving Group for Promotions



A planner is thus expected to study the trends of normal attrition and the impact of early retirement plans, if any, so as to assess the extent to which the stock of a particular job group is likely to be depleted during the plan period.

Retirement

In most countries, organisations specify the age of retirement or superannuation. Once a person attains the specified age, he/she automatically retires from employment and thus planners can easily calculate the number of retirees for a particular year. In those countries/enterprises where the age of retirement is not specified, an assessment can be made on what percentage of employees are likely to be lost due to retirements based on the trends of the past and the current age profile.

Other Reasons

In organisations where there are excesses all over, and redeployment strategies are either not possible or are inadequate, and where the organisation is incapable of offering “golden handshakes” in the form of voluntary separation plans, involuntary separations in the form of retrenchment can be used to reduce the workforce to an optimum level. This strategy, however, should be the last resort. Depending on the legal framework, different methods will have to be used. Such strategies will vary from country to country and enterprise to enterprise.

Involuntary separations could also be due to disciplinary or performance related factors where the management of an enterprise initiates the separation of the employees. The proportion of such separations could be minimal, though the planners must be conscious of this factor. Prolonged illness, deaths and incapacities due to accidents are some more reasons for depletion in the human resource inventory. However, these numbers are generally insignificant in most of the organisations.

Activity A

Identify the techniques being used for forecasting the internal supply of human resources in your organisation or any organisation you are familiar with.

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Activity B

Write briefly about the assessment of staff level being done in different departments of your organisation or any organisation you are acquainted with.

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4.4 EMPLOYEE TURNOVER ANALYSIS

Although discussion on employee turnover analysis appears in the previous chapter under the section on demand generation, its relevance to the forecasting of supply renders is important enough to warrant further discussion here.

Annual employee turnover is a method of measuring the attrition or wastage of employees. It is also known as the index of turnover or percentage of wastage, being the percentage of employees who quit employment. Generally this analysis is done for those employees who voluntarily separate from the services of an enterprise. To calculate the turnover, the following formula is generally used:

$$\frac{\text{Number of employees
Who leave during the year}}{\text{Average number of employees
employed during the year}} \times 100 = \text{Annual employee turnover}$$

For example, if in an organisation the average number of employees during 1996 were 5,000, and sixty out of these left during the year, the annual rate of employee turnover is calculated as follows:

$$60/5000 \times 100/1 = 1.2 \text{ per cent}$$

This means that 1.2 per cent of the employees left this organisation during 1996.

Employee turnover analysis can be done in many ways for the entire organisation, department or location wise, by reasons for turnover, and by performance rating.

In addition to internal supply, the organisations need to look out for prospective employees from external sources. External sources are important for specific reasons.

- i) Availability of new blood and new experience;
- ii) Replenishment of lost personnel; and
- iii) To meet expansion/diversification needs.

Sources of external supply vary from organisation to organisation, industry to industry, geographical locations to locations.

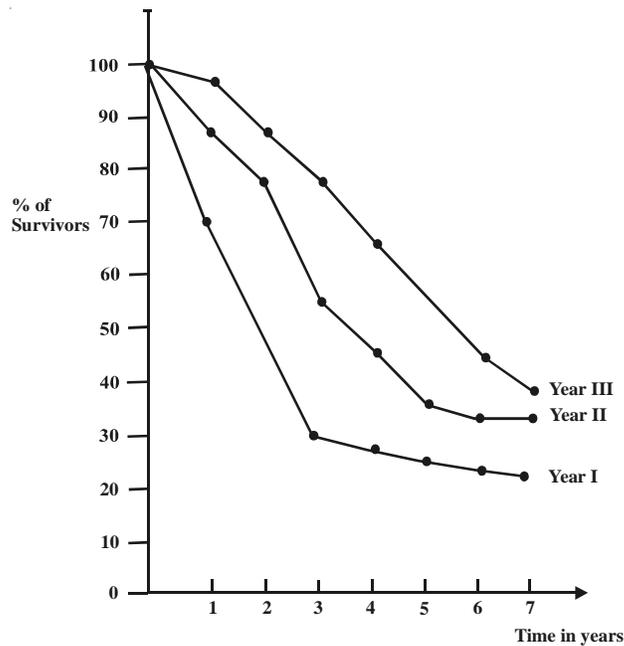
4.5 THE COHORT METHOD

Before understanding the 'Cohort Method', a word about the concept of survivor analysis is to be understood. This is the reverse of employee turnover analysis. Here, the percentage of employees who continue in the employment of an enterprise is measured as opposed to the percentage who quit employment.

In the Cohort Method, an analysis is done of a homogeneous group, i.e. a group of same or similar employees or those with same or similar characteristics. Such a group is called Cohort. At the end of each year the number of employees from the cohort who survive is calculated and expressed as a percentage of the total number of employees hired when the cohort was formed. This technique is generally applied to a group of employees whose survival in an enterprise is short. Exhibit 5 shows an analysis of the survivor function over a period of three years, using the cohort function.

In this exhibit, the pattern of retention by an enterprise over a period time clearly shows the changing retention profile. Such a change could be due to the influence of various factors such as personnel policies, product and marketing strategies, leadership styles, etc.

Exhibit 5: Cohort Survivors Function Applied Over Three Years



An analysis of this nature enables the planner to estimate the probability of a particular group of employees, with a defined length of service, leaving the organisation. A cohort analysis can also be done on the basis of age. The graphical representation of this analysis is known as “Log-normal wastage curve” the converse of which is a survival curve. The theory behind this method was developed by K.F. Lane and J.E. Andrew.

While there are several advantages of this method, there are also practical difficulties in managing this exercise. Some of the problems are:

- each leaver of an enterprise should be historically related to his/her cohort and the size of the cohort should be known.
- if there exists a low rate of wastage, the relative time taken to plot the cohorts could be ordinarily long.
- planners invariably start forecasting the wastage of groups who have not even joined the organisation.

4.6 THE CENSUS METHOD

The Census Method overcomes some of the problems of the Cohort Method by taking a bird’s eye view of the different cohorts at one point of time. These views are then combined to make an estimation of the survival, either by age or by length of service.

In Exhibit 5, using the Census Method, the survivor function is calculated based on the length of service. This is a very simple method of tabulating the data. In the first column, we have the length of service in years and in the second column we have the number of employees against each of the service length groups: at the beginning of the year. In the third column the number of employees who left employment is tabulated against each of the service groups and in the next column the wastage rate is calculated. In the last column the survivor rate is computed.

To get the survivor function for the second year, the survival rate of the first year is multiplied with the second year. For the third year, the survivor function of the second year is multiplied with the survival rate of the third year and so on. Here, the survivor function depends on the assumption that people in their second year of

employment will have experienced the same pattern of survival in their first year, as do the people who are now in their first year. In calculating the central rates survivor function we use average stock in the calculations as against the stock at the beginning of the year.

When the survivor function falls, it indicates a low rate of survivals and high rate of wastage. While interpreting this function, it is important to note that it is a cumulative curve.

Once the survivor function is established for a group of employees, it is possible to predict the probability of separation that exists in various service length groups of employees.

4.7 MARKOV CHAIN

In most organisations, employees are divided into several grades and they move up the organisational ladder from one grade to another. This may be deemed the hierarchical form of a manpower system. By and large, the routes that employees follow through the system are well defined. Exhibit 6 illustrates an example of this nature.

In a simple form of growth and hierarchy, an employee may grow from level I to level II, and then to level III and so on. It is, therefore, assumed that for level II the feeder group is level I, for level III it is level II and so on. From each group natural wastage can be expected due to the exist of employees.

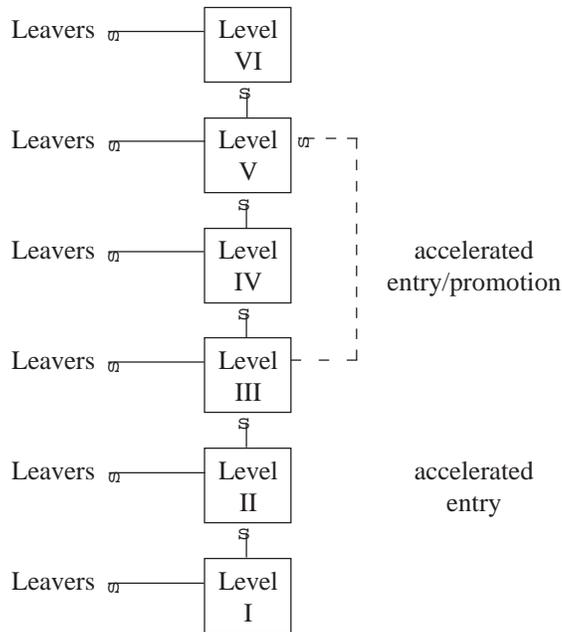
Under certain circumstances accelerated entry or growth is also possible, as illustrated in Exhibit 6, where an employee has skipped level IV and moved from level III to level V directly. Similarly, a few employees may join at higher level as illustrated in case of accelerated entry to Level II.

Exhibit 6: Census Method Used to Calculate Survivor Function

Length of Service on 1.1.95 in yrs.	# of Employees as on 1.1.95	# Empl. Separated during 95	Turnover rate (Wastage)	Survival Rate	Survivor Function
0-1	20	6	0.3	0.7	0.7
2-3	20	4	0.2	0.8	0.56
3-4	25	5	0.2	0.8	0.448
4-5	10	3	0.3	0.7	0.313
5-6	18	3	0.167	0.833	0.26
6-7	24	4	0.167	0.833	0.216
7-8	10	2	0.2	0.8	0.172
8-9	15	3	0.2	0.8	0.137
9-10	8	1	0.125	0.875	0.119
10-11	16	1	0.16	0.84	0.099
11-12	18	1	0.555	0.445	0.044
12-13	10	0	0	1	0.044
13-14	17	0	0	1	0.044
14-15	7	1	0.143	0.857	0.037
Total	218	34	0.156	0.844	

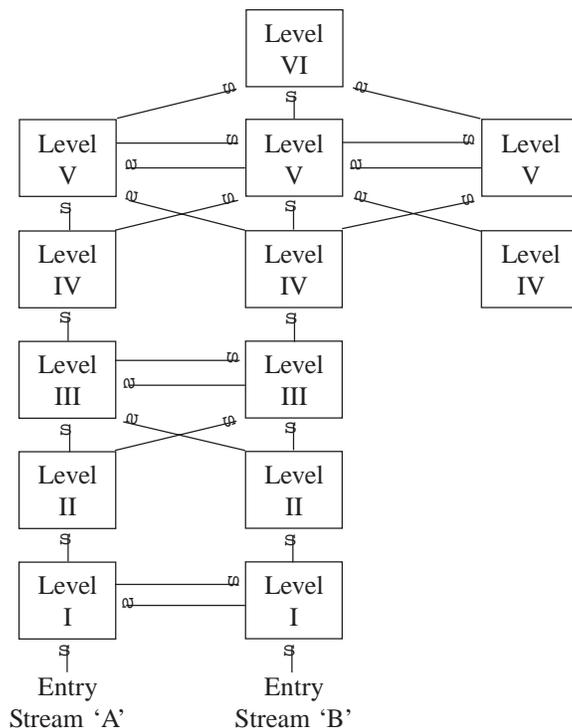
Complex hierarchical models also exist, as illustrated in Exhibit 7 where multiple streams of promotions are seen, which may cover and/or diverge at different levels depending on how the organisation is structured. Similarly, there exists the possibility of movements between the two streams at various levels. It is also possible that there will be a common entry level for more than one stream.

Exhibit 6.1: Markov Chain



The model in Exhibit 7 is classified as *Young & Almond's* model and can be described as a model for understanding the 'Markov Chain'. *Young & Almond* devised this model in 1961 for a company. Here, the assumption is that an employee moves up the ladder by means of a 'push' promotion. In this model there exists no requirement of a vacancy, and the employees move up the hierarchy as long as he/she meets with certain predetermined criteria, such as length of service and attainment of a particular level of skills or performance rating.

Exhibit 7: Complex Ladder for Promotions



As an illustration, consider a typical hierarchy where the following situation exists:

	<i>Level I</i>	<i>Level II</i>	<i>Level III</i>	<i>Level IV</i>
Current strength of employees	40	60	30	30
Rate of annual employee turnover	20%	15%	10%	8%
Percentage of promotions to next grade	60%	10%	5%	3%

At the end of the first year, in Level II, the scenario will be as follows:

- i) $60 \times 0.15 = 9$ will exit (A)
- ii) $60 \times 0.1 = 6$ will get promoted to Level III (B)
- iii) $40 \times 0.6 = 24$ will get into Level II from Level I (C)

Thus, the final picture of Level II will be

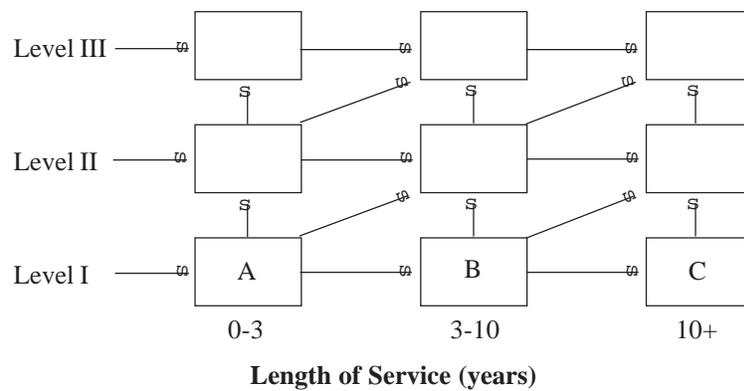
$$[60 - (A+B)] + C$$

$$\text{or } [60 - (9+6)] + 24$$

$$\text{or } 69 \text{ employees.}$$

The assumption is that the higher levels of grades will expand further every year while the lower levels of grades will keep decreasing. Prof. D.J. Bartholomew in his book “*Stochastic Models for Social Processes*” (Wiley 1967) has discussed a model of Markov chain and the same is elaborated in detail by D.J. Bell in his book ‘*Planning Corporate Manpower*’ (Longman 1974). Here the push factor of promotion is not as severe as was discussed in the earlier model. Exhibit 8 shows a different Markov Chain. A person hired at Level I will enter the box marked ‘A’. If he continues to remain in this level for three years he will automatically move to Box ‘B’ and after ten years to Box ‘C’. He may, however, within three years move to Level II as shown by the vertical arrow or after three years to Level II as shown by the diagonal arrow.

Exhibit 8: Markov Chain



Based on data of past trends of this nature and after considering employee turnover from each of the boxes, the planners may predict the supply level of employees from internal sources.

4.8 RENEWAL MODELS

In Markov model, the assumptions are changing grade size and fixed movement possibilities due to the push factor. In the renewal theory, the assumption is again that of fixed grade size but upward movements are linked to vacancies at higher levels. Such vacancies are caused either due to natural wastage or due to upward movements. This model, therefore, works on the probability of employees leaving an organisation at some point or another. Such exits are at a series of intervals, depending on either

the age profile or the profile of length of service. The proportion of leavers is likely to follow normal distribution. As and when a vacancy is created, the assumption is that it will be filled up through internal promotions. Promotions could fall into either of two possibilities, viz.: promotion based on seniority, which will trigger chain reaction and cause recruitment at the lowest level of hierarchy, or promotion due to merit where the promotability of individuals will be considered. Prof. Bartholomew has developed models based on these assumptions.

Institute of Manpower Studies (1972) in its report have compared the Markov Chain model and the renewal theory model as follows:

“The Markov or ‘Push’ type models assume that promotions are not dependent on vacancies occurring, but instead are the result of management ‘pushing’ individuals along career paths at fixed rates ——.”

“At the other extreme the renewal or ‘Pull’ type models assume that all promotions are the result of vacancies to fill gaps as they arise.”

It should be noted that in real life, a combination of Push and Pull is seen. At times both are seen independently. It is, therefore, necessary to consider historical trends and arrive at well-studied assumptions on future patterns.

Most mathematical models can be applied to big organisations only, where the population is large enough for the projections to be correct. It should also be remembered that these models work only in stable socio-economic and political scenarios, with stable markets. In situations where there are changing variables that are likely to make a significant impact on the enterprise, these models may not work, as the future may not necessarily follow the trends of the past. At senior levels of the hierarchy, the possibilities of mathematical model working is likely to be low, not only due to small numbers but also due to the fact that several internal as well as external factors continuously work on this group in a profound fashion.

4.9 SUMMARY

Human resource planners need to look at the sources of supply and evaluate them through in-depth studies to ensure that suitable strategies are evolved to meet business demands. The supply source will be divided into two categories viz., Internal supply and External supply. External supply is determined by factors extraneous to the company or enterprise level. Internal supply over which a company or enterprise has control is governed by the wastage rate (i.e. the rate of leavers from the company) and the internal flows caused by transfers and promotions. Methods of analysis and forecasting is, however, a well defined MIS based on personnel history records of each individual employee.

Annual employee turnover is a method of measuring the attrition or wastage of employees. There are several methods to be used to measure various aspects related to employee service, age, employee exit, etc. In turnover analysis, this analysis is known as “Long-normal wastage curve”. Most mathematical models can be applied to big organisations only, where the population is large enough for the projection to be correct.

4.10 SLEF-ASSESSMENT QUESTIONS

- 1) Explain the various methods of human resource supply in an organisation.
- 2) Describe the factors affecting internal levels. Explain the reasons for increase in employee groups.
- 3) Discuss the employee turnover analysis. Explain the different techniques for supply management.

4.11 FURTHER READINGS

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