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Stochastic Processes to Achieve the Threshold Level of Recruitment Process

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Abstract : Human resource process the so called Manpower planning consists of putting right number of people, right kind of people at the right place, right time, doing the right things for which they are suited for the achievement of goals of the organization. Manpower planning has got an important place in the field of industrialization. The purpose of Human Resource Planning is to get a better matching between manpower requirement and manpower availability. In this paper the stochastic model is proposed to get the expectation and variance of the time to achieve the threshold level for recruitment process.

Keywords - Stochastic model – Manpower recruitments, Manpower availability

Introduction

Manpower Planning is a two-phased process because manpower planning not only analyses the current human resources but also makes manpower forecasts and thereby draw employment programmers. Shortages and surpluses can be identified so that quick action can be taken wherever required. All the recruitment and selection programmers are based on manpower planning. It also helps to reduce the labor cost as excess staff can be identified and thereby overstaffing can be avoided. It recognizes the available talents in concern and training programmers can be done to enhance those talents. With the help of manpower planning we can utilize the human resources which are available which will increase the growth and diversifications of business.

Models in Stochastic processes

Some of us describe manpower planning with limited hiring opportunities in which they have presented the value of stochastic modeling. In which they have describe the objective function of the program maximizes the difference between billable revenue, and payroll costs, recruiting costs, training costs, and the expected cost of firing and subcontracting with following constraints. The overall staff balance constraint; it states that in every skill and grade category the net change in manpower is equal to the number of new hires, less the number lost to attrition or termination. All new hires and retooled resources are designated as in training for one period. The number of billable resources according to demand and supply. An upper limit on the proportion of billable resources that can be subcontracted. Balances the number of retrained resources.

Another Stochastic model describe on time to recruitment in a two grade manpower system using different polices of recruitment. A two grade organization in which depletion of manpower occurs due to its policy decisions is considered. They have constructed two mathematical models in which employing two different univariate recruitment policies, based on shock model approach. But the mean and variance of the time to recruitment are obtained for both the models under different conditions.

In this stochastic model has minimizing the manpower system cost during the recruitment and promotion period which are determined by the changes that take place in the system. It resulted in the form of recursive optimization, a dynamic programming. In that optimal number of recruits and promotions made so that the total cost incurred is minimum in the manpower planning system along with the various costs like recruitment costs, promotion costs, overstaffing costs, wastage costs and retention costs.

This model suggest that a hierarchical manpower systems – called the proportionality Markov manpower system model, which follow proportionality policies in recruitment and promotion of their staff, ostensibly with a view to safeguard the career interests of their existing employees. They took the study of a class of Markov manpower systems wherein the recruitment to each level or grade of the organization is restricted to a strict proportion of the promotions to it. Such restrictive covenants on the number of new employees recruited from external sources to a grade is the number of employees promoted to it from within the organization, were often introduced into the promotion and recruitment policies of many organizations, especially in countries wherein the inter-organizational mobility of employees was low or wherein alternative employment opportunities were limited, and was the genesis of these policies. Their model yields a more practicable means of control of the system. It also has the additional advantage that it can be used to achieve a desired blend of existing and fresh external manpower in an organization.

Stochastic Model on Expected Time:

A departure of people is common in much organization. Once a large number of departures from the organization reach a certain threshold level, it could be consider as a threshold break. The time to achieve threshold is an important feature of the organization. Any departure of people can induce down to the organization, and a large number of vacancies may even cause a 'threshold break' of the organization. If the total amount of departure of people crosses a particular level, the organization reaches down in economic status which will be called a threshold break point. The organization suffers a heavy loss of manpower and it cannot be run economically without recruitment when the number of exits of personnel crosses the threshold level. Thus, the time to achieve the threshold level is an important characteristic for the management of the organization.

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Here
T - Continuous random variable denoting the time of threshold break of the organization.
t - The time of occurrence of the decision.
G(t) - Cumulative distribution function of
T.
$M_T(s)$ - the moment generating function of T.
$M_X(s)$ - moment generating function of X.
The number of decisions made in (0, t] from a renewal process.
$V_i(t) = F_i(t) - F_{i+1}(t)$
where $F_0(t) = 1$.
Let E(T) and V(T) be the mean and variance of the time for achieve threshold level.
Probability of Continuous random variable to cross the threshold level T is greater than t is exactly i decisions in (0, t] and the threshold break time is not reached.

That is $P(T > t) = \sum_{i=0}^{\infty} [F_i - F_{i+1}] \beta^i$

Thus Cumulative distribution function of T is G(t).

$$G(t) = (1-\beta) \sum_{i=1}^{\infty} F_i(t) \beta^{i-1}$$

The probability density function of t is given by

$$G'(t) = (1-\beta) \sum_{i=1}^{\infty} f_i(t) \beta^{i-1}$$

The moment function of T is

$$M_T(s) = \frac{(1-\beta) M_x(s)}{1-\beta M_x(s)}$$

For s with $M_X(s)$ less than $\frac{1}{\beta}$ which gives

$$E[T] = \frac{E[X]}{1-\beta}$$

$$V[T] = \frac{(1-\beta) Var[X] + \beta (E[X])^2}{(1-\beta)^2}$$

Where $\beta = E[(1-\beta)U]$

Let X_i be the independent and identically distributed (i.i.d) exponential random variable with probability density function

$$f(x) = \frac{1}{a} e^{\frac{x}{a}}$$

Where x and a are positive values.

Let U_i be i.i.d Poisson random variable with parameter λ then $\beta = e^{-\lambda\theta}$.

Hence we obtain

$$E(T) = \frac{\beta}{1-e^{-\lambda\theta}} \text{ and } V(T) = \frac{a^2}{(1-e^{-\lambda\theta})}$$

the threshold level follows a Geometric distribution with parameter θ.

Conclusion

For fixed α, β and various values of λ, the mean threshold number decreases, the threshold break time also decreases, and as the rate of departure of people increases, the breakdown time of the organization decreases.

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