This article is intended to suggest a valuation method for internal human resources as loyal assets. The article will discuss how investments to obtain the loyalty of internal human resources provide an asset to an organization and will explore the importance of loyalty valuation for accounting. An attempt will be made in this article to relate game theory to the problem of human resource accounting. The models developed in this field for the valuation of human resources have proved deficient in one main aspect. The models ignore the special characteristics of human resource assets to organizations and as a result apply methods of valuation similar to those in use for the valuation of physical resources. The article argues that human resources can be regarded as assets of a special type. Control over them does not arise as a result of ownership or possession of the resource, but rather as a result of acquiring and maintaining their loyalty to an organization. This is because human resources are not generally bought and sold in the market, i.e., there is no acquisition cost in terms of a purchase price to allow for the control over them.

In recent years Sudanese employers have experienced a tremendous loss of skilled manpower to other countries and they have no way of assessing the value of this loss. This paper attempts to arrive at a way of assessing this loss and may help to take necessary action from the side of employers.

In the first place this article will explain a method through which it is possible to determine how much an organization should spend on improving the quality of working life and the conditions of work so as to maintain the loyalty of its labour force. The benefit to a firm in seeking to maintain the loyalty of its labour force is measured by the positive margins of potential contributions secured through a lower rate of turnover over costs incurred to at least partially eliminate the causes of turnover. In this sense the loyalty cost of internal human resources may be considered to provide an alternative aggregate measure for their valuation.

To develop a model to determine how much is to be spent on improving the quality of working life and conditions of work in order to maintain the loyalty of internal human resources, the following assumptions are made:

(i) The model assumes the labour force which any firm has is less than optimal, that is to say, any reduction in the size of the labour force will reduce the productivity, and hence the profitability of the firm. This means profitable opportunities for additional employment exist and firms will attempt to employ labour up to the optimal level.

(ii) The supply of labour in the industry is fixed and that there is full employment of available labour.

(iii) Any deficiency in the size of the labour force which any firm has, cannot be re-couped at a cost premium, e.g. overtime work, substituting machinery for labour.

(iv) Improvement in the quality of working life and conditions of work will affect workers' decision of whether to work for a particular employer or not, that is to say, employees can leave due to dissatisfaction with the quality of working life and conditions of work.

(v) The model will assume first there are two employers and then the same model will be extended to more than two employers.
Optimum Investments In Programmes for Improving the Quality of Working Life and Conditions of Work: A Two-Employers Approach:

In the two-employers approach, assume there are two firms, (a) and (b), each of which is attempting to reduce its turnover rate by providing an incentive for its labour force in order not to leave and work for the other employer. This incentive is in the form of a certain optimum amount of investment in terms of better quality of working life and conditions of work.

Assume \( a \) is the effectiveness of programmes to be provided by the firm (a) in improving the quality of working life and conditions of work. \( u \) therefore shows the rate at which firm (a) is able to maintain its existing labour force and the rate at which it can attract workers from firm (b).

Assume \( b \) is the effectiveness of programmes to be provided by firm (b) in improving the quality of working life and conditions of work. \( v \) therefore shows the rate at which firm (b) is able to maintain its existing labour force and the rate at which it can attract workers from firm (a).

Assume further that the amount to be spent by firm (a) in programmes for improving the quality of working life and conditions of work is \( x \), and the amount to be spent by firm (b) is \( y \).

The values of \( x \) and \( y \) are the amounts to be found by this approach.

The effectiveness of programmes aimed at improving the quality of working life and conditions of work to be provided by firm (a) in relation to the effectiveness of programmes to be provided by firm (b), can be shown as:

\[
\frac{a \cdot x}{a \cdot x + b \cdot y} \quad \text{(1)}
\]

And the effectiveness of programmes to be provided by firm (b) for improving the quality of working life and conditions of work in relation to the effectiveness of programmes to be provided by firm (a) can be shown as:

\[
\frac{b \cdot y}{a \cdot x + b \cdot y} \quad \text{(2)}
\]

If we assume the total size of the labour market to be shared by the two firms is \( S \), firm (a) will maintain the following share of the labour market:

\[
S \left( \frac{a \cdot x}{a \cdot x + b \cdot y} \right) \quad \text{(3)}
\]

Firm (b) will maintain the following share of the labour market:

\[
S \left( \frac{b \cdot y}{a \cdot x + b \cdot y} \right) \quad \text{(4)}
\]

Assume also \( P_a \) is the gross contribution per employee per year in firm(a):

\[
P_a \left( \frac{S \cdot x}{a \cdot x + b \cdot y} \right) \quad \text{(5)}
\]

This is the total gross contribution of firm (a) before deducting the cost of improving the quality of working life and conditions of work.

In a similar fashion the total gross contribution of firm (b) before deducting the cost of conditions of work is:

\[
P_b \left( \frac{S \cdot y}{a \cdot x + b \cdot y} \right) \quad \text{(6)}
\]

Where \( P_b \) is the gross contribution per employee per year in firm (b). From the gross contribution equations of firm (a) and firm (b), we can arrive at the net profit equations of the two firms by deducting the costs of programmes which are aimed at improving the quality of working life and the conditions of work. Let us refer to the net profit equations of firms (a) and (b) as \( N_a \) and \( N_b \) respectively.

\[
N_a \left( \text{net profit per year of firm (a)} \right) = \frac{P_a \cdot S \cdot x}{a \cdot x + b \cdot y} \quad \text{(7)}
\]

And similarly the net profit per year of firm (b) is:

\[
N_b \left( \text{net profit per year of firm (b)} \right) = \frac{P_b \cdot S \cdot y}{a \cdot x + b \cdot y} \quad \text{(8)}
\]

The objective of firm (a) is to maximize the effectiveness of its expenditure on programmes to improve the quality of working life and conditions of work for its labour force.
This objective of firm (a) shows how much
firm (a) should spend in maintaining the
loyalty of its labour force in order not only
to achieve its existing level of profits but
also to attain additional profits. Note that
this model assumes that the labour force of
each firm is less than optimal which means
that profitable opportunities for additional
employment are available.

So to maximize $N_a$ with respect to $x$
aN$_a$ should approach zero.

\[
aN_a = \frac{P_a S_a (\alpha x + \beta y) - \alpha P_a S_a x}{\alpha x} = 0 \quad (9)
\]

\[
\begin{align*}
& P_a S_a (\alpha x + \beta y) - \alpha P_a S_a x = (\alpha x + \beta y) \quad (10) \\
& x(P_a S_a x - P_a S_a x) + P_a S_a y = (\alpha x + \beta y) \\
& P_a S_a y = (\alpha x + \beta y) \quad (12)
\end{align*}
\]

Following the same steps

\[
aN_b = \frac{P_b S_b (\alpha x + \beta y) - \alpha P_b S_b x}{\beta y} = 0 \quad (13)
\]

From equations (12) and (13) above we have:

\[
P_a S_a y = P_b S_b (ax + by) \quad (14)
\]

\[
P_a y = P_b y \quad (15)
\]

\[
y = \frac{P_a y}{P_b} \quad (16)
\]

If, in equation (12), which is

\[
Y_a S_a y = (\alpha x + \beta y) \quad (a)
\]

We Substitute $P_a y$ for $y$

we will arrive at:

\[
\begin{align*}
& \frac{P_a S_a y}{P_a} - \frac{P_b}{P_a} x = 1 \quad (17) \\
& \frac{P_b}{P_a} x = 2(\alpha x + \beta y) \\
& \frac{P_a S_a y}{P_a} - \frac{P_b}{P_a} x = 1 \quad (18)
\end{align*}
\]

This should be the strategy of firm (a) for
its expenditure on programmes directed to
the improvement of the quality of working
life and conditions of work. Such a strategy
will minimize the rate of turnover of the
labour force working with firm (a).

Optimum vestments is, Programmes for
Improving the Quality of Working Life and
Conditions of Work: An $N$ Employers Approach

In the previous section an approach was
developed for determining the optimum
amount of expenditure for improving the
quality of working life and conditions of work
so as to minimise the turnover resulting from
the mobility of employees. In that approach
it was assumed that there were two firms
(employers) in that industry. The purpose of
this section is to extend the previous approach
by assuming the number of firms (employers)
is more than two.

In this approach, assume the number of
employees in a certain industry is $S$ and
the number of firms (employers) is $n$, and $n$
is greater than two. The question is how can
each firm establish its optimum strategy to
maintain the loyalty of its existing labour
force by providing a good quality of working
life and conditions of work?

Using the same notations of the previous
approach, we will have:

the $i$th firm spends $x_i$ in improving the
quality of working life and conditions of
work for its labour force. $x_i$ is what is needed
1

Establish by this approach.

The basic assumption of this approach is
that: the number of employees who maintain their loyalty to their original employer is a function of the quality of working life and the conditions of work provided by their employer in comparison to those provided by other competitive firms in the industry. This can be represented as:

\[
\frac{\sum s_i x_i}{S} = \frac{a_i x_i}{a} \tag{21}
\]

Where:

- \( S \): is the size of the labour market
- \( s_i \): is the share of the labour market of the firm
- \( a \): is the effectiveness of the \( i \)th employer's programme in improving the quality of working life and the conditions of work. It shows the rate at which the \( i \)th firm is able to maintain its existing labour force and the rate at which it can attract workers from other firms in the industry.
- \( x_i \): is the amount to be spent by the \( i \)th employer in improving the quality of working life and conditions of work.
- \( n \): is the number of firms in the industry.

In the illustration of the approach, let us assume there are three firms and the labour market between them is shared as follows:

\[
S = \sum_{i=1}^{3} s_i
\]

or

\[
S = s_1 + s_2 + s_3 \tag{22}
\]

The net profit per year for each firm, \( N_i \), can be shown as follows:

\[
N_i = \sum_{i=1}^{3} \frac{a_i p_i}{a_i x_i} - s_i \tag{23}
\]

Where

- \( N_i \): is the net profit per year of each firm;
- \( p_i \): is the gross contribution per employee per year before deducting the cost of expenditure in improving the quality of working life and the conditions of work.

From equation (23):

\[
N_{1} = \sum_{i=1}^{3} \frac{a_i p_i}{a_i x_i} - s_1 \tag{24}
\]

This is the net profit per year of the first firm. Similarly, the net profit of the second firm is

\[
N_{2} = \sum_{i=1}^{3} \frac{a_i p_i}{a_i x_i} - s_2 \tag{25}
\]

And the net profit of the third firm is

\[
N_{3} = \sum_{i=1}^{3} \frac{a_i p_i}{a_i x_i} - s_3 \tag{26}
\]

For the first (one) and any other firms the objective is to maximise the net profit \( N_i \) at a maximum when:

\[
\frac{\partial N_i}{\partial s_i} = 0 \tag{27}
\]

From equation (24) above

\[
\frac{\partial N_1}{\partial s_1} = \frac{3}{s_1 a_1 p_1 x_1} - 1 = 0 \tag{27}
\]

And for \( N_1 \) be maximum equation (27) should be equal to zero.

\[
\frac{\partial N_1}{\partial s_1} = \frac{3}{s_1 a_1 p_1 x_1} - 1 = 0 \tag{28}
\]

In a similar fashion we can maximise the effectiveness of programmes for improving the quality of working life and conditions of work for firms (two) and (three) and the equations for these firms can be shown as follows:

\[
N_2 = \sum_{i=1}^{3} \frac{a_i p_i}{a_i x_i} - s_2 \tag{29}
\]

\[
N_3 = \sum_{i=1}^{3} \frac{a_i p_i}{a_i x_i} - s_3 \tag{30}
\]

and

\[
N_1 = \frac{3}{s_1 a_1 p_1 x_1} - s_1 \tag{31}
\]

In a similar fashion we can maximise the effectiveness of programmes for improving the quality of working life and conditions of work for firms (two) and (three) and the equations for these firms can be shown as follows:
Firm (one can find its optimum strategy, $x_1$ in terms of $x_2$ and $x_3$ from the last three equations by equating them, which is $x_1 = x_2 + x_3$). The sum of the terms on the right-hand side of the equation.

From equation (36) above

\[ x_1 = \frac{1}{(x_2 + x_3)} \quad (x_2 + x_3) \quad \text{(37)} \]

Hence $x_1$ is expressed in terms of expected variables related to firms (two) and (three), but the variables related to firm (one) are the dominant ones.

Also $x_2$ can be found in terms of equation (35) above as follows:

\[ x_2 = \frac{1}{(x_2 + x_3 + x_3)} \quad (x_2 + x_3) \quad (x_2 + x_3) \quad \text{(38)} \]

Here $x_2$ is expressed in terms of expected variables related to firms (two) and (three), but the variables related to firm (one) are the dominant ones.

The question is which strategy should firm (one) choose? Is it the one shown by equation (37), or is that shown by equation (31)? The answer depends upon who of the two competitors is active in terms of attracting employees, from firm (one). If the more severe competitor is firm (two), then the answer is given by equation (37); otherwise it will be given by equation (39). Choosing firm (two) as the more severe competitor, for example, and giving the optimum strategy for firm (one) through equation (37) does not mean ignoring the expected behavior of firm (three).

Looking at equation (37), the expected behavior of firm (three) is also taken into consideration in terms of $x_1$ in the numerator of the right-hand side of the equation.

The implications of loyalty valuation for Accounting:

The proposed measure for the firm’s investment in human resources loyalty is based on the amount of investment the firm can afford for improving the quality of working life and conditions of work. According to this approach the amount to be spent by each firm is relative to its expected annual profit resulting from reducing turnover rates and to the expected behavior of its competitors. The expected behavior of competitors which is considered to be the approach is in terms of annual investments to be made by competitors for improving the quality of working life and conditions of work for obtaining and maintaining the loyalty of their employees.

To ascertain the cost required to provide an asset to a firm, it is necessary to discount the series of expected annual investments on improving the quality of working life and conditions of work over the expected service-life (to the firm) of current employees. The present value of these series of investments may be considered to provide a valuation measure for the internal human resources as a loyal asset. According to current accounting practices, this value is only recognized under the term goodwill and since goodwill is only added to the balance sheet under certain circumstances, the result is understatement of values. (3) The most serious consequences of such an arbitrary procedure are (a) periodic earnings are understated in some periods and overstated in others, (b) the firm’s assets are understated because the loyalty value of the internal human resources is not shown on the balance sheet.

Feasible Problems with the Approach.

Few, if any, mathematical approaches can faithfully reproduce the real world and the approach developed in this article is not an exception. However there are some problems with the approach which ought to be recognized.
(i) The approach assumes the gross contribution per employee per year to be the same for all classes of employees. The problem with such an assumption is that employees in different skill groups have different gross contributions per year. A highly skilled employee earns more than an average skilled employee. So the assumption of gross contribution per employee per year to be the same for all classes of employees is a limiting problem to the model. A possible solution is to define the gross contribution in terms of per pound of expected wages to be paid. Accordingly, in the two-employers approach, which is

\[ x = \frac{p_a S_{ab} - p_b}{p_a} \]

\( (a + b) \frac{p_b}{p_a} \]

\( p_a \) and \( p_b \) stand for the gross contributions per pound of expected wages in firms (a) and (b) respectively. \( S \) stands for the total wages bill expected to be paid per year in the labour market of the two firms. It can be computed by estimating the possible different classes of labour and multiplying each class by its relevant wage rate. For example, the labour market of the two firms can be classified into unskilled, semi-skilled and skilled employees.

(ii) A second problem with the approach developed in this article is that the data which is needed is probabilistic rather than deterministic in nature. The rather changeable features of the business environment render the attainment of precision in forecasting the future virtually impossible. Errors are bound to occur in even the most favourable circumstances and thus some risk and uncertainty (6) exist. Any prospective data for the purpose of decision-making can be based on past trends of the data as well as the present data. From this point one can say the risk and uncertainty associated with any information for the purpose of decision-making depends on the accuracy of both the past and the present data on which the required information are based.

To prepare any prospective data there must be an initial set of coefficients from which to start the process. These coefficients show the probability and the reliability of past and present data. The smoothing techniques revise the coefficients to be used in forecasting each successive observation. For statement of the problem of smoothing and forecasting see Brown (1963) and Gambling (1975, 7).

Since the data used in the approach developed by this article is prospective in nature, some techniques are needed to deal with the probabilistic nature of the data. Formally, techniques to deal with probabilistic data include simulation analysis and decision trees. These techniques are designed to map out the sequence of events in a decision problem, helping a firm to trace events through time and to examine the complex set of probabilities. Informally when a manager receives a piece of information, he will either accept or reject this piece of information. His acceptance or rejection depends upon his reliability on the source of the information. This means that managers carry out editing processes to any information supplied to them by applying a correction factor to that information. The magnitude of the correction factor will, of course, depend upon the reliability on the source of the information.

(iii) Thirdly, the approach assumes that the firm's labour force is optimal in size. It may be argued that if the firm's labour force is more than the optimum size, then employees, lay off may be a desirable thing and the need for maintaining their loyalty will be irrelevant. Such an argument ignores the longer-term cost to the company, in terms of additional investments required to replace the laid off employees when the causes of the lay off are removed. Lay off decisions normally arise due to seasonal fluctuations or business depressions and under such conditions the need for the lay off may be a temporary one. The variables the decision-maker needs to consider in a lay off decision are the expected wage savings resulting from the lay off decision versus the expected cost of rehiring and replacing the laid off employees when the causes of the temporary lay off are removed.
The expected wage savings resulting from the lay off decision will only be a relevant variable if we assume the level of production required by the market will be maintained after the lay-off decision. The expected replacement cost of the laid off employees, assuming the causes of the temporary lay off will be removed in the future, involves two types of employees:

(i) rehiring;
(ii) new hirings

The intention in making this distinction is to separate out those employees who can be rehired and who will have experience of the plant and whose suspension of employment is due to fluctuations in production. The other type of replacement (new hirings) arises as a result of the fact that in a lay off decision a firm will not expect a 100\% rehiring of old employees when they are needed again.

In the case of the rehiring of previously laid off employees, the expected replacement cost will include the cost of lost time in the start-up process. No cost will be incurred for the recruitment and selection processes because these processes have already been made for the same employees when they were acquired by the firm in the first time. No learning cost in the form of induction and training programs will be incurred because the rehired employees have already been subjected to these programs. However these costs will be incurred if there are changes in the technological production process during the lay off period. For employees who are not expected to return to work after the lay off period, the expected replacement cost will include all the elements of recruitment, placement and training costs. In a lay off decision if the expected wage savings resulting from the lay off are less than the expected cost of rehiring and replacing the laid off employees when they are needed then it may be worthwhile avoiding the lay off decision. But if the expected wage savings resulting from the lay off decision are greater than the expected cost of rehiring and replacing the laid off employees, then the lay off will be a desirable thing and there will be no need to maintain the loyalty of employees whose size exceeds the optimum size.

(iv) The model assumes the supply of labor in the industry is fixed and that there is full employment of the available labour. It may be argued that if the supply of labour in an industry is not fixed, a firm should not bother about maintaining the loyalty of its labour force because for every employee who may leave a replacement can be found in the market. Such a decision situation needs a comparison between the expected cost of replacing employees and the expected cost of maintaining their loyalty. If the expected loyalty cost is less than the expected replacement cost, then it is worthwhile avoiding the turnover and vice versa if the expected loyalty cost is more than the expected replacement cost.

(v) It may also be argued that if any deficiency in a firm's labour size can be recouped through a cost premium e.g. overtime work, then the firm should not bother about maintaining the loyalty of its labour force. In such a decision situation the firm needs to compare the expected incremental cost of labour in terms of overtime premium with the expected cost of maintaining the loyalty of the labour. If the expected loyalty cost is less than the expected cost of overtime premium, then it is worthwhile maintaining the loyalty of the labour force and vice versa if the loyalty cost is more than the overtime premium.

Conclusion:

The article suggests a valuation method for internal human resources as loyal assets. It shows the accounting implications of incorporating loyalty valuation in an existing firm's accounts. In particular, it shows the implications of loyalty valuation for the income statement and for the balance sheet. Its implications for the measurement of the financial effect of labour turnover with special reference to Sudan will be a forthcoming article by the author.
FOOTNOTES:

1. According to the author, the human resources within a company are as vital as the natural resources of the earth. Employees, in essence, are the driving force behind a company's success.


3. \( a_N = \frac{p_N \cdot S_N}{y} \) is obtained as follows:

   \[
   N_b = \frac{(x + y)}{(x + y) + p_N \cdot S_N - p_N \cdot S_N y} \]

   \[
   a_N = \frac{(x + y) + p_N \cdot S_N - p_N \cdot S_N y}{y} \]

   \[
   = \frac{(x + y) + p_N \cdot S_N - p_N \cdot S_N y}{(x + y) + p_N \cdot S_N - p_N \cdot S_N y} - 1 = 0
   \]

4. Equation (28a) derived from(27)

   \[
   a_N = \frac{S_N x_1 y_1 + S_N y_2 x_2 + S_N y_3 x_3}{x_1 + y_1 + x_2 + y_2 + x_3 + y_3} - 1
   \]

5. Goodwill is created when a business enjoys a favourable attitude of its employees, customers, and other stakeholders. These favourable attitudes do not arise without the presence of cost. The cost may be composed of various expenses, such as good relations with suppliers, advertising, quality control, etc. Accountants recognize goodwill only when it is purchased. The event which occasions the recognition of goodwill is the acquisition of a going concern by another enterprise.

6. In many contemporary economic studies, risk is distinguished from uncertainty in that under conditions of risk the possible outcome of each alternative course of action as well as the likelihood of occurrence of each outcome are known; or more correctly each possible outcome is assigned a subjective probability of occurrence. Thus, it has been suggested by Knight (1965) and Skinner (1969) that the term risk should be used to denote the holding of anticipations which are not single-valued but constituting a probability distribution having known parameters. Uncertainty should refer to anticipations under which parameters of probability distribution are themselves not single-valued, i.e., the parameters (\( X \) mean and standard deviation) are not single-valued under conditions of uncertainty while they are single-valued under conditions of risk.

7. Gambling states that the smoothing of data is in any case an inherent subjective operation. He refers to two alternative methods to achieve the result. An obvious choice might be to take an average of all the observations that have ever been taken, this could be made sensitive to change by taking a moving average of some of the last observations. According to Gambling a more useful method is to combine the past trend of the data with the present trend. This is known as "exponential smoothing" and is achieved by assigning the past as well as the present trends of the data coefficients showing the probability and the reliability of the data.

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