Internal Marketing: An Application of Principal Component Analysis

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Abstract—**Businesses in 21st century operate in ultra-competitive, dynamic and effervescent economies enabled by powerful machines & technology gadgets. The very existence of organizations in this digital maze depends on translating incredible amounts of data into powerful knowledge for decision making through scientific methods & statistical innovations. The job of advanced statistical techniques such as Multivariate Analysis is to illuminate, organize and interpret complex data with relative ease & luxury. This research uses the concept of Internal marketing to understand application of Principal Component Analysis (PCA). The study empirically tests data collected of 322 respondents through structured survey in 60 branches of 8 leading commercial banks in the region. The questionnaire was developed using 20 items based on extensive literature review. The results confirm the performance of proposed framework which can be utilized as statistical & managerial tool for employee development & organizational effectiveness. The components extracted are; motivation, understanding & differentiation, dissemination of information, strategic reward, training and inter-functional coordination.**

Index Terms—**factor analysis, principal component analysis, internal marketing, employee development, statistical package for social sciences (SPSS)**

I. INTRODUCTION

Expanding markets, growing competition, increasing costs, outsourcing key operations, changing technologies and vying for sustainability & green practices have compelled businesses to reconsider their business philosophy and strategic thinking. Organizations need to revitalize their capabilities and core competencies to counter emerging trends and market pressures not only to create better value for customers but employees as well. Businesses have understood the value of Human Resources by considering employees as assets to be nurtured rather than costs to be minimized. Many Endeavour's have been made in this regard to develop vibrant workforce. Internal Marketing (IM) is at the helm of modern business philosophy to adapt to new circumstances. This term was coined in the middle of 1970's as a recipe for engaged workforce, better productivity and service performance [1].The concept has captured attention of HR & Marketing professionals to decipher complex trends and understand transformation for functional viability. IM has been widely discussed in academic literature of service quality during1980's [2]-[5]. It is also incorporated in academic literature pertaining to Service Management [6], [7] and Relationship Marketing literature [8], [9], [5]. Ref [10] discovered that "Through Internal marketing, strong reciprocal exchange relationships could be created and sustained within the firm. This happens because of the trust, understanding and commitment among the employees when they are satisfied". The aspect of employees as an internal customer is based on the belief that in-house operational excellence is a perpetual phenomenon & therefore has impact on service quality & external market. Delighted employees breed happy clientele & outstanding customer service which means frequent business and word of mouth viral marketing.

II. LITERATURE REVIEW

Internal Marketing has not only enabled organizations differentiate but attain strategic fit and coherence among organizational policies and processes. It also helps organizations achieve their strategic, tactical & operational goals by bridging the gap between horizontal & vertical linkages. By establishing efficient communication channels, organizations successfully meet discrepancies & business challenges. This empowers organizations to solve problems and functionalize organizational actions. Furthermore Ref. [10] discovered that IM plays a vital role in realizing mission & objectives of the firm through two important parameters; involvement and commitment which are prerequisites for motivated & engaged workforce. Organizational goals cannot be achieved in isolation as they are symbiotic & interdependent. In order to enhance employee performance it is therefore pertinent to manage and control relations with consummate communication & coordination. Conventional Marketing to the external

marketplace can't generate results without Internal Marketing practices as both processes complement each other. Ref. [11] suggested that key to successful external marketing and excellent service is Internal Marketing, whereas, Ref. [12] said that conventional external marketing is less important than IM.

IM also plays a vital role in attracting competent employees and prevents employee turnover. Ref. [13] stated that Internal Marketing is successfully recruiting and motivating competent employees to achieve high quality services for the clients. First the organization should sell the job to a competent pool of employees and then focus on selling their services in the market [14].

The environment created through IM spawns awareness among employees to celebrate their existence in the organization [4], [15], [16]. Thus IM connects the employee to the firm enabling him/her to produce better work quality. Ref. [17] said that IM is the way to achieve excellent service and external marketing. Financial institutions such as banks adapting IM practices are contented to achieve their targets through workforce satisfaction and employee engagement [18]. IM also encourages healthy competition amongst employees. It has been found that in such organizations customers feel connected to the corporate & product brands showing strong allegiance and loyalty. Organizations therefore need to promulgate IM practices to create strong bond with the customers so that they could out smart their rival brands in market share and patronage [19].

Many researchers, [11], [20]-[22], suggest that the thesis of IM is to consider employees and jobs as customers and products of the firm. IM helps exterminate status quo - a barrier to change efforts by leading employees towards empowerment, self-control and confidence.

Organizations should not forget the mantra of considering their employees as important as customers; failure to do so can pool a dissatisfied workforce eroding customer market and market potential [23]. Ref. [23] alleged that it is indispensable for the firm to weigh external and internal customer on same scale. This attitude of firm should reflect in its operational philosophy and standards of behaviour. Ref. [24] said that in order to meet requirements of external market the firm should capitalize on competent, trained, reinforced, motivated and knowledgeable internal market and this market constitutes of employees in the organization.

Ref. [25] proposed that in IM both buyers and sellers are from the same organization and they both compete within that organizational context. This makes concept of IM more pervasive than commercial marketing. In fact it stimulates the development of new ideas to create improved products and services for customers. A pragmatic approach in this regard is networking which permeates contacts and referrals to publicize products & services. IM practices encapsulate motivation, shared goals, continuous quality improvement, fluid organizational culture and quest for productivity [26]. Ref. [27] proposed that IM is a philosophy of developing a working environment with high quality systems by controlling and aligning all the interdependent elements to improve individual and organizational functions and competencies that ultimately contribute to successful business performance. All these activities should be monitored carefully to achieve effective IM that leads to accomplishment of organizational goals.

A. Principal Factor Component Analysis

Principal Factor component Analysis is a statistical technique that allows businesses to trim mountains of data by reducing complexity and finding themes amongst observable variables. Factor Analysis can be defined as the statistical technique for comprehending underlying structure & dimensions amongst the variables in the discourse. Ref. [28] described the Factor Analysis (Principal Component Analysis), as a technique for identifying groups or cluster of variables. Exploring & understanding the behavior of variables form the basis for multivariate analysis, one of the multivariate techniques such as Factor Analysis strives to unearth essential coherence & correlation among the variables by aggregating highly correlated variables and generating new composite measures represent group of sub variables. Principal Component Analysis is an interdependence technique for identifying groups of variables and plays a unique role in the application of other multivariate techniques. Factor analysis groups variables that are collinear hence offers solution to multicollinearity, serious technical issue (No multicollinearity is prerequisite assumption for Regression & Discriminant Analysis) that contributes redundant information and causing other variables to appear less significant than others. PCA is utilized to decipher the structure of latent variables that can't be measured otherwise directly such as IM has many facets and can't be gauged without exploring dimensions and items. This study focuses on 20 different aspects of Internal Marketing.

In reality this is more of a generalized model as it can identify the pattern of association among variables and respondents by examining whether the correlations exist between the variables or between the respondents by using *R factor* analysis for variables and *Q factor* analysis for respondents. This study focuses on 20 different aspects of IM and applies *R factor* technique to analyse these variables for identifying latent dimensions of the variable under investigation.

B. Theoretical Perspective on Principal Component Analysis

Ref. [29] stated that "Factor model in which the factors are based on the total variance, with component analysis, unities (1s) are used in the diagonal of the correlation matrix; this procedure computationally implies that all the variance is common or shared". Component analysis begins with a matrix that represents the relationship between variables. The linear components, also called variates or factors of that matrix, are then calculated by determining the Eigen values of the matrix. These Eigen values are used to calculate Eigen vector, the elements of which provide the loading of a particular variable on a particular factor which basically are the b-values of

following equation. The β in the equation represent the factor loading.

$$Yi = \beta 1x1 + \beta 2x2......\beta nxn + \varepsilon i$$

The Eigen values are the measure of the substantive importance of eigenvector with which it is associated.

C. Summary of the Variables

Variables in this research were incorporated after extensive review of the literature on IM and evaluation of several structured questionnaires on proposed subject. The survey was conducted by asking questions on a one-on-one basis from employees of different commercial banks. The self-administrative technique was used in collecting the data.

III. RESEARCH METHODOLOGY

The study uses quantitative research methods and draws upon primary data for investigation. Our contribution is to generate and structure a framework on IM for upcoming studies, therefore this research is of exploratory nature. Through wide enquiry on corresponding literature, concepts are illustrated by empirical evidence on IM for component factor analysis. The pilot testing was conducted to demonstrate valid & reliable results. Survey was carried out in 60 branches of 8 leading commercial banks i.e. Muslim Commercial Bank (MCB), Habib Bank Ltd (HBL), United Bank Ltd (UBL), Allied Bank Ltd Askari Bank Ltd , Al- Habib Bank Ltd , Meezan Bank Ltd & Standard Chartered Bank Ltd (SCB) . 4 to 10 respondents (Tellers in our case) were chosen from each branch of 8 respective banks. After screening data of 350 respondents, 322 respondents were used for statistical Analysis. The instrument investigated response on 20 items, each measured on five point scale with 1 for Highly Agree & 5 for Highly Disagree. Non probabilistic, convenience sampling was used and every respondent was administered questionnaire by researchers, it was re administered by changing the position of the question if researchers deemed it necessary. This technique was used to hold full attention of the teller and avoid wage or irrelevant answers. Each question in the questionnaire was very attentively and carefully filled which made the data reliable and relevant to the requirement of the research and gave accurate results.

IV. RESULTS

Correlation matrix was produced using coefficients and significance levels. This matrix can be divided into two halves. The first half describes the Pearson correlation coefficient among every pair of variables whereas the second half holds the one tailed significance of coefficients. Variables used for factor analysis should correlate with other variables and if they don't than they should be removed.

Therefore the pattern of relationships is checked by using correlation matrix. Simplest method to do this is by scanning the significance values. Significant values show that all variables correlate fairly well with others so there

is no reason to consider removing any variable at this stage. Determinant is listed for this data whose value is 3.80E-008. Therefore, multicollinearity is not a problem of this data.

Inverse of the correlation matrix is used in various calculations including factor scores. The matrix is useful for calculation in a factor analysis but has minimal practical significance. KMO statistics can be used for both types of variables; multiple or individual. On the diagonal of anti-image correlation matrix, all KMO values for individual variables are present which were highlighted in the auto-correlation table. Ref. [30] suggests that minimum of 0.5 is required. In our case this value draws to be 0.693. Similarly the significant value of Barlett's Test of Sphericity shows that factor analysis is right for this data. According to null hypothesis of Bartlett's test original R matrix is identical matrix. Interdependence between variables is essential for factor analysis. Correlation coefficient will be zero if correlation matrix were identity matrix therefore the significant value of this test is very important. Bartlett's test is very significant (p < .001) for this set of data hence factor analysis is appropriate.

The anti-image matrix is an extremely important part of results especially the diagonal values represent measurement of sampling adequacy (MSA). These values should be above 0.5 for all variables in this data almost all value are above 0.5 except X6, X10, and X 14 but the values above than 0.5 of KMO and communalities of these variable .919, .836, and .918 allow to use these variables in further analysis. Another option is excluding these variables from the analysis but removal of these variables affects the KMO statistics as well as anti-image matrix. In the rest of the anti-image correlation matrix, partial correlation between variables is represented by off diagonal elements. Factor analysis requires very small correlations between variables (the smaller the better). Ref. [29] said "After factor analysis, the matrix of semi correlation between variables is anti-image correlation matrix which represents the degree of the variables to describe each other. The diagonal contains the measures of sampling adequacy for each variable, and the off-diagonal values of partial correlation among variables"

Ref. [28] stated that communality is the proportion of common variance within a variable. All variance is common variance is the primary assumption of principal components analysis. That is why all variances is 1 before extraction in column named initial. In effect, all of the variance associated with a variable is assumed to be common variance, extracting of factor gives a clear picture of the actual amount of common variance. Common variance is represented by the communalities in the extraction column. So it means the variance of 79.1% associated with X1 is shared variance, or common variance. Another way to understand these communalities is by looking at the percentages of the variance. These percentages are further explained by looking at the core factors. All variance is described by the factors and all the communalities are 1 because before extraction there is equal number of factors and variables. Some information

after extraction is usually lost due to the discarded factor. The retained factors cannot explain all of the variance present in the data. But they can explain some. The amount of variance in each variable is represented by communalities after extraction. This can further be described by retained factors.

Factor extraction process starts with determining the linear components within the data set means Eigen vector by calculating the Eigen values of correlation matrix. Most of the Eigen vectors in correlation matrix will be unimportant. The magnitudes of the associated Eigen values determine the importance of particular vector. The criteria of retaining factor value with Eigen value greater than 1 was used in the research article. This allows listing all Eigen values before extraction, after extraction and related to linear components after rotation. Linear components are found in data set when they are not extracted yet. Variance is represented by the linear components which are related to Eigen values. In the next column factor 1 explains 26 because it displays Eigen values in terms of percentage of variance, out of 155 of total variances. This shows that the initial factors show high variance especially factor 1 whereas other factors show low variance.

We are left with 6 factors as threshold of value 1 is bigger than 1. Eigen values are again shown along with the percentages of variance in the Extraction Sums of Squared Loading column. Value in the table and the values before extraction are the same, but the table is empty after the sixth factor because the discard factors values are ignored. All Eigen value after rotation is shown in the last part of Rotation Sums of Squared Loadings table. Rotation results in optimizing the factor structure and the relative importance of the factor six is steady due to effect of these data. When orthogonal rotation was not used, factor 1 showed much more variance than reaming 3, (26.155% in comparison to 14.567%, 13.138%, 9.809, 9.075, and 8.131) however, after extraction it accounts for only 21.321 of variance compared to 15.305, 12.852, 12.643, 9.391 and 9.361% respectively).

In component matrix before rotation each variable in the table is loading onto each factor. Loading less than 0.4 is suppressed so there are empty spaces for few of the loadings. Component matrix does not play vital role in interpretation but rotation eight variables load highly onto the first factor this is why this factor accounts for most of the variance.

The correlation coefficients among all the variables which are based on factor model are expressed in the upper part of the reproduced correlation matrix. And on diagonal part all the communalities after extraction of variables have been placed. Correlations of reproduced matrix and R matrix are different because in reproduced matrix correlations are from model and not from observed data. We can expect reproduced correlation coefficient and the original correlation coefficient to be the same only when the model was a perfect fit to the data.

Therefore to assess the fit of this model the difference between the observed correlations and the correlations based on the model should be examine. For example if we take the correlation between variable 1 and 2, the correlation based on the observed data is -.081. The correlation based on the model is-.090 which is slightly higher. Calculation of the difference as follows:

$$\text{Residual} = R \text{ observed} - R \text{ from model residual} = (-.081) - (-.090) = 0.009$$

This difference is the value quoted in the lower half of the reproduced matrix labeled *Residual* for the variable X1 and X2. Therefore, the lower half of the reproduced matrix contains the difference between the observed correlation coefficients and the one predicted from the model. The difference between computed value residual and table value of residual is .001 because of using only 3 digits in computation. For a good model these values will be small in fact most of the values should be less than .05. The summary describes number of residuals that have an absolute value greater than .05 in this data there are 27 residual (14%) that are greater than .05 there are no hard and fast rules about what proportion of residual should be below .05 but not more than 50% of the data are greater than .05.

Another name of that rotated component matrix is rotated factor matrix that contained each variable loading for each factor. The component matrix and rotated component matrix hold the same information except rotated component matrix is calculated after rotation. This matrix considers several things. Initial variables are shown according to the order of their size of loadings and then we asked to suppress the loadings less than 0.4 therefore values less than 0.4 have not be displayed. Compare this matrix with the component matrix. Before rotation first factor contained most of the variables with high loading. However the things has clarified considerably after the rotation of the factor structure The final step is to look at the variables that load onto the similar factor to try to recognize common themes.

In the first factor all variables that load together highly, seem to relate to psychological & behavioral patterns amongst employees such as motivation, empowerment, job satisfaction, peer relationship, and monetary benefits. As all these attributes enable employees for excellence and quest for superior performance hence we label this as Motivation. The second factor loads all variables together which distinguish an organization in job market on key characteristics and philosophy to take employees as assets by not only training and development but rewarding them based on education, experience and aspiration for challenges.

Third factor aggregates related items such as participation in key resolutions and changes that will affect the organization. Manager constantly keeps employees engaged by listening and caring about their issues. Coupled with physical aspects & ergonomics this leashes a powerful force of engagement in organization.

The items that load for fourth factor include rewards, recognition and their link with realization of organizational goals. Therefore we label this factor as strategic reward.

Effective leadership, training and knowledge dissemination constitute the fifth factor termed as training as managers and supervisors have to coach the employees working in diversified and educated market.

The sixth factor loads all attributes that seem to create fit in horizontal and vertical communication of information concerning policies and standard practices, therefore we might label this factor inter- functional coordination.

Component transformation matrix tells about the level to which the factors were changed to get the results. If changes were not required, this matrix would be identity matrix.

The Eigen-value of each factor in the initial solution is plotted. The scree plot also suggests the optimal number of factors and suggests to stop analysis at the moment the mountain ends and the error begins. The last major drops occur between sixth and seventh factors, so six factor were used in this paper.

V. CONCLUSION

This Companies of all sizes and stripes are acknowledging the fact that implementing IM practices is key to employee satisfaction and great brand on outside. Employees are the strategic asset of the organization leveraging highly complex and technology enabled marketplace. Superiority is possible through smart analysis of huge data for precise and calculated decisions. With Statistical packages, almost unimaginable just a few years ago, have made possible tremendous advances in the analysis of data. No longer are methodological restrictions a critical concern to the theorist striving for empirical support.

Techniques like Multivariate analysis will drastically change the way of researchers of thinking about problems, research designs and solution that they derive from those researches. These techniques enable the researchers to easily get the answers of questions of complexity in natural settings. This enables the researchers to conduct significant theoretical researches and help in evaluation of the effects of parametric variations that occur naturally in the context.

The study has enabled the authors to understand the ability of some leading multivariate statistical technique namely the principle component factor analysis to find out the dimensions of IM in Pakistan commercial banks. Using these techniques we have identified some sensible grouping of the variables that could be used as predictors in causal studies near future

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