A NOVEL FRAMEWORK FOR ANALYZING INTERNAL BRAND MANAGEMENT IN THE BANKING SECTOR: A PROBABILISTIC APPROACH

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Abstract. *This study proposes an internal branding index for the banking sector by using a weighted linear equation that is defined by using six dimensions of internal brand management practices. This study discusses a quantitative framework for monitoring the quality of the internal brand management practices in the banking sector. The framework is based on an index, which is discussed under two scenarios when the purpose is to monitor internal brand management practices among the same type of banks and among banks of different types, for instance, public, private, and mortgage banks. Both mathematical and numerical procedures for the selection of optimum weights are discussed. Concepts of Bernoulli distribution, binomial distribution, Poisson distribution, and matrix algebra, are used in the development of the proposed index. The computation of the proposed index requires quantitative acumen; nonetheless, organizations can train existing personnel or hire a statistician or data scientist. Although this would mean an increase in costs in the short term, it can result in long-term benefits such as improved brand image, a motivated workforce, and increased market share. This is the pioneering study that presents a holistic index for monitoring the internal brand management practices. The framework is generic and it can be applied on the banking sector of any country.*

Introduction

For-profit organizations strive for an increased market shares and profitability, forward-looking organizations realize that expenses on employee training and education are a promising investment (Elkeles, 2020). Globally in the year 2015,

organizations spent 356 USD on employee training and education (Beer, Finnström & Schrader, 2016). Although organizations give weight to employee training and education; nonetheless, these initiatives need to be designed in a manner that positive behavioral outcomes are yielded, such as an improved employee brand performance (Judge, Piccolo & Ilies, 2004; Wallace & De Chernatony, 2009).

The share of the financial services in the global gross domestic product (GDP) is unignorable; with a share of 93 trillion USD in the world GDP, Ross (2021) discussed that in the year 2021 the financial services shall account for roughly 24% of the global economy. Businesses worldwide are facing constrains of frugality due to the pressing situation that has emerged due to significant shocks, such as inflationary pressure, and pandemics (Acocella, 2021; Nesheva-Kiosseva, 2021). Banking industry has witnessed pressures to adopt policy interventions to mitigate the negative externalities induced due to COVID-19 (Demirgüç-Kunt, Pedraza, & Ruiz-Ortega, 2021). Although such interventions proved beneficial in the short-run; nonetheless, financial institutions that are either undercapitalized or are located in nations with limited budgetary space have found that prudential regulations have intensified the pressure on them (Demirgüç-Kunt, Pedraza, & Ruiz-Ortega, 2021). This challenging landscape has pronounced the importance of developing a strong internal brand and monitoring the employees' performance with a lens of internal branding practices (Maurer, 2020). Globally, the banking sector is evolving; increased competition among many industries, especially banks, has resulted from national deregulation, privatization, and an increased competition (Ubaid, Lashari & Rana, 2020). In the wake of intense competition, the profitability of the banks or organization is reliant on exploring new ways to increase the equity of the brand (Aaker, 1991). Building a strong internal brand thus becomes the most important business action any firm can perform in today's global competitive environment (Raj, 2020). Internal branding also has the potential to provide a sustainable competitive advantage to the firms or the banks, as the brand relationships cannot be easily duplicated by the competitors (Barney, 1991). Moreover, it also has the potential to warrant satisfaction among the employees and the customers.

Internal branding is considered as important catalyst for an organization's success, and it has witnessed enough admiration and acceptance among the world's leading corporate giants (Drake, Gulman & Roberts, 2005; Boone 2000). Most of the existing studies on internal brand management are limited to an impact of internal brand management on employee's brand loyalty, brand commitment, and their attitude and behavior (Boone, 2000; Burmann & Zeplin, 2005; De Chernatony & Cottam, 2006; Hankinson, 2002; Papasolomou & Vrontis, 2006; Kotter & Heskett, 1992; Punjaisri, Wilson & Evanschitz, 2009).

Few studies cover a purview of internal brand management with emphasis on the internal stakeholders of an organization (King & Grace, 2012; Piehler et al., 2016; Punjaisri & Wilson, 2011; Xiong, King & Piehler, 2013). However, there is a paucity of a well-constructed internal brand index that thoroughly covers all the important dimensions of internal brand management. This study thus necessitates the importance of such an index and construct an internal brand management index around six important dimensions which are brand identification, brand knowledge, brand communication and training, brand trust, brand commitment, and brand performance. The study disseminates a framework for analyzing the internal branding practices in banking sector organization by offering this new internal branding index (IBI). Furthermore, it also discusses the stochastic properties of the proposed index.

Literature Review

Dimension of Internal Brand Index

The proposed internal branding index is designed around six dimensions: brand identification, brand knowledge, brand communication and training, brand trust, brand commitment, and brand performance. These dimensions are discussed in the next few paragraphs.

The dimension of brand identification refers to an employee's sense of belonging to a brand (Punjaisri & Wilson, 2011). According to researchers (Gopalan & Brady, 2020; Liu et al., 2020; Stachl & Baranger, 2020), the sense of belonging is an important motivator for the human behavior. Belongingness, or the desire to be a part of a particular group, is synonymous with the term "belongingness" (Lambert et al., 2013). Classmates, colleagues, sports' teammates, and an ethnic group, all examples of groups from which members of group may derive a sense of belongingness. In the context of organizational behavior, sense of belongingness is decisive in determining the employee's performance (Van Dyne & Pierce, 2004). Internal organizational stakeholders, such as those working in customer service, are responsible for ensuring that external target customers have a consistent brand-defined experience that adheres to established brand standards (Van Nguyen et al., 2019). This implies that the internal organizational stakeholders have a lucid understanding of the shared values, goals, and brand personality (Van Nguyen et al., 2019). From a psychological perspective, researchers argue that when an organization's staff positively identify with the service brand to maintain their current membership, it increases the probability of them adhering to the brand's standards (Hoang, 2022). Consequently, they consciously or unconsciously adopt practices and behaviors that positively influence the brand identity (Hoang, 2022).

The dimension of brand knowledge is defined as an organization's employees' capacity to comprehend information about a certain brand (Piehler et al., 2016); it

is one of the requirements for brand-related employee behavior. According to Xiong et al. (2013), employees' familiarity with a company's brand has an effect on their level of brand loyalty. Brand knowledge refers to a company's workforce's shared understanding of the brand's meaning, such as a commitment to the firm's brand values, as well as their understanding of the demands and expectations of the brand's external customers, as well as their role in ensuring that the brand keeps its promises to those customers. Certain, unambiguous, and consistent internal brand knowledge dissemination enables businesses to translate specific organizational intents, such as the brand promise and values, into employee attitudes and behaviors (Xiong et al., 2013).

The dimension of brand communication and training is defined as the managerial tool to familiarize the employees about the brand, shape a productive behavior of employees, and build affective attachment with the brand (Piehler, 2018). Researchers who contributed to the corporate and internal branding literature purported the crucial role of consistent exposure to brand communication in encouraging the success of internal branding (Hofer & Grohs, 2018).

The dimension of brand trust is defined as the brand's ability to live up to deliver its expected promise or purpose (Kimpakorn & Tocquer, 2009). Members of an organisation will develop an affective brand commitment (attachment) and perceived brand trustworthiness, which then stimulates their behaviour to engage in useful brand-citizenship behaviours, once they have a better understanding of a service provider's brand reliability, honesty, and integrity —for instance, the brand's capacity to perform its pivotal functions and deliver on the brand promise) (Erkmen & Hancer, 2015). One of the key goals of internal branding practices is to develop a brand-committed and brand-aligned human capital that exhibits trust in the organization's capacity to deliver transparently on the brand promise (Erkmen & Hancer, 2015).

The dimension of brand commitment is defined as the degree to which employees feel psychologically tied to the brand, resulting in their readiness to go the extra mile to assist the company in meeting its objectives (Burmann & Zeplin, 2005). The emotional connection between a company's employees and its brand is represented and encapsulated by the concept of "brand commitment." (King & Grace, 2012; Piehler et al., 2016; Punjaisri, Wilson, & Evanschitz, 2009).

The dimension of brand performance is defined as the degree to which employees perform their roles; it encapsulates delivering a high-quality product and services to fulfil brand's promise to meet high-quality standards (Punjaisri et al., 2009). Brand performance is a decisive factor for an organization's overall performance that stimulates corporate brand success (King & Grace, 2012; Morhart, Herzog & Tomczak, 2009). Internal brand management is often used in service-oriented organizations to ensure that brand performance is consistent with customers' service quality expectations and brand perceptions (Xiong, 2014). Researchers

argue that employee performance is a pivotal outcome of the internal brand management process to ensure that customers are satisfied and loyal (Budur & Poturak, 2021).

Many a times, organizations collect data through surveys to generate and analyse data on crucial metrics; however, less attention is paid to the fact that ill-planned surveys are rather detrimental for the organization. This is the reason that researchers advise inclusion of a statistician in the planning phase of a project cycle (Helo et al., 2019; Misro et al., 2014). To avoid the issue of what the researcher phrase as "feedback fatigue" (Barrett et al., 2018; Glazer, 2015) it is proposed that the annual surveys may be conducted to curate data on internal branding; if one conducts surveys too frequently, then respondents may feel burdened to fill it. To enhance response quality and response rates, lottery-based incentives or other methods may be adopted by the organizations (Neal, Neal & Piteo, 2020; Stanley et al., 2020), such as awarding some points in the annual evaluation to those employees who fill the survey in time. This study highlights a need for a regular monitoring of the internal branding practices in the banking sector, while controlling for external variation in the scores of the internal branding scale that may arise if one uses different scale on different time.

After a rigorous literature review on internal branding, this study disseminates a framework for analyzing the internal branding practices in banking sector organizations. In addition, its novelty stems from the fact that it offers a new internal branding index (IBI); furthermore, it discusses the stochastic properties of the proposed index.

Materials and Methods

This study proposes a new index for monitoring the internal brand management practices in banking sector. The proposed index is abbreviated as IBI; it uses data on six dimensions of internal brand management practices — the dimensions are holistically incorporated by Muhammad (2021) and are adopted from Kimpakorn and Tocquer (2009); Punjaisri et al. (2009); Punjaisri and Wilson (2011). The six dimensions are: brand identification, brand knowledge, brand communication & training, brand trust, brand commitment, and brand performance. The details about the exact items (questions) in each of these six dimensions is exhibited in Table 1 to Table 6 (Annexture-Research Instrument). Next, we discuss the stochastic framework and interval estimation for the proposed index i.e., IBI.

Let us define a weighted stochastic variable Y by using the equation given below.

$$Y = W_1 X_{BI} + W_2 X_{BK} + W_3 X_{BCT} + W_4 X_{BT} + W_5 X_{BC} + W_6 X_{BP}, \text{ where } \sum_{i=BI}^{BP} W_i = 1, \text{ Eq. (1)}$$

Where W_i are weights assigned the basis of variance optimization, to the six constructs around which the IBI conceptually pivots. Furthermore, define the internal branding index (IBI) in equation (2).

$$IBI = W_1 I_{BI} + W_2 I_{BK} + W_3 I_{BCT} + W_4 I_{BT} + I_5 X_{BC} + I_6 X_{BP}. \quad \text{Eq. (2)}$$

Note that each of $X_j, j = BI, BK, BCT, BT, BC, BP,$ can be declared as stochastic variables with the underlying distribution as the Bernoulli probability distribution with the respective parameters $p_i = p(I_j > \tilde{I}_j)$, where $j = BI, BK, BCT, BT, BC, BP,$ and $\tilde{I}_j$ is the minimum acceptable threshold score for the jth construct of the IBI. Alternatively phrasing, $X_j = \begin{bmatrix} 0 \, if \, I_j \leq \tilde{I}_j \\ 1 \, if \, I_j > \tilde{I}_j \end{bmatrix}, j = BI, BK, BCT, BT, BC, BP.$ If we define I_{ji} as the score on the I_{ji} construct of internal branding practices for the ith bank, where $i = 1,2,\ldots\ldots k, where k$ is the number of total banks used to compute the IBI, moreover, $j = BI, BK, BCT, BT, BC, BP.$

Next, the overall index of internal branding practices for the jth construct may be defined by using equation 3.

$$I_j = \sum_{i=1}^{k} \sum_{l=1}^{k_d} I_{jil}, j = BI, BK, BCT, BT, BC, BP, \quad \text{Eq. (3)}$$

The subscript i is used to indicate data for the ith bank, the subscript l is used to capture the expected variation in the lth indicator (note that each construct is a set of some indicators or questions) of the jth construct of internal branding practices, while k_d is the number of indicators in the jth construct of internal branding practices. It is worth noticing that the minimum and the upper bounds of the can be mathematically expressed as shown in inequation number 1.

$$0 \leq I_j \leq Lk_j, j = BI, BK, BCT, BT, BC, BP. \quad \text{In Eq. (1)}$$

where L is the number of options used in Likert scale used in the research instrument for generating scores of IBI, for instance, *L=5* for a five points Likert scale.

It is important to note that the inequation (1) demands that one uses a uniform number of response options within the jth construct of internal branding practices. Expressed alternatively, this implies that one should not use a mix of different Likert scale— for instance, a mix of three points and five points Likert scale is inadvisable. Note that this requirement is judicious even from a usability perspective; it is strenuous for respondents if they have to fill a questionnaire in which different questions have different number of response options— it may also increase the expected time to complete the survey or create stress for special populations, such as the ones having the "Counting Obsessive Compulsive Disorder" (COCD). COCD may be conceptually defined as an urge to adopt counting-based behavior; person effected with the COCD would like to count to

achieve a state of feeling satisfied by counting things or tasks (Van Dalfsen, 2020). If one uses Likert scale with mixed response options, then it may cause anxiety among the respondents with CO-CD.

In Table 1, notations for the 8 indicators of the dimension of the brand identification are enlisted. For further explication, one can refer to the detailed description of one of the indicators, for instance $I_{BI(i)1}$ represents the score of the ith bank for the 1st indicator of the brand knowledge dimension. In Table 2, notations for the 10 indicators of the dimension of the brand knowledge are enlisted. For further explication, one can refer to the detailed description of one of the indicators, for instance $I_{BK(i)1}$ represents the score of the ith bank for the 1st indicator of the brand knowledge dimension. In Table 3, notations for the 11 indicators of the dimension of the brand communication and trust are enlisted. For further explication, one can refer to the detailed description of one of the indicators, for instance $I_{BCT(i)1}$ represents the score of the ith bank for the 1st indicator of the brand communication and trust dimension. In Table 4, notations for the 4 indicators of the dimension of the brand trust are enlisted. For further explication, one can refer to the detailed description of one of the indicators, for instance $I_{BT(i)1}$ represents the score of the ith bank for the 1st indicator of the brand knowledge dimension. In Table 5, notations for the 9 indicators of the dimension of the brand trust are enlisted. For further explication, one can refer to the detailed description of one of the indicators, for instance $I_{BC(i)1}$ represents the score of the ith bank for the 1st indicator of the brand commitment dimension. For further explication, one can refer to the detailed description of one of the indicators, for instance $I_{BP(i)1}$ represents the score of the ith bank for the 1st indicator of the brand performance dimension.

Making use of the LeCam's inequality for the Poisson Binomial distribution, one can infer that the probability distribution of I_j $(j = BI, BK, BCT, BT, BC, BP),$ is Poisson with the parameter λ_j, note that $\lambda_j = \sum_{l=1}^{k_j} p_l$ in other words, it is the summation of the Bernoulli probabilities corresponding to the indicator of the construct (LeCam, 1965).

A mathematical expression for the likelihood that that $X_j = 0$ is given in equation (4).

$$p(I_j) = I_j \leq \hat{I}_j = \sum_{Y=0}^{\hat{I}_j} \frac{e^{-\lambda_j}(\lambda_j)^Y}{Y!}.$$ Eq. (4)

The variance expression for the weighted stochastic variable Y defined in equation (1), is given in equation (5). Equation (5) is interesting in the fact that it is a numerical estimate for the variability in the values of proposed internal branding

index as a result of change in any of its six constructs— while the scale used to monitor internal branding practices, remains the same.

Furthermore,
$$V(Y) = W_1^2 V(X_{BI}) + W_2^2 V(X_{BK}) + W_3^2 V(X_{BCT})$$
$$+W_4^2 V(X_{BT}) + W_5^2 V(X_{BC}) + W_6^2 V(X_{BP}).$$
Eq. (5)

Note that in equation (5), the notation $V(.)$ is reserved for the variance of the stochastic variable inside the bracket. While stating the equation (5), use is made of the following property of the variance operator: variance of a summation of stochastic variables, is the summation of individual variances of the stochastic variables, and variance of a product of a constant and a stochastic variable is the product of the constant and the variance of the stochastic variable (Gupta & Kapoor, 2020). Note that, in equation (5) the stochastic variables are captured by X_j ($j = BI, BK, BCT, BT, BC, BP$), while W_j are the weights (constant).

Next, the discussion regarding the minimization of the $V(Y)$ is presented. Making use of the mathematical concepts of derivatives, the variance expression can be used to derive the optimum values of the weights.

Next, we impose the condition that the sum of weights used to construct IBI, is 1. This condition reduces the equation (5) to its refined form given in equation (6).

$$V(Y) = W_1^2 V(X_{BI}) + W_2^2 V(X_{BK}) + W_3^2 V(X_{BCT})$$
$$+W_4^2 V(X_{BT}) + W_5^2 V(X_{BC}) + (1 - \sum_{m=1}^{5} W_m)^2 V(X_{BP}).$$
Eq. (6)

Now, relying on the properties that X_{js} are mutually independent, and variance of the jth Bernoulli random variable is $p_j q_j$ (Nedelman & Wallenius, 1986), so we can write:

$$A = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_1}(\lambda_1)^Y}{Y!} \right) \left(\sum_{Y=I_3}^{Lk_j} \frac{e^{-\lambda_1}(\lambda_1)^Y}{Y!} \right), B = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_2}(\lambda_2)^Y}{Y!} \right) \left(\sum_{Y=I_3}^{Lk_j} \frac{e^{-\lambda_2}(\lambda_2)^Y}{Y!} \right),$$

$$C = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_3}(\lambda_3)^Y}{Y!} \right) \left(\sum_{Y=I_3}^{Lk_j} \frac{e^{-\lambda_3}(\lambda_3)^Y}{Y!} \right), D = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_4}(\lambda_4)^Y}{Y!} \right) \left(\sum_{Y=I_3}^{Lk_j} \frac{e^{-\lambda_4}(\lambda_4)^Y}{Y!} \right),$$

$$E = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_5}(\lambda_5)^Y}{Y!} \right) \left(\sum_{Y=I_3}^{Lk_j} \frac{e^{-\lambda_5}(\lambda_5)^Y}{Y!} \right), \text{ and } F = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_6}(\lambda_6)^Y}{Y!} \right) \left(\sum_{Y=I_3}^{Lk_j} \frac{e^{-\lambda_6}(\lambda_6)^Y}{Y!} \right)$$

For the purpose of minimizing the variance of the proposed internal branding index we take the partial derivative of equation (6) with respect to W_j ($j = BI, BK, BCT, BT, BC, BP$), which yields the following system of linear equations.

$$\frac{\partial V(\gamma)}{\partial W_1} = 2W_1 A - 2(1 - \sum_{m=1}^{5} W_m)F = 0, \frac{\partial V(\gamma)}{\partial W_2} = 2W_2 B - 2(1 - \sum_{m=1}^{5} W_m)F = 0,$$
$$\frac{\partial V(\gamma)}{\partial W_3} = 2W_3 C - 2(1 - \sum_{m=1}^{5} W_m)F = 0, \frac{\partial V(\gamma)}{\partial W_4} = 2W_4 A - 2(1 - \sum_{m=1}^{5} W_m)$$
$$F = 0, \frac{\partial V(\gamma)}{\partial W_5} = 2W_5 E - 2(1 - \sum_{m=1}^{5} W_m)F = 0.$$

Eq. (7)

System-1 Note that we have used the rules of derivatives to develop this system of linear equations given in System-1 (Fitzpatrick, 2009). Relying on the matrix algebra (Searle & Khuri, 2017), one can rewrite the System-1 as follows.

$$\begin{bmatrix} A+1 & -1 & -1 & 1 & 1 \\ -1 & B+1 & 1 & 1 & 1 \\ -1 & 1 & C+1 & 1 & 1 \\ -1 & 1 & 1 & D+1 & 1 \\ -1 & 1 & 1 & 1 & E+1 \end{bmatrix} \begin{bmatrix} W_1 \\ W_2 \\ W_3 \\ W_4 \\ W_5 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

$$M_{5*5} W_{5*5} = I_{5*1}$$

Note that Q_{i*j} implies a matrix having i rows and j columns, while $(Q_{i*j})^{-1}$ represents the multiplicative inverse of Q_{i*j}.

Other than the mathematical solution of System-1, one can also approach this scenario, numerically. The procedure is exhibited in Figure 1; we advise the use of add-in called DigDB for Microsoft Excel to generate all possible combinations of the weights $W_1, W_2, W_3, W_4,$ and W_5. An easy description of which is explained in a video lecture available from Rao Hub (2020).
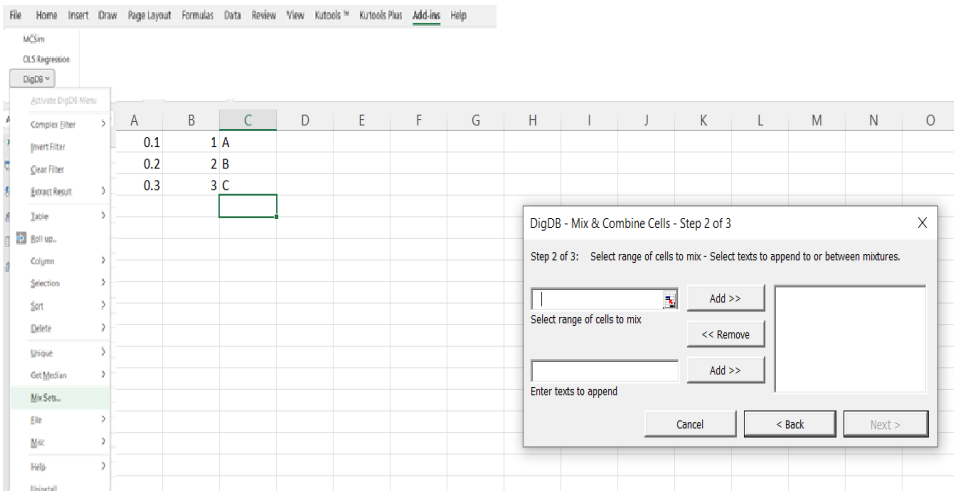

Figure 1:   Illustration: How to Generate all Possible Samples in Microsoft Excel using the Add-In DigDB

Once all possible combinations of these weights are curated, one can calculate W_6 by using the expression, $W_6 = 1 - W_1 - W_2 - W_3 - W_4 - W_5$. Note that for some of the combinations of W_1, W_2, W_3, W_4, and W_5, the value of shall be negative which is not valid for a meaningful construction of the internal branding index—such a condition implies that the sixth dimension of the IBI is assigned a weight in a manner that it lessens its importance. Therefore, once all possible values of the *V(Y)* are generated, one can easily find the minimum value of the variance, thereby, allowing one to choose the optimum weights, and optimum expression for the IBI. The equation for optimum variance of IBI is given below.

$$\left. \begin{aligned} IBI &= Min(W_1 I_{BI} + W_2 I_{BK} + W_3 I_{BCT} + W_4 I_{BT} + W_5 I_{BC} + I_6 I_{BP}), W_j > 0, \\ (j &= BI, BK, BCT, BT, BC, BP). \end{aligned} \right\} \quad \text{Eq. (8)}$$

Statistical Inference for the Proposed Index

Due to constraints related to time, cost, and human resource, often one relies on a sample to infer results about the population. Survey experts advise to use appropriate sample design to minimize sampling errors — the quality of estimates may be contaminated by errors that arise when the researcher fails to select a sample that is representative of the target population (Lohr, 2021). Statistic is a summary value from a random sample that is an estimate for the corresponding parameter— a summary value from the entire population which is unknown because of the fact that the full population is not surveyed (Lohr, 2021). Irrespective of the quality of the sample, sampling errors can only be minimized rather than totally veneered; therefore, the equation (2) may be interpreted as a statistic (the value of the proposed index in a random sample of banks) that is an estimate for the corresponding population parameter (the value of the proposed index for all the banks in the list of all banks for which one wishes to monitor the internal brand management practices). Given the fact the proposed index is a weighted sum of Poisson variates, the probability distribution of the proposed index is the "Compound Poisson Distribution" (Bohm & Zech, 2014); which reduces to the "Normal Distribution" in sufficiently large samples. In this regard, making use of the Central Limit Theorem (Kwak & Kim, 2017), one can infer that in reasonably large sample, the probability distribution of the proposed index is normally distributed so a $100(1 - \alpha)\%$ confidence interval for the value of the IBI in population is given as follows.

$$I\hat{B}I \pm Z_{\frac{\alpha}{2}} \left(\frac{\sqrt{V(I\hat{B}I)}}{\sqrt{n}} \right) \qquad\qquad \text{f} \qquad \text{Eq. (9)}$$

Where $I\hat{B}I$ is the value of the proposed index in a sample of size n, $V(I\hat{B}I)$ is the value of variance from equation (6) (by using the optimum values of weights), and $Z_{\frac{\alpha}{2}}$ is the αth quintile of the standard normal distribution.

Stratified Version of the Proposed Index

Many a time, the target population is heterogeneous and there is a need to use a sampling design that performs efficiently under such a scenario. The stratified random sampling is one such design that can be used to cater for the diversity in the population. One may use the stratified version of the proposed index, if interest is to use the proposed index in a situation where the internal brand management practices differ across different types of banks, such as private banks, public banks, mortgage banks, microfinance banks, and commercial banks. The stratified version of the proposed index is given in equation (10).

$$IBI_S = \sum_{h=public....}^{lastbanktype}\left(W_{1h}I_{BI(h)} + W_{2h}I_{BK(h)} + W_{3(h)}I_{BCT} + W_{4(h)}I_{BT(h)} + W_{5(h)}I_{BC(h)} + W_{6(h)}I_{BP(h)}\right).$$

Eq. (10)

Where h = public, private, commercial,.........last bank type.

Note that in the stratified version, one has to find weights W_1, W_2, W_3, W_4, and W_5 that needs to be optimized within each of the hth strata; each bank type represents a stratum.

Internal brand management practices may differ across different types of banks. It is advisable to use the stratified version of the proposed index if the target population comprises different types of banks; researchers have empirically proved the supremacy of the stratified random sampling in heterogeneous populations (Arnab, 2017; Chambers & Skinner, 2003).

The strata-specific optimum weights can be derived by using the system of linear equations given in equation (11).

$$\begin{bmatrix} A_h+1 & -1 & -1 & 1 & 1 \\ -1 & B_h+1 & 1 & 1 & 1 \\ -1 & 1 & C_h+1 & 1 & 1 \\ -1 & 1 & 1 & D_h+1 & 1 \\ -1 & 1 & 1 & 1 & E_h+1 \end{bmatrix}\begin{bmatrix} W_{1h} \\ W_{2h} \\ W_{3h} \\ W_{4h} \\ W_{5h} \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} \qquad \text{Eq. (11)}$$

$$M_{5*5}^h W_{5*5}^h = I_{5*1}^h$$

$$W_{5*5}^h = \left(M_{5*5}^h\right)^{-1} I_{5*1}^h$$

Where, h = public, private, commercial,.........last bank type.

Also, the primary-diagonal's entries in the matrix M_{5*5}^h are the variances of the stochastic variables $X_{BI}, X_{BK}, X_{BCT}, X_{BT}, X_{BC}$, and (X_{BP}), defined for the six dimensions (i.e., BI, BK, BCT, BT, BC and BP), in the hth stratum. Mathematically

speaking, the primary-diagonal's entries in the matrix M_{5*5}^h can be defined through the following expressions.

$$A_h = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_{1h}(\lambda_{1h})^Y}}{Y!}\right)\left(\sum_{Y=I_3}^{Lkj} \frac{e^{-\lambda_{1h}(\lambda_{1h})^Y}}{Y!}\right), B_h = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_{2h}(\lambda_{2h})^Y}}{Y!}\right)\left(\sum_{Y=I_3}^{Lkj} \frac{e^{-\lambda_2(\lambda_2)^Y}}{Y!}\right),$$

$$C_h = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_{3h}(\lambda_{3h})^Y}}{Y!}\right)\left(\sum_{Y=I_3}^{Lkj} \frac{e^{-\lambda_{3h}(\lambda_{3h})^Y}}{Y!}\right), D_h = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_{4h}(\lambda_{4h})^Y}}{Y!}\right)\left(\sum_{Y=I_3}^{Lkj} \frac{e^{-\lambda_4(\lambda_4)^Y}}{Y!}\right),$$

$$E_h = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_{5h}(\lambda_{5h})^Y}}{Y!}\right)\left(\sum_{Y=I_3}^{Lkj} \frac{e^{-\lambda_{5h}(\lambda_{5h})^Y}}{Y!}\right), and F_h = \left(\sum_{Y=0}^{I_3} \frac{e^{-\lambda_{6h}(\lambda_{6h})^Y}}{Y!}\right)\left(\sum_{Y=I_3}^{Lkj} \frac{e^{-\lambda_{6h}(\lambda_{6h})^Y}}{Y!}\right)$$

Discussion

This study is a classic example of solution-oriented application of statistics and mathematics to practical issues. Purpose of any quantitative formula is appreciated well by those without complex quantitative acumen, if they are able to relate to it by noting that the formula offers a solution to problems faced by them. In this regard, this study is interesting in a sense that it takes an interdisciplinary purview of brand management issues faced by the banking sector; it offers relevant content for statisticians, econometricians, human resource departments, and managerial economists. Increasingly researchers are proposing integration of AI (Artificial Intelligence) in social sciences, specifically, management sciences (Daskou, & Mangina, 2003; Grover, Kar & Dwivedi, 2022). A possible extension of this study can be taken up by the AI experts for automated optimization of the weights used to compute the proposed index.

Any organizations face demands for accountability from three sources: demands for upward accountability, demand for downward accountability, and demand for internal accountability. The internal accountability emphasizes on a transparent provision of information within an organization; the proposed internal brand management index can improve organization's scores on the internal accountability (Nazuk et al., 2020).

This study presents a novel framework for monitoring the internal brand management practices of the organizations in the banking sector. Although the proposed framework is discussed with an emphasis on the banking sector; nonetheless, it can easily be adapted for other type of organizations. The proposed index pivots around six dimensions each of which is measured on a five-points Likert scale. The six dimensions are: brand identification, brand knowledge, brand communication and training, brand trust, brand commitment, and brand performance. The computation of the proposed index requires quantitative acumen; nonetheless, organizations can train existing personnel or hire a statistician or a data-scientist. Although in the short-run it would mean an increased cost; however, in the long-run this can translate into positive outcomes, such as an improved brand image, a motivated workforce, and an increased market share.

Limitations and Avenues for future research

Organizations can conduct a cost-benefit analysis of adopting the proposed index; get advice from the quantitative expert whether adoption of the proposed index has brought positive impact. Econometricians or statisticians may be provided special access to company's data to test for impact analysis, such as Chow break-point test may be applied to test for structural break (Eke, Eke & Inyang, 2015; Nielsen &Whitby, 2015). Interesting econometric inquiries are possible in future, for instance, one time-series or panel data is available for organizations, then Johansen (1992) cointegration analysis may be used to test for long-run association of internal brand management practices and liquidity or analyzing the consequences of management reforms on internal branding practices (compare pre-reforms scores with post-reforms). Survey data are often used for comparison purposes, such as comparisons across countries or comparisons over-time. To be effective, this would require equivalent questions and equivalent responses options to the questions. The proposed index may be used by banking sector in any country; for cross-country comparisons of the proposed index, it is advised by researchers that survey data must be collected in a manner that equivalent questions and equivalent response options are used. In other words, if one has to compare the index's score for Pakistan with the score for China, then it must be ensured that it has been computed using the same research instrument in the two countries. For situations that require comparison of internal brand management using two or more different instruments, one needs to use some standardization before comparing the scores; in this regard, one may refer to De Jonge, Veenhoven and Arends (2014) proposed a standardization technique called the "Reference Distribution Method".

One of the avenues for improving the proposed methodology is to designing an index for the case when banks have data regarding internal brand management on different scales in different time periods, for example, scale 1 (a questionnaire) in year 1 to 5, and scale 2 (another questionnaire) in year 2 to 10. Sometimes, employees in an organization may report false responses just to be socially desirable; even in anonymous surveys there is no guarantee of hundred percent truthful reporting (Bradburn, Sudman, & Wansink, 2004). Another extension of this study is to estimate the sensitivity level of each question used in the dimensions of the proposed index; one may use Randomized Response Technique (Chu et al., 2020; Reiber, Schnuerch & Ulrich, 2020; Warner, 1965) or Item Count Technique (Gaia, 2020; Ehler, Wolter & Junkermann, 2021) to obtain data on sensitive questions.

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Research Instrument
Hints: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and
5 = Strongly Agree

Table 1   *Indicators for Brand Identification*

Ind. No		Description of the Indicator					
1	$I_{BI(i)1}$	I am proud to tell others that I am part of this bank (brand).	1	2	3	4	5
2	$I_{BI(i)2}$	I feel a sense of ownership for this bank (brand).	1	2	3	4	5
3	$I_{BI(i)3}$	My sense of pride towards this bank (brand) is reinforced by the brand-related messages.	1	2	3	4	5
4	$I_{BI(i)4}$	I view the success of this bank (brand) as my own success.	1	2	3	4	5
5	$I_{BI(i)5}$	This bank (brand) is like a family to me.	1	2	3	4	5
6	$I_{BI(i)6}$	I feel belonging to this bank (brand).	1	2	3	4	5
7	$I_{BI(i)7}$	When I talk about this bank (brand), I usually say 'we' rather than 'they'.	1	2	3	4	5
8	$I_{BI(i)8}$	When someone praises this bank (brand), it feels like a personal compliment.	1	2	3	4	5

*Adapted from Punjaisri et al. (2009) (two studies)

Table 2 *Indicators for Brand Knowledge*

Ind. No		Description of the Indicator					
1	$I_{BK(i)1}$	I know clearly the goals of this bank (brand).	1	2	3	4	5
2	$I_{BK(i)2}$	I know clearly the policies of this bank (brand).	1	2	3	4	5
3	$I_{BK(i)3}$	I know the customers' expectations regarding this bank (brand).	1	2	3	4	5
4	$I_{BK(i)4}$	I understand that my work is important to the success of this bank (brand).	1	2	3	4	5
5	$I_{BK(i)5}$	I understand how my behavior can impact this bank (brand).	1	2	3	4	5
6	$I_{BK(i)6}$	I understand how my own work has made a contribution to the bank (brand) success.	1	2	3	4	5
7	$I_{BK(i)7}$	I understand my role in delivering the brand promise of this bank (brand).	1	2	3	4	5
8	$I_{BK(i)8}$	I know the meaning of this bank (brand) for customers.	1	2	3	4	5
9	$I_{BK(i)9}$	I know this bank (brand) is excellent in its service.	1	2	3	4	5
10	$I_{BK(i)10}$	I know clearly who the bank (brand) target customers are.	1	2	3	4	5

*Adapted from Kimpakorn and Tocquer (2009)

Table 3 *Indicators for Brand Communication and Training*

Ind. No		Description of the Indicator					
1	$I_{BCT(i)1}$	Training programs gives me appropriate skills in relation to delivering brand promise.	1	2	3	4	5
2	$I_{BCT(i)2}$	I am usually attracted towards messages made of colourful materials.	1	2	3	4	5
3	$I_{BCT(i)3}$	This bank informs me in an excellent way about things that is relevant to my work.	1	2	3	4	5
4	$I_{BCT(i)4}$	I feel encouraged to come up with new suggestions of how to do things.	1	2	3	4	5
		Orientation					
5	$I_{BCT(i)5}$	Orientation program triggers my inspirations to appropriately fulfil the brand promise delivery.	1	2	3	4	5
6	$I_{BCT(i)6}$	I like the brand manuals of this bank (brand).	1	2	3	4	5
		Group Meeting					
7	$I_{BCT(i)7}$	During the group meeting, I am clearly informed of the brand mission.	1	2	3	4	5
8	$I_{BCT(i)8}$	I clearly understand my role in relation to the brand mission, after attending the group meetings.	1	2	3	4	5
		Briefing					
9	$I_{BCT(i)9}$	Briefings contain all essential information for me to provide services according to brand expectations.	1	2	3	4	5
10	$I_{BCT(i)10}$	The brand standards are constantly reinforced during the briefings.	1	2	3	4	5
11	$I_{BCT(i)11}$	The brand promise is constantly reinforced during the briefings.	1	2	3	4	5

*Adapted from Punjaisri et al. (2009).

Table 4 *Indicators for Brand Trust*

Ind. No		Description of the Indicator					
1	$I_{BT(i)1}$	I trust this bank (brand).	1	2	3	4	5
2	$I_{BT(i)2}$	I rely on this bank (brand).	1	2	3	4	5
3	$I_{BT(i)3}$	This bank is an honest brand.	1	2	3	4	5
4	$I_{BT(i)4}$	This bank is a safe brand.	1	2	3	4	5

* Adapted from Chaudhri and Holbrook (2001)

Table 5 *Indicators for Brand Commitment*

Ind. No		Description of the Indicator					
1	$I_{BC(i)1}$	I usually tell my friends that this is a great bank (brand) to work for.	1	2	3	4	5
2	$I_{BC(i)2}$	I am proud to tell others that I am part of this bank (brand).	1	2	3	4	5
3	$I_{BC(i)3}$	For me this is the best of all possible banks (brands) to work for.	1	2	3	4	5
4	$I_{BC(i)4}$	It would take a lot to cause me to leave this bank (brand).	1	2	3	4	5
5	$I_{BC(i)5}$	I am extremely happy that I chose to work for this bank (brand) over others I was considering.	1	2	3	4	5
6	$I_{BC(i)6}$	I really care about this bank (brand).	1	2	3	4	5
7	$I_{BC(i)7}$	I would accept almost any type of job assignment to keep working for this bank (brand).	1	2	3	4	5
8	$I_{BC(i)8}$	I am willing to put in a great deal of effort beyond that normally expected to help this bank (brand) to be successful.	1	2	3	4	5
9	$I_{BC(i)9}$	With this bank (brand), I obtain what I look for in my work life.	1	2	3	4	5

* Kimpakorn and Tocquer (2009)

Table 6 *Indicators for Brand Performance*

Ind. No	Description of the Indicator					
1	The quality level of my services meets the brand standards of this bank (brand).	1	2	3	4	5
2	I never neglect aspects of the job I am supposed to perform (R).	1	2	3	4	5
3	I can successfully fulfil responsibilities specified in my job description.	1	2	3	4	5
4	I effectively fulfil the promise that the bank (brand) has with its customers.	1	2	3	4	5
5	I always handle customers' specific requests within a standard set for the bank (brand).	1	2	3	4	5

* Adapted from Punjaisri and Wilson (2011)