# MEASURING EFFECTIVENESS OF HUMAN RESOURCE INFORMATION SYSTEM IN THE STATE BANK OF INDIA

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## ABSTRACT

*Researchers and practitioners mostly rely on end user satisfaction for the success of information systems. In this context, the effectiveness of a Human Resource Information System (HRIS) largely depends on employee satisfaction of human resource management (HRM) practices in an organization. In this paper, we attempt to empirically evaluate the effectiveness of information technology based HRIS in the State Bank of India (SBI) by using an analytical procedure. For this purpose, we identify four key HRM functions, viz. recruitment, performance appraisal, grievance redressing and retirement & voluntary vacation for the evaluation of HRIS effectiveness. From the data obtained from a 23-item-based questionnaire, we employ an exploratory factor analysis to obtain six factors that are instrumental in employee satisfaction with the introduction of HRIS. We also employ Saaty's analytic hierarchy process to get relative weights of the said HRM functions in the SBI from pair-wise judgmental responses of a set of employees. Finally, we use the Technique of Order Preference by Similarity to Ideal Solution (TOPSIS), a multi-attribute decision-making methodology, to determine the relative contribution of these factors with respect to stated HRM functions in HRIS effectiveness.*

**Keywords:** Human Resource Information System, Effectiveness, Factor Analysis, AHP, TOPSIS.

## INTRODUCTION:

Information is an important and critical resource in any organization. In this context, the management of human resources (HR) with the help an information technology based system has resulted in the evolution of human resource information system (HRIS). This system helps organizations in supporting and improving the communicational process by significantly reducing the cost and time of human resource management (HRM) activities. The complicated operations necessary for hiring and retaining top performers and improving productivity with improved job satisfaction of the employees becomes much simpler by adopting HRIS. As the implementation of HRIS in some organizations has helped them in their strategic HRM by improving their HR practices through increasing competitiveness and re-engineering the entire HR functions (Beckers and Bsat, 2002; Ngai and Wat, 2006), it has also influenced many organizations, including banks to implement HRIS for effective management of their HR. Although HRM functions vary across organizations to a large extent, they are similar in nature, as far as the overall structure is concerned. However, the effectiveness of HRIS along different HR functions might vary depending on the compatibility of the system with the organizational culture.

The structure of HRIS is a critical factor affecting the performance of an organization. This structure requires the objectives, goals and strategies of the organization to be in alignment with the design of its HRIS. Apart from its hardware configuration, HRIS design influences its evolutionary growth in the organization when it takes into consideration employee satisfaction associated with the system from the beginning to the end. Although many such systems were directly procured from vendors and implemented for getting positive results, some of them were truly designed as per the requirement of the organizations. Infact, the implemented systems were also re-designed after the initial implementation, which was followed by getting feedback from the stakeholders.

However, in order to optimize the effectiveness of HRIS as a whole, there is a need to know as to how the system achieves users' satisfaction across various HRM functions. This will help in modifying the system that will bring maximum employee satisfaction by improving HR practices in the organization. In this paper, we develop a methodology to assess the effectiveness of HRIS at the State Bank of India (SBI) in Bhubaneswar city of Odisha. At first, we identify the factors contributing to employee satisfaction, if HRIS is properly implemented. Then, we apply a multi-criteria decision-making based methodology to assess the satisfaction level of the employees with the HRIS of the SBI in those factors across four major HR functions. These values are the contribution of these factors in employee satisfaction and hence, will be helpful in enlightening the management of SBI to take necessary steps in order to make the system more effective.

## MEASURING EFFECTIVENESS OF HRIS:

Accomplishment of organizational goals by HRIS can be evaluated in terms of two perspectives (Hamilton and Chervany, 1981(a)), viz.

- The efficiency with which the HRIS design and operations utilize employee, materials and data to provide the required information to the users; and
- The effectiveness of the users utilizing the HRIS for the accomplishment of organizational goals.

However, the above perspectives can be integrated into "user's evaluation perspective" (Hamilton and Chervany, 1981(b)), as several studies support the validity of user assessments of system effectiveness ( Campbell , 1979; Lucas, 1975), since users are generally concerned with accuracy, timeliness and reliability of their required information. As usability of the system and associated satisfaction varies across age groups and levels of management, it is very much important to incorporate multiple viewpoints in the evaluation framework to have a more participative consideration.

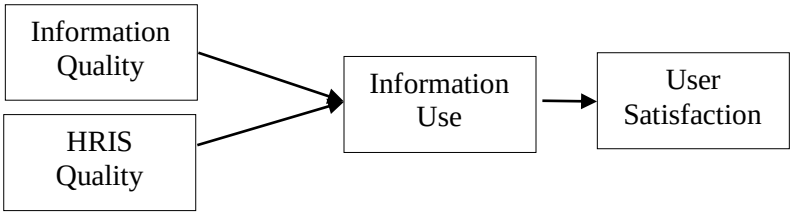
In the goal centered view for evaluating a HRIS, it becomes absolutely necessary to develop evaluation criteria to assess how well the objectives are being achieved (Hamilton and Chervany, 1981(b)). The literature on organizational effectiveness also highlights the importance of user/ client view in effectiveness evaluation (Giordano, 1977). Due to the complex nature of effectiveness construct for the evaluation of information systems, Thong and Yap (1996) suggested user satisfaction as an integrated perceptual construct along the criteria of effectiveness, which may vary from organization to

organization. Hence, in the context of HRIS, employee satisfaction with the system serves as the link between objectives concerning the information generated by the system and the objectives concerned with the improved organizational processes. We show a diagrammatic representation of the process as in fig 1, considering quality as a measure of effectiveness (Pitt et al., 1995). In this study, we measure the effectiveness of HRIS based on:

1. Information quality that includes accuracy, precision, timeliness and reliability of the information, and
2. Service quality as perceived by the employees.

Hence, in order to improve the effectiveness of the HRIS as a whole, it becomes pertinent to measure end-user satisfaction across HR functions, so that, discrepancies with the goal level can be minimized by taking necessary steps for improving the system to meet the expectations. Although, there have been several attempts to measure the effectiveness of information systems in general and HRIS in particular (Islam and Rasad, 2006; Mohanty and Tripathy, 20007; Gungor et al. 2009; Zeydan, 2009; Wen, 2009; Mangaraj and Aparajita, 2013; Phudphad et al, 2017), in this paper, we use a hybrid methodology, integrating factor analysis with two multi-attribute decision-making methodologies for the purpose.

**Fig: 1: Effectiveness model based on quality**




## HRIS IN THE STATE BANK OF INDIA (SBI):

State bank of India (SBI) is the largest Indian public sector bank having 209, 567 number of employees of its own. Having a huge customer base, the HR department of SBI is the key to its success which does several jobs, including hiring the best people from the market, providing them a suitable training as per market demand, retaining good and qualified people, maintaining transparency in the management system, taking care of employees' safety & healthcare and above all performing important HR functions, viz. performance appraisal, promotions, transfers, rewards and recognitions, grievances redressing etc. The HRIS of the SBI, also known as SBI HRMS was implemented by the bank to automate all the important processes of its employees starting from recruitment to retirement. This system was designed by Tata Consultancy Services (TCS) in association with implementation partner WIPRO, having the following technical specifications.

## FUNCTIONAL COMPONENTS OF HRMS:

Following are the important functional components of SBI HRMS.

**Input:** The input function provides the capability needed to feed the information about the employees into the HRMS database. After the formal process of gathering necessary data, it enters them into the database for further processing to provide various outputs to the end users.

**Processing:** The data stored in the HRMS data base are processed to produce outputs as per standardized formats. The users are exempted from the complex calculations involved in the entire data processing process. The data processing time is reduced to the maximum possible extent, enabling managers of the SBI to faster decision making and strategic planning.

**Output:** This component of HRMS is visible to its users with formatted outputs for easy understanding. An employee who asks for information is not expected to understand the technical aspects of the report, but rather the summary of it in a simple format, by simply clicking on the interface provided in the system for its users.

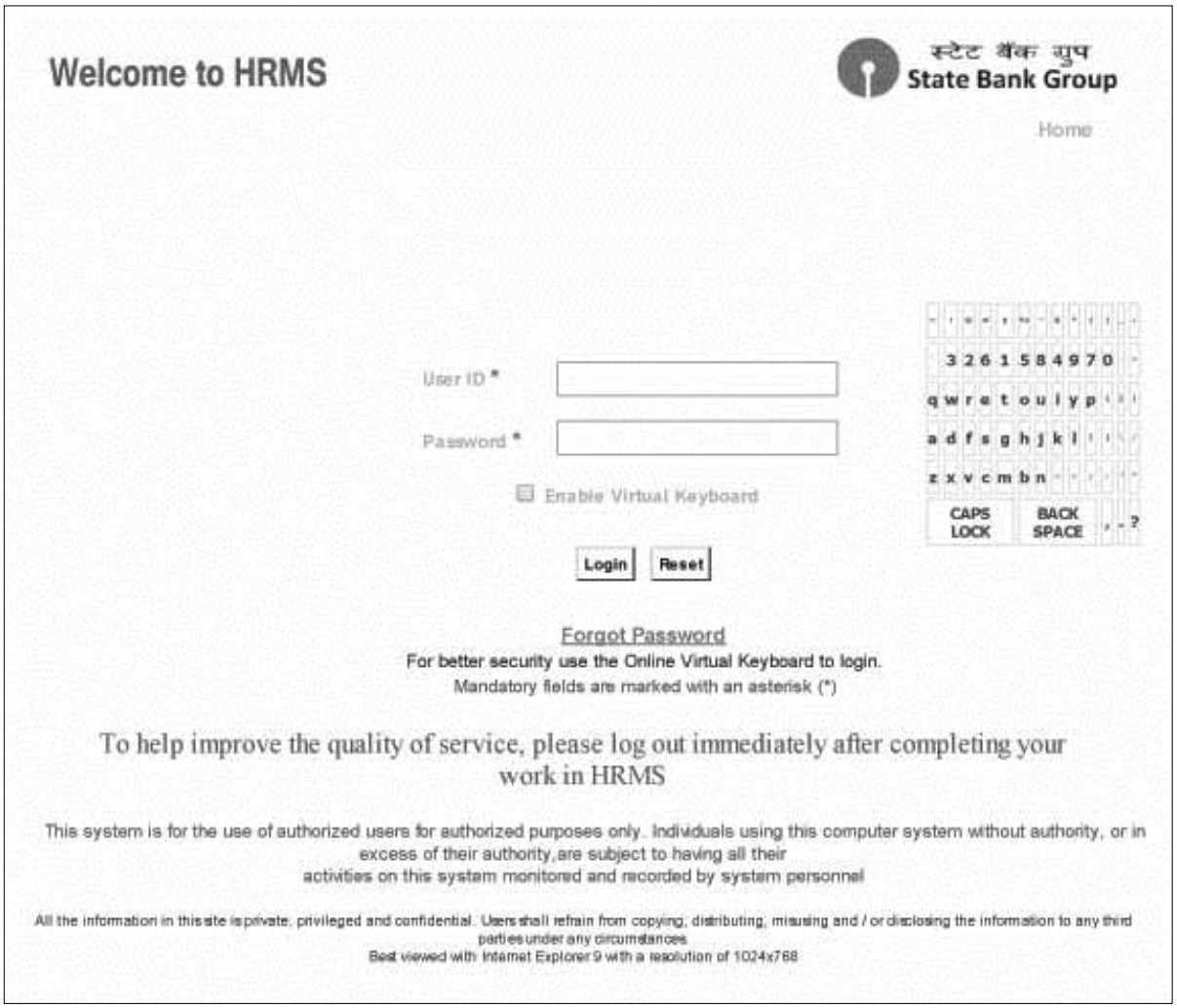
**Maintenance:** This component of HRMS is responsible for updating the data base from time to time. Even if new data about an employee enter into the system, his/her old data are also maintained as

historical information for future reference. Hence, the data pertaining to the entire tenure of an employee are stored and referred to, as and when required.

**TECHNICAL FEATURES OF THE SBI HRMS:**

- Software - Java
- Hardware - IBM Mainframe
- O/S Server - Cross Platform (Linux, Windows)
- Web Server - Apache Web Server.
- Application Server - Tomcat
- Database Server - Oracle
- Programming Language - Cobol, .NET
- Architecture - Service Oriented Architecture (SOA) platform and Database Independent.

**Pic 1: Login menu of the SBI HRMS**




An employee can log in the system (Picture 1) with his user-id and password to access the modules, such as, Recruitment, Placement, Salary Management, Performance Appraisal, Promotion, Transfer, Training, Rewards and Recognition, Leave Rules Management, Attendance Record Management, Employees Self Service, Grievance Redress, Career Development System, Welfare Management, Travel Management etc. The management of the data center and disaster recovery are done at Mumbai and Chennai respectively.

**METHODOLOGY:**

The research methodology for this study consists of three main steps as follows:
**Step 1:** Perform an exploratory factor analysis to identify the factors that are instrumental in employee satisfaction associated with the HRMS.
**Step 2:** Collect pair-wise preference data (α_ij) in a 9-point scale ( Table 1) across four major HR functions (Table 2) from employees at different age groups serving at different levels in different types of units, viz, branch offices (urban and rural), regional office and head office and perform the analytic hierarchy process (AHP) analysis (Satty, 1980).

**Table 1: Saaty's 9-point preference scale**

| Intensity of importance | Definition | Explanation |
|---|---|---|
| 1 | Equal importance | Two activities contribute equally to the objective |
| 3 | Moderate importance | Experience and judgment slightly favor one activity over another |
| 5 | Strong importance | Experience and judgment strongly favor one activity over another |
| 7 | Very strong importance | Experience and judgment is favored very strongly over another |
| 9 | Extreme importance | Experience and judgment is favored extremely over another |

**Table 2: Preference data matrix for HR functions.**

| HRM functions | Recruitment | Performance appraisal | Grievance redressing | Retirement and voluntary vacation |
|---|---|---|---|---|
| Recruitment | 1 | $\alpha_{12}$ | $\alpha_{13}$ | $\alpha_{14}$ |
| Performance appraisal | $1/\alpha_{12}$ | 1 | $\alpha_{23}$ | $\alpha_{24}$ |
| Grievance redressing | $1/\alpha_{13}$ | $1/\alpha_{23}$ | 1 | $\alpha_{34}$ |
| Retirement and voluntary vacation | $1/\alpha_{14}$ | $1/\alpha_{24}$ | $1/\alpha_{34}$ | 1 |

Here, $\alpha_{ij}$, are the values in the 9-point scale as described in table 1. Obtain the weights of these HR functions for consistent matrices and average them to get their final weights. These weights reflect the relative importance of these functions as perceived by an employee in the SBI.
**Step 3:** Collect data in a 5-point scale from the employees regarding the factors obtained in step 1 with respect to the stated HR functions and construct an attribute-criteria matrix.
**Step 4:** Perform TOPSIS analysis based on the weights (Step 3) for criteria (Step 1) and the attribute-criteria matrix (Step 3).
In this context, we explain the concept behind TOPSIS and the steps involved as follows:
TOPSIS (Technique of Order Preference by Similarity to Ideal Solutions) is a multi-attribute decision-making technique that uses compensatory aggregation to compare a set of alternatives with respect to a finite number of weighted criteria. It was initially developed by Hwang and Yoon (1981), based on the concept of a negative ideal solution (NIS) and a positive ideal solution (PIS) that uses the concept of the shortest geometric distance from the PIS and the longest geometric distance from the PIS to evaluate the alternatives. The PIS is the solution that has the maximum value in all the positive criteria (frequency, monetary) and the minimum value in all the negative

criteria. The best alternative is selected which has the shortest distance to PIS and the farthest distance to NIS. The steps of TOPSIS are as follows:

1) Obtain the normalized weights of criteria by some analytical method.
2) Establish the data matrix that shows the average score of employees ( $x_{ij}$ ) along the stated HR criteria.
3) Normalize the data matrix R = $\lfloor r_{ij} \rfloor_{m*n}$

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^{2}}} \quad i = 1\ ;\ldots.;\ n$$

4) Establish the weighted matrix as follows:

$$V = \lfloor v_{ij} \rfloor_{m*n}\ ,\ v_{ij} = \lfloor w_j r_{ij} \rfloor$$

5) Determine the positive ideal point $v_j^+$ and negative ideal point $v_j^-$ for j= 1,2,…,n
6) Determine the distance from point $v_{ij}$ to positive ideal point $v_j^+$ and negative ideal point $v_j^-$ for j=1,2,..,n as follows :

$$d_i^+ = \left[\sum_{j=1}^{n}(v_{ij} - v_j^+)^2\right]^{1/2} \quad \text{and} \quad d_i^- = \left[\sum_{j=1}^{n}(v_{ij} - v_j^-)^2\right]^{1/2}$$

7) Compute the relative closeness (RC) to the ideal solution.

$$R_i = \frac{d_i^-}{d_i^+ + d_i^-}$$

Hence, larger value of $R_i$ will signify closeness to the PIS.

8) Normalize the RC value in the range 0 to 1.

**RESULT AND DISCUSSION:**

We used an exploratory factor analysis to identify the underlying factors that explained the pattern of correlations between a set of observed variables associated with the use HRMS. We considered 23 items that identified 6 major benefits felt by the employees due to the implementation of the SBI HRMS (Table 3).The high communality of these items indicate the high association of these variables within each factor. These factors along with their eigen values and variances are presented in table 3.

**Table 3: Factors contributing employee satisfaction**

| Factors | Eigen value | Variance (%) |
|---|---|---|
| Quick and easy access to information | 2.82 | 21.76 |
| Centralized information | 2.65 | 16.98 |
| Easy administration of HR functions | 2.43 | 14.54 |
| Faster HR transactions | 2.06 | 11.09 |
| Reliability of information | 1.96 | 8.76 |
| Faster communication | 1.90 | 6.75 |

Then we process each HR function's weights from the 9-point scale employing Microsoft office EXCEL 2010. Application of the AHP methodology to these HRM functions includes four stages as per the following:

**Stage 1:** Get employees' pair-wise comparison judgments for the HRM functions as shown in table 2: We administered questionnaires to gather the employees' pair-wise comparison responses in a scale of 1 to 9 as shown in table 1.

**Stage 2:** Estimate consistency: After the employees' judgments were obtained, it was necessary to check the consistency of each employee's pair-wise judgments. This was estimated by a consistency ratio (CR), a ratio of consistency index (CI) to random index (RI).

Mathematically, $CR = {CI}/{RI}$ CI is computed as:

$CI = {(\lambda_{max} - N)}/{(N-1)}$ , where $\lambda_{max}$ and N represent the greatest Eigen value and number of HR functions under consideration. RI is the random index (Table 4) for different values of N.

**Table 4: Random consistency indices**

| **N** | 1-2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| **RI** | 0 | 0.58 | 0.9 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 | 1.49 |

**Stage 3:** Compare CR with the threshold value: For the CR value less than 0.10, the comparisons were acceptable. Those judgments were considered consistent.

**Stage 4:** Pool the weights generated from consistent judges: The weights obtained from the set of consistent judges were averaged to get the final weights of the HRM criteria. These scores indicated the relative importance of each of the HRM criteria as perceived by the employees and mentioned in table 5.

**Table 5: Attribute-criteria matrix for effectiveness measurement of SBI HRMS**

| **Factors** | **Recruitment (0.12)** | **Performance appraisal (0.29)** | **Grievance redressing (0.23)** | **Retirement and voluntary vacation ( 0.36)** | **Relative weights** | **Rank** |
|---|---|---|---|---|---|---|
| Quick and easy access to information | 3.75 | 3.25 | 3.65 | 4 | 0.16 | 3 |
| Centralized information | 4.25 | 3.6 | 4.17 | 4.25 | 0.29 | 1 |
| Easy administration of HR functions | 3.6 | 3.2 | 4.2 | 3.83 | 0.14 | 4 |
| Faster HR transactions | 3.83 | 3.17 | 3.56 | 3.75 | 0.09 | 6 |
| Reliability of information | 4 | 4.1 | 3.62 | 3.5 | 0.11 | 5 |
| Faster communication | 4.2 | 3.9 | 3.5 | 3.25 | 0.21 | 2 |

The average values of the scores obtained from the employees for the factors are presented in table 5 for TOPSIS analysis. The last two columns of the table show the normalized relative contribution and rank of these factors in the effectiveness measurement of the SBI HRMS.

## CONCLUSION:

We applied a multi-attribute-based decision-making methodology for measuring the effectiveness of SBI HRMS in terms of employee satisfaction along the four important HRM criteria. For this, we considered Bhubaneswar city and four different types of offices of the SBI. We applied a cluster sampling approach to select our sample for the study. From the HRM point of view, we selected four major functions that influenced the effectiveness of the system. By employing an exploratory factor analysis for the 23 items

pertaining to these functions, we obtained six factors responsible for employee satisfaction in these functions due to the implementation of HRMS. In order to prioritize these functions in the context of the organizations, we ranked them using the AHP methodology of Saaty and obtained normalized weights of each of them. These weights reflected their relative importance in the organization as perceived by the employees. Then, using a 5-point scale, we again collected data from the employees regarding the degree of satisfaction of these factors for the HR functions as described. We constructed a matrix of these data for the four weighted criteria and performed TOPSIS analysis to find out the relative contribution of these factors to the overall effectiveness of the HRMS. These values can be further compared with their corresponding expected values across various regions to know the effectiveness of the system as a whole, so that appropriate action may be initiated to improve the system in order to meet employee satisfaction.

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