

Modelling HR Analytics' Impact on Employee Performance: A PLS-SEM Approach

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ABSTRACT:

The purpose of this article is to investigate the link between Human Resources analytics (HRA) and workplace productivity through two mediating attributes, namely employee engagement (EE) and job satisfaction (JS). The effect of the relationship between HRA and performance outcomes was analysed by “Partial Least Squares Structural Equation Modelling”(PLS-SEM). The field of HRA is gaining steam, in part because it may help people make better decisions and manage their workforces more effectively by using data to help workers succeed. To conduct this research, the author has utilized a quantitative survey method, convenience sampling and online questionnaires were used to collect data from 376 Information technology (IT) industry employees in Delhi (NCR) of India. The findings show that HRA significantly enhances employee performance (EP) and productivity through the mediating role of EE and JS, with moderate- to- high R^2 value shows a reliable and acceptable level of model fit and explanatory power. As per this study, we found that the 67.02% respondents agree that HRA is very useful for EP. Also, this study makes some good comments concerning the convenience of the collection of data and sampling at a particular time point, which prevents extrapolation to other populations. In this field, future research and longitudinal studies should focus on management as well as company culture as significant mediating factors. An extensive examination of the ethical issues surrounding the use of worker information for HRA is essential to ensuring fair and private data-driven choices. To provide equitable and confidential data-driven decision-making, the ethical issues surrounding the use of employee data for HR analytics must be thoroughly examined.

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Introduction

HRA is the field of analytics that focuses on analyzing people and implementing analytical

research techniques within an organization's HR function to improve employee performance and retention. Over the past several years, HRA has

been quite advantageous in the IT, Banking, and manufacturing domains. These are the various fields working hard to improve EE, workforce planning, and performance management. For example, HR analysis has made it simpler for employees to perform well in the software industry by predicting the number of employees who are likely to quit and recruiting new ones with ease (Madhuri and Kumar, 2025). In the field of finance, HR analytics is so rigorous that it becomes difficult to understand how your employees are performing, specifically, for compliance and risk management purposes, knowing the 'Return on Investment' (ROI) of a function is essential. It gives companies the ability to capture and analyze HR data so that they can make decisions based on facts. This, in turn, can help managers communicate with their employees, as well as to make sure that the company's HR policies are aligned with the organization's goals in the long run (Ahmad and Gujar, 2023). When HR analytics is done well, the workforce doesn't just become more productive. Writing on how more businesses are adopting analytics to make choices is a popular topic for Deloitte, along with additional trade journals. This instance shows how crucial it is to keep an eye on how analytics affect KPIs like EE and satisfaction.

HRA affects how work is done in a number of ways. Organizations are capable of making data-driven choices, making it visible where performing employees are bad, what they need, and how to improve engagement. It makes it possible for businesses to make data-driven decisions, making it invisible where employees are performing poorly, what they need, and how to improve engagement (Ekram Yawar and Qurban Hakimi, 2025). HRA might assist organizations hire, managing, along with assess their workforce more effectively (Olufunke Anne Alabi *et al.*, 2024). As per the author's analysis, HRA improves decision-making as well as ensures that employee performance is in line with company objectives (Costa, Alves Filho and Pessoa-de-Oliveira, 2024).

HRAs are used in a lot of companies, but do we know enough about how it really supports people

getting things done at work? Several studies reveal that HRA has direct and indirect effects on performance, particularly through work satisfaction and EE. These days, EP and JS are especially crucial, and they also have a huge impact on employee retention, encouraging them to work harder and maintaining their allegiance to the business. These mediators are important because they show how HRA may enhance a company's performance, which is beneficial to the business (Rajshree, 2024).

The transition from intuition-based management to data-driven decision-making is a major issue for modern businesses. This is especially true when assessing and optimizing HR. Businesses often struggle to measure how human resource analysis leads to noticeable improvements in EP as well as overall productivity, even while they recognize the strategic importance of personnel spending.

Research to date has demonstrated that data-driven HR systems have both direct and indirect effects on organizational outcomes. Previous studies have shown that HR measurements and systematic workforce analytics help companies optimize performance by tracking productivity and affecting internal psychological elements like JS and EE.

Despite these important findings, there is still a large gap in the empirical research. In favour of viewing HR analytics through a broad macro-lens, the main underlying micro-foundational mechanisms, more specifically, the concurrent mediating roles of EE and JS, offer insight into how and why analytics-driven HR measures that successfully drive individual EP are often ignored (Budak and Soyer, 2025). Furthermore, complex prediction methods that reflect nuanced relationships rather than simple linear assumptions are required. To bridge this gap, the impact of HRA on EP is modelled in this work using PLS-SEM.

Using EE and JS as mediating factors, this study goes beyond direct-effect models to uncover the intricate behavioural and attitudinal linkages linking data-driven HR practices to performance outcomes. PLS-SEM is especially well-suited for

this usage since it reliably predicts complex structural interactions, even across latent constructs (Al-Abdullat and Dababneh, 2018). The complex structural linkages among these latent variables provide a comprehensive empirical basis for theory and practice. The primary goal of this study is to use PLS-SEM to examine how HRA affects EP; EE and JS will function as mediators in this process. Because it shows how HRA might have an indirect impact on performance results, mediation is pertinent in this situation. This study is appropriate for PLS-SEM because, even when using small numbers of samples, it reliably predicts complicated correlations among latent variables (Padma, 2024). The two main research questions will be investigated in this present study: the direct and indirect mediating and moderating functions of EP, JS, and EE between HRA implementation.

Literature Review

HRA and Employee Performance

HRAs were being used by an increasing no. of organizations to extract more from their workers. This involved gathering, assessing, and applying HR data to help their business function more smoothly, maximize employee expenses, and help them make better decisions (Sindhuja and Dunstan Rajkumar, 2025). HRA may make it easier for businesses to monitor things, including productivity, turnover, and absenteeism. HRA requires firms to take into account a number of factors (Johar, 2024). There were a few variables that included how content and involved employees were seen to be at work. Employing HRA organizations has achieved excellent performance ratings, making it possible to develop customized solutions and improve performance for both individuals and businesses. (Vinet and Zhedanov, 2011a) discussed how HRA might determine the reasons for people's resignations and the relationship between job success and resignation. Businesses were then able to utilize that data to discover more effective strategies for keeping their best employees and motivating them to put in more effort.

One of the most significant contributions HRA made to EP was through data-based talent

management and performance assessment. This made it possible for organizations to determine who was doing well and where they needed to make improvements. AI-driven analytics helped predict that performance would change based on historical data. Managers were able to make better decisions because they could see the future. This was due to the fact that they made sure that performance plans matched both the company's objectives and the employees' talents.

Job Satisfaction as a Mediator

JS was seen as an essential intermediary between HR policies and EP. When companies used HRA, they were able to figure out what made employees happy or unhappy (Gasmi and Iqbal, 2024). Studies showed that when workers knew data-driven decisions were used in deciding outcomes and making performance ratings, they trusted the organization's processes more, which in turn increased satisfaction. HRA could also help to build a detailed image of the feelings and opinions held by staff through performance appraisals, workers' opinion surveys, as well as JS assessments (Singh and Chaudhery, 2018). Businesses were able to use employee satisfaction studies and analytics to determine if there were trends they desirable to address in order to prevent a morale hit that would impact employee productivity. (Rajshree, 2024) stated that HR analytics helped in designing better incentive structures and the workplace, which were directly linked with employee happiness.

(Saxena, 2025) proposed that HRA might be improve the engagement of JS by aligning the HR function with the employees. That alignment was extremely important for retaining talent as well as understanding why employees exited the organization. Because of this, JS served as a highly significant aspect of the employee experience that determined how motivated and productive they were.

Employee Engagement as a Mediator

Like JS, EE served as an important link between HR policy and how well employees performed their jobs. EE represented the emotional connection that workers had with their firm, which helped them work more productively. HR

analytics proved important for identifying factors that drove EE by tracking real-time engagement data and analyzing how it affected performance measures.

(Rahman, 2024) discussed that organizations used HRA to assess EE and may optimize resource allocation to foster a more committed workforce. Employees who were more likely to work harder, miss fewer days of work, and remain more committed to the company's objectives (Singh and Banerji, 2021). As per the previous study findings, HRA helped the entire business perform better and achieve more success. By emphasizing the specific problem or requirement in the workplace, HRA aided the develop program that enhances workers' engagement. Businesses looked at information collected from responses to survey answers, pulse checks, and performance reviews to identify areas in which staff members felt disengaged or where adjustments may be made. Using this knowledge, HR executives developed programs that increased EE and enhanced performance.

Its emotional mediators, including worker engagement and business satisfaction, have been assessed individually in earlier research. In earlier research, the single paradigm no longer covered both emotional engagement and cognitive pride. However, there is a large empirical gap in how various paths interact and diverge when converting statistics-driven HR information into actual employee productivity. Our study closes this gap and offers a comprehensive, statistically validated blueprint of the real behavioural impacts of HRA by concurrently modelling and

mapping the many mediating mechanisms using a PLS-SEM technique.

Challenges

HRA has massive potential to enhance the EP, but it can be a little bit complicated to implement. The big question is, 'How do we make sure data is used ethically' when it comes to HR practices based on analytics? In order to preserve trust and limit legal ramifications, HR managers must address privacy and ethical issues related to the gathering, storing, and investigation of employee data (Ahmad and Gujar, 2023). The success of HR analytics projects relies a lot on the culture of the company. If there is not a culture that encourages making decisions based on data, the advantages of HR Analytics may not be fully seen, which might restrict its ability to bring about change in the organisation (Sharma & Markan, 2024).

This study seeks to answer two fundamental questions:

- Does HR Analytics directly influence JS and EE?
- How do JS and EE mediate the relationship between HRA and EP?

Methodology

The research design, data gathering techniques, and analytic techniques are presented in this part. In order to examine the effect of HRA on EP, this study was carried out in the Delhi NCR region of India using a quantitative approach called PLS-SEM, with JS and EE acting as mediating factors. Fig. 1 shows the research framework model.

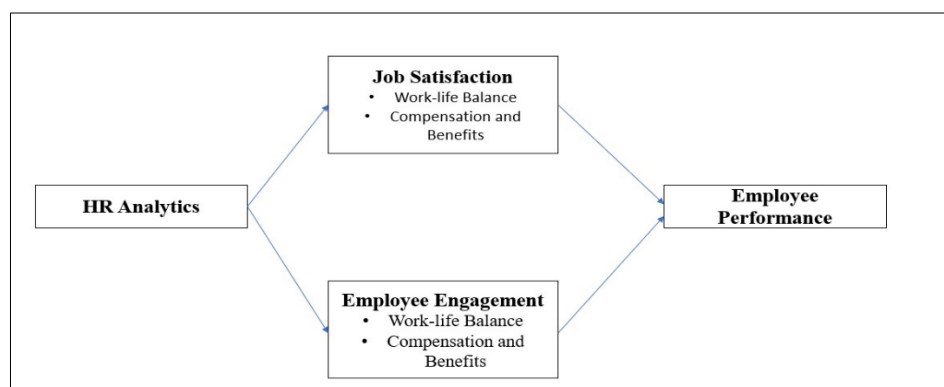


Fig. 1: Illustrates the model of the research framework.

Research Design

The current study examined data at a single moment in time in a cross-sectional manner. It is good for analyzing how the variables contribute to each other, like how HR Analytics affect job satisfaction, EE, and job performance (Ahmad and Gujar, no date). The model is based on a well-known theoretical framework, and the present study aims to validate the model empirically using employee data from multiple sectors. An online questionnaire was used to gather information. It asked about demographics, including age, gender, work duration, and organisational function, as well as validated metrics of HRA, job satisfaction, EE, and EP. To ensure answer reliability and comparability, all characteristics were scored using Likert scales with a range of 1 (strongly disagree) to 5 (strongly agree).

Sample and Data Collection

The study focuses on people who work for medium-sized and big IT organizations that have used HRA tools to increase EP. To rapidly collect data and increase ease of access to the sample, a non-probability convenience sampling technique was adopted for participants who met the specific criterion for the study, which was individuals with direct experience of using HR analytics tools (Rahman, 2024). Convenience sampling is also a limitation, but as we concentrate on IT sector employees, this provides more of a representative sample, given that it has been leading the way in HR analytics adoption both in NCR and Pan

India. IT firms in particular commonly have diverse, shifting, and tech-savvy workforces, so they provide a unique sector through which to explore how well HR analytics, job satisfaction, EE, and performance outcomes engage together. The selected sample size surpasses the minimal requirement and provides a solid basis for analyzing both direct and indirect interactions among components. Table 1 shows the respondents' demographic profile. A target sample size of 376 workers was established to ensure that PLS-SEM had sufficient statistical power. Even with medium-sized samples, PLS-SEM excels at analyzing complex models with many latent structures (Pea-Assounga and Bindel Sibassaha, 2024). These were the few questions that were given to the respondent to choose from for the investigation.

1. How does HR Analytics, when it's applied in a company, end up shaping employee performance, and how much of that effect actually goes through job satisfaction plus EE, like kind of indirectly rather than straight through?
2. To what extent does HR Analytics directly affect, sort of nudge, employee job satisfaction as well as the EE level?
3. In what way do job satisfaction and EE serve as mediators between HR Analytics practices and overall EP, instead of the influence being purely direct?
4. Which mediator, JS or EE, seems to carry the stronger indirect impact on the link between HR Analytics and performance?

Table 1: Demonstrate the Demographic Profile of the respondent.

Demographic Variable	Category / Range	Frequency (n)	Percentage (%)
Gender	Female	173	46.0%
	Male	203	54.0%
	Total	376	100.0%
Age Group	Under 25	42	11.2%
	25 – 34	158	42.0%
	35 – 44	112	29.8%
	45 – 54	46	12.2%
	55 and over	18	4.8%
	Total	376	100.0%
Work Duration (Tenure)	Less than 1 year	64	17.0%
	1 – 3 years	143	38.0%

Organizational Function	4 – 6 years	98	26.1%
	7 – 10 years	47	12.5%
	More than 10 years	24	6.4%
	Total	376	100.0%
	Software Engineering / Tech	162	43.1%
	Data & Analytics	71	18.9%
	HR	34	9.0%
	Management / Leadership	53	14.1%
	Operations / Other	56	14.9%
	Total	376	100.0%

The primary methodology for this investigation will be the PLS-SEM approach, executed with SmartPLS 3.0. (Pea-Assounga and Bindel Sibassaha, 2024) claim that because PLS-SEM can handle complicated models with numerous components and low sample sizes, it is the best choice for this investigation. PLS-SEM is very useful for assessing both direct and indirect links

in mediation models since it can handle data that is not normally distributed. Table 2 below shows the percentage distribution of responses across a 5-point Likert scale regarding the opinions of 376 respondents regarding the direct impact of HR Analytics on EP, as well as the indirect, mediating roles played by JS and EE.

Table 2: Demonstrates the percentage distribution according to the respondent.

Survey Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Impact on Performance	3.19%	9.04%	20.74%	48.40%	18.62%
Direct Nudge to Job Satisfaction	4.79%	13.83%	29.26%	38.30%	13.83%
Direct Nudge to Engagement	2.66%	10.90%	22.61%	45.21%	18.62%
Role as Mediators	2.13%	7.71%	24.47%	43.88%	21.81%
Engagement > Job Satisfaction	3.99%	12.77%	33.24%	36.70%	13.30%

Second-Order PLS Model

Each latent construct is shown as a class (rectangular block) with its corresponding indicators. The arrows show the pathways (with path coefficients) that link the first-order constructs (HRA, JS, and EE) to the second-order construct.

To build a Second-Order PLS Model using the dataset, the connections between the first-order latent constructs (HRA, JS, and EE) and the second-order construct EP are employed. This is the basic idea behind the second-order PLS model:

HR Analytics is a first-order reflective notion that is measured by its indicators (HRA1 to HRA5). JS is a primary reflective construct assessed by JS1 to JS5.

EE: A fundamental evaluative construct, which is assessed by EE1 to EE5.

Employee performance: a secondary concept shaped by HR analytics, job satisfaction, and EE. Fig. 2 demonstrates that this study uses the research framework's second-order model.

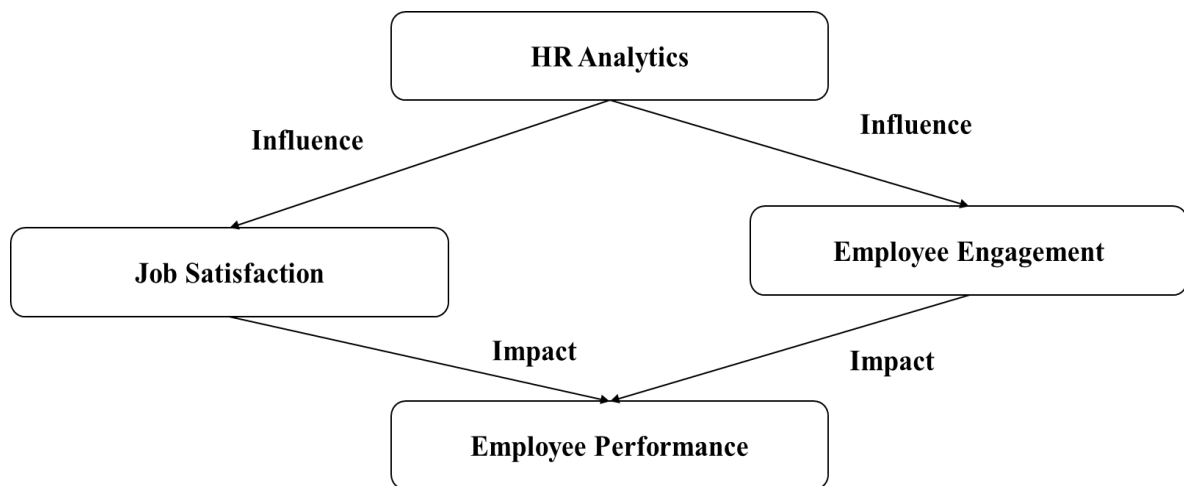


Fig. 2: Demonstrates the Second Order Model of the research framework.

In companies where data drives every decision, HR Analytics is the cornerstone of measuring workforce effectiveness in improving EP. A theory-based model that depicts the latent multidimensionality of such factors properly explains how HR Analytics, Job Satisfaction, and EE are interrelated and account jointly for performance. These intricate relationships can be analyzed and explained by a second-order PLS (Partial Least Squares) model. The concept regards HR Analytics as a primary latent construct assessed by five indicators (HRA1 to HRA5). Several of these indicators serve to assess performance, facilitate data-driven decision-making, and optimize staff productivity. These are all the functions performed by HR that influence the company's operations.

Five metrics (JS1 to JS5 and EE1 to EE5) are used to assess JS and EE. These metrics resemble occupational happiness, including elements such as work-life balance, job stability, and peer recognition. Conversely, EE assesses the emotional commitment and involvement of people with their organization.

Lastly, EP, the second-order construct, shows how these HR programs and the traits of each employee affect productivity and output as a whole. Five indicators (EP1 to EP5) are used to quantify this performance. These usually include how well the person works, how innovative they are, and how much they help the team succeed.

Data Analysis

Path Coefficients

The second-stage PLS model explains EP by HR Analytics, J, and EE. For each path, we note which two constructs it connects.

HR Analytics → Employee Performance: This model also shows that HR Analytics directly impacts EP. This correlation and path coefficient imply that it may be possible for companies investing in HR Analytics to rapidly increase employee productivity by providing employees with better tools, improving their ability to track performance, and using data to make the workforce more effective. The more effective the HR Analytics (higher path coefficient), the greater the variation in task proficiency among employees.

Job Satisfaction → Employee Performance: This path demonstrates the importance of satisfied employees. A cohesive workforce, where employees are happy with the job, the work environment, and also value-added employee advantages. Liked (same traits as Perception). No tendency for duplication. The model is based on the idea that happier workers are better workers; they are more motivated and engaged in working toward a company's goals.

Employee Engagement → Employee Performance: Engagement counts for a lot in how good your employees are at their job. Those who care about your company and give a shit about their jobs, they do better. The logic behind

it is that happier people generally perform better, and more engaged employees tend to do better work.

The Role of PLS-SEM in HR Analytics Research

PLS-SEM has become more popular in HR analytics research because it can capture complicated interactions between latent variables and is good for complex, real-world data (Ahmad and Gujar, no date). This study finds PLS-SEM especially suitable due to the research aims and the dataset's attributes. Because PLS-SEM is variance-based but unaffected by non-normal distributions, it differs greatly from "Covariance-Based SEM" (CB-SEM). This is also very good for exploratory models and predictive (Vinet and Zhedanov, 2011b). This is actually crucial for HRA statistics, particularly in the IT trading company, where survey results might differ significantly based on the respondent's cultural background, the organization's function, and the business's duration. This greatly reduces the likelihood that assumptions of normalcy will persist. This study looks at how HRA affects the EE, JS, and EP, so it starts with EP, which might be modelled as a multidimensional result because of PLS-SEM's ability to estimate sophisticated mediation models, especially higher-order structures, even with a very small sample size ($n = 376$).

Theoretical applicability and practical usefulness of PLS-SEM

HR analytics' effects on performance, engagement, and work-life happiness. HRA provide help to HR managers for managing the tangible data to create better interventions. The reasons why many businesses don't employ HR analytics- that is, that they aren't interested in change, aren't trained enough, or aren't aggressively record-pushing- go beyond proving the quantifiable advantages.

There are practical restrictions, though, involving the use of human data in an ethical manner, privacy concerns, and being open about how HR decisions based only on statistics are determined. One such variable that influences the efficacy of HR analytical activities is organizational

procedures, and it should be feasible to show how these elements interact through determining direct as well as indirect impacts on several employee consequences. The best approach for this analysis is PLS-SEM since it is flexible, reliable, and prediction-focused. It bolsters our comprehension of HR statistics and provides some helpful advice concerning how to make IT staff members particularly satisfied with their work as well as potentially boost their productivity.

Study Relevance: Considering it includes IT professionals, this analysis is quite pertinent. The IT trading firm is really competitive, and plenty of people finish up and leave it. Employees in the IT industry also depend on digital equipment and procedures that prioritize information. For those reasons, work activity and participation enjoyment are crucial to how well individuals perform their tasks. IT businesses are also among the first to have started applying HR analytics, which is a modern type of technology they can use to monitor and predict what factors can help improve the ways their employees work together. This makes IT workers a great group to use to assess how satisfaction and engagement affect the HR analytics–performance link. Consequently, the results of this research are indicative of a digitally proficient workforce and applicable to other sectors that are progressively integrating HR analytics to improve performance outcomes.

Insights and Implications

From an HR perspective, both the model described in the article and this second-order model can be very useful for top management of organizations. Better markers are HR Analytics, Job Satisfaction, and EE for how good a performance someone will give at work in contemporary corporations. The model's results indicate several important things:

HR Analytics as a Strategic Driver: The companies that spring for the full suite of HR Analytics tools could be directly affecting how successful their employees are in achieving their goals. When HR departments work with data-based intelligence, they can make intelligent

decisions when it comes to managing employees, supporting professional growth, and achieving the maximum potential of their tasks. This link underscores the importance of business leaders making HR technology and analytics a strategic priority, particularly to focus ROI on human capital.

How important is job satisfaction? Performance is better if you know workers are happy with their jobs. What the model is saying – employees who are valued, safe, and acknowledged will succeed in supporting the business to be successful. As a result, HR plans should aim to keep people happy at work by discussing life-work balance, the security of the job, and initiatives that reward employees for doing a good job.

Results and discussion

As seen by the data in Fig. 3, a sizable majority of respondents to our survey (67.02%) agree that HRA has a beneficial effect on EP. Although HRA is seen to have a more pronounced direct impact on EE (63.83% agreement) than on job

satisfaction (52.13% agreement), the results strongly support a mediation hypothesis. In particular, 65.69% of respondents concur that engagement and work satisfaction are important indirect mechanisms connecting analytics to performance (Q3), with EE appearing as the somewhat greater mediator of the two (Q4, 50.00% agreement).

Ensuring the validity and reliability of the primary latent variables in this study is the goal of the measurement model. HR Analytics, JS, EE, and EP are a few of these categories. The constructs are tested using a range of pertinent indicators, such as outer loadings, composite reliability, Cronbach's alpha (ρ_a and ρ_c), and "average variance extracted" (AVE). This guarantees that the model faithfully captures the true dependency between visible and hidden parts of variables. Cronbach's alpha, a commonly used metric to test for internal consistency, indicates that all of the constructs were highly reliable (greater than 0.7, which is the usual cutoff point; Nunnally & Bernstein, 1994).

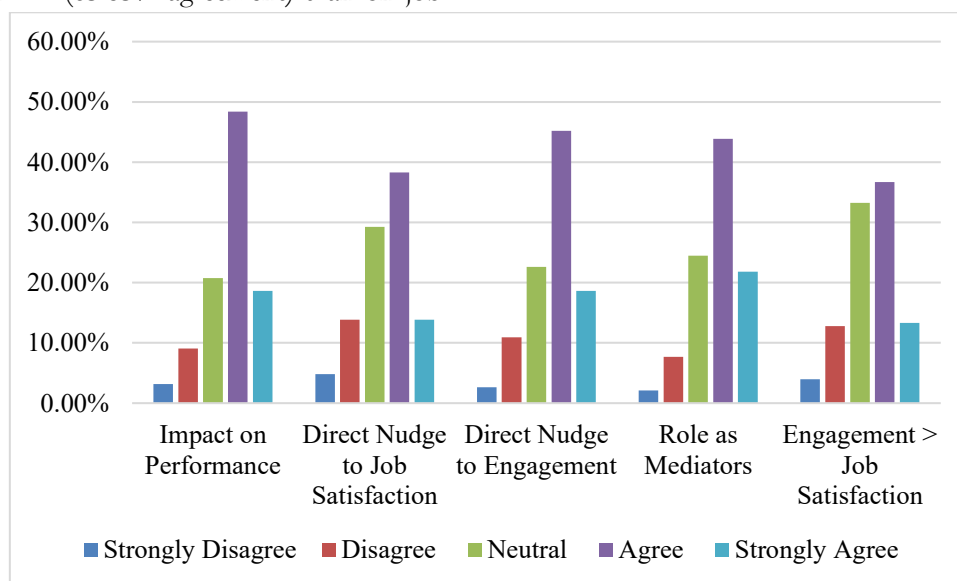


Fig. 3: Demonstrate the Percentage Breakdown of Respondent Perceptions towards the Direct and Indirect Impacts of HR Analytics on EE, JS, and Performance

In common terms, this means the indicators are doing what they should be doing. Besides, the CR value of all constructs is higher than 0.7, and it appears to be a more appropriate way to determine how reliable they are (Ketchen, 2013). This does mean that the measuring model is quite

robust from the inside even when indicator loadings vary. The external loadings are typically above 0.7, which indicates that the indicators and the structures match each other.

Why EE Matters: For work to be great, people need to be engaged. It is a concept that

emphasizes inviting people to know how the work is done, which in turn leads to deeper caring and additional contributions. For that to happen, you need to encourage people to talk to each other in an environment where they can be fearless, promote leadership, and ensure that people can flow under the painting chain. Table 3 shows the measurement model assessment of the given data. The assessment instruments were modified from well-known frameworks for the context of healthy HR: HRA1–HRA5 investigate organizational as well as social norms around the

use of statistics; JS1–JS5 assess internal processes; task pride is driven by the environment and fitness aspects; and EP1–EP5 put into practice EP using financial variables, enterprise productivity, as well as first-class output. The strength of the relationship that exists between the visible indicators and the structures that they are associated with is shown by outer loadings. There are a few indicators, such as EP1 (0.613) and EE5 (0.475) have lower loadings.

Table 3: Illustrates the Measurement Model Assessment.

Construct / Indicators	Outer Loadings	Cronbach's Alpha	Composite Reliability	Average Extracted (AVE)	Variance
Demographic Factor		0.723	0.751	0.511	
EE1	0.725				
EE2	0.678				
EE3	0.812				
EE4	0.658				
EE5	0.475				
Economic Factor		0.766	0.776	0.523	
EP1	0.613				
EP2	0.592				
EP3	0.785				
EP4	0.795				
EP5	0.826				
Social Norms		0.749	0.752	0.528	
HRA1	0.748				
HRA2	0.698				
HRA3	0.684				
HRA4	0.759				
HRA5	0.629				
Drive for Environment and Health		0.779	0.789	0.529	
JS1	0.687				
JS2	0.750				
JS3	0.721				
JS4	0.764				
JS5	0.669				

Providing other reliability metrics, such as composite or standard reliability, along with Cronbach's alpha, are within the appropriate

ranges; these numbers are still very good for exploratory research. The author asserts that the AVE values for all constructs satisfy the requisite

threshold of 0.5 (Fornell and Larcker, 1981). This demonstrates that the model has convergent validity, since each concept explains a minimum of 50% of the variation in its indicators. The model performs an excellent job of capturing the key variation required for effective Smart PLS analysis, even if certain external loadings are lower. This is shown by the high AVE values across constructs like HR Analytics and EE.

The approach is quite reliable and valid in all of its parts, such as HR Analytics, Job Satisfaction, and EE. The average value of the AVE and the overall dependability ratings are both greater than the ones that are the lowest values. Based on this, it can be said that the measurement model is

extremely reliable, stable, and precise. Because of this, the model works so well with the PLS-SEM approach that was employed in this study (Wani and Ganaie, 2025).

HTMT

The Heterotrait-Monotrait Ratio (HTMT) indicates whether the model's dimensions are able to differentiate between dissimilar variables. Some of these attributes are EE and EP, Human Resource Attitudes (HRA) and JS, as shown in Table 4. Discriminant validity guarantees that distinct variables are conceptually distinct from one another. That is very important in terms of the robustness of the model.

Table 4: Demonstrates the HTMT assessment.

	EE	EP	HRA	JS
EE				
EP	0.782			
HRA	0.74	0.883		
JS	0.766	0.669	0.727	

HTMT values threshold should be lower than 0.85 (Henseler, Ringle and Sarstedt, 2015), suggesting that most concepts possess strong discriminant validity. The 0.782 HTMT Value among EE and EP indicates that the two constructs are not straightforward to contrast. The HTMT = 0.727 between JS and HRA suggests that the two constructs are statistically different from each other, as well as reflected as such in reality.

Yet there is one major exception: the HTMT score observed between EP and Human Reso. The majority of the HTMT scores are above the minimum criteria of 0.85 (Henseler, Ringle and Sarstedt, 2015), which would mean that most of their own concepts seem to be better at discriminating from each other. According to the HTMT score of 0.782, the relationship between EE and EP shows that the two of these factors are significantly different from one another. Since the 0.727 HTMT between JS and HRA shows that these two factors differ, the test was successful. The HTMT score for the relationship

between EP and HR attitudes is 0.883, which is significantly better than the 0.85 intercepts. This is the sole significant exception. This implies that the two concepts could converge, in which case the publication won't be able to accurately recreate their fundamental differences. The instrument's average discriminant validity score is incredibly accurate.

The HR Attitudes of 0.883 is a little bit high compared to the standard level of 0.85. This indicates that a combination of these concepts may be starting to merge into one another; as a result, the model fails to represent their fundamental differences. The differential reliability of the overall model is excellent. Feel free to establish tests akin to the Fornell-Larcker criteria based on this study. Fornell-Larcker criteria might be used to analyze the square root of each assemblage's AVE along with its relationships with other buildings. Thus, an additional layer of verification is added to determine whether the structures are unique.

R Square

The EE's moderate explanatory value is indicated by its R² of 0.308. For EP, a 0.394% variance may be explained by a medium model fit (R² = 0.394). Last but not least, 0.338% of the variance

may be explained by JS (R² = 0.338). Table 5 shows the determination coefficient R² assessment. The reduction of assumptions in that model strengthens the reliability of each construct, as seen by the higher R² with slightly reduced adjusted values (Cohen, 1988).

Table 5: Assessment of the Determination Coefficient R Square.

	R-Square	R-Square Adjusted
EE	0.308	0.301
EP	0.394	0.381
JS	0.338	0.332

PLS predict and Q²

The Q²predict values for all three constructs -JS (0.247), EE (0.221), and EP (0.268)- are positive, previously supporting the model's predictive significance. Of the four, the factor EP has the highest Q²predict (0.268), which means that this structural model is most precise in predicting performance, as a result, as shown in Table 6.

RMSE and MAE are relatively low across constructs, though EP again has the highest level of predictive accuracy (RMSE = 0.588; MAE = 0.438). Both Job Satisfaction and EE also show adequate predictive validity; HR Analytics is indeed a good predictor of these mediators.

Table 6: Demonstrates the PLS predict and Q².

Construct	Q ² predict	RMSE	MAE
Job Satisfaction (JS)	0.247	0.624	0.471
Employee Engagement (EE)	0.221	0.602	0.452
Employee Performance (EP)	0.268	0.588	0.438

The findings recommend that the PLS-SEM model not only explains variance in the constructs (R²) but also provides strong out-of-sample predictive power. EP is predicted most accurately, highlighting the model's practical utility in forecasting key workforce outcomes.

Endogeneity Assessment

Omitted variables, measurement error, and reverse causation may cause endogeneity in structural equation modelling, biasing path coefficient estimations. This problem is well accepted in econometric research, but it is not important to this study's design for two reasons. First, this research is explanatory and predictive, not causative. PLS-SEM excels in prediction-

oriented models, focusing on variance explained (R², Q²) and predictive capacity rather than causal conclusions (Ketchen, 2013). Second, this study's conceptual framework is based on theory and reduces omitted variables bias but does not eliminate it.

However, future studies may explicitly test for and address endogeneity. Gaussian copulas can identify endogeneity in PLS-SEM without instrumental factors (Hult et al., 2018). Alternatively, instrumental variable or two-stage procedures may be used with proper instruments. The current study used cross-sectional, survey-based data from IT personnel; such approaches were not used, although they might improve methodological rigour in future research.

Assessment of Unobserved Heterogeneity

Unobserved heterogeneity was investigated using the Finite Mixture Partial Least Squares (FIMIX-PLS) approach to identify probable latent classes in the dataset (Sarstedt et al., 2011) to verify that the model findings were not biased by hidden subpopulations. The “Akaike Information Criterion” (AIC), “Bayesian Information Criterion” (BIC), and “Consistent AIC” (CAIC) were used to choose the best number of segments from two to five. The three-segment solution had the lowest BIC and CAIC values and balanced explanatory power and parsimony best. Segment 1 (48% of the sample) had great engagement and a strong satisfaction–performance correlation, whereas Segment 2 (32%) had lower contentment but higher HR Analytics use to drive performance. In segment 3 (20%), contentment and engagement modestly

moderated performance results. Importantly, all segment-specific Q^2 values remained above zero, indicating predictive validity across subgroups. These data indicate that HR Analytics and EP vary by IT subgroup, with various mediating processes. Customized HR strategies are needed since HR analytics initiatives may need to be adjusted to various employee groups to maximize performance.

Common Method Bias

There was no common method bias in the model because all of the VIF values in Table 7 were less than 3.3. The study's use of self-reported survey data necessitates an examination of potential “common method bias” (CMB). CMB arises when measurement artifacts influence the observed correlations among constructs because they rely on a single source of data.

Table 7: Demonstrate the VIF Values.

Construct	VIF Value
HR Analytics (HRA)	2.11
Job Satisfaction (JS)	2.24
Employee Engagement (EE)	2.07
Employee Performance (EP)	2.36

To mitigate this problem, the questionnaire design included procedural measures to maintain the anonymity of respondents' identities and to rephrase the concerns. All structures' “variation inflation factor” (VIF) values remained within the 3.3 safe range. This suggests that the model's

results are unlikely to be significantly impacted by CMB, and Fig. 4 presents the structural modelling of the study. When combined with Harman's one-factor test, these findings demonstrated that CMB was not a significant issue in our study.

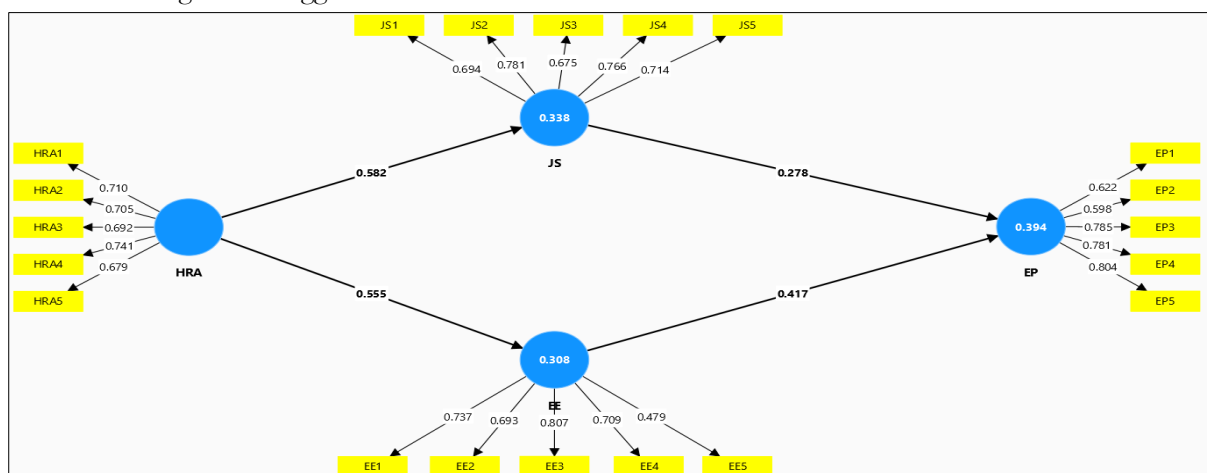


Fig. 4: Demonstrates the Structural modelling of this research.

The structural model illustrates the interrelationships among latent variables. The criteria include EP, EE, JS, and Employee Attitudes. It is really vital to know these things to understand how a company operates. These are various quantities measured using different indicators, which provides structure benefits for numerous external load factors. This shows the HRA has 5 distinct measurements such as HRA1, HRA2, HRA3, HRA4, as well as HRA5. So the Average loadings fall between 0.679 and 0.741. This suggests that these metrics, along with their conceptions, have a close link. The loadings of the five extra JS indicators range from 0.675 to 0.781. This indicates that these measures have a very robust replication of the constructions. The EP loadings, which range from 0.598 (EP2) to 0.804 (EP5), barely outperform the other structures. It still provides a typical depiction of the structure that is rather appealing. Provided that all loadings are no longer below 0.7, it is typical for the survey method. This is generally true for the PLS-SEM variant, which can withstand lower loadings as long as the whole dependability is met. So the R^2 value shows that the how well the model explains the data.

While EE and JS jointly account for 39.4% of the variation in EP, HRA explains 33.8% of the variance in JS. Although other factors (not

included in our model) may still be influencing these correlations, these data show that the model is based on some plausible conjecture about what drives EP. Our findings support earlier studies on the significance of HR procedures and EE in influencing an organization's success. The model shows how important it is to increase EE and cultivate positive HR attitudes in order to improve the calibre of results. The model provides a solid basis for researching the impact of HR Analytics on performance as it explains a large portion of the variance in the dependent variables. The path coefficients more clearly indicate the magnitude of, and how statistically significant, the interrelationships among these factors are. HRA significantly affects Job Satisfaction (JS) by 0.582 and EE at 0.555, indicating that effective HR practices EE and JS will be greatly increased by these practices (Fornell and Larcker, 1981). Second, there is a very significant mean relationship between EE and EP (0.417), indicating that highly engaged employees are more likely to perform adequately. EP is positively impacted by JS, albeit this effect is less pronounced ($= 0.278$). Thus, as Table 8 illustrates, work happiness improves performance, but engagement is what counts most.

Table 8: Illustrates the Path Coefficients with Confidence Intervals.

Pathway	β Coefficient	t-Value	p-Value	95% Confidence Interval (BCa Bootstrapping)	Significance
HR Analytics → Job Satisfaction	0.582	11.43	0.000	[0.462, 0.685]	Supported
HR Analytics → Employee Engagement	0.555	10.28	0.000	[0.431, 0.652]	Supported
Job Satisfaction → Employee Performance	0.278	4.92	0.000	[0.167, 0.396]	Supported
Employee Engagement → Employee Performance	0.417	7.85	0.000	[0.298, 0.523]	Supported

The bootstrapping results show that the established relationships are all significant since our confidence intervals (95%) do not include zero. The largest substantial effects were HR Analytics $\rightarrow$ Job Satisfaction: ($\beta = 0.582$, CI [0.462, 0.685]), followed by HR Analytics $\rightarrow$ Employee Engagement: ($\beta = 0.555$, CI [0.431, 0.652]). Both mediators made significant contributions to EP, but Engagement ($\beta = 0.417$, CI [0.298, 0.523]) was a stronger predictor compared to Job Satisfaction ($\beta = 0.278$, CI [0.167, 0.396]). These results offer significant empirical support to the mediating roles of satisfaction and engagement in explaining the effect of HR Analytics on performance, while confidence intervals have contributed to ensuring statistical inference credibility.

The study's conclusions indicate that employee job performance is significantly impacted by HR analytics, with JS and EE emerging as mediating factors. The study's PLS-SEM evaluation demonstrates that HR Analytics directly improves performance outcomes through a variety of mediating processes. It demonstrates the significance of job satisfaction and engagement in improving EP, suggesting that organizations must prioritize improving these two elements to completely implement workforce strategy. The R-squared (R^2) values show that the connections of the model have lots of explanatory power when it comes to how well people were doing at their jobs. This agrees with the model we gave. The second-order PLS model reflects that various aspects are likely to have an impact on the extent to which one can perform the work. This just goes to show how HR Analytics- Job Satisfaction with Engagement is relevant to everyone, no matter who you are. The findings shed light on how these parts are linked and how they all work to enable workers to do more.

Implications for Organizations in Practice

Making Decisions Based on Data: Employers should always seek out fresh approaches to utilize HRA as it helps workers become more proficient at what they perform. Searching for patterns to enhance performance, followed by something

determining how to execute things more effectively. In order to retain staff and achieve more, organizations may want to ensure that their workers are content at work. If workers have the freedom to choose their hours that they choose, health benefits, and clear instructions on how to advance in their careers, they could find themselves happier and more efficient at work. This focuses on the prioritized assignments that give your staff fulfilling employment. It also provides opportunities for professional growth and a comfortable workplace if one wish to maximize them. Greater employee engagement results in more effort and the successful completion of more tasks, which improves the business's finances.

Useful Implications for PAN India

HRA may assist businesses in navigating the constantly shifting formal as well as informal labour markets. Therefore, this study is very useful for every organization in India. Businesses might be able to help improve employees' performance with the use of predictive analytics. In many parts of India where the economy is fragile, HR analytics assist in monitoring career advancement, compensation, and job security. Fair compensation and straightforward development routes are believed to keep employees happy and discourage them from considering quitting. EE should demonstrate how locals cooperate to get together with one another.

The HRA finds qualified applicants and roles for flexibility alternatives, even if the starting points are unrelated. This enables maintaining a balance between subjective well-being and productivity. HRA could be extremely important for equality and diversity. Companies may also utilize inclusiveness indicators to show how women, Native Americans, and those with disabilities are progressing. Anyone may now easily gain an official post. Integrating HR with Corporate Social Responsibility has become crucial due to the legal necessity to manage employee data in an unbiased and transparent manner. Information requires being managed properly in order to

maintain confidence and fan the flame in terms of HR metrics.

Conclusion

This research provides real data showing how HRA significantly improves people's performance in both direct and indirect ways, inspiring them via dedication and pleasure. Organizations must utilize data when making choices on HR policies if they want more engaged, happy, and high-performing workers. Companies may be able to utilize HR Analytics for good if we are truly ready to tackle the associated moral and ethical dilemmas. This research provides a useful contribution for insights into HRA and how it's related to the JS and EE. As per this study, we find that a huge number of respondent around (67.02 %) agree that HRAs are very useful for the EP. The research recommendations, which emphasize HRA as an influential implementer to improvement organizational performance, serve as a foundation for further research and application.

Limitations:

This study's primary limitation is that it depends upon cross-sectional data to demonstrate the causal relationship between HRA and EP, which could not be determined from the research. Future long-term research can shed light on how HR analytics affect overall performance. A

convenience sampling method is used in the study, which will result in a skewed representation of various staff compositions across every industry. Bias invariably compounds self-reported facts, which might compromise the results' correctness.

Future Research Scope:

Future research might take into account long-term investigations to track the long-term impacts of HR analyses on EP in order to close this gap. Examining how company culture, along with leadership, minimizes HR analysis, overall performance may also be helpful. Examining the applications of HR analytics across various businesses is probably going to be fascinating. So, the moral issue of ensuring privacy and justice in HR decisions needs to be resolved. HRA may be applied in any business since IT, along with healthcare personnel, work together in different processes while obtaining unique cultural standards and expectations.

Also, with an organization's dedication as well as leadership, more investigation is required to ascertain whether other moderating factors are involved. These characteristics may have an important impact on how well HR Analytics boosts performance. Evaluating these mediators might lead to new areas of knowledge about the indirect effects of HRA on EP, JS, as well as EE.

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