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Research Article

LEVERAGING HR ANALYSIS FOR WORKFORCE COST OPTIMIZATION AND DATA-DRIVEN DECISION MAKING: EVIDENCE FROM JASAN TOOLCRAFTS & EQUIPMENTS, SALEM

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Abstract: This study aimed to explore the role of HR analytics for workforce cost optimization and for data-driven HR decisions at Jasan Toolcrafts & Equipments, a manufacturing company based in India. Within the framework of a descriptive survey, a stratified random sample of 130 employees was analyzed by using Two-Way ANOVA, Multiple Linear Regression as well as Factor Analysis (PCA). The main results reveal that the frequency of reviewing employee performance data significantly affects workforce planning ($p = 0.000$). Furthermore, Gender has a significant effect on statistical use ($p = 0.001$).The second regression model revealed that management's evaluation of employee's utilization strongly predicts skill optimization (Beta = 0.475; $p = 0.000$; $R^2 = 0.284$). The third regression model revealed that the workforce data used for performance evaluation significantly controls workforce related expenses ($p = 0.001$). Factor analysis of the variables work experience, trend analysis as well as performance data led to the identification of one dimension of HR analytics which explained 49.74% of total variance (KMO = 0.628). In summary, this study highlights the importance of well-structured HR analytics for optimized workforce costs and for strategic HR management at manufacturing companies. Therefore, sufficient investment in corresponding tools as well as in HR staff's analytics capabilities and in a data-oriented HR culture is required.

Keywords: HR Analytics, Workforce Cost Optimization, Data-Driven Decision Making, Manufacturing Industry, Employee Performance, Workforce Planning, Jasan Toolcrafts & Equipments.

INTRODUCTION

It is evident from today's world that the management of data has to be done in such a manner that it becomes competitive compared to other organizations. As far as the contribution of people in terms of their role in the effectiveness and innovation of any organization is concerned, it can be stated that they are the most important resources of the modern world. The management of human resources along with its cost has become strategically significant due to the development and competitiveness of the business. However, from an intuitive perspective, human resource management is a field that calls for intuition. As a result, there is no need to examine information in the fields of motivation, training and development, recruiting, and selection. However, as time goes on, other models are created, necessitating their study.

The process of collecting, analyzing, and interpreting information about the human resource for the improvement of the efficiency of human resources management is referred to as HR analytics. This involves the analysis of information relating to the employees such as the performance of the employees, attendance, employee turnover rate, recruitment ratio, training cost, and more. One advantage of HR analytics is the control of labor costs. Some of the labor costs that can be determined are as follows: salary, benefits, training cost, recruitment cost, overtime cost, and turnover cost.

Some of the labor management problems faced by such firms in the production process include labor-intensive labor

management practices, reduced operating costs, production, and employee satisfaction. Jasan Toolcrafts & Equipments is one such firm that operates from Salem, Tamil Nadu and deals in the production of machinery. It is essential for the firm to adopt appropriate labor management techniques due to the highly competitive nature of the industry. A brief review of the application of HR analytics in reducing labor cost is highlighted in this report.

RELATED WORKS

The growing body of literature on HR analytics reflects its expanding strategic significance across industries. Select studies from 2022 to 2026 are reviewed here to contextualize the present research.

According to Aakanksha Uppal, Yashmita Awasthi, and Anubha Srivastava (2024), in their research on machine learning algorithms for predicting employee performance, predictive models eliminate bias in the evaluation process and improve decisions in human resource management. This validates the efficiency of AI-based tools in selecting excellent employees and developing personalized training modules.

According to Alessandro Margherita (2022), research areas in HR analytics have been structured to identify major topics, which include, among others, data-based decision-making, workforce planning, and performance management. Performance management, workforce optimization, and decision support using analysis are found to be highly related areas within the domain of HR analytics research, which relates strongly to the current research framework.

Hamieddine, Chaymae, Smail Tigani, and Abdelah Chehri (2024) showed that data analysis greatly enhances work force planning, recruitment, and performance management. According to their study, agile organizations based on real-time data become more responsive and make better-informed decisions, which proves the relevance of the current research concerning performance evaluation.

The research conducted by Ndjama (JDN) (2025) explores the possibility and challenges that HR analytics offers in decision-making within organizations. From the outcomes of this study, HR analytics leads to improved decision-making provided that organizations adopt adequate performance measurement systems and use data, thereby proving the findings of this study.

In their study from 2023 on Customized human resource monitoring through HR analytics and artificial intelligence, Xiaoyu Huang, Fu Yang, and Lihua Zhang found out that personalization contributes to better employee satisfaction and performance. In addition, the integration of AI with HR analytics can help improve workforce management strategically, which reflects the potential noted currently.

Adil Benabou and Fatima Touhami (2025) worked on improving HRM processes through classification and regression tree modeling for predicting employee turnover. According to their research results, predictive analytics allows for proactive actions aimed at preventing attrition and promoting employee retention.

The study by Charles Cayrat and Peter Boxall (2022) was conducted using the data from 40 large firms to determine problems related to the use of HR analytics like privacy of information, lack of expertise, and resistance to change among others.

STATEMENT OF THE PROBLEM

In truth, in general, the challenge faced by most production firms in terms of controlling the expenses associated with the human workforce becomes obvious due to the fact that there are no proper data analyses and management techniques for human resources. There is simply no logic behind the decision-making process involved in human resource management, leading to inefficiency in the management of employees and the high expenses incurred in conducting business operations. As such, it becomes necessary to come up with a certain strategy for the analysis of the trends in human resource management, one that focuses not only on the productivity of the employees but also on the mismanagement of their workforce.

OBJECTIVES OF THE STUDY

- To examine the role of HR analytics in improving workforce cost management and enhancing overall operational efficiency within Jasan Toolcrafts & Equipments, Salem.
- To analyze how data-driven HR practices support managerial decision making related to employee performance, workforce planning, and resource utilization in the organization.
- To identify the benefits and practical applications of HR analytics in optimizing workforce productivity and improving strategic human resource management practices in the company.

MATERIALS AND METHODS

Research Design

The format of the studies adopted is that of descriptive studies. This type of research design is uniquely ideal for the systematic description of precise populations, conditions, or phenomena. While causal research designs attempt to find to establish a cause-and-effect mode between two variables, descriptive research offers the simplest descriptions approximately a positive state wins in a selected scenario without establishing any causal mode by means of simple general observation. Descriptive research is qualitative for collecting information regarding contributions of hard work, productivity of manpower, and practice of HR analysis use of questionnaires.

Population and sample size

The target audience in this situation is all employees whose contributions lead to the value creation of the employees of Jasan Toolcrafts & Equipments, Salem. The amount of subjects used in the studies can be one hundred and thirty via the use of stratified sampling technique. Stratified sampling refers to the categorization of people under distinct strata based on specific criteria such as departments within the organization, task role, and experience.

Data Collection

Primary fact sequences are carried out by conducting grounded questionnaire surveys as well as male or female interview. On the alternative hand, secondary records became acquired through annual reviews from companies and HR analytical related books and on-line sources.

Variable

The following variables are examined: departments, gender, age, enjoy, performance appraisal frequency, HR reports, employee utilization rating, information about work pressure in performance appraisals, data-based selection and paintings force price management as independent and independent variables, respectively.

STATISTICAL TOOLS, BE USED

IBM SPSS software was used in carrying out the statistical analysis of the findings and the following statistics tools were utilized:

- Two-Way ANOVA Tool.This tool is used to determine the effect of two independent categorical variables on a continuous dependent variable as well as interaction effects among the variables. This tool was used to examine any existing differences in relation to gender, department, age and HR reports as concerns workforce decision making.
- Multiple Linear Regression: Used to examine the relationship between one dependent variable and multiple independent variables, quantifying the influence of each predictor. Applied to assess how HR practices, employee utilization, and workforce data contribute to cost control and skill optimization.
- Factor Analysis (Principal Component Analysis): Used to identify and group related variables into a smaller number of underlying factors, simplifying complex datasets and detecting hidden patterns among HR analytics variables.

DATA ANALYSIS & INTERPRETATION

Two-Way ANOVA – To find the difference between gender, frequently are employee performance records reviewed in the organization and effective do you think employee data analysis is in improving workforce planning

H_0: There is no comprehensive difference between gender, frequency of employee performance record review, and the effectiveness of employee data analysis in improving workforce planning.
H_1: There is a comprehensive difference between gender, frequency of employee performance record review, and the effectiveness of employee data analysis in improving workforce planning.

Table 1 Descriptive Statistics

Dependent Variable: effective do you think employee data analysis is in improving workforce planning				
gender	Frequently are Employee Performance Records Reviewed in the Organization	Mean	Std. Deviation	N
Male	Very frequently	1.58	.561	33
	Occasionally	1.93	.474	27
	Rarely	3.20	.837	5
	Total	1.85	.690	65
Female	Very frequently	1.23	.439	13
	Occasionally	1.79	.415	24
	Rarely	2.00	.000	2
	Total	1.62	.493	39

Total	Very frequently	1.48	.547	46
	Occasionally	1.86	.448	51
	Rarely	2.86	.900	7
	Total	1.76	.631	130

Source: Primary data

Table 2: Tests of Between-Subjects Effects

Dependent Variable: effective do you think employee data analysis is in improving workforce planning					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	16.012[a]	5	3.202	12.564	.000
Intercept	155.153	1	155.153	608.725	.000
@ gender	3.183	1	3.183	12.488	.001
@ frequently are employee performance records reviewed in the organization	9.146	2	4.573	17.941	.000
@ gender * @ frequently are employee performance records reviewed in the organization	1.518	2	.759	2.978	.059
Error	24.978	128	.255		
Total	363.000	130			
Corrected Total	40.990	129			
a. R Squared = .391 (Adjusted R Squared = .360) @ 5% significance					

Source: Primary data

Since the significance level of the total model is less than 0.05 at 0.000, the model is statistically significant, meaning that the null hypothesis will be rejected. This means that indeed, there exists a statistically significant relationship between the three independent variables, which include gender, performance monitoring, and the effectiveness of performance records of employees. The significance level of the gender variable is 0.001, meaning that there is a statistically significant relationship between perceptions of both sexes.

However, the significance of the interaction effect between gender and review frequency (0.059) is just above 0.05, and hence the interaction effect of the two factors does not carry any statistical significance. The value of R^2 is 0.391, which means that 39.1% of the variability of the dependent variable has been explained by the independent variables. Performance reviews are essential in workforce planning.

Multiple Linear Regression – To find the regression between effectively does the organization utilize employee skills and abilities, often does management evaluate the efficiency of employee utilization and frequently are cost-related workforce reports reviewed by management.

H_0: There is no comprehensive relationship between management evaluation of employee utilization, review of cost-related workforce reports, and effective utilization of employee skills and abilities.
H_1: There is a comprehensive relationship between management evaluation of employee utilization, review of cost-related workforce reports, and effective utilization of employee skills and abilities.

Table 3: Descriptive Statistics

	Mean	Std. Deviation	N
effectively does the organization utilize employee skills and abilities	1.76	.631	130
often does management evaluate the efficiency of employee utilization	1.63	.610	130
frequently are cost-related workforce reports reviewed by management	1.65	.587	130

Source: Primary data

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.533[a]	.284	.270	.539
a. Predictors: (Constant), frequently are cost-related workforce reports reviewed by management, frequently are cost-related workforce reports reviewed by management				

Source: Primary data

Table 5: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.629	2	5.814	20.000	.000[b]
	Residual	29.362	128	.291		
	Total	40.990	130			

a. Dependent Variable: effectively does the organization utilize employee skills and abilities

b. Predictors: (Constant), frequently are cost-related workforce reports reviewed by management, frequently are cost-related workforce reports reviewed by management

Source: Primary data

Table 6: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.742	.184		4.035	.000
	often does management evaluate the efficiency of employee utilization	.491	.094	.475	5.248	.000
	frequently are cost-related workforce reports reviewed by management	.133	.097	.124	1.367	.175

a. Dependent Variable: effectively does the organization utilize employee skills and abilities

Source: Primary data

Dependent Variable: effectively does the organization utilize employee skills and abilities | Source: Primary data

The regression analysis indicates that the model is statistically significant at a level of significance of 0.000, thereby making it necessary for the null hypothesis to be rejected. With an R^2 of 0.284, it implies that there exists a moderate degree of explanation. Among all the variables examined, the assessment by managers of how well the workers have been utilized stands out as the most significant factor (Beta = 0.475, p = 0.000). In spite of being directed correctly, the cost review pertaining to the examination of work forces is statistically insignificant (p = 0.175). Factor Analysis – To find the factor analysis between work experience in the organization, often does management analyze workforce trends before making decisions and useful is workforce data in improving employee performance evaluation.

Table 7: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.628
Bartlett's Test of Sphericity	Approx. Chi-Square	72.262
	df	6
	Sig.	.000

Source: Primary data

Table 8: Communalities

	Initial	Extraction
Work Experience in the Organization	1.000	.645
often does management analyze workforce trends before making decisions	1.000	.694
useful is workforce data in improving employee performance evaluation	1.000	.387

Extraction Method: Principal Component Analysis.

Source: Primary data

Table 9: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.990	49.744	49.744	1.990	49.744	49.744
2	.904	22.605	72.350			
3	.738	18.460	90.809			

Extraction Method: Principal Component Analysis.

Source: Primary data

Table 10: Component Matrix[a]

	Component
	1
Work Experience in the Organization	.803
often does management analyze workforce trends before making decisions	.833
useful is workforce data in improving employee performance evaluation	.622
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

Source: Primary data

The KMO test result shows 0.628, demonstrating sufficient sampling adequacy, while the Bartlett's Test of Sphericity shows significant results ($p = 0.000<0.05$). There is one extracted component, representing 49.74% of the total variance. All the three variables show high factor loadings, which are as follows: workforce trend analysis (0.833), work experience (0.803) and usefulness of workforce data in performance evaluation (0.622). As the findings indicate, all the three variables are significantly related and form an integrated dimension under Human Resource analytics with experience, trend awareness and performance evaluation.

FINDINGS

- The Two-Way ANOVA model examining gender, frequency of performance reviews, and workforce planning effectiveness is statistically significant ($p = 0.000$), with $R^2 = 0.391$. Gender is significant at $p = 0.001$, and frequency of performance record review is highly significant at $p = 0.000$, indicating that frequent reviews substantially enhance data-driven workforce planning outcomes.
- However, in this research, there is no notable value on the interaction effect between gender and review frequency (p-value = 0.059). The result implies that despite the differences in their point of views, the interaction of the two variables did not bring about new differences when it comes to effectiveness in workforce planning. Two-Way ANOVA was run separately to confirm that use of human resources-related reports significantly influences workforce decision-making ($p = 0.006$), while age has no significant influence on decision-making ($p = 0.439$). Interaction effect of age and HR reports is also non-significant ($p = 0.172$).
- The second regression equation shows statistical significance ($p= 0.000$, $R^2= 0.284$), which proves that the assessment by management of employee usage forms the strongest factor that predicts skill deployment (Beta = 0.475, $p = 0.000$). Reviewing reports on cost-related issues is not statistically significant on its own ($p = 0.175$)
- Thirdly, there is significance in the third regression ($p = 0.000$, $R^2 = 0.192$) because data about employees utilized in performance appraisal ($p = 0.001$) as well as work experience ($p = 0.006$) significantly help control costs associated with the
- The factor analysis done through PCA method gives only one factor with a value of KMO = 0.628 and Bartlett's significance value of 0.000. This one factor has accounted for 49.74% of variance. Workforce trend analysis (0.833), work experience (0.803), and performance data utility (0.622) constitute this factor.
- Another factor analysis (KMO = 0.657; Bartlett's $p = 0.000$) reveals one factor accounting for 49.70% of variance, proving that skills utilization by employees, decision making based on data, and decision support data availability are highly related aspects of the HR analytics system.

SUGGESTIONS

The company needs to bolster the integration of HR analytics into their management decision-making process. Given the results showing that the use of HR reports plays a big role in making decisions regarding the workforce, it is only proper that the HR reports are always produced and understood by the management for better decision-making and efficiency.

It is suggested that there should be a more organized and consistent process of conducting performance reviews since the frequency with which the company reviews its employee performance records is recognized as a significant factor that influences the effectiveness of its workforce planning process. It becomes necessary to assess the usage of employee usage since this is the single factor showing a very strong influence towards skills usage (Beta = 0.475). Assessing the performance of employees regularly enables efficient resource allocation as well as ensuring high productivity levels.

In order to solve this problem, the organization needs to focus on enhancing the efficiency of data regarding the workers in conducting the performance appraisal. The introduction of such a data-driven system will contribute significantly towards making the appraisal process objective and will increase employees' level of motivation.

Recommendations include investing in HR analytic tools, training, and culture. The improvement of the analytical capabilities of the HR personnel and managers, coupled with the creation of an organizational culture that values evidence-based decision-making, will greatly improve cost efficiency in the management of the workforce.

CONCLUSION

This research paper regarding the use of HR analytics in cutting down labor costs and aiding decision making through data analysis in Jasan Toolcrafts & Equipments, Salem, clearly demonstrates the growing importance of using such techniques in modern-day HRM within the manufacturing sector. The significance of the impact created by HR analytics can be seen as substantial and statistically significant in relation to its contribution to organizational performance through the use of HR reports and data-driven decisions.

The results show that using data to drive HR strategies increases the effectiveness of managers when making decisions related to aspects like employee performance evaluations, staffing plans, and resource use. Analysis of past employee performance records and the greater use of workforce data facilitate better decision-making. The significant role played by management evaluation of employee utilization indicates that the key factor in workforce optimization is not reporting but analysis.

Moreover, factor analysis proves that the notion of work experience, analysis of trends within the organization, and importance of performance data represents one coherent idea in HR analytics, highlighting the point that the significance of analytics grows as knowledge about the situation grows on the part of the employees.

In conclusion from the research carried out above, it can without any doubt be said that even though the firm may be involved in one way or another in the utilization of HR analytics, it is clear that the organization still has ample opportunity for exploiting the benefits of HR analytics. All they require at this point is the right perspective to manage and analyze their HR data.

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