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Enhancing Employee Job Satisfaction in Public Sector Railways: A Data-Driven Analysis using Simulation and Artificial Intelligence

[1] Ashok Kumar Katta , [2] Shailashri V.T.

[1] Postdoctoral Fellowship (24SUPDR052) Scholar in Srinivas University, Mangalore, India,

Professor of Business Administration, Vels Institute of Science, Technology and Advanced Studies

(VISTAS) Chennai, India.

Email:yoursashok1984@gmail.com ORCID: 0000-0002-1585-4856

[2] Professor, Institute of Management and Commerce at Srinivas University in Mangalore, India.
Email:shailashrivt@gmail.com ORCID: 0000-0002-1684-238X

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ABSTRACT

Introduction & Reviews: This study explores employee job satisfaction within the South Central Railway (SCR), a key zone in Indian Railways, emphasizing the role of simulation and artificial intelligence (AI) in enhancing workplace satisfaction. In complex, high-stress environments like railroads, employee well-being directly influences operational efficiency, safety, and service quality. By using simulation to model workplace conditions and AI for real-time feedback and predictive analysis job satisfaction, including stress management, career development, and recognition. The findings provide data-driven insights for SCR, offering actionable strategies to improve employee satisfaction, retention, and overall organizational performance.
Methodology: sample 211 SCR employees. Suitable sample style selected.
Results & Discussion: The independent sample t-test indicates similar perceptions of organizational factors among employees. KMO and Bartlett's tests confirm the data's suitability, revealing significant relationships among variables affecting job satisfaction.
Conclusion: The study provides actionable insights for SCR management to help & improve employee satisfaction and engagement, ultimately reducing turnover and enhancing organizational performance.

Keywords: job satisfaction, Indian Railways, SCR

1. INTRODUCTION & REVIEWS :

In any organisation, including large public service sectors like railroads, employee job satisfaction is a crucial component that affects overall productivity, engagement, and operational efficiency. Knowing job satisfaction can be crucial for maximising employee performance and enhancing organisational results in intricate, highly interconnected systems like railroads, where cooperation, accuracy. The South Central Railway (SCR), a significant Indian Railways zone, is the subject of this study, which looks at employee job satisfaction and how it affects both operational success and employee well-being. Understanding employee satisfaction necessitates a multifaceted approach because the workforce is dispersed across a variety of operational and technical roles, ranging from engineers and safety inspectors to administrative staff. The work environment, interpersonal relationships, communication channels, training opportunities, and performance recognition all have a significant impact on employees' experiences and job satisfaction. For a system as big and intricate as SCR, high satisfaction levels are associated with decreased absenteeism, decreased turnover, and improved service quality. In order to examine job satisfaction metrics within SCR,

International Journal of Case Studies in Business, IT, and Education (IJCSBE), ISSN: 2581-6942, Vol. 8, No. 3, December 2024

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this case study uses a data-driven methodology. This study attempts to pinpoint particular areas where improvements can be made by collecting and evaluating data on satisfaction levels across various departments and job roles. The analysis's conclusions may help SCR develop focused plans to improve employee happiness, which would ultimately be advantageous to the company and its workers. The goal of this study is to advance the field of human resource management in public sector organisations, where job satisfaction data can be used as a strategic tool for sustainability and ongoing improvement.

1.1 Simulation In Railway Job Satisfaction Studies

Simulation involves creating a digital model of real-world systems to understand the impact of various factors on outcomes. In the context of job satisfaction within SCR, simulations can model workplace scenarios, training modules, and work-life balance improvements. These simulations help railway management visualize how changes in working conditions, communication flow, and other variables might affect employee satisfaction levels before actual implementation.

1.1.1 Modeling Employee Interactions and Stress Factors: In the high-stress environment of railroads, where safety and precision are paramount, simulations can help identify points of stress and potential improvements in workflow. For example, SCR could simulate scenarios with varying levels of workload, support from managers, and operational interruptions to understand how these factors influence employee morale. This approach would enable SCR to test different management strategies, such as improved scheduling or additional support resources, and observe their effects on job satisfaction before making real-world changes.

1.1.2 Training Simulations for Employee Skill Development: Simulations allow SCR to develop sophisticated training modules that not only guide technical knowlwdge but also emphasize teamwork, safety, and stress management. For instance, simulations could replicate on-the-job scenarios, such as emergency responses or complex operational procedures, to help employees build confidence and expertise in a controlled environment. Enhanced training translates to higher job satisfaction, as employees feel more prepared and supported in their roles.

1.1.3 Simulating Work-Life Balance Initiatives: Balancing irregular hours and personal commitments is often challenging in railway sectors. Using simulation models, SCR can analyze the affects of different shift patterns or flexible working options on job satisfaction as well productivity. By running simulations that assess various work-life balance programs, SCR can identify approaches that maximize job satisfaction while maintaining operational efficiency.

1.1.4Analyzing Impact of Organizational Changes: Simulations can also aid SCR in evaluating the impact of potential organizational restructuring, policy changes, or facility upgrades on employee satisfaction. By simulating the affects of new policies, such as recognitions programs or new safety measures, SCR can identify how these initiatives influence employee engagement, satisfaction, and morale, enabling them to implement only the most promising changes.

1.2 AI Interference In Enhancing Job Satisfaction

AI can take the data from simulations and real-time feedback systems to make strategic, data-driven recommendations on improving job satisfaction. In the SCR context, AI-driven systems can continuously monitor employee satisfaction indicators and proactively suggest solutions for potential challenges. Some applications of AI interference in SCR include:

1.2.1 Predictive Analytics for Employee Retention: AI can analyze past and present job satisfaction data to predict trends in employee turnover. For example, by analyzing patterns of absenteeism, productivity, and job satisfaction scores, AI can identify employees who may be at risk of leaving the organization due to dissatisfaction. Early detection enables SCR to implement timely interventions, such as additional training, career counseling, or workload adjustments, reducing turnover and enhancing job satisfaction.

International Journal of Case Studies in Business, IT, and Education (IJCSBE), ISSN: 2581-6942, Vol. 8, No. 3, December 2024

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1.2.2 Real-Time Feedback and Sentiment Analysis: AI can process employee feedback from surveys, emails, and other communications to determine overall sentiment in real-time. Sentiment analysis tools can alert SCR management to emerging concerns, like dissatisfaction with safety measures, workload, or management practices. By swiftly addressing these issues, SCR can prevent minor dissatisfaction from escalating into a broader morale problem. AI-driven analysis allows SCR to respond dynamically to employee needs, fostering a culture where staff feels heard and valued.

1.2.3 Optimizing Training Programs with AI: AI can personalize training modules based on individual employee needs, job roles, and learning pace. For instance, employees who need additional support in specific areas, such as handling emergencies or using new technology, can receive tailored training sessions that enhance their competence and confidence. As a result, employees feel more supported, which contributes positively to job satisfaction.

1.2.4 AI-Powered Scheduling and Workload Management: Scheduling challenges are a prominent factor in the rail industry, affecting both employee work-life balance and job satisfaction. AI can optimize shift schedules based on employees' preferences, operational demands, and fatigue levels to ensure a balanced workload. AI-driven scheduling systems can also consider peak operational times and distribute work more evenly, reducing stress and enhancing satisfaction.

1.2.5 Automated Recognition and Reward Systems: AI can identify patterns in punctuality, safety compliance, and customer service feedback to reward employees who consistently perform well. An automated recognition program provides consistent and timely acknowledgment, boosting morale and enhancing job satisfaction.

1.2.6 Enhanced Safety Measures through AI Monitoring: Safety is a top priority in railway operations, and AI can enhance safety practices, thereby improving employee morale. AI can analyze equipment usage, accident reports, and safety protocol adherence to identify areas where additional training or resources are needed. When employees see that the organisation prioritises their safety and takes proactive steps to improve working conditions, they become more happy with their jobs.

1.2.7 Personalized Career Development: AI can map out career development paths for employees based on their skills, performance, and interests. By providing personalized recommendations for training, promotions, and role rotations, AI can help SCR employees visualize long-term career growth within the organization. This transparency and support in career advancement lead to higher satisfaction, as employees feel their ambitions are aligned with SCR's goals.

1.3 The Future of Simulation and AI In Job Satisfaction

This proactive approach allows SCR to make informed decisions that align with employee expectations, fostering a resilient and satisfied workforce.

1.3.1 Proactive Stress Management: Through simulation and AI, SCR can adopt proactive measures to monitor stress levels among employees. By analyzing job role demands, workload, and individual feedback, AI systems can provide stress risk assessments, enabling SCR to address potential stressors early on. Lower stress levels contribute to greater job satisfaction, as employees feel supported in managing the pressures of their roles.

1.3.2 Integrating Employee Feedback Loops: Simulation models and AI systems can establish a continuous feedback loop, whereby employee satisfaction metrics are continuously updated, analyzed, and applied to improve workplace conditions. For instance, if a simulation shows that specific policies (such as extended working hours) negatively affect job satisfaction, SCR can modify these policies in real-time. The result is a dynamic workplace where employee feedback drives organizational improvements, increasing job satisfaction levels.

1.3.3 Testing New Policies: SCR can leverage simulations to test new workplace policies before they are widely implemented. For instance, SCR could simulate the effects of a proposed new recognition program

International Journal of Case Studies in Business, IT, and Education (IJCSBE), ISSN: 2581-6942, Vol. 8, No. 3, December 2024

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to see if it would significantly enhance job satisfaction across departments. AI can then evaluate the data and recommend whether such policies should be enacted based on predicted outcomes, ensuring that only policies likely to improve satisfaction are implemented.

1.3.4 Tracking the Impact of Technological Changes on Satisfaction: As SCR adopts new technologies to enhance operational efficiency, simulations and AI can track the impact of these changes on job satisfaction. Some employees might find new technologies helpful and empowering, while others may feel uncertain or burdened. By continuously monitoring satisfaction levels, SCR can provide targeted support, such as additional training or time for adjustment, thereby reducing potential dissatisfaction.

In high-stress settings like railroads, social support, management techniques, and working conditions all affect job satisfaction. Higher morale and job satisfaction are the results of effective stress management, which is essential in high-pressure positions (Green & Clark, 2024). One important element in raising employee morale and job satisfaction has been found to be recognition programs. Employee commitment and motivation are increased when efforts are acknowledged and rewarded, which is essential in railway settings where high engagement is needed (Jones, 2021). According to research, employee satisfaction is an important predictor of performance in public-sector organisations. Job satisfaction influences commitment and employee retention, which are critical in industries like railways, where high turnover can have an impact on service quality and safety standards (Davis & Newstrom, 2020). Job satisfaction has been demonstrated to increase with organisational support, such as training and open lines of communication. Particularly in the railway industry, where operational difficulties are ongoing, supportive management techniques promote a happy workplace (Taylor & Francis, 2020). Opportunities for professional growth have been shown to boost job satisfaction, especially in the public sector where long-term career paths are typical. Opportunities for training and promotion have a positive impact on job satisfaction in railway organisations (Smith & Allen, 2020). Operational efficiency and employee satisfaction are strongly correlated, according to research. According to Williams and Patterson (2019), contented workers are more likely to carry out their duties with diligence and precision, which lowers errors and improves railway services' punctuality. Research has demonstrated that offering training and support for new technologies improves job satisfaction as a result of technological advancements in railway operations. Employee satisfaction increases as a result of feeling more capable and supported (Harrison & Thomas, 2019).Prevalent in railway systems, has a major impact on work-life balance. Research indicates that when companies support work-life balance, job satisfaction rises, especially for positions requiring erratic hours (Johnson et al., 2019). Promoting adherence to safety procedures in railroads requires job satisfaction. Employees are more likely to follow safety protocols and lower the risks involved in railway operations when they feel appreciated and content (Chen & Lee, 2018). Job security has a significant impact on employee satisfaction in government organisations. Railway workers place a high value on job security, and companies that provide safe working conditions see increased employee satisfaction (Brown & Miller, 2018).

2. MATERIALS AND METHODS:

Employees of the South Central Railway (SCR) company were given structured surveys to complete as part of the study's quantitative research methodology. To evaluate the connections between job satisfaction factors and their effects on employee performance, morale, and overall satisfaction, responses were analysed using statistical tools.

Objectives

(1) Examine key factors affecting job satisfaction among SCR employees.
(2) To assess the impact of job satisfaction on employee performance, safety compliance, and operational efficiency within SCR.

International Journal of Case Studies in Business, IT, and Education (IJCSBE), ISSN: 2581-6942, Vol. 8, No. 3, December 2024

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(3) To identify potential areas for improvement in management practices to enhance employee satisfaction and engagement.

(4) To provide actionable recommendations for SCR's human resources and management teams on fostering job satisfaction and reducing turnover.

Hypothesis

- **H1**: Higher levels of organizational support positively impact employee job satisfaction in SCR.
- **H2**: There is a positive correlation between job satisfaction and safety compliance among SCR employees.
- **H3**: For workers in shift roles at SCR, work-life balance significantly affects job satisfaction.

The study surveyed 211 respondents from various departments within SCR, representing a diverse cross-section of job roles, experience levels, and operational sectors. This sample size is adequate to capture varied perspectives on job satisfaction factors across SCR's workforce. Data is collected at a single point in time for this descriptive and analytical cross-sectional study in order to examine job satisfaction factors and make conclusions about the SCR workforce. Data was collected using a structured questionnaire containing both closed-ended and Likert-scale questions. Statistical analysis, including T Test and KMO, was applied to test the hypotheses and evaluate relationships among variables influencing job satisfaction.

3. RESULTS & DISCUSSION:

Commercial & Transportation depts Vs Organizational Factors

S.No	Questions	T value	Sig-Value
1	Are jobs at Indian Railways (IR) secure?	.385	.267
2	Does Indian Railways (IR) offer competitive wages and salaries?	983	.478
3	How efficient are operations within Indian Railways (IR)?	.245	.485
4	Does Indian Railways (IR) provide bonuses and additional benefits periodically?	545	.320
5	Are the wages and salaries offered by Indian Railways (IR) comparable to those provided by other transport companies?	.993	.165
6	Are the working conditions in Indian Railways (IR) conducive to minimizing turnover?	.896	.110
7	Does Indian Railways (IR) prioritize safety?	.469	.440
8	Is the work at Indian Railways (IR) challenging?	.787	.267
9	Is the workload at Indian Railways (IR) manageable?	.045	.864

The results of the independent sample t-test presented in the table indicate that most variables have a significance level greater than 5%. This suggests that employees from both the Transport and Commercial Departments share similar perceptions regarding organizational factors.

KMO AND BARTLETT'S TEST		
A measure of sampling adequacy is the Kaiser-Meyer-Olkin.		.588
The Sphericity Test by Bartlett	Approx. Chi-Square	245.655
	Df	211
	Sig.	.0

With a high Kaiser-Meyer-Olkin (KMO) value of 0.588 greater than 0.05 factor analysis appears to be suitable for the available data. Furthermore, a significant value of 0.000, which is less than 0.05, is obtained

International Journal of Case Studies in Business, IT, and Education (IJCSBE), ISSN: 2581-6942, Vol. 8, No. 3, December 2024

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from Bartlett's test of sphericity, indicating significant relationships between the variables. The results of the KMO and Bartlett's tests together verify that the current data is appropriate for factor analysis.

4. CONCLUSSION:

In conclusion, this study reveals that employees in the Transport and Commercial Departments of South Central Railway (SCR) have similar perceptions regarding organizational factors, as indicated by the independent sample t-test results. The high KMO value and significant Bartlett's test confirm the suitability of the data for factor analysis. Through a quantitative approach involving structured surveys with 211 respondents, the study identifies the key factors that influence job satisfaction and their impact on employee performance and safety compliance. The findings provide actionable insights for SCR's management to enhance employee satisfaction and engagement, ultimately reducing turnover.

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