

## **Strategic HR Practices in Steel Industries and Sustainable Developmental Goals**

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## Abstract

The purpose of the paper is to detect global strategic human resource practices of steel industries and discover their latent thematic dimensions and lastly, to establish their link with the sustainable developmental goals (SDGs). To conduct the study, systematic literature review was conducted to detect the strategic HR practices prevailing globally from reputed peer-reviewed journals published between 2018 to 2026. From a pool of 238, articles and removing duplication, 114 articles were sorted out for the study in phase-II. Subsequently, these articles were subjected to a further screening process based on their relevance, objectivity, and alignment with the objectives of the present study. As a result, 43 articles were identified as directly relevant and suitable for detailed analysis. A systematic analysis of these selected studies enabled the identification and synthesis of 16 strategic HRM practices relevant to the steel industry. Further, these strategic HR practices were thematically categorised and aligned with sustainable developmental goals (SDGs). The findings will offer academicians an opportunity for further analysis and practitioners with a structured framework to attend the strategic HR practices. The study will contribute to emerging literature the linking of strategic HR practices with SDGs and can provide a foundation to address the complex challenges of steel industries. The study broadens the scope of strategic HR practices integrating SDG in this framework discovering four key dimensions.

**Keywords:** Strategic Human Resource Practices; Steel Industry, Sustainable Developmental Goals

## 1. Introduction

The steel industry stands as the foundation pillar of infrastructure, industrial, and economic development (Nechifor *et al.*, 2020; Wandebori & Murtyastanto, 2023; Islam, 2025). The industry being capital intensive, stands in a hyper-competitive market witnessing rapid technological infusion, fluctuating demand cycles, and stringent regulatory guidelines (Wang *et al.*, 2021; Lindskov, 2022; Weinel *et al.*, 2024). Traditional growth strategies in heavy industries hinges on modern equipment, huge capital investment, and optimised supply chain, whereas organization's contemporary achievement lies on human capital planning (Rezaei *et al.*, 2021; Absar *et al.*, 2022; Tian and Ou, 2024; Polevoy *et al.*, 2026). Profit margin is dictated in a continuous improvement programmed plant efficiency, and workplace safety, but

competitive advantage is gained through the core driver, i.e., human resources (Jiang *et al.*, 2020; Branca *et al.*, 2020; Verma *et al.*, 2020; Kumar *et al.*, 2026; Ge *et al.*, 2026).

Hence, strategic human resource management (SHRM) takes the centre stage in steel manufacturing transitioning from conventional to transaction-oriented HRM (Gajdzik and Wolniak, 2021). Organizational capability is being built on integration of varied HR practices and alignment of HR strategies with larger business objectives (Moustaghfir *et al.*, 2020; Storey & Wright, 2023). By encompassing talent acquisition, organized competency development, performance-based reward systems, unremitting safety training, and active employee retention, strategic HR practices directly influence operational improvement in steel industry (Kumar *et al.*, 2026). Custom-made HR interventions are required to uphold operational efficiency and productivity in the inimitable workplace of steel industries with multi-shift operations & production in a challenging work environment, and complex labour-management relationships.

Exploratory and empirical research tailored for steel industries present in fragmentation regardless of extensive literatures examining SHRM (Das, 2023; Boon *et al.*, 2025; Cheng *et al.*, 2025; Kumar *et al.*, 2026). SHRM remained a homogeneous entity in existing literatures overlooking distinct realities of operations, safety, blue to white collar labour ratios etc. prevailing in metallurgical entities (Das, 2023; Vanderstukken *et al.*, 2026). Moreover, quantitative studies focussed on linkages between HPWS (High-Performance Work Systems) and organizational reflections. Lack of exploratory, contextualised insights concerning to strategic interventions towards operational practices adopted and perceived in steel plants, are observed.

To abridge these gaps the present study focusses on the SHRM practices being implemented in steel plants in an ever-changing dynamic environment. The following objectives are delivered in this study:

- i. To identify the primary strategic HR practices being prevailing in global steel industries,
- ii. To factorize the strategic HR practices in Indian environment, and
- iii. Finally, to link those strategic with prevailing Sustainable Developmental Goals.

The article is structured in a systematic manner; section-2 describes the methodology adopted, section-3 covers the findings, section-4 deals with discussion and section-5 concludes the article.

## 2. Research Methodology

*2.1 Detection of strategic HR practices:* A systematic literature review was employed to detect the strategic HR practices prevailing globally from reputed peer-reviewed journals published between 2018 to 2026. Relevant literatures were retrieved from reputed databases such as Scopus, ScienceDirect, Springer, and ProQuest. Following a systematic screening and filtering process, the strategic HRM practices relevant to steel industries were identified and sequenced alphabetically for further analysis.

*2.2 Factorization of strategic HR practices:* The strategic HR practices so obtained were subjected to a group of five experts who have more than 15-years of experience in HRM in steel plants of India. After multiple discussions for week, the experts suggested four factors accommodating the 16 strategic HR practices.

*2.3 Linking with SDGs:* For each strategic HR practice, the primary linked SDG were evaluated from the 17 SDGs. After linking each SDG with respective strategic HR practice, table 2 was formed.

## 3. Findings

### 3.1 Strategic Human Capital Development

*3.1.1 Apprenticeship Programs:* Apprenticeship Programs are attractive to job-seeking youths because the steel industries provide practical on the job-trainings which can be an early entry to employment, economic independence, and social recognition. These programs provide a mechanism for developing industry-ready skills and bridging school-to-work transitions (Altreiter, 2021). The need for initial vocational education and training to respond to Industry 4.0 as digitisation is transforming production processes and demanding new skill requirements (Antonazzo *et al.*, 2023). Industrial transitions require coordinated skill policies, retraining, and workforce adjustment measures (Botta, 2019).

*3.1.2 Competency Mapping:* Shaheen *et al.* (2019) developed a framework for contractual workers in India's steel sector classifying competencies into knowledge, skills, and attitudes supported by behavioral indicators. Organizations can map and evaluate workforce competencies for recruitment, training, development, and performance management. Complementing this, Marlapudi and Lenka (2025) identified seven competency groups and 21-

sub-groups prioritizing digital-technical and industry specific competencies recognizing generic competencies as foundational, followed by cognitive and business competencies.

*3.1.3 Leadership Development:* Effective leadership behaviour shapes employee attitudes, satisfaction, and performance in Indian steel industry (Keshari and Verma, 2018). Leadership commitment led to innovation, speed, strategic capability and organizational transformation in JSW steel, India (Singh, 2024). Leadership and managerial capabilities support supply chain resilience in Mobarakeh Steel Company, Iran (Amin *et al.*, 2025).

*3.1.4 Learning & Development:* Absorptive capacity and enterprise system practices of organizations co-evolve in a continuous learning process wherein the ability to acquire, assimilate and application of new knowledges become helpful in adapting to new technological changed environment (Wu *et al.*, 2022). Technological capabilities of Iran's steel industry strengthened in adopting technological learning mechanism driving innovation through learning experience, interaction, and knowledge development (Attarpour and Nasri, 2023). Workforce skills, technological knowledge, and organizational readiness are the factors of successful implementation of Industry 4.0 (Khourshed *et al.*, 2023).

*3.1.5 Skill Development:* Singh and Gupta (2018) highlighted worker training, skill development, occupational health, and social wellbeing as important social dimensions of sustainability in Indian steel industry. Akyazi *et al.* (2023) emphasized the importance of technical knowledge, interdisciplinary skills, and ability to manage emerging sustainable production technologies. Stroud *et al.* (2026) further showed that AI adoption in metallurgy requires transversal skills such as problem solving, collaboration, communication, adaptability, and critical thinking, in addition to technical skills.

*3.1.6 Talent Management:* Systematic talent identification, development, retention and alignment of employee capabilities to address organizational objectives, Salamatian *et al.* (2024) developed a talent management model that highlighted the importance of talent management in technology-intensive steel industry. Developing a talent management support system in sustaining organizational human capabilities, Morioka *et al.* (2025) demonstrated the value of systematic approaches in identifying employee capabilities, supporting employee development, and maintaining skill and knowledge.

## **3.2 Employee Relations, Inclusion & Wellbeing**

*3.2.1 Diversity & Inclusion:* Women's participation in traditionally male-dominated steel industries is shaped by organizational structures, workplace culture, and opportunity for career development. Gender discrimination and occupational segregation can restrict women's advancement and inclusion (Salminen-Karlsson, 2020). Tata Steel's approach to LGBT+ inclusion demonstrated organizational policies, leadership commitment, awareness initiatives, and inclusive network practices support diversity (Bharadwaj and Singh, 2021).

*3.2.2 Employee Engagement:* Work-life balance, leadership style and employee engagement contribute employee performance highlighting workforce effectiveness (Katili *et al.*, 2021). Supportive management practice can enhance employee attachment strengthening employee loyalty in Egyptian iron and steel industry (Abd-El-Salam, 2023). Lean management contributes to sustainable performance with employee performance play an important moderating role (Thawonrnsujaritkul and Boonnual, 2024). Employee involvement fosters green HRM supporting sustainability in steel industry (Kumar *et al.*, 2026).

*3.2.3 Employee Welfare:* Employee wellbeing, social responsibility, safe working conditions and stakeholders' welfare are highpoints in the integration of eco-centric and socioeconomic dimensions in sustainability framework of steel industry (Lahiri *et al.*, 2025). ESG-oriented practices emphasize the social dimensions of Thailand's steel industry (Thawonrnsujaritkul and Boonnual, 2024).

*3.2.4 Industrial Relations:* Sustainable industrial relations depend on joint learning, collective bargaining, cooperation and institutional adaptation to respond constructively in technology implementation and organizational changes (Müller-Jentsch, 2018). Digital gamification supported energy-efficiency initiatives in European steel industries creating new forms of employee participation and interaction, stressing workforce involvement (Stroud *et al.*, 2020). Decarbonization involves argued power relations and governance, making stakeholder negotiation and worker participation important (Grouiez and Klenaner, 2026).

### **3.3 Digital, Innovation & Performance Excellence**

*3.3.1 Digital HR:* Changes in workforce capabilities are happening through digitisation, data-driven decision making, automation, and knowledge management reshaping value creation in the steel sector considering Industry 4.0 (Tolettini and Lehmann, 2020). Transition towards Industry 4.0 depends on IoT, AI, robotics, and cloud computing increasing the need for digital-skilled manpower (Gajdzik and Wolniak, 2021). Digitally supported and transparent HR

practices enhance job satisfaction (Bandyopadhyay and Srivastava, 2022). Zhou *et al.* (2022) showed that intelligent manufacturing transform steel production, emphasizing the need for employee reskilling, digital HR and technology-oriented workforce development.

**3.3.2 Innovation Culture:** Knowledge management support innovation and sustainability by facilitating organizational learning, knowledge sharing, and new practices development in integrated steel industry (Deshmukh *et al.*, 2024). Critical value-management factors supporting sustainable steel manufacturing, emphasise on strategic management, innovation, stakeholder involvement, and continuous improvement (Ali *et al.*, 2026).

**3.3.3 Performance-based Rewards:** Implementation of sustainability initiatives can be strengthened linking employee responsibilities and organizational targets with employee involvement, operational responsibilities and effective management of waste-water management of steel plants (Deng *et al.*, 2023). Green total factor productivity needs organizational mechanisms to pursue green innovation and efficiency improvement with encouraged employees and managers to meet technological changes and environmental performance (Zeng *et al.*, 2025).

### **3.4 Sustainable, Responsible & Safe HRM**

**3.4.1 CSR Participation:** CSR Programs can be strategically integrated into organizational expansion adapting to local stakeholder and institutional context (Park *et al.*, 2019). Organized labour influences corporate philanthropy highlighting employees and unions as important CSR stakeholders (Song *et al.*, 2020). Tarigan *et al.* (2021) established that CSR positively influences employees' job pursuit intention and performance through quality of work life. CSR can strengthen stakeholder relationships, employee attraction, workplace quality making it a relevant HR practice for steel industry.

**3.4.2 ESG Integration:** ESG reporting strengthens connectivity between sustainability initiatives and measurable outcomes in Tata Steel (Dutta, 2025). Sector specific ESG scoring demonstrates importance of standardized sustainability in steel industry (Dutta and Ghosh, 2025). Tata Steel's sustainability transformation emphasizes decarbonization, renewable energy, resource efficiency and stakeholder-oriented practices in ESG integration (Belavadi and Kulkarni, 2026).

**3.4.3 Safety Excellence:** Systematic hazard identification, implementation of preventive measures, and strengthened occupational safety practices found essential for preventing occupational accidents and injuries among iron and steel workers in West Bengal, India (Rajak *et al.*, 2022). Tappura *et al.* (2023) emphasised the importance of safety monitoring indicators in facilitating continuous improvement through a systematic framework for measuring and managing safety performance. Costa *et al.* (2024) observed through two field studies that pushing interventions into working environment safer employee behaviour can be practised, highlighting the potentiality of behavioural approaches to complement conventional safety systems.

**Table 1:** Summary of Findings

| # | Factors                                      | Strategic HR Practices    | Author (Year)                                                                                                            |
|---|----------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 1 | Strategic Human Capital Development          | Apprenticeship Programs   | Botta (2019); Altreiter (2021); Antonazzo <i>et al.</i> (2023)                                                           |
|   |                                              | Competency Mapping        | Shaheen <i>et al.</i> (2019); Marlapudi and Lenka (2025)                                                                 |
|   |                                              | Learning & Development    | Wu <i>et al.</i> (2022); Attarpour and Nasri (2023); Khourshed <i>et al.</i> (2023)                                      |
|   |                                              | Skill Development         | Singh and Gupta (2018); Akyazi <i>et al.</i> (2023); Stroud <i>et al.</i> (2026)                                         |
|   |                                              | Talent Management         | Salamatian <i>et al.</i> (2024); Morioka <i>et al.</i> (2025)                                                            |
|   |                                              | Leadership Development    | Keshari and Verma (2018); Singh (2024); Amin <i>et al.</i> (2025)                                                        |
| 2 | Employee Relations, Inclusion & Wellbeing    | Diversity & Inclusion     | Salminen-Karlsson (2020); Bharadwaj and Singh (2021)                                                                     |
|   |                                              | Employee Engagement       | Katili <i>et al.</i> (2021); Abd-El-Salam (2023); Thawonrsujaritkul and Boonnual (2024); Kumar <i>et al.</i> (2026)      |
|   |                                              | Employee Welfare          | Thawonrsujaritkul and Boonnual (2024); Lahiri <i>et al.</i> (2025)                                                       |
|   |                                              | Industrial Relations      | Müller-Jentsch (2018); Stroud <i>et al.</i> (2020); Grouiez and Klenaner (2026)                                          |
| 3 | Digital, Innovation & Performance Excellence | Digital HR                | Tolettini and Lehmann (2020); Gajdzik and Wolniak (2021); Bandyopadhyay and Srivastava (2022); Zhou <i>et al.</i> (2022) |
|   |                                              | Innovation Culture        | Deshmukh <i>et al.</i> (2024); Ali <i>et al.</i> (2026)                                                                  |
| 4 | Sustainable, Responsible & Safe HRM          | Performance-based Rewards | Deng <i>et al.</i> (2023); Zeng <i>et al.</i> (2025)                                                                     |
|   |                                              | CSR Participation         | Park <i>et al.</i> (2019); Song <i>et al.</i> (2020); Tarigan <i>et al.</i> (2021)                                       |
|   |                                              | ESG Integration           | Dutta (2025); Dutta and Ghosh (2025); Belavadi and Kulkarni (2026)                                                       |
|   |                                              | Safety Excellence         | Rajak <i>et al.</i> (2022); Tappura <i>et al.</i> (2023); Costa <i>et al.</i> (2024)                                     |

(Source: Authors' Findings)

### 3.5 Linking Sustainable Developmental Goals with Strategic HR Practices

The principal DSGs aligned with each strategic HR practices were evaluated from the list of 17 SDGs. The details are mentioned in Table 2.

**Table 2:** Associated SDGs with Strategic HRs and Factors

| #                                                           | Factors                                      | Variables                                                                                                                                     | SDGs Linked with CSEs                              | SDGs Linked with Factors |
|-------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------------------|
| 1                                                           | Strategic Human Capital Development          | Apprenticeship Programmes<br>Competency Mapping<br>Learning & Development<br>Skill Development<br>Talent Management<br>Leadership Development | SDG 8<br>SDG 8<br>SDG 4<br>SDG 8<br>SDG 8<br>SDG 8 | SDG 4, 8                 |
| 2                                                           | Employee Relations, Inclusion & Wellbeing    | Diversity & Inclusion<br>Employee Engagement<br>Employee Welfare<br>Industrial Relations                                                      | SDG 10<br>SDG 8<br>SDG 3<br>SDG 8                  | SDG 3, 8, 10             |
| 3                                                           | Digital, Innovation & Performance Excellence | Digital HR<br>Innovation Culture<br>Performance-based Rewards                                                                                 | SDG 9<br>SDG 9<br>SDG 8                            | SDG 8, 9                 |
| 4                                                           | Sustainable, Responsible & Safe HRM          | CSR Participation<br>ESG Integration<br>Safety Excellence                                                                                     | SDG 12, 10<br>SDG 12<br>SDG 8, 3                   | SDG 3, 8, 10, 12         |
| <b>Overall SDGs associated with Strategic HR Practices:</b> |                                              |                                                                                                                                               | <b>SDG 3, 4, 8, 9, 10, 12</b>                      |                          |

(Source: Authors' Compilation)

## 4. Discussion

Based on the theoretical aspects and discussions of literature aimed to clarify the objectives of the research with 16 attributes and their underlying factors aligning with SDGs. According to findings, the 16 attributes identified in this study were clubbed into four factors based on the recommendations of field experts. These factors are appropriately labelled according to the conceptual similarity and thematic relevance such as, F1: Strategic Human Capital Development, F2: Employee Relations, Inclusion & Wellbeing, F3: Digital, Innovation & Performance Excellence, and F4: Sustainable, Responsible & Safe HRM. Out of 17 SDGs, 6 SDGs are found linked to strategic HR practices of steel industry.

*5.2 Practical Implications:* The proposed framework can serve as a practical guide for large steel plants as a guiding and systematically identifying, address and manage strategic HR practices and challenges across large steel plants improving environmental, social and operational performances.

*5.3 Limitations and Future Research Directions:* The is confined to Indian context and covers selected large public and private steel plants. Therefore, the findings may vary across different

geographical region, institutional context, and size of steel plants. Further research could extend this study by developing Interpretative Structural Modelling (ISM) Modelling framework incorporating the identified attributes of SHRM practices. Future directions could be employment of SEM (Structural Equation Modelling) to discover links, direct or indirect effects on overall performance of steel plants.

## 5. Conclusion

The study adopted expert consultation to discover the latent dimensions, such as, *Strategic Human Capital Development, Employee Relations, Inclusion & Wellbeing, Digital, Innovation & Performance Excellence*, and *Sustainable, Responsible & Safe HRM*. All the 16 strategic HR practices prevailing in global forum are being practised in Indian conditions. Overall, SDG 3, 4, 8, 9, 10, and 12 are found linked with Strategic HR Practices. By examining these dynamics this study contributes context-bound empirical insights withing Indian steel industries. Practically the findings provide a basis for actionable design with high impact tailored to the emerging demands of Indian steel industry.

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