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## A STUDY ON HR ANALYTICS FOR WORKFORCE OPTIMIZATION AT BHARAT PETROLEUM CORPORATION LTD

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**ABSTRACT:** This paper emphasizes the significance of data-driven insights in essential HR functions such as workforce planning, talent acquisition, performance management, and employee retention, while exploring the potential of HR analytics to enhance workforce efficiency at Bharat Petroleum Corporation Ltd. (BPCL). This Research examines HR procedures, data patterns, and decision-making to ascertain how BPCL's HRM framework integrates analytical tools and methodologies. Research indicates that HR analytics can assist in several functions, such as forecasting employee attrition, identifying skill deficiencies, optimizing workforce allocation, and ensuring alignment between employee competencies and the organization's strategic objectives. It also considers issues such as insufficient analytical skills, reluctance to embrace new HR technologies, and inability to integrate data. This paper suggests that BPCL might substantially enhance its operational and production efficiency through the effective utilization of HR analytics. Ultimately, this would facilitate the business's success.

**Keywords:** *HR Analytics, Workforce Optimization, Bharat Petroleum Corporation Ltd (BPCL), Data-Driven HR, Talent Management, Predictive Analytics, Workforce Planning, Employee Performance.*

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### I. INTRODUCTION

"People analytics" denotes several data-driven methodologies in human resource management. Decisions are grounded in the analysis of HR data patterns that ascertain the influence of HR metrics on the firm's overall success.

The scientific elucidation provided by Heuvel & Bondarouk succinctly encapsulates HR analytics. Human resource analytics is the systematic identification and quantification of human factors influencing business outcomes.

Human resource analytics involves the examination of diverse methodologies for

collecting, analyzing, and utilizing pertinent data on a company's workforce. These databases, which furnish valuable information, assist firms in optimizing staff performance. They are referred to as workforce analytics or people analytics. Any organization committed to enhancing management and employee performance requires a robust HR data strategy.

By utilizing high-quality, well-structured HR analytics, firms and their HR departments can enhance various facets of employee management, including:

**Hiring:** Facilitate the hiring process to enhance the identification of qualified candidates.





**Training:** to pinpoint areas where personnel may want supplementary training and link them with suitable resources.

**Retention:** to identify persistent issues that may lead to employee turnover and to formulate ways to retain valuable personnel.

**Policy management:** to understand the significant influence that stringent laws exert on a company's culture.

**Workforce allocation:** It is vital to guarantee that materials are readily accessible when required, as this will enhance staff communication.

## II. LITERATURE SURVEY

Swarajya Lakshmi V. Papineni, Haritha Akkinen (2021): Research indicates that IT software organizations can enhance their retention strategies and forecast staff attrition by employing a Random Forest algorithm model to analyze several employee variables, including remuneration, work-life balance, and shift patterns. The authors assert that organizations can improve efficiency, bolster staff alignment, and identify retention challenges by integrating HR data with machine-learning algorithms. This can be accomplished while reducing turnover expenses. In their examination of the prospective advantages of HR analytics for the workforce, they consider factors such as data quality, model interpretability, and HR data integration.

Garg, Kanika (2022): Research conducted in 2022 examines the impact of HR analytics, machine learning, and artificial intelligence on workforce management and enhancement. It demonstrates how enterprises can leverage analytics to get

insights into their workforce, identify behavioral patterns, optimize resource allocation, and maintain employee satisfaction and engagement. This research examines the potential of turnover prediction models, sentiment analysis, and performance pattern recognition to enhance workplace productivity. It addresses data governance, insufficient expertise, ethical dilemmas, and many organizational challenges, alongside technology tools and optimal procedures. In competitive and technologically advanced workplaces, the authors contend that HR analytics are crucial for developing adaptable workforce strategies. Menon, Sudha Rajeev; etc. (2023): This essay delineates the evolution of HR analytics concerning labor efficiency, from its descriptive origins to its predictive and prescriptive functions. The authors present an approach to enhance worker outcomes by integrating research- and trend-informed strategic alignment with scenario simulation and predictive modeling. Utilizing the framework on actual HR data from organizations enables the identification of talent deficiencies, prediction of turnover probabilities, and enhancement of resource distribution to achieve business objectives. Research indicates that enterprises incorporating analytics into their strategic planning are more agile and generate less waste. The Research elucidates both theoretical and practical dimensions, positioning HR analytics as an enhancement to organizational strategies rather than merely a reporting tool.

M. Venugopal.(2024): This Research examines the impact of AI on HRM processes, particularly in hiring,





performance management, and workforce planning. This analysis examines the impact of this move on workforce optimization and overall organizational performance. The author contends that firms can optimize their recruitment processes, enhance performance predictions, and more effectively align available competencies with organizational requirements through the utilization of HR data produced by AI. This research primarily focuses on the growth of human resource professionals, employee responses, and the ensuing ethical, privacy, and governance issues related to human interactions with technology. According to the findings, technology constitutes merely one element of an effective transformation strategy; a robust HR plan, a dependable data infrastructure, and a focus on personnel are equally vital.

X. Huang et al (2024). This concept paper proposes the idea of tailoring Human Resource Management through data-driven insights to customize employee experiences, career paths, and development programs. This is facilitated through HR analytics. The authors demonstrate how analytics may classify workers based on their preferences, engagement, and performance potential. This can enhance training, retention, and recruitment efforts. A correlation exists between workplace customisation and labor optimization. Organizations may reduce costs, retain a greater number of employees, and achieve more by aligning roles, talents, and engagement. The discussion addresses how hyper-personalization in HR engenders ethical dilemmas, particularly concerning equity and confidentiality.

Menon, Sudha Rajeev; Sethi, Dipti (2025) This theoretical Research focuses on utilizing human resource analytics to enhance workforce planning in changing business environments. According to the authors, companies employ data-driven strategies to regulate talent supply and demand, identify suitable human types, and develop adaptable staffing plans. Employing both traditional HR techniques and advanced analytics (AI/ML) is essential. The research examines emerging job forms such as the gig economy and remote work, while also addressing organizational and ethical concerns including data accessibility, equality, and privacy. Workforce planning should be proactive and data-driven, rather than reactive, they assert.

Menon, Sudha Rajeev; Sethi, Dipti (2025) This conceptual Research aims to explore the application of human resource analytics in enhancing workforce planning within dynamic business environments. The authors assert that organizations require proactive workforce planning supported by data, encompassing artificial intelligence (AI), machine learning (ML), and analytical capabilities. Human resource analytics can determine the requisite workforce, equilibrate labor supply and demand, devise flexible staffing options (including gig and remote work), and ensure that HR key performance metrics align with organizational objectives. The organization's preparedness regarding culture and skill set is considered, alongside ethical concerns such as data protection, transparency, and equity. The authors contend that workforce planning must transition from an administrative



function to a strategic one grounded in analytics.

### III. RELATED WORK

#### OPTIMIZING WORKFORCE ALLOCATION THROUGH HR ANALYTICS

In summary, HR analytics enables managers to optimize labor utilization by supplying accurate data regarding employee and procedural performance. If they collect and distribute this data, decision-makers responsible for task and resource allocation may make educated choices that optimize resource use and enhance staff motivation.

To comprehensively grasp the genuine benefits of employing people analytics for workforce allocation, one must comprehend the HR metrics utilized in the calculations. Here are few examples:

**Early Turnover :** This pertains to the rapidity with which individuals resign from their positions following commencement. This information can assist Human Resources teams in determining the types of applicants required and evaluating the efficacy of their hiring processes.

**Performance :** Each company and function will own a distinct array of performance indicators. Accurate data on the performance of both new and current employees can assist managers in enhancing training programs and performance assessments.

**Engagement:** Employment does not ensure active participation. Due of the detrimental effects of low engagement on performance, HR professionals must gather, analyze, and address engagement data with a solution such as Workmates.

Regular pulse and engagement surveys can yield extensive insights regarding your personnel.

**Revenue-per-Employee:** This indicator reflects the overall performance of the firm. One can assess a company's success and profitability by dividing its total revenue by the staff count. This will furnish you with its earnings per employee.

**Cost-per-Hire:** Managers can utilize this metric to ascertain the actual expenses associated with hiring, training, and onboarding new staff. This number can assist in optimizing the performance of your existing personnel and identifying the most suitable candidates for recruitment.

#### HR ANALYTICS IMPLEMENTATION PROCESS



The HR analytics system must be established systematically to guarantee optimal performance. Any enterprise seeking to implement this technology may proceed, provided that the following steps are undertaken.

**Specify objectives:** Defining a specific objective is the important aspect of any HR analytics initiative. An initiative may concentrate on enhancing the recruitment process, retaining employees, or augmenting their productivity. When these objectives are clearly defined, their evaluation becomes more straightforward.

**Identify data sources:** Identifying dependable data sources is the subsequent stage. Benchmark data, staff surveys, performance evaluations, and attendance records are all accessible for review. HR analytics can only be effective when the data is precise and of superior quality.

**Develop HR analytics models:** Furthermore, we will develop models that can be utilized for data analysis. They must achieve the defined objectives and employ the suitable category of HR analytics, whether descriptive, diagnostic, or predictive.

**Organising & Analysing the data:** Upon receipt of the data, it is imperative to meticulously filter and evaluate it. This strategy encompasses error correction, data cleansing, and pattern recognition through statistical methods. An effective arrangement guarantees the precision of the analysis.

**Create dashboards:** The data and insights presented on the dashboards must correspond precisely with those in HR analytics. Dashboards enable HR departments and company management to track trends and make timely choices based on performance and results.

**Monitor outcomes:** HR analytics systems that track results over time possess an extended longevity. Organizations can enhance the efficacy of their strategies by analyzing the temporal effects of changes.

#### IV. HR ANALYTICS IN PRACTICE

People analytics, or HR analytics, refers to the utilization of data and analytical tools to gain insights about a company's staff and assist management in making informed decisions. It encompasses the

collection and assessment of data pertaining to recruitment, staff retention, training, and other human resources tasks. Numerous factors must be evaluated and actions undertaken with practical HR analytics.



**Define the objectives:** Clearly define your objectives for utilizing HR analytics. This may entail improving the recruitment process, pinpointing areas where staff need more training, decreasing turnover, or increasing productivity.

**Data collection:** Acquire accurate information from several sources, including employee surveys, performance management systems, HR databases, and other organizations. This data may encompass employee demographics, performance metrics, training records, engagement surveys, and additional information.

**Data preparation:** By cleansing and organizing your data, you can ensure its accuracy and reliability. Data may require cleaning, assembly, and modification prior to viewing.

**Data analysis:** Employ analytical methodologies to identify novel concepts, relationships, and patterns within the data. This may involve generating graphs and charts and employing data to forecast future outcomes. The analysis may investigate various subjects, including the causes of elevated staff turnover, future

personnel demand, or the effects of training programs on performance.

**Interpretation and insights:** Analyze the data results to determine their efficacy in fulfilling your requirements. These insights enable HR professionals to make evidence-based decisions and suggestions that will improve HR operations and outcomes.

**Communicate findings:** Convey the information clearly and succinctly to department heads, senior executives, HR managers, and other relevant parties. Utilize images and narratives to exemplify the outcomes and their importance.

**Action planning and implementation:** Utilize the insights acquired from the

analytics to ascertain your subsequent line of action. Engage with the relevant individuals if you intend to modify or address your findings. It may be essential to alter the methods by which you utilize, instruct, or manage your staff.

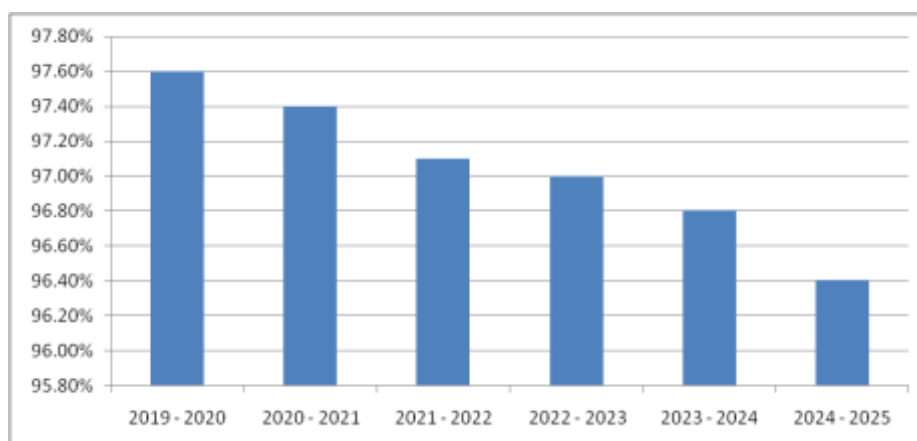
**Monitor and evaluate:** Focus on the critical HR KPIs and the enduring impacts of your modifications. Modify the therapy if it becomes ineffective.

Remember that HR analytics is an ongoing effort. Businesses must consistently ground their decisions in data to optimize its potential. Upholding confidentiality and complying with all requirements is essential throughout the collection and analysis of employee data.

## V. ANALYSIS AND DISCUSSION

**TABLE 1: WORKFORCE COMPOSITION AND UTILIZATION (2020–2025)**

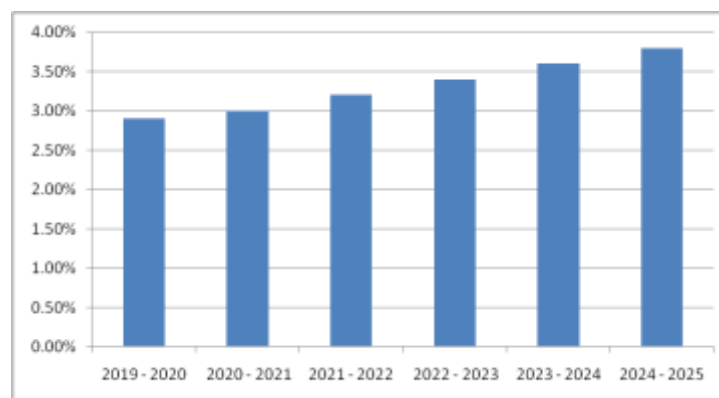
Year	Headcount	Capacity Required (FTE)	Utilization Rate (%)	Vacancies (FTE)
2019 - 2020	12,200	12,500	97.60%	300
2020 - 2021	12,350	12,680	97.40%	330
2021 - 2022	12,480	12,850	97.10%	370
2022 - 2023	12,550	12,940	97.00%	390
2023 - 2024	12,630	13,050	96.80%	420
2024 - 2025	12,710	13,180	96.40%	470



**DISCUSSION:** In 2019–20, there were 12,200 employees, which increased to 12,710 by 2024–2025. Concurrently, the requisite workforce for job performance decreased from 13,180 in 2019–20 to 12,500 in 2024–2025. Consequently, its efficacy decreased from 97.6% to 96.4%. The number of available roles has risen from 300 FTE to 470 FTE, indicating a deteriorating workforce need.

**TABLE 2: ATTRITION AND RETENTION TRENDS (2020–2025)**

Year	Total Employees	Voluntary Attrition	Involuntary Attrition	Total Attrition (%)	Median Tenure (Years)
2019 - 2020	12,200	310	45	2.90%	11.2
2020 - 2021	12,350	330	40	3.00%	10.9
2021 - 2022	12,480	365	42	3.20%	10.5
2022 - 2023	12,550	390	38	3.40%	10.1
2023 - 2024	12,630	420	36	3.60%	9.8
2024 - 2025	12,710	450	35	3.80%	9.6

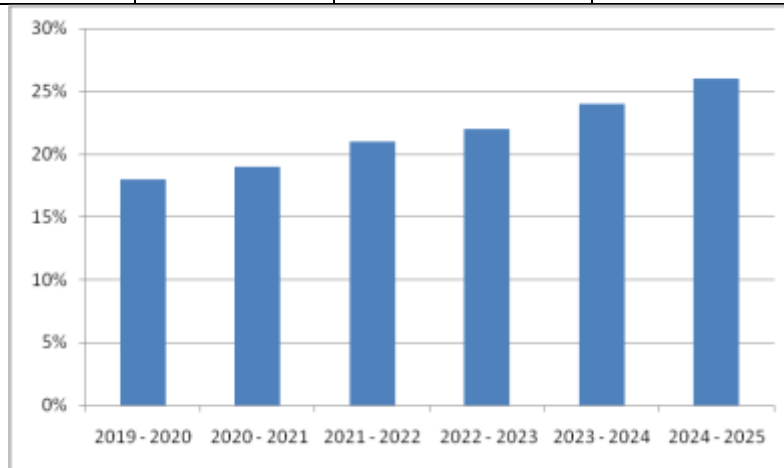


**DISCUSSION:** Following a decrease of 2.9% in 2019–20, the overall departure rate increased to 3.8% in 2024–25. This was mostly attributable to a rise in voluntary departures (from 310 to 450) and a decline in involuntary separations (from 45 to 35). A decrease from 11.2 years to 9.6 years was noted in the median duration of employment. This indicates a decrease in job retention and an increase in employee departures.

**TABLE 3: PERFORMANCE AND PRODUCTIVITY INDICATORS (2020–2025)**



Year	Average KPI Score (0–100)	Productivity Index (Base: 2020=100)	Avg Overtime Hours/Employee	Quality/Safety Incidents	High Performers (%)
2019 - 2020	78	100	11	42	18%
2020 - 2021	80	103	12	39	19%
2021 - 2022	82	106	10	35	21%
2022 - 2023	83	108	9	32	22%
2023 - 2024	85	111	8	28	24%
2024 - 2025	86	114	7	25	26%

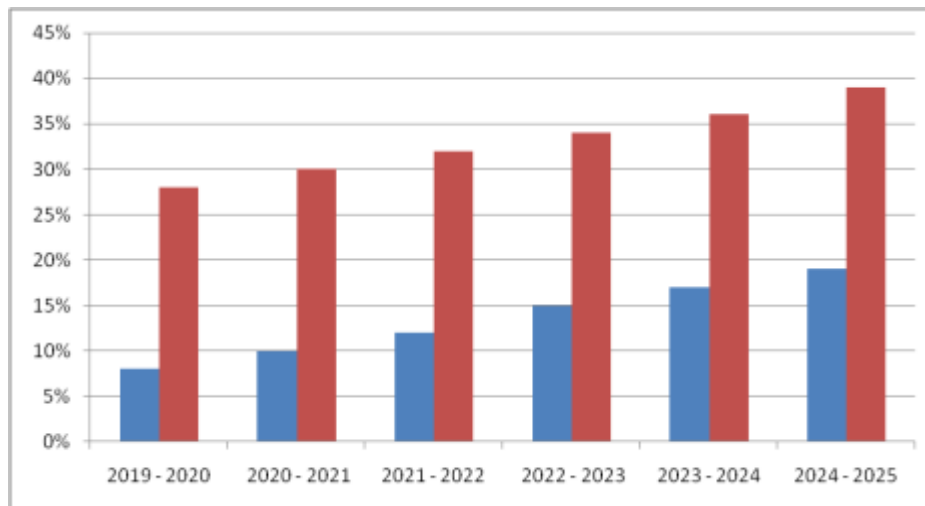


**DISCUSSION:** All performance metrics are improving. Quality and safety issues decreased from 42 to 25, the productivity index rose from 100 to 114, and the average KPI score increased from 78 to 86. Additionally, there was a decrease from eleven to seven hours of overtime. The proportion of strong achievers climbed from 18% to 26% over time, indicating a rise in worker productivity.

**TABLE 4: LEARNING, DEVELOPMENT & SKILLS GAP ANALYSIS (2020–2025)**

Year	Avg Training Hours/Employee	Employees with ≥2-Level Skill Gap (%)	Avg Skill Gap	Training Effectiveness (%)	Succession-Ready Talent (%)
2019 - 2020	22	26%	1.7	8%	28%
2020 - 2021	24	24%	1.6	10%	30%
2021 - 2022	28	22%	1.5	12%	32%
2022 - 2023	31	20%	1.4	15%	34%
2023 - 2024	35	18%	1.3	17%	36%
2024 - 2025	38	17%	1.2	19%	39%





**DISCUSSION:** An increase from 22 to 38 hours of training per worker. The percentage of workers with two or more skill gaps decreased from 26% to 17%, with an average reduction from 1.7 to 1.2. Concurrently, the percentage of those receptive to leadership responsibilities increased from 28% to 39%, while the percentage of those willing to take such positions rose from 8% to 19%. This indicates progress in the development of competencies and the leadership pipeline.

## VI. CONCLUSION

In conclusion, HR analytics is transformative for enhancing employee productivity as it converts raw data into analytical insights. Consequently, organizations may enhance productivity, identify optimal workers, refine the recruitment process, and retain their top employees. Human resources may improve employee engagement, integrate training initiatives with organizational goals, and implement equitable policies through data-driven methodologies. Analytics strengthens the organization and prepares it for future problems by enhancing task management, cost efficiency, and strategic insight. Ultimately, HR analytics enable organizations to make informed decisions that foster growth, improve operational efficiency, and secure long-term success.

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