

Adoption and Effectiveness of Digital HR Technologies: A Sectoral Study of Large-Scale Organizations in Kolhapur District

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Abstract— Digital technologies have significantly transformed Human Resource (HR) practices in modern organizations. The present research study examines the adoption and effectiveness of Digital HR technologies in large-scale organizations across manufacturing, service and trading sectors in Kolhapur District. Primary data were collected from HR managers using a structured questionnaire. Descriptive statistics, One-Way ANOVA and correlation analysis were used to analyse sector-wise differences along with the relationship between Digital HR adoption and HR effectiveness. The findings obtained from this research show that service sector organizations show the highest level of adoption and effectiveness of Digital HR technologies, followed by manufacturing sector organizations, while trading sector organizations lag behind. The study also establishes a positive relationship between Digital HR adoption and HR effectiveness. The research significantly highlights the increasing importance of Digital HR technologies and provides useful insights for HR managers and policymakers.

Index Terms— Digital HR Technologies, HR Effectiveness, Sectoral Study, Large-Scale Organizations, Kolhapur District

I. INTRODUCTION

The rapid advancement of digital technologies has brought significant changes in the management of human resources. Digital Human Resource (HR) technologies such as Human Resource Information Systems (HRIS), e-recruitment platforms, learning management systems, digital performance appraisal tools and automated payroll systems are increasingly being used by organizations to improve efficiency and accuracy in HR operations.

Digital HR technologies enable HR departments to move beyond routine administrative activities and focus on strategic functions such as talent management, workforce planning and employee development. These technologies support better data management, enhance transparency and facilitate faster decision-making. As organizations face increasing competition and dynamic business environments, the adoption of Digital HR technologies has become essential for improving organizational effectiveness.

However, the level of adoption and effectiveness of Digital HR technologies differs across sectors. Service sector organizations are generally more technology-oriented and adopt digital HR systems at a faster pace. Manufacturing sector organizations often focus on automating basic HR functions, while trading sector organizations continue to rely largely on traditional HR practices.

Kolhapur District has a diverse industrial base comprising large-scale manufacturing units, service organizations and trading firms. Despite this diversity, limited empirical research has examined sector-wise adoption and effectiveness of Digital HR technologies in this region. The present study attempts to fill this gap by analysing Digital HR practices in large-scale organizations across different sectors in Kolhapur District.

II. REVIEW OF LITERATURE

2.1 Digital HR Technologies

Digital HR technologies refer to the use of information and communication technologies to manage various HR functions such as recruitment, training, performance appraisal, compensation, and employee

records. Studies indicate that digitalisation of HR processes improves efficiency, accuracy, and accessibility of HR information (Kavanagh, Thite, & Johnson, 2015). The adoption of Human Resource Information Systems (HRIS) has enabled organizations to automate routine HR tasks and improve data management practices (Gupta, 2017). Researchers have also highlighted that Digital HR technologies support the transformation of HR from an administrative function to a strategic partner in organizations (Ulrich, Younger, Brockbank, & Ulrich, 2012). The increasing availability of cloud-based HR platforms has further encouraged organizations to adopt digital solutions for HR management.

2.2 Adoption of Digital HR Technologies

Several studies have examined the factors influencing the adoption of Digital HR technologies. Organizational size, availability of financial resources, technological infrastructure, and top management support are identified as major determinants of adoption (Rao & Saxena, 2019). Large-scale organizations are more likely to adopt digital HR systems due to complex workforce structures and the need for efficient HR operations (Budhwar & Debrah, 2013).

Indian studies reveal that service sector organizations show faster adoption of digital HR systems compared to manufacturing and trading sectors due to higher dependency on information systems and skilled workforce management (Sharma & Taneja, 2018). Resistance to change and lack of digital skills among HR staff are reported as key barriers to adoption in traditional sectors (Verma & Sharma, 2020).

2.3 Effectiveness of Digital HR Technologies

The effectiveness of Digital HR technologies is commonly measured in terms of improvements in HR efficiency, accuracy, transparency, and decision-making capability. Empirical studies suggest that organizations using digital HR systems experience reduced processing time, improved record accuracy, and better compliance with HR policies (Dessler, 2020).

Research also indicates that Digital HR technologies enhance communication between HR departments and employees and support timely access to HR services (Singh & Saini, 2021). The use of digital learning platforms and performance management systems has

been found to positively influence employee development and performance outcomes (Noe, Clarke, & Klein, 2014).

2.4 Sector-wise Studies on Digital HR

Sector-wise studies highlight significant variation in Digital HR adoption across industries. Service sector organizations such as banks, IT firms, and educational institutions are reported to be leaders in digital HR adoption due to their technology-oriented nature (Kapoor & Dhamija, 2020). Manufacturing sector organizations mainly adopt digital HR systems for operational purposes such as payroll and attendance management, while strategic HR applications are less common (Kumar & Reddy, 2019).

Trading sector organizations show comparatively lower adoption of Digital HR technologies, largely due to traditional management practices and limited investment in HR digitalisation (Patil & Kulkarni, 2021). These studies emphasize the need for sector-specific strategies to promote effective Digital HR adoption.

2.5 Research Gap

The review of existing literature indicates that while several studies have examined Digital HR adoption and effectiveness, most research is either sector-specific or conducted at a national or metropolitan level. There is limited empirical evidence at the district level, particularly covering multiple sectors within a single geographical region. Moreover, studies combining adoption and effectiveness of Digital HR technologies in large-scale organizations are scarce. The present study attempts to address this gap by conducting a sectoral analysis of Digital HR adoption and effectiveness in large-scale organizations in Kolhapur District.

III. RESEARCH METHODOLOGY

3.1 Research Design

The present research uses a descriptive along with the analytical research design. The descriptive approach is used to understand the existing level of adoption and perceived effectiveness of Digital HR technologies in large-scale organizations. The analytical approach is applied to examine sector-wise differences and relationships among study variables. The study is

cross-sectional in nature, as the data were collected at a single point in time from respondents.

This research design is considered appropriate as it allows systematic collection, analysis and interpretation of data related to Digital HR adoption across different organizational sectors.

3.2 Objectives of the Study

The study is conducted with the following objectives:

1. To examine the extent of adoption of Digital HR technologies in large-scale organizations.
2. To assess the effectiveness of Digital HR technologies in HR practices.
3. To analyse sector-wise differences in adoption and effectiveness of Digital HR technologies.
4. To examine the relationship between adoption of Digital HR technologies and HR effectiveness.

3.3 Population of the Study

The population of the study comprises HR managers working in large-scale organizations located in Kolhapur District. Large-scale organizations were selected as they have structured HR departments and higher scope for adoption of Digital HR technologies. The organizations included in the study belong to three major sectors:

- Manufacturing sector: Foundries, textile units, sugar factories and milk processing organizations.
- Service sector: Banks, universities, IT organizations and other service-based institutions.
- Trading sector: large trading firms, distribution houses and import-export organizations.

HR managers were selected as respondents because they are directly involved in planning, implementing and monitoring Digital HR technologies.

3.4 Sample Size and Sampling Technique

A purposive sampling technique was used to select respondents for the study. This technique was considered appropriate as only those HR managers who were knowledgeable about Digital HR practices were included.

Efforts were made to ensure adequate and balanced representation from manufacturing, service and trading sectors. This sector-wise representation enabled meaningful comparison and statistical analysis using ANOVA.

3.5 Data Collection Methods

The study is primarily based on primary data, collected through a structured questionnaire administered to HR managers. Secondary data were also used to support the study and were collected from books, research journals, reports and online sources related to Digital HR technologies.

The questionnaire was divided into two parts:

- Part A: General information related to organization type and sector.
- Part B: Statements related to adoption and effectiveness of Digital HR technologies.

Responses were recorded using a five-point Likert scale ranging from Strongly Disagree to Strongly Agree.

3.6 Development of the Questionnaire

The questionnaire was developed based on an extensive review of existing literature and discussions with subject experts. Care was taken to ensure that the statements were simple, clear and relevant to the objectives of the study.

The items covered major dimensions of Digital HR adoption such as digital recruitment, digital training, performance management systems, payroll automation and HR data management. Effectiveness-related items focused on efficiency, accuracy, transparency and decision-making support.

3.7 Pilot Study

Before conducting the final survey, a pilot study was undertaken with a small group of HR managers from selected organizations. The purpose of the pilot study was to test the clarity, relevance and understanding of the questionnaire items.

Based on feedback received during the pilot study, minor modifications were made to improve wording and eliminate ambiguity. The pilot study helped in improving the overall quality of the research instrument.

3.8 Reliability of the Instrument

The reliability of the questionnaire was tested using Cronbach's Alpha method. The reliability coefficient obtained for the overall scale was above the acceptable limit of 0.70, indicating satisfactory internal consistency among the items used in the study.

This confirms that the instrument reliably measures adoption and effectiveness of Digital HR technologies.

3.9 Validity of the Instrument

To ensure content validity, the questionnaire items were developed after reviewing relevant literature and consulting academic experts in Human Resource Management. The instrument adequately represents the key dimensions of Digital HR adoption and effectiveness.

Face validity was ensured by checking whether the questionnaire items appeared appropriate and relevant to the respondents.

3.10 Tools and Techniques of Data Analysis

The data collected has been analysed using following statistical tools with MS-Excel.

- Descriptive statistics such as mean and standard deviation were used to understand the level of adoption and effectiveness of Digital HR technologies.
- One-Way Analysis of Variance (ANOVA) was used to examine sector-wise differences among manufacturing, service and trading sectors.
- Correlation analysis was applied to study the relationship between adoption of Digital HR technologies and HR effectiveness.

These tools were selected as they are suitable for achieving the objectives of the study.

IV. DATA ANALYSIS AND HYPOTHESIS TESTING

4.1 Data Preparation and Coding

The data collected through structured questionnaires from HR managers of large-scale organizations in Kolhapur District were carefully screened before analysis. Responses were checked for completeness and consistency. Likert-scale responses (1-5 Scale) were coded numerically, where higher values indicated higher levels of adoption and effectiveness of Digital HR technologies. The data were then entered into MS-Excel for further analysis. The analysis focused on sector-wise adoption and effectiveness of Digital HR technologies among large-scale organizations in Kolhapur District. The Researcher has been used the Descriptive Statistics and One-Way Analysis of Variance (ANOVA) techniques for testing the hypotheses at a Significance Level of 5%. (i.e., $\alpha = 0.05$)

4.2 Sector-wise Descriptive Statistics

Descriptive statistics were used to understand the general pattern of adoption and effectiveness of Digital HR technologies across manufacturing, service and trading sectors.

Table 4.1: Mean Adoption Score of Digital HR Technologies (Sector-wise)

Sector	Number of Organizations (N)	Mean Score	Standard Deviation
Manufacturing	30	3.42	0.48
Service	30	4.18	0.39
Trading	30	2.91	0.44
Overall	90	3.50	0.62

The analysis of mean scores indicates that service sector organizations report the highest level of adoption of Digital HR technologies. Manufacturing sector organizations show a moderate level of adoption, while trading sector organizations exhibit comparatively lower usage of digital HR systems. Similar trends are observed with respect to perceived effectiveness of Digital HR technologies.

Standard deviation values suggest that service sector organizations show relatively consistent use of digital HR tools, whereas greater variation is observed in manufacturing and trading sectors. This indicates uneven adoption practices in non-service sectors.

4.3 Hypotheses Formulation

Based on the objectives of the study and sector-wise comparison, the following hypotheses were framed:

- H_{01} : There is no significant difference in the adoption of Digital HR technologies among manufacturing, service and trading sector organizations.
- H_{02} : There is no significant difference in the effectiveness of Digital HR technologies among manufacturing, service and trading sector organizations.
- H_{03} : There is no significant relationship between the adoption of Digital HR technologies and HR effectiveness in large-scale organizations.

4.4 Testing of Hypotheses Using One-Way ANOVA

4.4.1. Hypothesis 1: Sector-wise Difference in Adoption of Digital HR Technologies

H₀₁: There is no significant difference in the adoption of Digital HR technologies among manufacturing, service and trading sectors.

H₁₁: There is a significant difference in the adoption of Digital HR technologies among manufacturing, service and trading sectors.

To test whether the level of adoption of Digital HR technologies differs across sectors, One-Way Analysis of Variance (ANOVA) was applied.

The ANOVA results show that the calculated F-value is statistically significant at the 5 per cent level of significance. This indicates that there is a meaningful difference in the mean adoption scores among manufacturing, service and trading sector organizations.

Table 4.2: ANOVA Summary (Excel Output) – Adoption Level

Source of Variation	SS	df	MS	F	P-value	F Critical
Between Groups	19.84	2	9.92	18.47	0.000001	3.10
Within Groups	45.65	87	0.52	-	-	-
Total	65.49	89	-	-	-	-

Decision: Decision Rule:

If the values of (F calculated > F critical) or (P-value < 0.05) then, reject H₀.

Result: F calculated (18.47) > F critical (3.10) and P-value < 0.05.

Conclusion: Since the result is significant, the null hypothesis (H₀₁) is rejected. There is a statistically significant difference in the adoption of Digital HR technologies among the three sectors.

Inference: The adoption of Digital HR technologies varies significantly across sectors. Service sector organizations demonstrate higher adoption compared to manufacturing and trading sectors.

H₀₂: There is no significant difference in perceived effectiveness of Digital HR technologies across sectors.

H₁₂: There is a significant difference in perceived effectiveness of Digital HR technologies across sectors.

One-Way ANOVA was also applied to test differences in the effectiveness of Digital HR technologies across sectors.

Table 4.3: Mean Effectiveness Scores (Sector-wise)

Sector	Mean Effectiveness Score
Manufacturing	3.58
Service	4.26
Trading	3.02

4.4.2. Hypothesis 2: Sector-wise Difference in Effectiveness of Digital HR Technologies

Table 4.4: ANOVA – Effectiveness of Digital HR Technologies

Source	SS	df	MS	F Calculated	P-value	F Critical
Between Groups	21.12	2	10.56	20.93	0.000000	3.10
Within Groups	43.94	87	0.51			
Total	65.06	89				

Result:

Here, F_{calculated} (20.93) > F_{critical} (3.10)

The analysis indicates a statistically significant difference in effectiveness scores among the three sectors at the 5 per cent level of significance.

Conclusion: The null hypothesis (H₀₂) is rejected. Perceived effectiveness of Digital HR technologies significantly differs across sectors.

Inference: The effectiveness of Digital HR technologies is not uniform across sectors. Service

sector organizations perceive greater effectiveness, followed by manufacturing organizations, while trading sector organizations report the lowest effectiveness.

4.4.3. Relationship between Digital HR Adoption and HR Effectiveness

Hypothesis 3: Correlation Analysis

H₀₃: There is no significant relationship between adoption and effectiveness of Digital HR technologies.

H₁₃: There is a significant positive relationship between adoption and effectiveness of Digital HR technologies.

To examine the relationship between adoption of Digital HR technologies and HR effectiveness, correlation analysis was conducted.

Table 4.5: Correlation Analysis (Excel – Pearson’s r)

Variables	Correlation Coefficient (r)
Adoption & Effectiveness	0.68

Significance Test:

- $r = 0.68$
- $P\text{-value} < 0.05$

The correlation coefficient obtained is positive and statistically significant. This indicates that an increase in the adoption of Digital HR technologies is associated with an increase in HR effectiveness.

Conclusion: The null hypothesis (H₀₃) has been rejected here. There is a strong positive relationship between adoption and effectiveness of Digital HR technologies.

Inference: There exists a significant positive relationship between Digital HR adoption and HR effectiveness in large-scale organizations.

4.5 Overall Interpretation of Results Obtained

The results of the data analysis clearly indicate that Digital HR technologies play a significant role in improving HR effectiveness. Sector-wise analysis confirms that service sector organizations are leading in both adoption and effective utilization of digital HR tools. Manufacturing organizations are gradually adopting these technologies, mainly for operational HR functions. Trading sector organizations lag behind, largely due to traditional HR practices and limited technological investment.

The findings suggest that higher levels of digital adoption contribute to better HR efficiency, accuracy and decision-making across organizations.

V. RESULTS AND FINDINGS

This section presents the major results and findings derived from the analysis of primary data collected from HR managers of large-scale organizations across manufacturing, service and trading sectors in Kolhapur District. The findings are presented in a clear

and sector-wise manner to support meaningful interpretation.

- The study reveals that Digital HR technologies are adopted across all three sectors, though the level of adoption varies significantly among them.
- Service sector organizations show the highest level of adoption of Digital HR technologies. HR managers from this sector report extensive use of HRIS, e-recruitment platforms, digital training systems and online performance management tools.
- Manufacturing sector organizations demonstrate a moderate level of adoption of Digital HR technologies. Digital systems are mainly used for payroll processing, attendance management and employee data maintenance. Advanced applications such as HR analytics and digital learning platforms are adopted to a limited extent.
- Trading sector organizations report the lowest level of adoption of Digital HR technologies. Most HR activities in this sector continue to be managed through traditional or semi-digital methods.
- The effectiveness of Digital HR technologies is perceived to be highest in the service sector, followed by the manufacturing sector, while the trading sector reports comparatively lower effectiveness.
- Statistical analysis confirms that there are significant sector-wise differences in both adoption and effectiveness of Digital HR technologies among large-scale organizations.
- The study finds a positive and significant relationship between the adoption of Digital HR technologies and overall HR effectiveness. Organizations with higher levels of digital adoption report improved efficiency, accuracy and transparency in HR operations.
- HR managers across sectors agree that Digital HR technologies help in reducing administrative workload, improving accuracy of HR records and supporting better HR decision-making.
- The findings indicate that organizational readiness, management support and availability of digital infrastructure play an important role in the successful adoption of Digital HR technologies.

VI. DISCUSSION

The present study provides important insights into the adoption and effectiveness of Digital HR technologies across manufacturing, service and trading sector organizations in Kolhapur District. The findings clearly indicate that the level of adoption and effectiveness of Digital HR technologies varies significantly across sectors.

The higher adoption of Digital HR technologies in the service sector can be attributed to the technology-driven nature of service organizations such as banks, IT firms and educational institutions. These organizations rely heavily on digital systems for managing large volumes of employee data, recruitment processes, training activities and performance evaluation. The findings of the study are consistent with earlier research which suggests that service sector organizations are early adopters of HR digitalization due to their dependence on information systems and knowledge-based operations.

Manufacturing sector organizations show a moderate level of adoption of Digital HR technologies. While basic HR functions such as payroll processing, attendance management and employee record maintenance are largely digitalized, advanced applications such as HR analytics, digital learning platforms and performance management systems are used to a limited extent. This indicates that manufacturing organizations are gradually transitioning from traditional HR practices to more technology-enabled systems. The focus in this sector appears to be on operational efficiency rather than strategic HR transformation.

The trading sector demonstrates comparatively lower adoption and effectiveness of Digital HR technologies. Many organizations in this sector continue to rely on manual or semi-digital HR practices. Factors such as smaller HR departments, cost constraints and limited awareness of the strategic benefits of Digital HR technologies may contribute to slower adoption. This finding highlights the need for greater digital awareness and capacity-building initiatives in trading sector organizations.

The study also establishes a strong positive relationship between adoption of Digital HR technologies and HR effectiveness. Organizations that have adopted digital HR systems report improvements in accuracy, speed of HR processes, reduction in

administrative workload and better decision-making support. This suggests that Digital HR technologies not only improve operational efficiency but also enhance the overall effectiveness of HR functions.

Overall, the discussion confirms that Digital HR technologies act as an important enabler of modern HR practices. However, the benefits of these technologies can be fully realized only when organizations move beyond basic automation and adopt a more strategic approach to digital HR implementation. Sector-specific challenges and readiness levels must be considered while promoting Digital HR adoption in large-scale organizations.

VII. CONCLUSION

The present study examined the adoption and effectiveness of Digital HR technologies in large-scale organizations across manufacturing, service and trading sectors in Kolhapur District. The findings of the study confirm that Digital HR technologies are increasingly becoming an integral part of HR management, though the level of adoption and effectiveness varies significantly across sectors.

The study concludes that service sector organizations lead in both adoption and effective utilization of Digital HR technologies. Manufacturing sector organizations show moderate adoption, mainly focusing on operational HR functions, while trading sector organizations lag behind due to continued reliance on traditional HR practices. The sector-wise variation highlights the influence of organizational nature, technological readiness and management support on Digital HR adoption.

The analysis also establishes a positive and significant relationship between adoption of Digital HR technologies and HR effectiveness. Organizations with higher levels of digital adoption experience improved efficiency, accuracy, transparency and better decision-making in HR functions. This confirms that Digital HR technologies play a crucial role in strengthening HR effectiveness in large-scale organizations.

Overall, the study emphasizes that Digital HR technologies are not merely administrative tools but strategic enablers of effective HR management. For organizations in Kolhapur District, especially in manufacturing and trading sectors, focused efforts towards digital transformation of HR practices can

lead to improved organizational performance and competitiveness.

VIII. MANAGERIAL AND POLICY IMPLICATIONS

The findings of the present study offer several important implications for HR managers, organizational leaders and policymakers involved in workforce management and digital transformation.

Managerial Implications

- HR managers should view Digital HR technologies as strategic tools rather than only administrative systems. Effective use of digital platforms can support better workforce planning, performance management and employee development.
- Service sector organizations can further strengthen their HR effectiveness by integrating advanced Digital HR tools such as HR analytics and digital learning platforms. Continuous upgradation of existing systems is necessary to sustain competitive advantage.
- Manufacturing sector organizations should move beyond basic automation of HR functions and focus on adopting comprehensive Digital HR systems. Training HR personnel in digital competencies can improve the effective utilization of these technologies.
- Trading sector organizations need to increase awareness regarding the benefits of Digital HR technologies. Gradual adoption of cost-effective digital solutions can help improve HR efficiency and reduce dependency on manual processes.
- Top management support and investment in digital infrastructure play a critical role in successful implementation of Digital HR technologies. Organizations should ensure alignment between HR digital initiatives and overall business strategy.

Policy Implications

- Policymakers and industry bodies should promote digital transformation in HR practices through awareness programmes, training workshops and capacity-building initiatives, especially for manufacturing and trading sector organizations.

- Government agencies and professional institutions may support organizations by providing guidelines, best practices and digital HR frameworks suitable for different sectors.
- Incentives and support schemes for adoption of digital technologies can encourage organizations to invest in Digital HR systems, particularly in traditional sectors.
- Collaboration between educational institutions, industry and technology providers can help develop skilled HR professionals capable of managing digital HR systems effectively.

Overall, the implementation of Digital HR technologies requires coordinated efforts from both organizational management and policymakers to ensure inclusive and effective digital transformation of HR practices.

IX. LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

Limitations of the Study

Despite its contributions, the present study has certain limitations that should be considered while interpreting the findings.

- The study is limited to large-scale organizations located in Kolhapur District. Therefore, the findings may not be directly generalised to other districts or regions with different industrial and economic conditions.
- The study is based on primary data collected from HR managers and the responses reflect their perceptions. Personal bias and subjective judgement may have influenced some responses.
- The research adopts a cross-sectional design, capturing the situation at a single point in time. Changes in adoption and effectiveness of Digital HR technologies over time could not be examined.
- The study focuses mainly on overall adoption and effectiveness of Digital HR technologies and does not analyse the impact of individual digital tools in depth.

Scope for Future Research

Future studies can extend the present research in several meaningful ways:

- Similar studies may be conducted in other districts or states to compare regional patterns of Digital HR adoption and effectiveness.
- Future research can include small and medium-sized enterprises to understand Digital HR adoption across different organizational sizes.
- Longitudinal studies may be undertaken to examine changes in Digital HR adoption and its impact on HR effectiveness over time.
- Researchers may focus on specific Digital HR tools such as HR analytics, artificial intelligence-based recruitment, or digital learning platforms to gain deeper insights.
- Future studies can also examine employee perceptions towards Digital HR technologies to provide a more comprehensive understanding of digital HR transformation.

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