ISSN: 2278-7518

CYBER TIMES®
INTERNATIONAL JOURNAL OF TECHNOLOGY AND MANAGEMENT

Volume 19 - Issue 2, April 2026 - September 2026
Bi-Annual Double Blind Peer Reviewed Refereed Journal

CYBER TIMES®
(Leader in innovative Tech-World)

Cyber Times International Journal of Technology & Management

Vol. 19 - Issue 2, April 2026 – September 2026
ISSN: 2278-7518

Scientific Journal Impact Factor Value for 2024 = 6.007

Editorial Office & Administrative Address:

Delhi:
The Editor,
A19/1, Mansa Ram Park,
New Delhi-110059.

ISSN: 2278-7518

Phone: +91-9811485729, +91-9312903095

Website: https://journal.cybertimes.in

Email: editor@cybertimes.in

From the Editor's Desk

At the outset, I take this opportunity to express my sincere gratitude to all the Editorial Board Members, Editors, Peer Review Members, contributors, and readers for making ***Cyber Times International Journal of Technology & Management*** an outstanding success. Their unwavering support, dedication, and commitment to academic excellence have significantly contributed to the growth and reputation of the journal.

We are pleased to present **Volume 19 – Issue 2** of ***Cyber Times International Journal of Technology & Management***. This issue features a collection of high-quality research papers and scholarly articles that reflect contemporary developments, innovative ideas, and critical insights across emerging areas of Technology, Management, Law, Education, and other multidisciplinary domains. The diversity of topics covered in this issue highlights the increasing importance of interdisciplinary research in addressing global challenges and opportunities.

The overwhelming response received from researchers, authors, academicians, law-enforcement agencies, and industry professionals for submitting their research papers and articles is deeply appreciated and duly acknowledged across the globe. Their valuable contributions have enriched the journal's content and strengthened its role as a platform for disseminating knowledge, fostering innovation, and encouraging scholarly dialogue among academia, industry, and society.

On behalf of the Editorial Team, I extend my heartfelt thanks to all authors for their valuable research contributions and to our reviewers for their constructive evaluations that help maintain the highest standards of publication quality. We hope that the research published in this issue will inspire further inquiry, collaboration, and advancement in various fields of study, while continuing to serve as a meaningful resource for our readers worldwide.

We look forward to receive your valuable and future contributions to make this journal a joint endeavor.

With Warm Regards,

Dr. ANUP GIRDHAR

Editor-In-Chief
Cyber Times International Journal of Technology & Management

General Information

- ***"Cyber Times International Journal of Technology & Management"*** is published bi-annually. All editorial and administrative correspondence for publication should be addressed to The Editor, Cyber Times.

- The Abstracts received for the final publication are screened by the Evaluation Committee for approval and only the selected Papers/ Abstracts will be published in each edition. Further information is available in the "**Guidelines for paper Submission"** section.

- Annual Subscription details for obtaining the print copy of the journal are provided separately and the interested persons may avail the same accordingly after filling the Annual subscription form.

- This journal is meant for education, reference and learning purposes. The author(s) of this of the book has/have taken all reasonable care to ensure that the contents of the book do not violate any existing copyright or other intellectual property rights of any person/ company/ institution in any manner whatsoever. In the event the author(s) has/have been unable to track any source and if any copyright has been inadvertently infringed, please notify the publisher in writing for the corrective action.

- **Other Publications:**
  - Cyber Times Newspaper (English) – RNI No: DELENG/2008/25470
  - Cyber Times Newspaper (Hindi) – RNI No. DELHIN/1999/00462

- **Printed & Published by:** Cyber Times
  A19/1, Mansa Ram Park, New Delhi-110059

CTIJTM Editorial Advisory Board Members

Name	Designation, Organization/ University	Country
Dr. Sushila Madan	Associate Professor, Delhi University	India
Dr. A. K. Saini	Professor, GGS IP University	India
Mr. J. R. Ahuja	Former Consultant, AICTE	India
Mr. Mukul Girdhar	Advocate Delhi High Court	India
Mr. Geetesh Madan	Q.A. Consultant with Tesco Bank, Newcastle	UK
Dr. Deepak Shikarpur	Chairman Board of Studies, Pune University	India
Dr. B. B. Ahuja	Deputy Director, COE - Pune	India
Prof. M. N. Hoda	Director, Bharati Vidyapeeth's (BVICAM)	India
Dr. S. C. Gupta	Director, NIEC, GGS IP University	India
Dr. S. K. Gupta	Professor, IIT Delhi	India
Dr. K. S. Wani	Principal, SSBT’s COET, Bambhori, Jalgaon	India
Dr. K. V. Arya	Associate Professor, IIITM, Gwalior	India
BRIG. Dr. S.S. Narula	Director, Gitarattan International Bussiness School	India
Dr. Sarika Sharma	Director, JSPM'S ENIAC Institute of CA, Pune	India
Dr. S.K.M. Bhagat	Prof. & Head, MIT Academy of Engg., Pune	India
Dr. Jack Ajowi	Jaramogi Oginga Odinga University of Sci. & Tech.	Kenya
Dr. Srinivas Sampalli	Professor, Dalhousie University, Halifax	Canada
Dr. Ijaz A. Qureshi	V.P. Academic Affairs, JFK Inst. of Tech. and Mgmt.	Pakistan
Aryya Bhattacharyya	Director, CIP, Columbus State University	US
Dr. M. M. Schiraldi	Assistant Professor, 'Tor Vergata' University of Rome	Italy

Executive Editorial Advisory Board Members

Name	Designation, Organization/ University	Country
Ms. Kanika Trehan	Editor - Cyber Times, New Delhi	India
Mr. Rakesh Laxman Patil	Editor - Cyber Times, Pune	India
Adv. Tushar Kale	Cyber Lawyer, Pune	India
Adv. Neeraj Aarora	Cyber Lawyer, New Delhi	India
Mr. Sanjeev Sehgal	HOD, SJP Polytech, Damla, Haryana	India
Mr. Rajinder Kumar Bajaj	GM, Satake India Engg. Pvt. Ltd., (Japan)	India
Dr. B. M. Patil	Associate Professor MIT, Pune	India
Dr. Rajesh S. Prasad	Professor, DCOER, Pune University	India
Dr. Binod Kumar	Associate Professor, MIT Academy of Engg, Pune	India
Prof. Dr. M. Husain	HOD, SSBT’s COET, Bambhori, Jalgaon	India
Prof. Dr. U. S. Bhadade	HOD, SSBT’s COET, Bambhori, Jalgaon	India
Dr. V. N. Wadekar	Prof. & Head, MIT college of Engg. CMSR, Pune	India
Dr. M.D. Goudar	Associate Prof. & Head, Pune University	India
Dr. Mohd. Rizwan Alam	Sr. Lecturer, Amity University	Dubai
Prof. Jagannath Aghav	Professor & Head, CSE & IT, COE - Pune	India

Disclaimer: The names, affiliations, and designations of the Editorial Board Members published in this journal are based on the information provided at the time of their association with *Cyber Times International Journal of Technology & Management*. Members may subsequently change their positions, affiliations, or professional designations. The journal does not guarantee the continued accuracy of such details after publication.

Cyber Times International Journal of Technology and Management - CTIJTM

Volume 19 - Issue 2

CONTENTS

Data Analytics in Healthcare: Strategic Integration, Operational Transformation and Governance Challenges

Dr. Manisha Shedge
PhD, SET, M. Com, MPhil, MBA(Finance)
Assistant Professor, Department of Management,
Tilak Maharashtra Vidyapeeth, Pune, India
Email: manisharshedge@gmail.com

Mr. Achinta Banik
M. Com. CPA, CGA, MBA (Data Analytics)
Professor, School of Business, George Brown Polytechnic, Toronto,
Canada Corporate Controller, Cencora, USA
Email: achinta01@gmail.com

ABSTRACT

The healthcare sector is undergoing significant digital transformation due to increasing costs, regulatory changes, demographic shifts and technological progress. In this environment, data analytics has emerged as an essential tool for improving healthcare delivery, operational efficiency and financial performance. This paper explores the strategic integration of data analytics in healthcare through a qualitative review of academic and industry literature. It examines the role of descriptive, predictive and prescriptive analytics in enhancing patient care, hospital management and public health outcomes. Findings suggest that analytics can improve diagnostic precision, reduce hospital readmissions and optimize resource utilization. However, challenges such as fragmented data systems, interoperability limitations, privacy concerns and algorithmic bias continue to restrict widespread implementation. To overcome these barriers, the study proposes a governance-oriented framework emphasizing leadership support, data quality management, ethical practices and interdisciplinary skill development. The research positions data analytics as a strategic asset in modern healthcare systems

KEYWORDS: *Healthcare Analytics, Strategic Management, Artificial Intelligence, Data Governance, Predictive Modeling, Public Health Informatics*

1. Introduction

Healthcare systems worldwide are under increasing pressure to provide quality patient care while maintaining financial sustainability. Factors such as aging populations, chronic diseases, rising healthcare costs and regulatory complexity have accelerated the need for evidence-based healthcare models(2). Simultaneously, digital technologies generate vast amounts of healthcare data through electronic health records, wearable devices, genomic research and telemedicine platforms.3 Data analytics has therefore become a strategic tool for improving diagnostic accuracy, operational efficiency and healthcare decision-making(4). The COVID-19 pandemic further highlighted the importance of analytics in monitoring infection trends, predicting hospital capacity and supporting vaccine distribution(5) Despite these advancements, challenges related to governance, infrastructure, ethical concerns and

workforce preparedness continue to limit widespread adoption of healthcare analytics.

2. Literature Review

Evolution of Healthcare Analytics

Early healthcare analytics primarily focused on retrospective reporting and epidemiological trend analysis. The adoption of electronic health records (EHRs) significantly enhanced healthcare organizations' ability to collect, store and access large volumes of complex clinical data, thereby expanding opportunities for data-driven decision-making (8). In recent years, the integration of big data technologies, cloud computing and artificial intelligence (AI) has transformed healthcare analytics from largely descriptive approaches to more advanced predictive and prescriptive models. These technological advancements enable healthcare providers to anticipate clinical risks, improve treatment planning and allocate healthcare resources more efficiently across healthcare systems (9).

Machine learning improves diagnostic imaging, disease prediction and clinical decisions by identifying complex data patterns beyond human recognition.

Strategic Role of Data in Healthcare

Recent studies show healthcare systems increasingly adopting value-based care focused on patient outcomes, quality and cost efficiency. Data analytics supports this transition by improving decision-making, care coordination, resource allocation and operational efficiency. Analytics-driven organizations report better patient satisfaction, reduced readmissions and enhanced healthcare service delivery with minimized organizational waste.

Artificial Intelligence and Clinical Decision Support

AI has significantly improved clinical decision support systems through machine learning, natural language processing and deep learning technologies (10). AI-driven systems enhance diagnostic accuracy, support early disease detection and improve clinical interventions in areas such as radiology, pathology, sepsis, cardiovascular diseases and cancer care. These technologies also encourage standardized treatment pathways and operational efficiency (11). However, studies emphasize that AI should function as a decision-support tool under human supervision rather than as an autonomous system. Effective implementation requires transparency, interdisciplinary governance and ethical oversight to address concerns related to accountability, bias and clinical responsibility. (13)

Governance and Ethical Concerns

Ethical healthcare analytics requires transparent governance addressing bias, privacy, cybersecurity and regulatory compliance throughout data collection and implementation processes. (14)The literature highlights an ongoing tension between promoting data accessibility for innovation and upholding strict privacy protections. Compliance with health information privacy regulations demands structured data governance policies, clearly defined access controls and explicit accountability mechanisms. (15) Governance, ethical oversight, leadership accountability and organizational culture are essential for responsible healthcare analytics implementation. Without robust governance frameworks, technological adoption may exceed an organization's capacity for effective oversight. (16)

3. Research Objectives

1. To examine the role of healthcare analytics in value-based care and organizational sustainability.

2. To assess the impact of analytics on clinical, operational and financial performance.
3. To identify technical, organizational and regulatory barriers in healthcare analytics implementation.
4. To develop a governance-based framework for ethical and sustainable healthcare analytics.
5. To integrate strategy, performance and governance perspectives in healthcare analytics.

4. Methodology

This study adopted a qualitative and descriptive research approach based on a comprehensive review of healthcare analytics literature. Secondary data were collected from peer-reviewed journals, conference papers and industry reports published between 1990 and 2026. Sources were identified through databases such as Google Scholar and PubMed using keywords related to healthcare analytics, big data, artificial intelligence and clinical decision support. Relevant studies focusing on patient care, operational efficiency and public health outcomes were included. The collected literature was analyzed to identify major themes, trends and challenges, including predictive analytics, cost optimization, ethical concerns and public health management.

5. Findings and Discussion

Clinical Outcome Enhancement

Predictive analytics improves clinical outcomes through early disease detection, accurate risk assessment and timely interventions. By analyzing patient, genomic, biomarker and behavioural data, predictive models support preventive healthcare, reduce readmissions and emergency visits and improve long-term disease management. Effective implementation requires interoperable data, clinical oversight, governance, organizational readiness and collaboration.(15)

Operational Optimization

Healthcare analytics improves operational efficiency through better resource allocation, workflow coordination and capacity management. Predictive analytics supports bed occupancy forecasting, staffing optimization, inventory management and emergency department operations, reducing bottlenecks, burnout, wait times and waste. Effective implementation depends on interoperable systems, accurate data, collaboration and strong governance frameworks.

Financial Sustainability

Healthcare analytics supports financial sustainability by improving cost clarity, revenue accuracy and resource allocation. As healthcare systems move toward value-based reimbursement, financial performance increasingly depends on balancing costs with measurable outcomes. Data-driven financial analytics helps identify inefficiencies and strengthen financial discipline.

Financial analytics also improves budgeting and long-term planning. Forecasting models using historical spending patterns, patient volumes and reimbursement trends help administrators make informed decisions regarding capital allocation and investments. Better financial visibility enables proactive financial management.

However, effective financial analytics requires integrated data systems, standardized reporting and strong governance. Organizations that combine financial, clinical and operational analytics are better positioned to achieve long-term resilience, efficiency and quality care while maintaining ethical standards and patient access.(16)

Public Health and Crisis Response

Healthcare analytics strengthens public health systems and crisis response through disease surveillance, epidemiological modelling and real-time dashboards. These tools support prediction of disease spread, identification of high-risk populations, vaccination planning, resource allocation and emergency coordination. Consequently, healthcare analytics enables faster, evidence-based decision-making and improves responses during public health emergencies.(17)

6. Implementation Challenges

Data Fragmentation and Interoperability: Patient data is often scattered across electronic records, laboratory systems and imaging platforms lacking standardized integration, limiting interoperability and comprehensive analytics.

Privacy and Cybersecurity Risks: Healthcare analytics faces challenges related to protecting sensitive medical data, complying with regulations and preventing breaches that may damage patient trust and institutional reputation.

Algorithmic Bias and Ethical Risks: AI-driven models may reinforce social or demographic inequalities, requiring fairness audits, monitoring and ethical governance frameworks.

Infrastructure and Financial Constraints: Advanced analytics implementation requires major investments in infrastructure, technology and expertise, creating adoption barriers for smaller institutions.

Workforce Capability Gap: Limited interdisciplinary expertise in healthcare and data science restricts effective analytics integration and data-driven decision-making.(18)

7. Proposed Strategic Governance Framework

Transforming healthcare analytics into a strategic capability requires a structured governance framework aligned with long-term organizational objectives. Executive leadership alignment is essential for integrating data-driven initiatives into planning and decision-making. Standardized data governance policies ensure data quality, security and accountability, while interoperable digital infrastructure enables seamless data exchange across clinical, administrative and analytical systems for timely insights. Effective governance also requires ethical AI oversight to ensure transparency, fairness and responsible data use. Continuous training programs improve data literacy among healthcare professionals and collaboration among clinicians, administrators and data scientists strengthens the integration of analytics into healthcare practices. Together, these elements support patient-centred, evidence-based healthcare delivery.

8. Implications for Policy and Practice

The findings highlight key implications for healthcare policy, particularly the need for national data governance and interoperability standards to enable seamless information exchange, improve coordination, support analytics, public health monitoring, research collaboration and evidence-based policymaking. Policymakers should also establish ethical AI frameworks addressing bias, privacy, transparency and accountability. Governments must invest in workforce development to strengthen data literacy and interdisciplinary skills among healthcare professionals. From a managerial perspective, healthcare leaders should treat analytics as a strategic long-term investment by aligning digital infrastructure, analytics tools and workforce capabilities with organizational goals. Collaboration between policymakers and healthcare leaders is essential for sustainable, patient-centred healthcare transformation.

9. Conclusion

Healthcare data analytics has emerged as a powerful catalyst for transforming modern healthcare systems, enabling improvements

in clinical decision-making, operational efficiency and financial sustainability. By harnessing large and complex datasets, healthcare organizations can enhance diagnostic accuracy, optimize resource utilization and support informed strategic planning. However, the successful adoption of analytics extends beyond technological capabilities; it requires strong strategic leadership, robust governance frameworks, ethical oversight and a skilled workforce capable of interpreting and applying data-driven insights effectively.

Despite significant progress in digital health technologies, there remains a critical need for further research to assess the long-term impact of analytics on patient outcomes and overall healthcare quality. Future studies should focus on developing standardized evaluation metrics and empirical frameworks that allow consistent measurement of performance across healthcare institutions. Such efforts will be essential for ensuring scalability, comparability and sustained value from analytics initiatives.

As healthcare systems continue to evolve in an increasingly digital environment, data analytics must be viewed not merely as a supplementary tool but as a foundational pillar of healthcare delivery. Its strategic integration into clinical, operational and policy-level decision-making will be vital in building resilient, efficient and equitable healthcare systems capable of meeting future challenges.

References:

1. (JAMA Netw Open. (2025). *EHR interventions to reduce hospital readmissions*. https://doi.org/10.1001/jamanetworkopen.2025.21785
2. Boettiger DC et al. (2023). *Population aging and NCD burden in Saudi Arabia*. BMC Health Serv Res, 23. https://doi.org/10.1186/s12913-023-10309-w
3. Weng JK et al. (2024). *Real-time wearable biometric integration with EMRs*. JCO Clin Cancer Inform, 8:e2400040. https://doi.org/10.1200/CCI.24.00040
4. Pitocco C et al. (2020). *Using data analytics to improve hospital quality*. J Healthc Manag, 65(4), 285–298. https://doi.org/10.1097/JHM-D-19-00118
5. Parker F et al. (2024). *Decision-support dashboard for hospital capacity management*. arXiv. https://doi.org/10.48550/arXiv.2403.15634
6. Heinrichs H et al. (2022). *Digitalization and COVID-19 response measures*. Sci Rep, 12. https://doi.org/10.1038/s41598-022-24726-0
7. Nikiforova A et al. (2025). *Responsible AI adoption challenges in the public sector*. arXiv. https://doi.org/10.48550/arXiv.2510.09634
8. Raghupathi W & Raghupathi V. (2026). *Big data in healthcare and AI challenges*. Health Inf Sci Syst, 14(1). https://doi.org/10.1007/s13755-026-00433-2
9. Nuthakki S et al. (2019). *NLP of MIMIC-III clinical notes*. arXiv. https://doi.org/10.48550/arXiv.1912.12397
10. Gomez-Cabello CA et al. (2024). *AI-based CDSS in primary care*. Eur J Investig Health Psychol Educ, 14(3), 685–698. https://doi.org/10.3390/ejihpe14030045
11. Freyer N et al. (2024). *Explainability in AI-DSS healthcare systems*. BMC Med Ethics, 25. https://doi.org/10.1186/s12910-024-01103-2
12. Elgin CY & Elgin C. (2024). *Ethical implications of AI-driven CDSS*. BMC Med Ethics, 25. https://doi.org/10.1186/s12910-024-01151-8
13. Technol Forecast Soc Change. (2026). *Embedding AI ethics in enterprise governance*. 86. https://doi.org/10.1016/j.techsoc.2026.103261
14. J Biomed Inform. (2025). *Advancing healthcare analytics: thematic review*. 171. https://doi.org/10.1016/j.jbi.2025.104934
15. Int J Med Inform. (2026). *Blockchain in healthcare: systematic review*. 101741. https://doi.org/10.1016/j.imu.2026.101741
16. Artetxe A et al. (2018). *Predictive models for hospital readmission risk*. Comput Methods Programs Biomed, 164, 49–64. https://doi.org/10.1016/j.cmpb.2018.06.006
17. Johnson R et al. (2024). *EMRs to predict hospitalization and mortality*. J Am Board Fam Med, 37(4), 583–606. https://doi.org/10.3122/jabfm.2023.230381R1
18. Anuyah S et al. (2024). *Deep learning and predictive modelling in clinical trials*.