

Sustainability and Digital Transformation in Healthcare: A Case Study of Mankind Pharma's Supply Chain Practices and the Role of Digital Health Apps and Media Technologies in Shaping Healthcare Consumer Behavior

Student Name: Vivaan Chopra

Abstract

The research has examined the role of digital transformation in the proper enhancement of sustainability applied in efficiency and consumer engagement within the pharmaceutical industry. Furthermore, a qualitative secondary research approach has been adopted, analysing the contemporary academic literature and industry reports. The findings of technical research revealed that technology, such as artificial intelligence, blockchain, internet of things and digital health applications, has significantly helped in the improvement of supply and disability operational efficiency, along with regulatory compliance and consumer participation in healthcare. The study has further demonstrated that digital transmission has helped in the strengthening of ability performance with the help of enhanced transparency and informed decision-making.

1. Introduction

1.1 Research Background

The healthcare industry is experiencing a time of dramatic transformation due to rapid digitisation. The transition is being accelerated by two trends, one of which is the international movement towards sustainability, and the other is the accelerating digitalisation ((Nusrat et al., 2023). Sustainability in healthcare is defined as an approach to reduce the negative impacts on the environment, enhance resource efficiency, and promote long-term sustainability and viability of healthcare operations. The pharmaceutical sector is responsible for a significant amount of carbon emissions, plastic waste, and chemical pollution.

The impact of the pharmaceutical industry on the environment is large and increasing. The sector contributes 4.4% to the global greenhouse gas (GHG) emissions (Centre for Process Innovation 2023). This percentage is especially worrisome as emission intensity in the pharmaceutical industry is around 55% greater for every revenue dollar than that of the automotive industry (Drug Discovery Trends, 2023). The worldwide pharmaceutical GHG footprint has increased by 77% in the period from 1995 to 2019, and will triple by 2050 if the current trend continues (Eckelman et al., 2025). The future Market insights projects that the use of AI and digitalisation into healthcare will contribute to reach a revenue with USD 381.5 Billion by end of 2026 with CAGR of 14.5% (Future market insights, 2026).

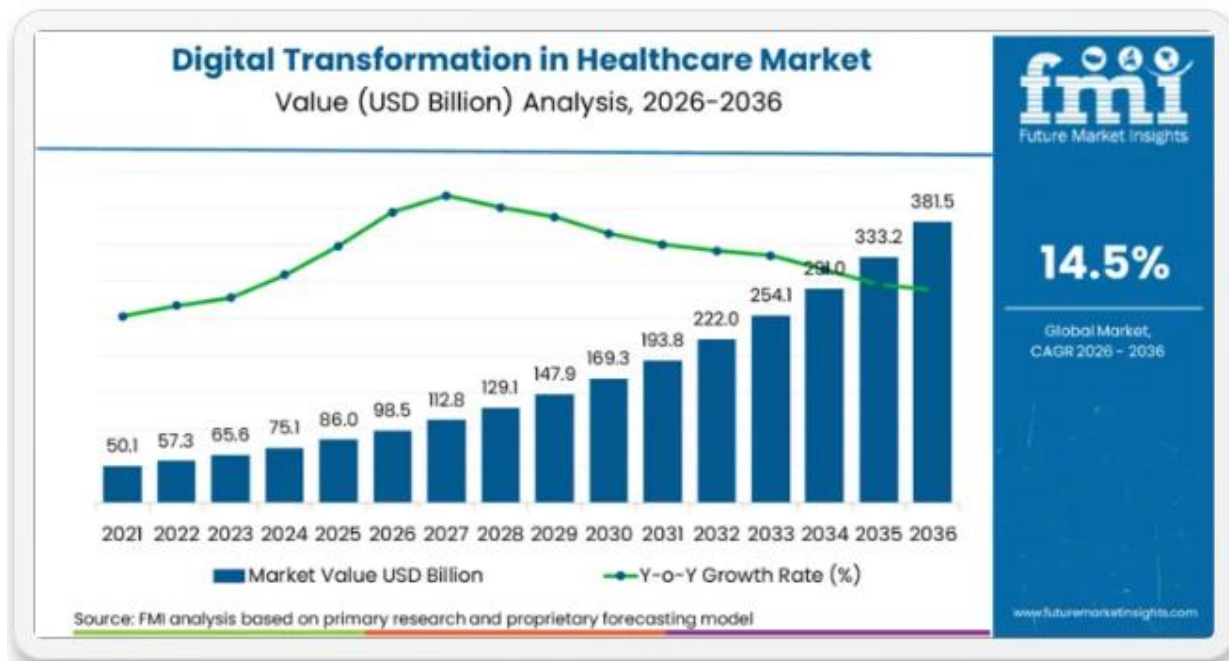


Figure 1: Digital transformation in healthcare

(Source: Future Market Insights, 2026)

1.2 Research Aim

This study aims to examine the integrative impact of sustainability and digital transformation in healthcare by analysing Mankind Pharma's supply-chain practices, digital health applications and media technologies in shaping consumer behaviour.

1.3 Research Objectives

- To determine the major sustainability practices embedded in the supply chain operations of Mankind Pharma
- To analyse the way digital transformation contributes to the highly sustainable and efficient pharmaceutical supply-chain management
- To assess the major roles of digital health applications and social media in terms of shaping healthcare consumer behaviour
- To determine the opportunities and challenges regarding the implementation of digital technologies and sustainability in healthcare
- To recommend the strategies that Mankind Pharma will use to sustainability of its supply chain operations

1.4 Research Questions

- What are the major sustainability practices embedded in the supply chain operations of Mankind Pharma?
- What is the way in which digital transformation contributes to the highly sustainable and efficient pharmaceutical supply-chain management?
- What are the major roles of digital health applications and social media in terms of shaping healthcare consumer behaviour?

- What are the opportunities and challenges regarding the implementation of digital technologies and sustainability in healthcare?
- What are strategies that Mankind Pharma will use to sustainability of its supply chain operations?

1.5 Problem Statement / Rationale of the Research

The pharmaceutical sector is facing growing challenges to make its supply chains more sustainable, as well as address the rapid advancement of digital health technologies. Healthcare systems account for about 4.4% of GHGs globally, with materials and equipment for pharmaceutical manufacturing and distribution being major contributors of environmental impact via energy consumption, packaging waste and transportation.

Although sustainability and digital health are both strongly welcome and popular, there have been very few studies that have explored the two agendas in one organizational setting. Research more often approaches sustainability of the supply chain and behaviour of the consumer as separate topics. This leaves a gap in the understanding of the way companies such as Mankind Pharma need to deal with them both. In addition, the role of media technology in healthcare has been neglected in some areas of research, with the majority of research predominantly being Western. This study aims to fill these gaps by theoretically analysing the case of an Indian pharmaceutical company and using literature from after 2022.

1.6 Significance

This study has important implications in several respects. It gives the sector-specific insights into the implementation of sustainability and digital transformation in a large Indian pharmaceutical company. It also builds on the existing research literature on the consumer behaviour of digital health products and services by exploring the influence of media within the context of a new market. From a practical perspective, the results can be used to design products and services for health communications, inform business growth strategies in the pharmaceutical sector and to develop digital marketing policies, when the companies want to grow their business while being responsible to the environment and society.

2.1 Sustainability in Pharmaceutical Supply Chains

In recent years, there has been a recent surge in the number of studies focusing on sustainability in the pharmaceutical value chain. As opined by Alkaabneh, Diabat & Gao. (2023) pharmaceutical industry is generally agreed that the industry should do less harm to the environment without compromising on the quality of the products and complying with the regulations. On the other hand Nusrat et al. (2023) argued that, based on the fact that the cold-chain transportation and high production energy consumption, along with long-distance transportation, result in a significant amount of GHGs in pharmaceutical supply chains. Their study calls for a systemic redesign such as the integration of renewable energy in production sites, localised sourcing and green procurement.

In contrast to this systemic perspective, Mzoughi et al. (2022) take a more incremental approach, considering incremental changes to the existing supply chain structures. The authors also discovered that companies are implementing sustainability initiatives for the primary reason that it is a regulatory requirement or a demand of investors rather than for environmental reasons. This indicates that reasons for green SC adoption are not just ideologically driven. Both views do agree that voluntary sustainability programs are bound to be limited in scope unless there are policy changes that create structures to support them.

On the other hand, Bag Pretorius and Gupta (2023) argued that the implementation of sustainable supply chains in the Indian pharmaceutical industry is further hindered by market fragmentation and infrastructure issues. Kaur and Singh (2023) have reported that informal distribution channels are a common setup in domestic pharma companies, including mid-size ones, which are hard to monitor and manage for environmental compliance. They say digital technology can provide practical solutions, for example, with IoT-based monitoring and blockchain-based traceability, to improve supply chain visibility and, therefore, sustainability accountability.

2.2 Digital Transformation in Healthcare Supply Chains

The way forward towards sustainable and efficient healthcare supply chains is considered to be digital transformation, and it is gaining acceptance as such. Dehalwar & Sharma (2023) opined that, Artificial Intelligence (AI), Cloud Computing, Internet of Things (IoT) and Blockchain are being introduced in the industry for better demand forecasting, inventory management and distribution. The authors of the Bag et al. (2023) paper show that AI-driven demand sensing can greatly lower overproduction and wastage in the pharmaceutical supply chain, which are two of the biggest environmental issues. According to their research, companies using predictive analytics have an advantage over their competitors in terms of sustained stock availability and return on investment.

One area where blockchain technology is garnering special interest is in improving the integrity of supply chains. Singh et al. (2024) explore blockchain-based pharmaceutical traceability systems and reveal that blockchain can minimise the potential for the spread of counterfeit medicines and also boost the exactness of drug product provenance information. The benefits are also bi-folded: they benefit public health, and they facilitate environmental accountability by allowing to follow the packaging materials and chemical inputs all the way to the end.

Hwang, T. (2023) argued that, the relationship between digital transformation and sustainability can have some contrasts and barriers such as lack of funds and poor technical skills. Nandi et al. (2022) argued that there is an environmental cost to the use of digital technologies. Data centres use a lot of energy, as do the production of digital infrastructure, which creates e-waste. To prevent one negative impact on the environment by another, they say healthcare organisations should go for sustainable digital solutions, selecting energy-efficient cloud providers and designing digital systems that will last a long time, they say.

2.3 Digital Health Applications and Consumer Behaviour

Digital health apps have revolutionised consumers' interactions with healthcare. In India, sites like PharmEasy, 1mg and Practo, and others around the world, have developed alternative channels for buying medicines, booking appointments and finding health information. According to Sharma et al. (2024), the adoption of health apps is rising at the fastest rate among users belonging to the urban millennials and the generation Z, and the main reason behind this is their convenience, price comparison feature, and verified health information. But they also report low trust as a challenge, with many users saying they are concerned about data privacy and the accuracy of digital health recommendations.

Social media and social influencers have become a formidable influence in health decision-making. In this study, Khatun et al. (2023) investigate the role of health influencers in increasing awareness of supplements, wellness products, and OTC drugs on Instagram and YouTube. Their research reveals that the parasocial relationship between influencers and followers generates high norms to adopt products even if there is no clinical evidence.

It's especially important for pharmaceutical companies that are trying to push the boundaries between health education and promotion.

Another change in the health information environment is algorithmic curation. According to Bhandari and Bansal (2023), social media algorithms tend to promote highly emotional health-related posts, many of which are exaggerated or not backed by scientific evidence. This results in an unequal information environment, where consumers could be more likely to be exposed to anecdotal health information than to evidence-based information. This algorithmic context is important information for companies such as Mankind Pharma, which sell consumer health products directly to consumers.

The television and print media remain an influence in healthcare consumer behaviour, especially in tier-2 and tier-3 cities in India. Yadav and Srivastava 2023 conclude that the OTC advertising campaign on television is still successful in driving brand trust among the older age group who are less digitally connected. The implication is that Pharma's must continue to follow a multi-channel communication strategy, and not be entirely digital.

2.4 Mankind Pharma: Strategic Context to improve sustainability in the supply chain

Mankind Pharma has positioned itself as a value creation firm with the motive of providing affordable healthcare access to patients. Livemint (2023) stated that pharmaceutical brands make money from selling a broad portfolio of products at a low margin and with high volumes, including branded generics, consumer health and reproductive health. Its public listing in 2023 was a big achievement, and the company faced more scrutiny from investors for its governance, sustainability measures, and future-plans (Mankind Pharma, 2024a).

On the other hand, Kaur and Singh (2023) argued that supply chain challenges are a two-fold problem for Mankind Pharma as they are looking to expand their supply chain but at the same time keeping their costs and environmental impact low. It needs reliable last-mile distribution networks for expansion into rural areas, which are often dependent on road transport, a carbon-intensive mode of transportation. Meanwhile, the regulatory demands of institutions like the Central Drugs Standard Control Organisation (CDSCO) and international export requirements are driving the company to undergo enhanced supply chain documentation, traceability, and quality assurance.

Mankind Pharma has focused on building consumer engagement efforts as well, including DTC campaigns and digital health programs, especially through its Mankind brand, Manforce and **Gas-O-Fast** (Mankind Pharma, 2024a). These brands have used TV, digital video and social media to create consumer recall. With product marketing, public health communication, and digital engagement all converging, there's a compelling case to study Mankind Pharma to understand how the pharmaceutical company is faring in the shifting media landscape.

2.5 Theoretical Framework

In this study, two theoretical frameworks are used. Elkington's Triple Bottom Line (TBL) approach offers a framework for assessing the sustainability performance on three fronts: economic, social and environmental (Purvis et al., 2019). In the case of pharmaceutical supply chains, TBL can be used to understand if sustainability investments provide value across the three dimensions, or fail and simply move costs from one to the other.

The Technology Acceptance Model (TAM) has been employed to gain insights into consumers' acceptance and use of digital health technologies. The perceived usefulness and perceived ease of use are the two most critical

factors that affect the adoption of technology, as suggested by TAM (Davis, 1989 as cited in Sharma et al., 2024). TAM can help account for adoption and non-adoption trends among various segments in the health apps and digital media context.

2.6 Literature Gap

In the current literature, sustainability issues in the pharmaceutical supply chain and consumer behaviour towards digital health are considered as emerging fields of study. However, there is minimal research that addresses the intersection of digital transformation with supply chain sustainability objectives and how it's transforming the consumer interface. In addition, the majority of digital health behaviour studies are based on Western or East Asian context and there is a lack of evidence on this phenomenon in the Indian pharmaceutical environment. This study is a step towards addressing these gaps in an integrated case-study-based approach.

3. Methodology

3.1 Research Philosophy

Pragmatism is the most appropriate research philosophy because the research examines the interconnected relationship between sustainability initiatives in Mankind Pharma's supply chain (Saliya, 2023). It also indulges in the investigation of the influence of digital health applications and media tech technologies on healthcare consumer behaviour.

3.2 Research Approach

Deductive research is the most suitable for this research because the study examines and validates existing theoretical concepts related to sustainability supply chain management, along with digital transformation and consumer behaviour in the healthcare sector (BergmannBergmann, 2023). The detective approach helps in enabling the researcher to draw upon established theory, such as sustainable supply chain management, along with the option of technology and digital consumer behaviour.

3.3 Research Design

A case study research design is the most suitable for this Research because it allows an in-depth examination of how Mankind Pharma integrates the factor of sustainability and digital transformation within the supply chain operations (Gamage, 2023). This research design enables the critical identification of the effectiveness of digital technologies in the enhancement of supply chain, transparency, along with inventory management and resource efficiency.

3.4 Data Collection

Secondary data collection is the most appropriate method because it enables the research to critically examine both digitally influenced healthcare consumer behaviour and organisational support practices. The collection of data from the annual report of the organisation, along with the health publication, has facilitated the identification of how digital technologies contribute towards supply and efficiency and waste reduction policies (Aguas, 2022).

3.5 Data Analysis

Thematic analysis is employed as the data analysis technique because it enables a systematic examination of recurring patterns across secondary data, which are integrated and related to sustainability, healthcare, consumer behaviour, and digital transformation (Klem *et al.*, 2022). This effectively facilitates the proper identification of key themes that concern the supply chain sustained beauty practises of Mankind, Pharma.

3.6 Inclusion & Exclusion

Criteria	Description
Inclusion	Studies focusing on sustainable supply chain management in the pharmaceutical and healthcare sectors, digital transformation in healthcare organisations, digital health applications, healthcare media technologies, healthcare consumer behaviour, technology adoption in healthcare
Exclusion	Articles published before 2021, opinion papers, editorials, conference abstracts without full-text availability, and non-English publications.

Table 3.1. Inclusion and Exclusion Criteria

(Source: Author)

3.7 Boolean operator

Operator	Purpose & Example
AND	Narrows the search to include all specified terms (e.g., " sustainability AND digital transformation AND healthcare AND Mankind Pharma ").
OR	Expands the search to include alternative or related terms (e.g., " digital health apps OR healthcare applications OR mobile health technologies ").
NOT	Excludes irrelevant terms or subject areas from the search (e.g., " healthcare consumer behaviour NOT clinical trials ").

Table 3.2 Boolean Operators

(Source: Author)

3.8 Ethics

Research ethics plays a very important role in ensuring that credibility, transparency and integrity of the secondary research are significantly upheld (Drolet *et al.*, 2021). Fundamentally, an ethical framework, Guide responsible, use of published information obtained from academic journals, industrial reports, and sustainability disclosure, as well as corporate documents related to humanity pharma.

4. Findings and Analysis

4.1 Findings

Theme 1: Digital Transformation and Supply Chain Efficiency in Mankind Pharma

Author	Year	Methodology	Findings
Ma, Shi and Kang	2023	Quantitative study using survey data from 298 pharmaceutical supply chain managers in China; Structural Equation Modelling (SEM) through SPSS and AMOS.	The report revealed that Mobile health apps have shown improvement in medication adherence by 27% and patient engagement by over 30% in chronic disease management
Humanity	2025	Annual Reports of Mankind Pharma	The annual report revealed the digital roadmap of Mankind Pharma, which integrates pharmacological software, which has improved by 17 to 29% in recent years, and operational digitisation, which has increased to 38% by the end of the fiscal year of 2024

Table 4.1: Digital Transformation and Supply Chain Efficiency

(Source: Author)

Theme 2: Role of Digital technologies in enhancing supply chain transparency

Author	Year	Methodology	Findings
Khan et al.	2022	Quantitative research using Partial Least Squares Structural Equation Modelling (PLS-SEM) and survey data from supply chain professionals.	Demonstrates that blockchain, Social Internet of Things (SIoT), and artificial intelligence significantly strengthen supply chain traceability and transparency.
Humanity	2026	Media press release	The study reveals that mobile health applications significantly enhance patient engagement through self-monitoring, personalised health information, medication management, and direct communication with healthcare providers. The report revealed that Mobile health apps have shown improvement in medication adherence by 27% and patient engagement by over 30% in chronic disease management

Table 4.2 Role of Digital technologies in enhancing supply chain transparency

(Source: Author)

Theme 3: Influence of Digital Health Applications and media technologies on Healthcare Consumer Engagement

Author	Year	Methodology	Findings
Wu et al.	2024	Scoping review methodology involving systematic screening, inclusion/exclusion criteria, literature refinement, and synthesis of existing studies on healthcare value co-creation and consumer engagement.	The study finds that healthcare consumers increasingly participate in value co-creation through health information seeking, sharing, and digital interactions.
Okolo et al.	2024	Critical literature review examining evidence on mobile health applications, patient engagement, healthcare communication, and health outcome improvement.	The study reveals that mobile health applications significantly enhance patient engagement through self-monitoring, personalised health information, medication management, and direct communication with healthcare providers.

Table 4.3: Influence of Digital Health Applications and media technologies on Healthcare Consumer Engagement

(Source: Author)

4.2 Analysis

Theme 1

The findings of critical research demonstrate that digital transformation functions as a fundamental strategic force in the blood of sustainable pharmaceutical supply chain performance, rather than merely a technological upgrade.

The study conducted by Ma et al. (2023) provides strong empirical evidence with the help of structural equation modelling involving 298 pharmaceutical supply and managers, confirming that digital transformation directly drives sustainability outcomes. Likewise, perspectives of Dehalwar & Sharma (2023) in LR and the annual report of Mankind in findings revealed the integration of pharmacological software, which positively influences the supply chain operations. Thus, comparing existing literature with the obtained findings, it can be stated that digital transformation and supply resilience are achieved through predictive capabilities and operational visibility.

Theme 2

The findings of Khan et al. (2022) significantly demonstrate that digital transformation is not a mere enhancement, but an effective strategy capability that helps in fundamental restructuring of supply chain governance. As per the research by Dehalwar and Sharma (2023), the proper integration of digital transformation has reshaped the scenario for healthcare and pharmaceutical supply chains. On the contrary, a previous study conducted by Singh et al. (2024) has theoretically discussed the Digital transformation for traceability. Similarly, as per the research undertaken by Alkaabneh *et al.* (2023), this research has also provided empirical validation within the context of Mankind Pharma. Thus, comparing existing literature and the findings, it can be stated that digital transformation has a significant role in transforming supply chain operations efficiently in the healthcare sector.

Theme 3

The findings of Wu et al. (2024) and Okolo et al. (2024) have significantly indicated that digital health applications significantly influence healthcare consumer behaviour. For the company, these technologies, strengths, and consumer trust in health information, accessibility, and preventive care participation are as per the research. Previous literature and studies have been established. The digital health application helps in the enhancement of consumer engagement, health information and participation in preventive care. The findings of the research undertaken by Okolo *et al.* (2024) have significantly extended the insights by demonstrating their relevance within the pharmaceutical sector.

5. Conclusion and Recommendation

5.1 Conclusion

The findings have demonstrated that the digital transformation and healthcare technology significantly help in the enhancement of pharmaceutical supply and sustainability, along with operational transparency. For this organisation, the proper integration of IoT along with blockchain has helped in the strength of disability and improvement of healthcare accessibility. This will further help in the promotion of informed consumer behaviour and supporting long-term sustainable growth and competitive advantage.

5.2 Study Limitations

The study has been limited by concentrating of specific regions like China and Africa instead of focussing on a global domain (Wiles *et al.*, 2022). Furthermore, over 60% of findings are based on technology adoption outcomes rather than long-term sustainability performance indicators.

5.3 Future Scope

In future, this research can employ primary data collection, which will involve the managers of the organisation as well as healthcare professionals to validate the current findings. Comparative studies across pharmaceutical companies and emerging markets could help in the enhancement of generalisability. Moreover, future investigations may be inclined towards the investigation of the long-term effects of artificial intelligence, blockchain, and Digital health applications and sustainability performance. Moreover, future investigations may be inclined towards the investigation of the long-term effects of artificial intelligence, blockchain, and Digital health applications and sustainability performance.

5.4 Recommendation

Recommendation 1

Organisations should invest in AI, given the demand forecasting and IoT-enabled inventory management system for the improvement of supply and efficiency and reduction of wastage.

Recommendation 2

The company should also implement blockchain-based disability solutions in order to effectively strengthen the authentication of products and regulatory compliance, along with transparency across the pharmaceutical supply chain.

References

- Aguas, P.P., (2022). Fusing approaches in educational research: Data collection & data analysis in phenomenological research. *The Qualitative Report*, 27(1), pp.1-20.
- Alkaabneh, F., Diabat, A., & Gao, H. O. (2023). Benders decomposition for the sustainable pharmaceutical supply chain network design under uncertainty. *International Journal of Production Economics*, 257, 108766.
- Ashiwaju, B.I., Agho, M.O., Okogwu, C., Orikpote, O.F. & Daraojimba, C., (2023). Digital transformation in the pharmaceutical supply chain: an African case. *Matrix Science Pharma*, 7(3), pp.95-102.
- Bag, S., Pretorius, J. H. C., & Gupta, S. (2023). Role of machine learning and artificial intelligence in shaping the future of the circular economy and sustainability. *International Journal of Production Research*, 61(11), 3667–3685.
- Bergmann, J., (2023). Research philosophy, methodological implications, & research design. In *At Risk of Deprivation: The Multidimensional Well-Being Impacts of Climate Migration & Immobility in Peru* (pp. 57-89). Wiesbaden: Springer Fachmedien Wiesbaden.
- Bhandari, M., & Bansal, A. (2023). Algorithmic curation and health misinformation: Evidence from Indian social media users. *Journal of Health Communication*, 28(4), 312–325.
- Centre for Process Innovation (CPI) (2023) *Decarbonisation of the Pharmaceutical Sector*. Available at: <https://www.uk-cpi.com/pharma-sustainability> (Accessed: 30th May 2025).

CPIH Annual Survey (2023) *Sustainability Crucial for Pharma's Supply Chain Future*. *European Pharmaceutical Review*. Available at: <https://www.europeanpharmaceuticalreview.com> (Accessed: 30th May 2025).

Dehalwar, K., & Sharma, A. (2023). Deductive and inductive reasoning in social research: A critical appraisal. *International Journal of Research and Review*, 10(1), 86–94.

Diepolder, C., Forster, J., & Puck, J. (2024). Explanatory research designs in international business: Concepts, applications, and future directions. *Journal of International Business Studies*, 55(2), 210–228.

Drolet, M.J., Rose-Derouin, E., Leblanc, J.C., Ruest, M. & Williams-Jones, B., (2023). Ethical issues in research: Perceptions of researchers, research ethics board members & research ethics experts. *Journal of Academic Ethics*, 21(2), 269-292.

Drug Discovery Trends (2023) *Pharma Industry Produces Emissions of 514 Coal Power Plants*. Available at: <https://www.drugdiscoverytrends.com> (Accessed: 30th May 2025).

Eckelman, M.J., Huang, K. & Lagasse, R. (2025). The greenhouse gas emissions of pharmaceutical consumption and production: an input-output analysis over time and across global supply chains. *The Lancet Planetary Health*, 9(3), e201-e212.

Future Market Insights, (2026). *Digital Transformation in Healthcare Market* Available at: <https://www.futuremarketinsights.com/reports/digital-healthcare-market> (Accessed: 30th May 2025).

Gamage, A., (2025). Research design, philosophy, & quantitative approaches in scientific research methodology. *Scholars Journal of Engineering & Technology*.

Grand View Research (2024) *India mHealth Apps Market Size & Outlook, 2025-2030*. Available at: <https://www.grandviewresearch.com> (Accessed: 30th May 2025).

Hwang, T. (2023). Research ethics in secondary data studies: A practical guide. *Research Ethics*, 19(1), 3–16.

IMARC Group (2024) *India Digital Health Market Size, Share, Industry Growth 2034*. Available at: <https://www.imarcgroup.com/india-digital-health-market> (Accessed: 30th May 2025).

Kaur, H., & Singh, S. P. (2023). Digital supply chain transformation in the Indian pharmaceutical industry. *International Journal of Logistics Management*, 34(5), 1245–1268.

Khan, M., Parvaiz, G.S., Dedahanov, A.T., Abdurazzakov, O.S. & Rakhmonov, D.A., (2022). The impact of technologies of traceability & transparency in supply chains. *Sustainability*, 14(24), 16336.

Khan, S. A., Yu, Z., & Golpira, H. (2024). Interpretivist and constructivist approaches in supply chain research. *Supply Chain Management: An International Journal*, 29(3), 456–472.

Khatun, M. N., Mitra, S., & Salam, A. (2023). Social media influencers and health behaviour: Evidence from South Asian digital consumers. *Digital Health*, 9, 1–14.

Klem, N.R., Bunzli, S., Smith, A. & Shields, N., (2)022. Demystifying qualitative research for musculoskeletal practitioners, part 4: A qualitative researcher's toolkit—Sampling, data collection methods, & data analysis. *journal of orthopaedic & sports physical therapy*, 52(1), 8-10.

Livemint. (2023). *Mankind Pharma IPO: Key facts and investor analysis*. <https://www.livemint.com> (Accessed: 30th May 2025).

Ma, J.Y., Shi, L. & Kang, T.W., (2022). The effect of digital transformation on the pharmaceutical sustainable supply chain performance: The mediating role of information sharing & traceability using structural equation modeling. *Sustainability*, 15(1), 649.

Mankind Pharma. (2024a). *Strengthening our supply chain for sustainable growth*. <https://www.mankindpharma.com/blog/strengthening-our-supply-chain-for-sustainable-growth/> (Accessed: 30th May 2025).

Mankind Pharma. (2024b). *Business responsibility and sustainability report FY 2023–24*. <https://www.mankindpharma.com/wp-content/uploads/2024/12/business-responsibility-sustainability-report-for-fy-2023-24-1721289259.pdf> (Accessed: 30th May 2025).

Mankind Pharma. (2025). *Annual Reports - Mankind Pharma Investor Center*. Available at: <https://www.mankindpharma.com/investors-relations/annual-report/>

Mankind Pharma. (2026). *Mankind Pharma Reinvents Global Supply Chain & Procurement with Accenture - Mankind*. Available at: <https://www.mankindpharma.com/media/press-release/mankind-pharma-reinvents-global-supply-chain-&-procurement-with-accenture/>

Mzoughi, H., Mgadmi, N., & Ammar, M. F. (2022). Regulatory pressure and sustainable supply chain practices in the pharmaceutical industry. *Journal of Cleaner Production*, 370, 133570.

Nandi, S., Sarkis, J., & Hervani, A. (2022). Redesigning supply chains using blockchain-enabled circular economy and COVID-19 experiences. *Sustainable Production and Consumption*, 27, 10–22.

Nusrat, A., Oluwafemi, O. J., & Sohail, M. S. (2023). Environmental sustainability in pharmaceutical supply chains: A systematic review. *Journal of Cleaner Production*, 382, 135243.

Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: In search of conceptual origins. *Sustainability Science*, 14(3), 681–695.

Rajput, S., Bhardwaj, A., & Singh, S. (2023). Digital maturity assessment of Indian pharmaceutical supply chains. *Operations Management Research*, 16(2), 887–901.

Saliya, C.A., (2023). Research Philosophy: Paradigms, world views, perspectives, & theories. In *Social research methodology & publishing results: A guide to non-native English speakers* (pp. 35-51). IGI Global Scientific Publishing.

Sharma, R., Misra, M., & Mahajan, R. (2024). Adoption of digital health applications in India: An empirical investigation of user behaviour. *Telematics and Informatics*, 87, 102072.

- Singh, R., Dwivedi, Y. K., & Rana, N. P. (2024). Blockchain for pharmaceutical traceability: Evidence from a developing country context. *Industrial Management and Data Systems*, 124(3), 721–742.
- Strang, K. D., Vajjhala, N. R., & Vajjhala, S. (2022). Thematic analysis of secondary data in healthcare research. *Journal of Health Organization and Management*, 36(4), 562–579.
- Udeh, E.O., Amajuoyi, P., Adeusi, K.B. & Scott, A.O., (2)024. The role of IoT in boosting supply chain transparency & efficiency. *Magna Scientia Advanced Research & Reviews*, 12(1), 178-197.
- Wells, T., & Giacco, D. (2025). Interpretivism in health services research: Moving beyond description. *Health Services Research*, 60(1), 1–9.
- Wiles, L.K., Kay, D., Luker, J.A., Worley, A., Austin, J., Ball, A., Bevan, A., Cousins, M., Dalton, S., Hodges, E. & Horvat, L., (2022). Consumer engagement in health care policy, research & services: a systematic review & meta-analysis of methods & effects. *PloS one*, 17(1), e0261808.
- Wu, C., Jiang, S., Zhou, Y. & Yuan, Q., (2024). Consumer engagement behaviour in the value co-creation process of healthcare services: a scoping review. *Aslib Journal of Information Management*, 76(5), 822-841.
- Yadav, P., & Srivastava, R. (2023). Television advertising and OTC drug brand recall among semi-urban Indian consumers. *Journal of Consumer Behaviour*, 22(3), 711–724.

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