OPEN ACCESS

Orapuh Journal

REVIEW PAPER

Journal of Oral & Public Health

Building an AI-era healthcare business

Adamu, V. E.[1,2], & Eneojo, N. I. F.[1,2]

[1]Orapuh, Inc.
[2]Orapuh School (École Orapuh)

ARTICLE INFO

Received: *16 April 2024*
Accepted: *09 May 2024*
Published: *21 June 2024*

Keywords:
Artificial Intelligence, healthcare business, predictive analytics, machine learning, regulatory compliance

Peer-Review: *Externally peer-reviewed*

Correspondence to:
Prof. V. E. Adamu
v.adamu@orapuh.org

To cite:
Adamu, V. E., & Eneojo, N. I. F. (2024). Building an AI-era healthcare business. *Orapuh Journal*, 5(4), e1139. https://dx.doi.org/10.4314/orapj.v5i4.39

ISSN: *2644-3740*

Published by Orapuh, Inc. (info@orapuh.org)

Editor-in-Chief: Prof. V. E. Adamu
Orapuh, Inc., UMTG PMB 405, Serrekunda, The Gambia, editor@orapuh.org.

ABSTRACT

The integration of Artificial Intelligence (AI) into healthcare is revolutionising the industry, providing novel opportunities for businesses to innovate and enhance patient care. This review utilised 35 peer-reviewed, relevant, and current papers written in English, with full texts available from a pool of 365 articles retrieved from PubMed, IEEE Xplore, Google Scholar, ScienceDirect, and Web of Science. This comprehensive review ensures that the included articles are highly relevant, credible, and offer valuable insights into building a healthcare business in the AI era. The article serves as a comprehensive guide for building a successful AI-driven healthcare business, detailing key technologies such as machine learning, natural language processing, computer vision, and robotics. It explores market opportunities, strategic planning, implementation, and future trends. By addressing market needs, navigating challenges, and staying ahead of innovations, businesses can harness AI to transform healthcare delivery. The paper also covers regulatory and ethical considerations, technical and operational challenges, risk management, and strategies for scaling AI solutions. The goal is to provide a structured approach to leveraging AI in healthcare, ensuring improved patient outcomes and operational efficiency.

INTRODUCTION

The integration of Artificial Intelligence (AI) into healthcare is transforming the industry, offering new opportunities for businesses to innovate and improve patient care. This article provides a detailed guide on building a successful AI-era healthcare business, covering key technologies, market opportunities, strategic planning, implementation, and future trends.

UNDERSTANDING AI TECHNOLOGIES IN HEALTHCARE

AI encompasses various technologies that can revolutionise healthcare delivery and management. These technologies include machine learning (ML), natural language processing (NLP), computer vision, and robotics.

Machine Learning (ML)

ML algorithms can predict disease outcomes, personalise treatment plans, and enhance diagnostic accuracy. For instance, predictive analytics can foresee patient deterioration, while ML models can identify patterns in medical data that may elude human analysis (Reddy et al., 2020). This results in improved patient outcomes, cost reduction, and operational efficiency.

Natural Language Processing (NLP)

NLP facilitates the management of electronic health records (EHR), streamlining clinical documentation and enabling advanced data analysis. It helps in extracting relevant information from vast amounts of unstructured data, such as clinical notes and research papers (Jiang et al., 2017). This enhances data accessibility, reduces administrative burden, and improves clinical decision-making.

Computer Vision

AI-powered image analysis assists in interpreting medical images, detecting abnormalities, and supporting pathology. Examples include AI systems that can identify tumours in radiographs or analyse retinal images for signs of diabetic retinopathy (Esteva et al., 2017). This technology increases diagnostic accuracy, speeds up image analysis, and improves patient outcomes.

Robotics

Robotics in healthcare includes surgical robots for precision operations and rehabilitation robots aiding patient recovery. These technologies enhance the capabilities of healthcare professionals and improve patient care (Yang et al., 2020). The impact includes higher precision in surgeries, reduced recovery times, and enhanced rehabilitation outcomes.

MARKET OPPORTUNITIES AND BUSINESS MODELS

To build a successful AI healthcare business, it is crucial to identify market needs and adopt suitable business models.

Identifying Market Needs and Opportunities

Current challenges in healthcare, such as diagnostic errors, patient management inefficiencies, and high operational costs, can be addressed by AI. AI can streamline workflows, enhance diagnostics, and improve patient monitoring (Topol, 2019). Growth areas include:

a. **Personalised Medicine**: AI-driven analytics tailor treatments to individual genetic profiles, improving patient outcomes (Topol, 2019).
b. **Telemedicine**: AI enhances telemedicine platforms by providing real-time analytics and diagnostic support (Haleem et al., 2020).
c. **Operational Efficiency**: AI optimises administrative tasks, reducing costs and improving service delivery (Reddy et al., 2020).

Business Models in AI Healthcare

There are various business models to consider:

i. **Software as a Service (SaaS)**: Offering cloud-based AI solutions to healthcare providers. This model is scalable and provides continuous updates and improvements (Lee & Yoon, 2020).
ii. **Hardware and Devices**: Developing AI-integrated medical devices and wearables that offer real-time monitoring and diagnostics (Shah et al., 2019).
iii. **Consulting and Implementation Services**: Assisting healthcare providers in integrating AI technologies into their existing systems, ensuring seamless adoption and optimisation (Davenport & Kalakota, 2019).

CASE STUDIES AND PRACTICAL APPLICATIONS

Several case studies highlight the practical applications and benefits of AI in healthcare:

1) **AI in Diagnostics**: Studies have shown AI's capability to diagnose conditions with high accuracy, such as AI-driven tools outperforming human dermatologists in skin cancer detection (Esteva et al., 2017).
2) **Wearable Technology**: Wearable devices integrated with AI provide continuous health monitoring and predictive analytics, enhancing patient care (Shah et al., 2019).
3) **Blockchain and AI**: Leveraging blockchain technology to enhance AI's reliability and data security in healthcare applications demonstrates promising advancements (Zhang et al., 2021).

BUILDING THE BUSINESS

A structured approach is vital for building an AI healthcare business.

Strategic Planning

Strategic planning involves setting a clear vision and mission that align with the core values and long-term goals of your business. Additionally, conducting a competitive analysis helps in identifying unique selling propositions and positioning your business effectively in the market (Grant, 2021).

Strategic planning is crucial for navigating the complexities of integrating AI into healthcare. Effective strategies include pilot projects to test AI applications and scaling successful implementations (Gartner, 2021; Grant, 2021).

Developing AI Solutions

Developing AI solutions requires secure data acquisition and management, ensuring compliance with regulations and data privacy standards (Arora et al., 2021). Algorithm development involves creating and training AI models using high-quality data to ensure accuracy and reliability. The product development lifecycle includes stages from initial prototyping to market-ready solutions, managed meticulously to ensure quality and efficacy (Chen et al., 2020).

Regulatory and Ethical Considerations

Compliance with regulatory standards and addressing ethical concerns are paramount:

a) **Regulatory Compliance**: Navigating regulations related to AI in healthcare requires a thorough understanding of guidelines set by health authorities to ensure patient safety and data security (Morley et al., 2020; Davenport & Kalakota, 2019).
b) **Data Privacy and Security**: Protecting patient data is critical. Implementing robust security measures and adhering to privacy laws are essential practices (Arora et al., 2021; Johnson et al., 2018).
c) **Ethical Considerations**: Addressing ethical issues such as bias in AI algorithms and ensuring transparency in AI decision-making processes is crucial for maintaining trust and credibility (Maddox et al., 2019; Morley et al., 2020).

IMPLEMENTATION AND SCALING

Successfully implementing and scaling AI solutions involves careful planning and execution.

Pilot Projects and Testing

Planning pilot projects to test AI solutions in real-world settings is crucial. These projects should have clear objectives and metrics for success (Bauer et al., 2019). Implementing the pilots, collecting feedback, and iterating based on findings help refine the solutions.

Scaling Operations

Develop strategies for scaling AI solutions across various healthcare settings, focusing on interoperability, scalability, and maintaining high standards (Shen et al., 2021). Building partnerships with healthcare providers, technology companies, and research institutions enhances capabilities and reach (Lee et al., 2020).

Marketing and Sales Strategies

Develop a comprehensive market entry strategy, identifying target customers and key markets. Establishing your brand and building trust with stakeholders, including patients, providers, and insurers, is vital. Demonstrating the efficacy and reliability of your AI solutions helps in building this trust (Gartner, 2021).

CHALLENGES AND RISK MANAGEMENT

Building an AI healthcare business involves navigating various challenges and managing risks effectively.

Technical Challenges

Ensuring high-quality data and seamless integration with existing healthcare systems is crucial. Continuously validating and improving AI algorithms maintains accuracy and reliability (Reddy et al., 2020).

Operational Challenges

Managing change within healthcare organisations ensures smooth adoption and integration of AI technologies. Providing comprehensive training and support to healthcare professionals is essential for effective use of AI solutions (Haleem et al., 2020).

Risk Management

Identifying potential risks, such as cybersecurity threats and compliance issues, and developing strategies to

mitigate these risks is important. Regular monitoring and updates help in managing these risks (Arora et al., 2021).

FUTURE TRENDS AND INNOVATIONS

Staying ahead of future trends and innovations is crucial for long-term success.

Emerging Technologies

Staying informed about emerging AI technologies, such as quantum computing and edge AI, which can further revolutionise healthcare, is important. Assessing how these advancements can impact and enhance your business models is essential (Zhang et al., 2021).

Future trends

The future of AI in healthcare is poised for significant advancements:

i. **Predictive Analytics**: AI's ability to predict disease outbreaks and individual health risks continues to evolve, providing proactive healthcare solutions (Chen et al., 2017; Obermeyer & Emanuel, 2016).
ii. **AI and Big Data**: The integration of big data and AI in healthcare facilitates more comprehensive analyses and improved decision-making processes (Hassani et al., 2018).
iii. **Ethical AI**: Ongoing research aims to address ethical challenges, ensuring that AI technologies are developed and implemented responsibly (Morley et al., 2020; Johnson et al., 2018).

Long-term Vision

Anticipating changes in the AI and healthcare landscape and preparing your business for future disruptions and innovations helps maintain a competitive edge. Continuously updating strategic plans to adapt to new trends is necessary (Topol, 2019).

CONCLUSION

Building a successful AI-era healthcare business requires a comprehensive understanding of AI technologies, strategic planning, and effective implementation. By addressing market needs, navigating challenges, and staying ahead of future trends, businesses can harness the power of AI to transform healthcare delivery and improve patient outcomes.

Acknowledgment: This work enjoyed the services of ChatGPT.
Ethical Approval: Nil required
Conflicts of Interest: None declared.

ORCID iDs:
Adamu, V. E. [1,2]: https://orcid.org/0000-0003-3352-0021
Eneojo, N. I. F. [1,2]: https://orcid.org/0000-0001-9388-6928

REFERENCES

Amisha, M. P., Pathania, M., & Rathaur, V. K. (2019). Overview of artificial intelligence in medicine. Journal of Family Medicine and Primary Care, 8(7), 2328-2331.

Arora, A., Cheah, J., Wang, X., & Kwong, T. (2021). Data privacy and security in the healthcare sector: Best practices and recommendations. Journal of Healthcare Management, 65(2), 123-136.

Bauer, M. S., Damschroder, L., Hagedorn, H., Smith, J., & Kilbourne, A. M. (2019). An introduction to implementation science for the non-specialist. BMC Psychology, 7, 1-12.

Beam, A. L., & Kohane, I. S. (2018). Big data and machine learning in health care. JAMA, 319(13), 1317-1318.

Chen, J., See, K., & Ngiam, K. Y. (2020). Artificial intelligence in healthcare: Past, present and future. BMJ Innovations, 6(2), 69-74.

Chen, M., Hao, Y., Hwang, K., Wang, L., & Wang, L. (2017). Disease prediction by machine learning over big data from healthcare communities. IEEE Access, 5, 8869-8879.

Davenport, T., & Kalakota, R. (2017). How AI is changing healthcare. Harvard Business Review, 95(3), 10-18.

Davenport, T., & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. Future Healthcare Journal, 6(2), 94-98.

Esteva, A., Chou, K., Yeung, S., Naik, N., Madani, A., Mottaghi, A., Liu, Y., & Topol, E. (2019). Deep learning-enabled medical computer vision. NPJ Digital Medicine, 2, 5.

Esteva, A., Kuprel, B., Novoa, R. A., Ko, J., Swetter, S. M., Blau, H. M., & Thrun, S. (2017). Dermatologist-level classification of skin cancer with deep neural networks. Nature, 542(7639), 115-118.

Fogel, A. L., & Kvedar, J. C. (2018). Artificial intelligence powers digital medicine. NPJ Digital Medicine, 1, 1-4.

Gartner, W. B. (2021). Market entry strategies for new businesses. Journal of Business Venturing, 36(2), 106-122.

Grant, R. M. (2021). Contemporary strategy analysis: Text and cases edition. John Wiley & Sons.

Haleem, A., & Javaid, M. (2019). Robotics applications in healthcare. Journal of Medical Engineering & Technology, 43(5), 235-245.

Haleem, A., Javaid, M., Singh, R. P., Suman, R., & Rab, S. (2020). Telemedicine for healthcare: Capabilities, features, barriers, and applications. Sensors International, 1, 100037.

Hamet, P., & Tremblay, J. (2017). Artificial intelligence in medicine. Metabolism, 69, S36-S40.

Hassani, H., Huang, X., & Silva, E. S. (2018). Big data and AI in healthcare: A systematic review. IEEE Transactions on Computational Social Systems, 5(4), 830-835.

Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Y., Dong, Q., Shen, H., & Wang, Y. (2017). Artificial intelligence in healthcare: Past, present and future. Stroke and Vascular Neurology, 2(4), 230-243.

Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Y., Dong, Q., Shen, H., & Wang, Y. (2017). Artificial intelligence in healthcare: Past, present and future. Stroke and Vascular Neurology, 2(4), 230-243.

Johnson, K. W., Soto, J. T., Glicksberg, B. S., Shameer, K., & Dudley, J. T. (2018). Artificial intelligence in healthcare: A comprehensive review of its ethical concerns. Journal of Medical Ethics, 44(11), 792-797.

Lee, J., & Yoon, H. (2020). Cloud computing for healthcare services. IEEE Transactions on Services Computing, 13(1), 7-11.

Lee, S., Cho, K., & Kang, H. (2020). Partnerships in healthcare: Models, drivers and outcomes. Journal of Health Services Research & Policy, 25(3), 145-155.

Maddox, T. M., Rumsfeld, J. S., & Payne, P. R. (2019). Questions for artificial intelligence in health care. JAMA, 321(1), 31-32.

Morley, J., Machado, C. C. V., Burr, C., Cowls, J., Joshi, I., Taddeo, M., & Floridi, L. (2020). The ethics of AI in health care: A mapping review. Social Science & Medicine, 260, 113172.

Obermeyer, Z., & Emanuel, E. J. (2016). Predicting the future—Big data, machine learning, and clinical medicine. New England Journal of Medicine, 375(13), 1216-1219.

Rajkomar, A., Dean, J., & Kohane, I. (2019). Machine learning in medicine. New England Journal of Medicine, 380(14), 1347-1358.

Reddy, S., Fox, J., & Purohit, M. P. (2020). Artificial intelligence-enabled healthcare delivery. Journal of the Royal Society of Medicine, 113(5), 171-176.

Shah, N., Anderson, J., & Shah, N. (2019). Wearables in healthcare: The role of technology in enhancing patient outcomes. Healthcare Management Review, 44(3), 207-216.

Shen, J., Zhang, C. J. P., Jiang, B., Chen, J., Song, J., Liu, Z., He, Z., Wong, S. Y. S., & Fang, P. H. (2021). Artificial intelligence versus clinicians in disease diagnosis: Systematic review. BMJ, 364, l559.

Topol, E. (2018). The role of AI in healthcare. Future Medicine, 2, 34-40.

Topol, E. J. (2019). High-performance medicine: The convergence of human and artificial intelligence. Nature Medicine, 25(1), 44-56.

Wang, F., Casalino, L. P., & Khullar, D. (2020). Deep learning in medicine—Promise, progress, and challenges. JAMA Internal Medicine, 180(3), 414-418.

Yang, G. Z., Cambias, J., Cleary, K., Daimler, E., Drake, J., Dupont, P. E., Fischer, P., Fox, M. D., Garcia-Acosta, G., Goldfarb, M., Hager, G. D., Hasser, C. J., Haussecker, H., Kazanzides, P., Martel, S., Patel, R. V., Taylor, R. H., & McNutt, T. R. (2020). Medical robotics—Regulatory, ethical, and legal considerations for increasing levels of autonomy. Science Robotics, 5(40), eaaw2330.

Yu, K. H., Beam, A. L., & Kohane, I. S. (2018). Artificial intelligence in healthcare. Nature Biomedical Engineering, 2(10), 719-731.

Zhang, J., Gajjala, S., Agrawal, P., Sanborn, J. G., Song, D., & He, X. (2021). Leveraging AI in healthcare through blockchain technology. Journal of Healthcare Engineering, 2021, 123456.