Review Article

Journal of Current Trends in Nursing & Health Care

Contemporary Health Information Technology (HIT): Opportunities and Challenges

Wullianallur Raghupathi[1], Viju Raghupathi[2], Joseph Tan[3]*

[1]Professor, Gabelli School of Business, Fordham University, USA

[2]Associate Professor, Koppelman School of Business, Brooklyn College of the City University of New York

[3]Professor, DeGroote School of Business, McMaster University

***Corresponding author:** Joseph Tan, Professor, DeGroote School of Business, McMaster University, USA, E-mail: tanjosep@mcmaster.ca

Received Date: 24 September, 2021
Accepted Date: 29 September, 2021
Published Date: 02 October, 2021

Citation: Wullianallur Raghupathi, Viju Raghupathi, Joseph Tan (2021) Contemporary Health Information Technology (HIT): Opportunities and Challenges. J Cur Tre Nur Health Care 2(3): 1-4

Abstract
Current developments of health information technology and applications are at a crossroads. As business organizations around the world undergo rapid digital transformation, so too must those services delivery centers and research facilities across and within the healthcare industry. Today, key beneficial outcomes of this phenomenon will not only include a reduction in the cost of health care but, more importantly, continuing improvement in the quality of healthcare services being delivered. In this brief, we highlight the key contemporary technologies that have the potential to impact healthcare services delivery and identify the emerging opportunities and challenges. The overarching goal is to provide a high-level panoramic overview of the contemporary state of health information technology.

Keywords: Digital Transformation, Health Information Technology (HIT), Managerial Challenge, Technological Issue

Introduction
While most healthcare services delivery organizations have implemented basic health information technology (HIT) applications such as EHRs, they must now leap forward to adopt more transformational applications such as innovations in consumer health informatics and health decision support systems [1-10]. Yet, many remain laggards in that these organizations are still applying HIT at the operational and/or tactical stages, primarily for routine and operational functions or merely adapting HIT to meet the mandated requirements for meaningful use (MU) and various clinical quality measures (CQMs); accordingly, the next level to pursue is the strategic thinking and use of HIT [11-13].

Today, few notable organizations have emerged as leaders, striving to transform healthcare with HIT quickly. Eventually though, organizations must focus on key, next generation, transformational applications including artificial intelligence (AI) and deep learning (DL), big data analytics (BDA), blockchain, cloud computing (CC), Internet of Everything (IoE) devices, mobile computing, robotic process automation, wearables, and others. In an era of rapid disruptive thinking and innovative entrepreneurship, AI and DL applications have rapidly come to the forefront of successful applications in health care and medicine. These data-driven models extract insight from the embedded patterns within the data [14-18]. BDA include descriptive, predictive, prescriptive, and wisdom or discovery analytics to assist in clinical diagnosis, the periodic monitoring of vital signs, and treatment [19,20]. Indeed, the technology has the potential to directly intervene in improving care quality while reducing medical errors. Blockchain has the potential to revolutionize healthcare data interchange and transactions by enabling a shared-governance, and a distributed, real-time way to share, disseminate and execute verifiable transactions securely [21,22].

CC is rapidly become an alternative to deliver HIT applications for better management of scaling demands especially for rapidly expanding care services delivery organizations [23,24]. CC allows software to be run and data to be stored on remote servers. In this sense, the subscribing healthcare delivery organization is freed of the need and accompanying responsibilities to install, upgrade, or engage in software maintenance. More importantly, if and should many organizations subscribe and use the same cloud-based platform, the possibility of interoperable data exchange and uniform processing of data can then be quickly coordinated and benefit from a network of connected digital data exchanges. While security is shifted to the cloud, laws are still unclear about intra- and/or inter-organizational data flows. This issue must yet be examined further.

An emerging technology is cognitive computing, for example, IBM's Watson application for health care. In general, cognitive computing is based on AI, natural language, and deep knowledge bases to aid clinicians in diagnosis and treatment decisions [25]. Today, the declining cost of computerized data processing and the exponential increase in computing storage have accelerated the use of cognitive computing in health care. This, indeed, is an advanced form of IT. More broadly, the applications of e-health and m-health have evolved over time and provided some of the greatest success in HIT deployment and implementations [26,27]. E-health implementations range from telemedicine and virtual health to internet and web-based applications. Healthcare delivery the world over has been transformed by e-health [28-30]. M-Health (mobile computing) along with the older e-health (electronic health or web-based health) also offers enhancements to healthcare delivery with facilitating effective and faster communication (e.g., between pharmacy-and-patient, paramedics-to-clinics, physician-and-patient, and more), facilitating everything from chat & texting to monitoring prescription drug intake and scheduling appointments [31,32].

The Internet of Everything (IoE) is yet another rapidly emerging platform, with potential for health care [33,34]. The IoE paradigm vies to connect everything digital, from hardware devices to software applications. One can imagine the potential of IoE for health care; essentially, the seamless and transparent coupling of all things electronic to provide health care – from telemedicine to remote monitoring of vital signs of patient. From wireless devices to skin-implanted chips to cell phone, all devices can work together to improve the quality of health care delivery. In this way, interoperability can also be achieved promptly, effortlessly, and beneficially as a value-added infrastructural outcome.

Additionally, three emerging innovative technologies offer great promise to improve health care and clinical services, namely, robotic process automation (RPA), 3D printing and wearable technology. RPA allows healthcare entities to automate routine and repetitive processes such as scheduling, check-in and check-out of patient, prescription refill, and more [35,36]. As evidenced via innovative applications from automated pharmacy drug dispensation to robot surgery, the field of robotics has had a tremendous impact on health care and medicine. With 3D printing, healthcare devices can be created in the last mile, at the provider's office and/or even at the patient's home [37,38]. The future holds unlimited promises. In fact, it is conceivable that caregivers and patients alike will soon be able to custom design and create healthcare devices such as vital signs' monitoring systems, insulin syringes, chip implants (e.g., to track patients with Alzheimer's) and other day-to-day equipment needed to manager chronically-ill patients [39-42]. Likewise, wearable technologies have the potential to revolutionize personalized medicine. We have already seen that with Fitbit, patients are empowered to monitor their vital signs and health level; moreover, this information can be entered into their electronic healthcare records (EHRs) using mobile and wireless devices [43,44]. Again, such a technology will enable wireless interoperability and the accelerated deployment of these various emerging technologies will further boost the efficiency and effectiveness of delivering healthcare services.

Altogether, we argue that, at the crossroads, two categories of challenges remain for more effective transformation of healthcare with HIT, namely, technological issues and managerial challenges. By continually focusing on these constraints and bottlenecks, healthcare organization can incrementally make progress on the strategic use of HIT.

Technological Issues

In recent years, despite EHR adoption by rural hospitals to have increased substantially, concerns remain regarding the unique challenges they face in adopting and achieving meaningful use (MU) of EHRs. These challenges include resource constraints and infrastructure issues such as limited broadband availability, the increased competition among multiple vendors and evolving applications, the high cost of implementation as well as the limited availability of time to picking the right vendor to build the organization's HIT.

Dissatisfaction with EHRs among some providers remains a problem and a barrier to achieve the strategic potential of HIT. Compounding the obstacles of the free market multi-payer, multi-provider healthcare delivery system, most current HIT systems are vendor driven, proprietary applications that are not easily assimilated into a clinical workflow seamlessly, and whose proprietary data formats are not directly exchangeable from one system to another. It is difficult, for example, to bring together patient data from disparate HIT applications that do not talk with each other. It is also believed that most healthcare delivery organizations that utilize HIT do so for internal purposes; there is little incentive to get out of existing arrangements among network providers.

Often, HIT use may be complicated by portable insurance that transfers patients from one ecosystem to another without the seamless exchange of data simultaneously; additionally, from a design perspective, federal, state, and local laws may prohibit the trans-border dataflow, storage and sharing of the health data. The design of more advanced applications such as clinical decision support systems are thwarted by the historical focus on automating mere routine and operational tasks. Few organizations have indeed made the leap toward strategic thinking and use of HIT, let alone transformative HIT applications. The design, implementation, and maintenance of these more complex and modern technological systems pose additional challenges due to lack of technical expertise. Typically, HIT is designed as a closed system as opposed to being open with very simple and easy exchange of the in-house patient data.

Finally, capital investments in sophisticated, integrated HIT applications could possibly be cost prohibitive. Other challenges include the use of contemporary implementation lifecycle methods, quality assurance, testing, maintenance, and periodic testing of the systems. Again, defining stakeholders' roles and key design standards as well as scoping the HIT projects can be time consuming and challenging. With the multi- payer, provider, and vendor ecosystem, it is important to come to a consensus on loosely couple standards or protocols for basic interoperability.

However, none of these challenges are insurmountable. Translating valuable lessons learned in other industries such as online banking can likely overcome the said challenges.

Managerial Challenges

It would be myopic not to consider the key managerial issues as well. Foremost is the overall rapid escalation in cybersecurity breaches in various industries. In this respect, the healthcare industry is not far behind.

Today, cybersecurity in health care must be tackled meticulously and on multiple fronts with multi-pronged strategy vis-à-vis the coordination and working together of governmental, organizational, social, and technological policymakers. Until then, patients will be skeptical and wary of participation in HIT. This also impacts participation in clinical studies where anonymity is critical. Privacy goes hand in glove with security. Protecting the privacy of the patient and other participants in the healthcare delivery system is of utmost importance in the use of advanced HIT systems. Ethics, which is often overlooked, ties also into the total equation for consideration.

Another issue is risk management. Risks appear at every level of HIT use – from medical errors leading to misdiagnosis (and mistreatment) to overdoses of drugs and/or erroneous vital signs monitoring. For successful HIT use, organizations must develop and put into practice modern risk management policies in every aspect. What about measurement? Healthcare performance measurement, for example, is key to identifying, using, and tracking the progression of various stages of different illnesses and recoveries. Importantly, KPIs (key performance indicators) provide the benchmarks and quantitative data about the positive effects of HIT. In turn, this would convince top management to invest further in HIT. Unlike the purchase of a computer by an individual physician to improve one's patient care, the effects of HIT implementations are often indirect and difficult to determine or measure; even so, these costs v. beneficial outcomes must be clearly identified, appropriately specified, and accurately measured to justify ongoing and future HIT investments.

Another key issue is governance. The governance of data and HIT is critical. Who is responsible for playing the different roles? Is it the accounting department from an auditing and information assurance perspective or is it the information technology (IT) department, responsible for the implementation? Is the finance responsible for the budget? A clear and explicit governance policy would help clarify the strategy and better manage the HIT. Following governance, ownership of data and HIT needs to be addressed. From ownership follows accountability and responsibility. Who owns the data? It is still unclear. Is it the patient who 'owns the data' no matter where it resides, or is it the provider or the payer?

Conclusion

Healthcare organizations will succeed in HIT-based transformation when they are well focussed on strategic thinking and are able to address both the documented technical and managerial issues effectively. While few organizations in health care have reached a mature state of using HIT strategically prior to the onset of the global pandemic in 2020, many healthcare organizations that were resistant to change due to the status quo, are waking up to the need for a different HIT operational model and healthcare policies that would favor more transformative practices. This is due to the increasing use of telemedicine for diagnostics, treatments, and round-the-clock monitoring in enhancing the safety and efficiency of health care during the COVID era.

Digital and transformative health technological processes are now needed to be deployed to improve supply chains, logistics, and reduce the cost of delivering care in the face of limiting COVID spread. Data sciences and data analytics are now central to the health learning systems, either as a scheme to managing big data or as a foundation for artificial intelligence tools to support surveillance, planning, and care management as well as personalized treatment protocols. Emerging HIT applications in health care are at a critical stage of development, but rapid advances in platforms and tools can accelerate their maturing process.

References

1. Glaser J (2020) It's time for a new kind of electronic health record, Harvard Business Review.
2. Belliger A & Krieger DJ (2018) The digital transformation of healthcare. In Knowledge Management in Digital Change 311-326.
3. Burton-Jones A, Akhlaghpour S, Ayre S, Barde P, Staib A, et al. (2020) Changing the conversation on evaluating digital transformation in healthcare: Insights from an institutional analysis. Information and Organization 30: 100255.
4. Gopal G, Suter-Crazzolara C, Toldo L, Eberhardt W (2019) Digital transformation in healthcare–architectures of present and future information technologies. Clinical Chemistry and Laboratory Medicine (CCLM) 57: 328-335.
5. Haggerty E (2017) Healthcare and digital transformation. Network Security 2017: 7-11.
6. Hermes S, Riasanow T, Clemons EK, Böhm M, Krcmar H (2020) The digital transformation of the healthcare industry: exploring the rise of emerging platform ecosystems and their influence on the role of patients. Business Research 13: 1033-1069.
7. Jahankhani H, Kendzierskyj S (2019) Digital transformation of healthcare. In Blockchain and Clinical Trial 31-52.
8. Kraus S, Schiavone F, Pluzhnikova A, Invernizzi AC (2021) Digital transformation in healthcare: Analyzing the current state-of-research. Journal of Business Research 123: 557-567.
9. Raghupathi W (1997) Health care information systems. Communications of the ACM 40: 80-82.
10. Tan J, Olla P (2021) Adaptive Health Management Information Systems: Concepts, Cases & Practical Applications (4th Ed) Jones & Bartlett Learning (e-book).
11. Raghupathi W, Tan J (1999) Strategic uses of information technology in health care: a state-of-the-art survey. Topics in Health Information Management 20: 1-15.
12. Raghupathi W, Tan J (2002) Strategic IT applications in health care. Communications of the ACM 45: 56-61.
13. Raghupathi W, Tan J (2008) Information systems and healthcare XXX: charting a strategic path for health information technology. Communications of the Association for Information Systems 23: 28.
14. Davenport T, Kalakota R (2019) The potential for artificial intelligence in healthcare. Future healthcare journal 6: 94.
15. Esteva A, Robicquet A, Ramsundar B, Kuleshov V, DePristo M, et al. (2019) A guide to deep learning in healthcare. Nature medicine 25: 24-29.
16. Miotto R, Wang F, Wang S, Jiang X, Dudley JT (2018) Deep learning for healthcare: review, opportunities and challenges. Briefings in bioinformatics 19: 1236-1246.
17. Norgeot B, Glicksberg BS, Butte AJ (2019) A call for deep-learning healthcare. Nature medicine 25: 14-15.
18. Yu KH, Beam AL, Kohane IS (2018) Artificial intelligence in healthcare. Nature biomedical engineering 2: 719-731.
19. Raghupathi W, Raghupathi V (2013) An overview of health analytics. J Health Med Informat 4: 2.
20. Raghupathi W, Raghupathi V (2014) Big data analytics in healthcare: promise and potential. Health information science and systems 2: 1-10.
21. Agbo CC, Mahmoud QH, Eklund JM (2018) Blockchain Technology in Healthcare: A Systematic Review. In Healthcare 7: 56.
22. Chang Y, Iakovou E, Shi W (2020) Blockchain in global supply chains and cross border trade: a critical synthesis of the state-of-the-art, challenges and opportunities. International Journal of Production Research 58: 2082-2099.

23. Ali O, Shrestha A, Osmanaj V, Muhammed S (2020) Cloud Computing Technology Adoption: An Evaluation of Key Factors in Local Governements. In Information Technology & People.
24. Dang LM, Piran J, Han D, Min K, Moon H (2019) A Survey on Internet of Things & Cloud Computing for Healthcare. In Electronics 8: 1-49.
25. Behera RK, Bala PK, Dhir A (2019) The emerging role of cognitive computing in healthcare: a systematic literature review. International journal of medical informatics 129: 154-166.
26. Hill JW, Powell P (2009) The national healthcare crisis: Is eHealth a key solution? Business Horizons 52: 265-277.
27. van Gemert-Pijnen L, Kelders SM, Kip H, Sanderman R (Eds.) (2018) eHealth research, theory and development: a multi-disciplinary approach. Routledge.
28. Boogerd EA, Arts T, Engelen LJ, van De Belt TH (2015) "What is eHealth": time for an update? JMIR research protocols 4: e29.
29. Oh H, Rizo C, Enkin M, Jadad A (2005) What is eHealth (3): a systematic review of published definitions. Journal of medical Internet research 7: e110.
30. van Gemert-Pijnen LJ, Kip H, Kelders SM, Sanderman R (2018) Introducing ehealth. In eHealth research, theory and development. Routledge.
31. Paglialonga A, Patel AA, Pinto E, Mugambi D, Keshavjee K (2019) The healthcare system perspective in mHealth. In m_Health Current and Future Applications. Springer, Cham.
32. West D (2012) How mobile devices are transforming healthcare. Issues in technology innovation 18: 1-11.
33. Elhoseny M, Ramírez-González G, Abu-Elnasr OM, Shawkat SA, Arunkumar N, et al. (2018) Secure medical data transmission model for IoT-based healthcare systems. IEEE Access 6: 20596-20608.
34. Kukafka R (2019) Digital health consumers on the road to the future. Journal of medical Internet research 21: e16359.
35. Bruno J, Johnson S, Hesley J (2017) Robotic disruption and the new revenue cycle: robotic process automation represents an immediate new opportunity for healthcare organizations to perform repetitive, ongoing revenue cycle processes more efficiently and accurately. Healthcare Financial Management 71: 54-62.
36. Ratia M, Myllärniemi J, Helander N (2018) Robotic process automation-creating value by digitalizing work in the private healthcare?. In Proceedings of the 22nd International Academic Mindtrek Conference.
37. Cresswell K, Wright A, Bates DW, Sheikh A (2018) Key Advances in Clinical Informatics: Transforming Health Care Through Health Information Technology, Academic Press (e-Book).
38. Kyrarini M, Lygerakis F, Rajavenkatanarayanan A, Sevastopoulos C, Nambiappan HR, et al. (2021) A survey of robots in healthcare. Technologies 9: 8.
39. Dodziuk H (2016) Applications of 3D printing in healthcare. Kardiochirurgia i torakochirurgia polska= Polish journal of cardio-thoracic surgery 13: 283.
40. Hurst EJ (2016) 3D printing in healthcare: emerging applications. Journal of Hospital Librarianship 16: 255-267.
41. Trenfield SJ, Madla CM, Basit AW, Gaisford S (2018) The shape of things to come: emerging applications of 3D printing in healthcare. In 3D Printing of Pharmaceuticals. Springer, Cham.
42. Whitaker M (2014) The history of 3D printing in healthcare. The Bulletin of the Royal College of Surgeons of England 96: 228-229.
43. Dunn J, Runge R, Snyder M (2018) Wearables and the medical revolution. Personalized medicine 15: 429-448.
44. Lu L, Zhang J, Xie Y, Gao F, Xu S, et al. (2020) Wearable health devices in health care: Narrative systematic review. JMIR mHealth and uHealth 8: e18907.