Guest Editorial: New Perspectives on Technology and Innovation Management to Strengthen the Development of Healthcare Organizations and Ecosystems

RECENTLY, healthcare organizations have continually put tremendous efforts to raise medical treatment standard as well as improve customer satisfaction and strengthen their business competence. The underlying reasons generally depends on the inadequate planning, inappropriate procurement, poorly organized and managed healthcare technical services, and a shortage of skilled personnel. Moreover, the mismanagement of physical assets impacts on the quality, efficiency, and sustainability of health services at all levels.

In modern healthcare, healthcare technology has a major role to play in order. Technology and innovation have become a vital component to drive the continual changes and to serve the objective of high-standard healthcare provision. Not only do healthcare organizations heavily rely on medical technologies, such as robotic surgery, CT scan, 3-D organ printing and precision medicine but also supporting technologies, such as health information system and healthcare ERP, have played an important role in facilitating organizational workflow and processes. In addition, most diagnostic, therapeutic, and rehabilitation activities are based on the extensive use of medical technologies. The management tools to make strategic decisions depend on the quality of information. By investing in those technologies, healthcare organizations are inevitably pressured by higher cost of services.

For example from the cost perspective, Internet-enabled services are continuously developed to support virtual care like telemedicine allowing healthcare providers to consult with patients virtually and provide diagnoses. Therefore, time and resources associated in an in-person hospital consult can be saved.

Despite that healthcare executives are trying to manage the rising cost of healthcare services, they are also facing the issues related to privacy, cybersecurity threats, mounting medical records, as well as the long-standing issues from internal organizations, such as change resistance and technology adoption. Therefore, to strengthen the development of healthcare organizations and ecosystems for the next decade, new perspectives on technology and innovation management are required.

Here are few examples of recent research works aiming to address the abovementioned challenges. Hsieh et al. [8] used the protection motivation theory and unified theory of acceptance to identify key factors of personal health record (PHR) adoption. Kharrazi et al. [10] conducted research aiming to forecast U.S. hospitals' electronic health record (EHR) technology adoption using Bass model. Alanazi and Al Anazi [1] explored the challenges of a patient's PHR technology adoption in healthcare, and they found that a poor integration between the PHR and EHR systems, user inexperience, and computer and health illiteracy are the key barriers of technology adoption. Glover et al. [7] studied how to improve quality of care through both technical and human components of integration.

Kochan et al. [11] conducted research on the uses of cloud computing to improve the hospital supply chain (SC) performance by applying system dynamics and simulation. Gao and Sunyaev [4] attempted to identify the industry-specific factors of cloud computing adoption in healthcare.

Gholamhosseini and Ayatollahi [6] attempted to design e-health readiness assessment tool for hospital. Glover et al. [7] surveyed online healthcare community users to understand their behaviors in seeking health-related information. Van Velthoven et al. [18] studied on how digitization affects healthcare organizations, whereas Laurenza et al. [12] conducted a case study to understand the effect of digital technologies adoption for healthcare industry. Faggini et al. [3] studied how the digital platform being an enabler between patients and physicians create sustainability for healthcare. Pantzartzis et al. [14] tried to build the technology roadmap layer and process to improve the resilience and sustainability of health and social care facilities in U.K.

Schultz et al. [17] conducted an empirical study in order to understand and manage innovation for eldercare due to demographic shifts around the world. Glover et al. [7] studied the effect of innovation leadership and SC innovation on SC efficiency in hospitals using the structural equation modeling technique.

Iyawa et al. [9] tried to explore the existing body of knowledge of digital health innovation ecosystems. Gerdsri et al. [5] conducted the bibliometric analysis to identify the active research areas and discover the professional communities along with their social networks in the emerging field of biomedical engineering in Thailand. Wu et al. [20] studied the ecosystem of healthcare services in China by aiming to understand and find ways to manage stakeholders.

Date of current version 16 June 2023.
Digital Object Identifier 10.1109/TEM.2023.3270001

Punnakitikashem et al. [15], [16] developed the stochastic programming model and algorithm to facilitate decision making of nurse managers in medical–surgical units in hospitals in nurse rescheduling and nurse assignment. RFID technology with data mining technique helped to predict the time nurse spent with patients. Baker et al. [2] reported positive results of the prototype testing of the optimization model of nurse assignment computerized program.

The current health context based on new technologies demands working with an updated model of management and organization, which requires a reengineering perspective to achieve appropriate levels of clinical effectiveness, efficiency, safety, and quality. However, planning and management of healthcare technology is complex and diverse. It requires combined knowledge, which includes engineering, commercial, logistics and planning, and management skills.

NATHASIT GERDSRI, *Guest Editor*
College of Management
Mahidol University
Nakhon Pathom 73170, Thailand

ÖZALP VAYVAY, *Guest Editor*
Faculty of Business Administration
Marmara University
Kadıköy/İstanbul 34722, Türkiye

PRATTANA PUNNAKITTIKASHEM, *Guest Editor*
College of Management
Mahidol University
Nakhon Pathom 73170, Thailand

ZEYNEP TUĞÇE KALENDER, *Guest Editor*
Industrial Engineering, Faculty of Engineering
Marmara University
Kadıköy/İstanbul 34722, Türkiye

CHANITRA THUWAJIT, *Guest Editor*
Department of Immunology
Faculty of Medicine Siriraj Hospital
Mahidol University
Nakhon Pathom 73170, Thailand

YOSCHANAN WONGSAWA, *Guest Editor*
Department of Biomedical Engineering
Faculty of Engineering
Mahidol University
Nakhon Pathom 73170, Thailand

REFERENCES

[1] A. Alanazi and Y. Al Anazi, "The challenges in personal health record adoption," *J. Healthcare Manage.*, vol. 64, no. 2, pp. 104–109, 2019.
[2] R. L. Baker, S. Tindell, D. B. Behan, P. G. Turpin, J. M. Rosenberger, and P. Punnakitikashem, "Phase I: Creating an electronic prototype to generate equitable hospital nurse-to-patient assignments," *CIN, Comput., Informat., Nurs.*, vol. 28, no. 1, pp. 57–62, 2010.
[3] M. Faggini, S. Cosimato, F. Nota, and G. Nota, "Pursuing sustainability for healthcare through digital platforms," *Sustainability*, vol. 11, no. 1, 2019, Art. no. 165.
[4] F. Gao and A. Sunyaev, "Context matters: A review of the determinant factors in the decision to adopt cloud computing in healthcare," *Int. J. Inf. Manage.*, vol. 48, pp. 120–138, 2019.
[5] N. Gerdsri, A. Kongthon, and S. Puengrusme, "Profiling the research landscape in emerging areas using bibliometrics and text mining: A case study of biomedical engineering (BME) in Thailand," *Int. J. Innov. Technol. Manage.*, vol. 14, no. 02, 2017, Art. no. 1740011.
[6] L. Gholamhosseini and H. Ayatollahi, "The design and application of an e-health readiness assessment tool," *Health Inf. Manage. J.*, vol. 46, no. 1, pp. 32–41, 2017.
[7] W. Glover, Q. Li, E. Naveh, and M. Gross, "Improving quality of care through integration in a hospital setting: A human systems integration approach," *IEEE Trans. Eng. Manage.*, vol. 64, no. 3, pp. 365–376, Aug. 2017.
[8] H. L. Hsieh, Y. M. Kuo, S. R. Wang, B. K. Chuang, and C. H. Tsai, "A study of personal health record user's behavioral model based on the PMT and UTAUT integrative perspective," *Int. J. Environ. Res. Public Health*, vol. 14, no. 1, 2017, Art. no. 8.
[9] G. E. Iyawa, M. Herselman, and A. Botha, "Digital health innovation ecosystems: From systematic literature review to conceptual framework," *Procedia Comput. Sci.*, vol. 100, pp. 244–252, 2016.
[10] H. Kharrazi, C. P. Gonzalez, K. B. Lowe, T. R. Huerta, and E. W. Ford, "Forecasting the maturation of electronic health record functions among US hospitals: Retrospective analysis and predictive model," *J. Med. Internet Res.*, vol. 20, no. 8, 2018, Art. no. e10458.
[11] C. G. Kochan, D. R. Nowicki, B. Sauser, and W. S. Randall, "Impact of cloud-based information sharing on hospital supply chain performance: A system dynamics framework," *Int. J. Prod. Econ.*, vol. 195, pp. 168–185, 2018.
[12] E. Laurenza, M. Quintano, F. Schiavone, and D. Vrontis, "The effect of digital technologies adoption in healthcare industry: A case based analysis," *Bus. Process Manage. J.*, vol. 24, no. 5, pp. 1124–1144, 2018.
[13] N. Liu, Y. Tong, and H. C. Chan, "Information seeking in online healthcare communities: The dual influence from social self and personal self," *IEEE Trans. Eng. Manage.*, vol. 64, no. 4, pp. 529–538, Nov. 2017.
[14] E. Pantzartzis, A. Price, and F. Edum Fotwe, "Roadmap layers and processes: Resilient and sustainable care facilities," *Eng., Construction Architectural Manage.*, vol. 26, no. 9, pp. 1986–2007, 2019.
[15] P. Punnakitikashem, J. M. Rosenberger, and D. B. Behan, "Stochastic programming for nurse assignment," *Comput. Optim. Appl.*, vol. 40, no. 3, pp. 321–349, 2008.
[16] P. Punnakitikashem, J. M. Rosenberber, and D. F. Buckley-Behan, "A stochastic programming approach for integrated nurse staffing and assignment," *IIE Trans.*, vol. 45, no. 10, pp. 1059–1076, 2013.
[17] J. S. Schultz, B. André, and E. Sjøvold, "Managing innovation in eldercare: A glimpse into what and how public organizations are planning to deliver healthcare services for their future elderly," *Int. J. Healthcare Manage.*, vol. 9, no. 3, pp. 169–180, 2016.
[18] M. H. Van Velthoven, C. Cordon, and G. Challagalla, "Digitization of healthcare organizations: The digital health landscape and information theory," *Int. J. Med. Informat.*, vol. 124, pp. 49–57, 2019.
[19] S. N. Yoon, D. Lee, and M. Schniederjans, "Effects of innovation leadership and supply chain innovation on supply chain efficiency: Focusing on hospital size," *Technol. Forecasting Social Change*, vol. 113, pp. 412–421, 2016.
[20] J. Wu, Y. Wang, L. Tao, and J. Peng, "Stakeholders in the healthcare service ecosystem," *Procedia CIRP*, vol. 83, pp. 375–379, 2019.

Nathasit Gerdsri received the Ph.D. degree in systems science/technology management from Portland State University, Portland, OR, USA, in 2004.

He is currently an Associate Professor, Consultant, Researcher, and Technologist with more than 20 years of experience in technology and innovation management, supporting the development of corporate strategy and government policy as well as the program development for management education. He has taken a new initiative as CEO and Founder of The Strategence—a startup that provides digital platform for management consultancy. His research focuses on roadmapping to enhance the robustness of TRM development process and implementation.

Dr. Gerdsri is an Area Editor of the *International Journal of Innovation and Technology Management* as well as Editorial Board Member of IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT as well as *International Journal of Technology Intelligence and Planning*.

Özalp Vayvay received the bachelor's degree in chemical engineering, and the master's and doctorate degrees in industrial engineering, and the Ph.D. degree in industrial engineering from the Marmara University, Istanbul, in 2000.

For more than 15 years, he has been the Head of engineering management with the Institute of Science. He has also been the Head of production management with Business School for about 1 year. He was a Researcher and Executive in some projects. He is a Faculty Member with Marmara University, Istanbul, Turkey. He has been a Thesis Advisor to many graduate students in the areas of his research fields in different industries. He has authored or coauthored many articles published in top-indexed journals in the areas of his research fields, which include supply chain management, technology and innovation management, process management and business process reengineering, multicriteria decision-making techniques, process management, and risk management.

Prattana Punnakittikashem received the Ph.D. degree in industrial and manufacturing systems engineering from the University of Texas at Arlington, Arlington, TX, USA, in 2007, with Alpha Pi Mu Industrial Engineering Honor.

She is currently an Assistant Professor, Researcher, and Consultant in operations management with the College of Management, Mahidol University, Nakhon Pathom, Thailand, where she is also a Program Chair of the masters' degree in healthcare and wellness management. Her dissertation was on integrated nurse staffing and assignment under uncertainty. She has authored or coauthored numerous publications. Her research interests include management in healthcare, science, bio-related industry in the areas of operations management, including lean management, process improvement and supply chain, healthcare and wellness management, and technology and innovation management.

Dr. Punnakitikashem is a Member of INFORMS, IIE, Alpha Pi Mu, and Tau Beta Pi. She is a Speaker at several international conferences. She is listed in Marquis Who's Who in the World.

Zeynep Tuğçe Kalender received the B.S. degree from Istanbul Commerce University, Istanbul, Turkey, in 2011, the M.S. degree from Istanbul Technical University, Istanbul, in 2013, and the Ph.D. degree in industrial engineering from Industrial Engineering Department, Marmara University, Istanbul, in 2020.

She is currently a Research Assistant with Industrial Engineering Department, Marmara University. During her Ph.D., her research was focused on healthcare quality management in terms of patient safety. Her current research interests include multicriteria decision making, fuzzy logic, quality engineering, managing service quality, engineering management, business process management, and healthcare management.

Chanitra Thuwajit received the Ph.D. degree in biochemistry from M.D. Mahidol University, in 2001.

He is currently an Associate Professor of biochemistry, Researcher, and Full-Time Academic Staff with the Department of Immunology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand. She is also the Vice Head Department and Program Director of Ph.D. curriculum in immunology (International Program). She is an Associate Visiting Professor with Kumamoto University, Kumamoto, Japan. She has been a recognized Cancer Research Scientist with a successfully funded portfolio of peer-reviewed research works.

Prof. Thuwajit was the recipient of several research awards, including Outstanding Preclinical Research Awards and Outstanding University Staff, and recently been recognized by Thai Society of Medical Biochemistry and Molecular Biology and Science Society of Thailand under the Patronage of His Majesty the King for the Research Excellence Award in 2018 and Outstanding Alumni, Faculty of Medicine Ramathibodhi Hospital, Mahidol University, in 2019.

Yoschanan Wongsawat received the Ph.D. degree in electrical engineering from the University of Texas at Arlington, in 2007.

He is currently an Associate Professor with the Department of Vice Dean of Research and International Relations, Faculty of Engineering, Mahidol University, Nakhon Pathom, Thailand. He has authored many research articles/books related to his research fields, which include brain–computer interface, image processing, and genomic signal processing.

Prof. Wongsawat is an Editorial Member and Reviewer of several international reputed journals. He is the Member of many international affiliations. He has successfully completed his Administrative responsibilities.