How artificial intelligence impacts the competitive position of healthcare organizations

Talal Ali Mohamad
Paris School of Business, Paris, France
Anna Bastone
Department of Management Studies and Quantitative Methods, University of Naples Parthenope, Napoli, Italy
Fabian Bernhard
EDHEC Business School, Nice, France, and
Francesco Schiavone
Department of Management Studies and Quantitative Methods, University of Naples Parthenope, Napoli, Italy and Paris School of Business, Paris, France

Received 1 March 2023
Revised 26 April 2023
29 June 2023
Accepted 10 July 2023

Abstract

Purpose – Digital transformation affected modern society influencing how businesses cooperate and produce value. In this context, Artificial Intelligence plays a critical role. This study aims to explore the role of Artificial Intelligence in organisational positioning within the market, influencing firms' competitiveness. In this vein, this research seeks to respond to the following research question: How does AI impact the competitive advantage of healthcare organizations?.

Design/methodology/approach – To tackle the research question, an explorative analysis using the case study method to investigate an international healthcare center in Dubai was conducted. Nine semi-structured interviews were conducted with the head and the members of the robotic surgery team in CMC Dubai to thoroughly understand what the components of the robotic approach are and how the arrangement before the introduction of this innovative technique while shedding light on the added value and the advantages of adopting such technique on both patient safety and patient satisfaction. Additionally, archival data and online documentation (e.g. industry reports, newspaper articles and internal documents) were analyzed to obtain data triangulation.

Findings – The results highlight three primary outcomes influenced by implementing AI in organizational processes: clinical, financial and technological outcomes. The study will offer interesting non-studied insights about the implementation of Artificial Intelligence tools in the healthcare sector and specifically robotic surgeries, and to which extent this will contribute and represent a competitive advantage. Results will hopefully insert a brick in the wall of the impact of AI tools on the quality and the results of surgical operations while emphasizing the benefits of integrating AI in surgical practice.

Corrigendum: It has come to the attention of the publisher that the article Ali Mohamad, T., Bastone, A., Bernhard, F. and Schiavone, F. (2023), "How artificial intelligence impacts the competitive position of healthcare organizations", *Journal of Organizational Change Management*, Vol. 36 No. 8, pp. 49-70. https://doi.org/10.1108/JOCM-03-2023-0057 did not include full details of all affiliation details at initial submission.

Our guidelines state that the ScholarOne record must accurately include all affiliation details at initial submission.

Schiavone, F.'s affiliation has been amended to include Paris School of Business, Paris, France as a second affiliation. This has now been amended in the online version of the paper.

Journal of Organizational Change Management
Vol. 36 No. 8, 2023
pp. 49-70
Emerald Publishing Limited
0953-4814
DOI 10.1108/JOCM-03-2023-0057

Originality/value – This study offers interesting theoretical and practical implications. It opens a new perspective to understand and manage AI tools in service. This research is not without limits providing valuable insights for future research.

Keywords Artificial intelligence: Competitive advantage, Healthcare organization, Innovation

Paper type Research paper

Glossary of abbreviations

CEO	Chief executive officer
AI	Artificial intelligence
CMC	Clemenceau Medical
JHMI	Johns Hopkins Medicine International
CPT	Current procedural terminology
DHA	Dubai healthcare authority
DRG	Diagnosis related group
TPP	Third party payers
3D	3 Dimensions
2 D	2 Dimensions
IVF	*In vitro* fertilization
OBGYN	Obstetrics and gynecology

1. Introduction

Undeniably, digital transformation has affected modern society and is transforming how businesses cooperate and produce value (Teece, 2018; Appio *et al.*, 2018). Digital technology improvements have opened new possibilities for building and modelling digital business models. Coordination and managing interactions with stakeholders are well-known difficulties businesses encounter in many industries, especially healthcare (Schiavone *et al.*, 2021). Organizations are trying to innovate healthcare business models by developing direct ties between physicians and patients to have a typical length of stay in the hospital with high-quality care (Laurenza *et al.*, 2018; Leone *et al.*, 2021). Indeed, the healthcare business model has been adapted to be more patient-centered and work in dynamic collaboration with actors involved in the health ecosystem (Schiavone *et al.*, 2022; Håkansson Eklund *et al.*, 2019).

The fast spread of Industry 4.0 technologies revolutionized the competitive landscape (Balogun and Ogunnaike, 2017). The key method for establishing a competitive advantage has been highlighted by healthcare providers as the effective use of digital technology (Heart *et al.*, 2017; Farahani *et al.*, 2018; Fiaz *et al.*, 2018). In this vein, digital technologies based on Artificial Intelligence can improve process quality, lower healthcare expenses and increase accessibility (Teece, 2018; Appio *et al.*, 2018; Leone *et al.*, 2021). This paper extend a previous analysis (Li *et al.*, 2023) exploring the topic of competitive advantage and the positioning of health organizations in the market (Rodríguez *et al.*, 2019; Butt *et al.*, 2019; Khan *et al.*, 2020; Matheny *et al.*, 2020; Hamet and Tremblay, 2017).

This study aims to determine the potential benefits of implementing innovative and digital solutions in the surgical industry, the improvements in patient assistance services and how the healthcare system can react and restructure in response to these benefits (Teece, 2018; Appio *et al.*, 2018; Leone *et al.*, 2021; Ziyadin *et al.*, 2018; Ferreira *et al.*, 2022; Hong and Lee, 2018). Despite the various research on AI's adoption in healthcare (Yu *et al.*, 2018; Jiang *et al.*, 2017; Davenport and Kalakota, 2019; Rong *et al.*, 2020), there is a lack of literature on its role as a competitive lever.

Drawing these assumptions, the research question concerns how implementing digital solutions based on Artificial Intelligence enables healthcare facilities to maintain their competitive position and gain additional benefits compared to traditional surgical approaches. To tackle the research question, an exploratory analysis was conducted

investigating the Clemenceau Medical Center in Dubai, one of the top private hospitals in the UAE (CMC). The analysis highlights AI's critical role in the quest for competitive advantage based on the study of primary and secondary data. However, using innovative and sophisticated digital technologies improves overall healthcare performance and, as a result, provides the opportunity to achieve a competitive advantage (Butt *et al.*, 2019; Khan *et al.*, 2020; Matheny *et al.*, 2020; Leone *et al.*, 2021; Ziyadin *et al.*, 2018).

Thus, this research aims to contribute to the innovation and organization management field (Håkansson Eklund *et al.*, 2019; Ziyadin *et al.*, 2018; Davenport and Kalakota, 2019) by analyzing the critical role of Artificial Intelligence adoption to improve organizations' competitive position by offering theoretical and practical insights. This research provides both theoretical and practical implications. From a theoretical point of view, this study extends the innovation management literature exploring AI from an organizational perspective. From a managerial point of view, the empirical evidence highlights the need for healthcare managers to invest in digital technologies optimizing resource allocation and quality of care. Finally, this study offers helpful insights for policymakers. AI's competitive advantages emphasize the key role of institutional intervention in supporting digital technologies implementation in healthcare organizations improving overall performance (Appio *et al.*, 2018).

The results show that AI enables healthcare institutions to guarantee high-quality care and improve their financial performance. Furthermore, an approach based on such technologies optimizes resource allocation and increases the potentiality and efficiency of the tools used (Khan *et al.*, 2020; Matheny *et al.*, 2020; Hamet and Tremblay, 2017). It is discussed the patient's entire experience and satisfaction and the expectations for a better performance than that obtained by traditional methods (Schiavone *et al.*, 2022; Håkansson Eklund *et al.*, 2019; Martins *et al.*, 2020). As a result, based on this premise, Artificial Intelligence should not be viewed as a barrier to overcome but rather as a pillar around which to build one's competitive advantage and overcome internal healthcare criticism (Khan *et al.*, 2020; Matheny *et al.*, 2020; Hamet and Tremblay, 2017).

This article is structured as follows. In Section 2, we analyze the role of Artificial Intelligence in healthcare and its competitive potential. Section 3 describes the methodology used and the data collection and analysis stages. Section 4 provides analyzed and discussed results in the next section 5. In the latter section, we also show implications for practitioners and policymakers. Finally, the limitations of the analysis conducted and various ideas for future research are defined.

2. Theoretical background

The global healthcare market is rising, and analysts believe this trend will continue in the medium to long term (Balogun and Ogunnaike, 2017). Indeed, healthcare facilities are being urged to take a less hospital-centric strategy and focus more on shifting patient expectations (Schiavone *et al.*, 2022). It entails transforming traditional business paradigms. Technology advancements and digitalization have emphasized the need for healthcare ecosystems to change significantly (Thuemmler and Bai, 2017; Prado-Prado *et al.*, 2020).

Ferreira *et al.* (2022) argue that the current state of competition poses a challenge to the development of innovative goods and/or services based on established resources and skills. To remain competitive in an ever-changing and increasingly competitive global market, developing countries must embrace digital technology, related business processes and managerial abilities (Ziyadin *et al.*, 2018). Hospitals that deploy modern IT systems in care services increase the quality of care and reduce diagnostic and treatment delays (Hong and Lee, 2018). IT systems generate new information that allows medical personnel to make more accurate diagnoses and provide more tailored therapies for patients. Hospitals can gain a competitive advantage by using IT resources to build new competencies and skills.

Today, technological advancement and digital innovations influence every aspect of human life, with healthcare being the most affected industry (Teece, 2018; Appio *et al.*, 2018;

Leone *et al.*, 2021). Adopting AI tends to affect several activities. The work of Jatobá *et al.* (2023) highlights a strong impact of AI on managing human resources. In particular, they show that the adoption of AI influences: (1) profit maximization through decision support and the automation of employees' work (Stanley and Aggarwal, 2019; Ivaschenko *et al.*, 2021; Pereira *et al.*, 2023), (2) talent acquisition (Pillai and Sivathanu, 2020; Johnson *et al.*, 2020; Mirowska and Mesnet, 2022) and (3) the training of HR staff to help them perform their tasks (Yorks *et al.*, 2020; Sturm *et al.*, 2021).

Through the appropriate allocation of resources and the use of new software and technologies, it may be feasible to fulfil the demand, reach high levels of quality and efficiency in delivering services and restrict costs simultaneously. Furthermore, a "continuum of care" can be established in which healthcare organizations securely communicate patient data (Leone *et al.*, 2021). AI-based methods can be helpful in the assessment of service quality (Martins *et al.*, 2020). Indeed, such methods allow for a more complete understanding of the cause-and-effect relationships between concepts and/or decision criteria, as well as minimizing omitted criteria in decision support processes.

According to Rodríguez *et al.* (2019), private hospitals in various geographical contexts confront considerable obstacles in adjusting to their contexts, such as an ageing European population or sophisticated and expensive medical and technical breakthroughs (Matheny *et al.*, 2020). As a result of this increase in the market, these private hospitals have shifted their market orientation, redesigning their strategies to achieve solid economic outcomes while not neglecting any of the network's stakeholders (Rodríguez *et al.*, 2019).

Over the last decades, healthcare institutions have assumed the fastest-growing segment of the services industry globally (Eckrich and Schlesinger, 2011). This increase in competition among private hospitals makes it recommendable for these healthcare organisations to take steps to understand patient behaviour and preferences, which facilitates developing programs that meet each patient's expectations in a personalized manner (Butt *et al.*, 2019). It includes implementing advanced technologies such as Industry 4.0 and Artificial Intelligence (Khan *et al.*, 2020; Matheny *et al.*, 2020; Hamet and Tremblay, 2017).

Identifying a clear definition of AI is currently a hotly debated topic. The dictionary suggests a dual nature of AI, defining it as both a science and an engineering. It is a science because it emulates humans by formulating objective, rigorous models and making undeniable scientific progress. AI is engineering because obtaining from machines performances that mimic behaviors considered inaccessible to the artificial realm provides a real advancement of engineering's contribution to improving human life. In this vein, as Kok *et al.* (2009) suggest, AI definitions could be classified in four main categories: (1) systems that think like humans, (2) systems that act like humans, (3) systems that think rationally and (4) systems that act rationally.

In synthesis, Artificial intelligence is "the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings" (Copeland, 2020). Therefore, we speak of Artificial Intelligence when it comes to programs and machines that can make decisions and draw conclusions independently without having clear "rules of the game", analyzing gigantic data sets, comparing, drawing conclusions and making decisions (Raisch and Krakowski, 2021; Plastino and Purdy, 2018; Sourdin, 2018). Prior industrial marketing research has identified AI as a vital technological infrastructure in various corporate activities and processes, including pricing, management, buyer behaviour (Waring *et al.*, 2020) and sales.

Big data, smart robots and Artificial Intelligence (AI) are changing and generating new competitive landscapes in healthcare today (Appio *et al.*, 2018). Smart robots are a new robot "species". They are one of the ways in which AI is manifesting itself in the healthcare industry. Because they are autonomous artificial intelligence systems, they can work alongside humans and learn from the operating environment, experience and feedback of human behaviour in human-machine interaction. The result is improved performance and operation of intelligent

robots. Surgery is one of the most important applications of this technology. One example of a smart robot is the Da Vinci Surgical System, characterized by four robotic arms assisting the surgeon during the procedure to provide the patient with a more precise operation and a faster post-operative recovery. Despite several difficulties, healthcare is one of the sectors with great opportunities to adopt machine learning, natural language processing and robotics. This technology offers numerous benefits in diagnostics, doctor work automation, treatment method selection and biopharmaceuticals (Waring *et al.*, 2020).

Currently, substitution and augmentation of AI are challenging topics. The substitution construct is rooted in the Resource Based View (RBV), which argues that others replace resources with the same functionality (Peteraf and Bergen, 2003). Adopting AI could lead to substitution by influencing the competitive dynamics of various sectors. Especially within health, AI-enabled systems improve our ability to diagnose and predict illnesses (Jiang *et al.*, 2017), creating a fertile ground for high-quality personalized therapies. This is due to the vast predictive capabilities of such technologies, rendering human capabilities almost obsolete (Agrawal *et al.*, 2018, p. 80).

Furthermore, human abilities are difficult to apply to non-related domains. The capabilities of AI, on the other hand, can be transferred across different domains (Agrawal *et al.*, 2018, p. 2), allowing companies to attack a wide range of markets and gain a highly competitive advantage (Krakowski *et al.*, 2022). Machines cannot make decisions autonomously. In this vein, we speak of augmentation, a close collaboration between humans and technologies to optimize task performance (Raisch and Krakowski, 2021). AI is characterized by analytical and mechanical value, but some doubts exist about its empathetic and intuitive capabilities (Huang and Rust, 2018). In this vein, healthcare organizations should integrate advanced technologies and human skills to guarantee higher-quality care.

Healthcare organisations should adapt their business model and strategy to the rapid change in the socioeconomic landscape (Mathai *et al.*, 2017; Chung, 2022). In this context, the central role of dynamic capabilities emerges. Teece *et al.* (1997) defined dynamic capability as "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments". Implementing digital technologies requires a unique set of skills and capabilities (Rialti *et al.*, 2019). Developing, new organisational, strategic and therapeutic skills influence competitive position in the market (Chakravorty *et al.*, 2020). Additionally, introducing breakthrough technology in the health sector, such as Artificial Intelligence, necessitates a cultural shift inside the medical community and new technologies that spur the process from the outside (Bohr, 2020). Digital advances emphasize the importance of putting patients at the center of decisions and treating them as active players in the value-generation process rather than passive subjects (Balta *et al.*, 2021).

3. Methodology

To answer the research question in a qualitative approach we used the case study methodology (Yin, 1994) investigating the Clemenceau Medical Center in Dubai (CMC) case. We used deliberate and theoretical sampling to search for a case rich in manifestations of our fundamental theoretical notions (Yin, 1994). CMC-Dubai is noted for being one of the few medical institutes in the area that allows patients to receive cutting-edge treatments and technologies. Furthermore, the hospital is fully equipped with the latest advanced medical technology to establish itself as a forerunner of a new medical service model based on a safe and caring environment in this geographic setting. Our goal is to represent the complexity of social behaviour by developing concepts and meaningful descriptions that are neither unduly simplistic nor prejudiced. This necessitates in-depth qualitative research that is contextualist (Alvarez *et al.*, 2015). Contextual analysis necessitates a thorough knowledge of the sector.

This in-depth, single case is designed to aid theory building through analytical generalization, not to generate statistical generalizability (Yin, 2003). We used extreme case

sampling because we wanted as much information on a representative example. Through this qualitative research approach based on primary and secondary data, we use multiple sources of evidence, such as semi-structured interviewees, archival data, including industry reports, newspaper and magazine articles and internal documents, to triangulate data (Yin, 2003).

3.1 Data collection and analysis

Data collection and analysis were conducted in the second semester of 2022 and organized in various phases. We conducted nine semi-structured interviews with the head and the members of the robotic surgery team in CMC Dubai. The main questions are included in the *Interview guide* in the Appendix. First, we prepared an interview guide to ensure that the same basic lines of inquiry were pursued with each person interviewed. The interview guide was used so the interviewer could choose when to pose questions about new areas of inquiry that were not previously anticipated (Patton, 2002). Table 1 presents information about the respondents.

Immediately after each interview, the researcher recorded the details about the setting and his observations about the session. The interviewer transcribed each interview in the same week it occurred. A second researcher checked all interview transcripts by listening to the recordings as he read them (Pagliarussi and Rapozo, 2011). After that, we start with the coding phase and the coding process whereby we start translating each interview into keywords and key codes that reflect our understanding of the data provided, a first phase of coding will result in around 100 codes and then a second phase will be conducted in which we are going to assemble similar codes and interdependent codes under the umbrella of one central code which will help us in understanding and deducting and analyzing our findings to propose actionable recommendations. It is also worth mentioning that all interviews abided by an interview protocol covering all logistics and technical sides. To guarantee the construct validity, we triangulated different data sources not only to provide diverse perspectives on the information but also to assure the robustness of our data and reduce the risk of biased perspectives. Internal validity was guaranteed using a clear research framework and triangulation, matching the theoretical foundations and the empirical findings.

Relatedly, this research's external validity was assured by justifying the case section and using a clear theoretical rationale to guide the study. Finally, the study's reliability was also assured by comparing information from all the key informants involved in Clemenceau medical center Dubai processes and matching this with data from another hospital (Emirates Hospital), thereby detecting and addressing any discrepancies. This further exploration helped us with potential retrospective issues and assisted the refinement of our theorizing (Murphy *et al.*, 1993).

Interviewee	Position	Organisation	Type of interview
RM	Director of robotic program-consultant urologist	CMC-Dubai	face to face
EAK	Director of obstetrics, gynecology and women health program-member of the robotic team	CMC-Dubai	face to face
AA	Director of surgery and weight loss program-member of the robotic team	CMC-Dubai	face to face
AW	Director of surgery program-Laparoscopic surgeon	Emirates hospital	face to face
MS	Operating room manager	Emirates hospital	face to face
AC	Director of clinical services	CMC-Dubai	face to face
HZ	Director of Nursing	CMC-Dubai	face to face
RA	Finance Manager	CMC-Dubai	face to face
PT	Director of revenue cycle management	CMC-Dubai	face to face

Table 1.
List of interviewees

Source(s): Authors work

In the second phase, we analyzed the interview transcripts following an iterative process following two main steps. Specifically, we have described the introduction and the development of the robotic program at CMC DUBAI chronologically, focusing on the main events in the development of this program and the idea behind introducing it in the market, and what they are expecting in the future from this program and how it will create a competitive advantage for the hospital in the future. Approaching the process as a sequence of events that describes how things change over time (Van de Ven, 1992), we systematized the available data, developing a chronology of events related to the different steps of the program and the challenges engaged. We tried to explore how and in which area the implementation of artificial intelligence will significantly help CMC's growth.

We translated this analysis into the case description reported in the next section. Following an abductive approach (Dubois and Gadde, 2002), we then explored the case by interpreting our data beyond the explanations the informants provided (Labianca *et al.*, 2000) and in line with our theoretical insights. Our analysis mainly aimed to link empirical observations to theoretical knowledge (Ragin and Becker, 1992).

3.2 Research setting

Clemenceau Medical Center Dubai (CMC-Dubai) was founded in February 2020 in the heart of Dubai and is an ultra-modern facility designed to serve patients from the Gulf and the Middle East. Founded and owned by the Abu Ghazaleh, Khansaheb and Dubai Investment Group, it employs about 500 professionals in CMC and about 2,500 in the whole group.

The CMC is a 100-bed hospital that offers all the specialty branches, including Neurology, General Surgery, Pulmonary, Cardiac Center, Urology, OB/GYN, Fertility and IVF Center, Digestive Disease and Colonoscopy Center, Diagnostic Services, Robotic Surgery and full-fledged Cancer Center with Radiation Oncology Department, among others. CMC holds out the most innovative treatments and technologies available in the region in a friendly and relaxing environment (Clemenceau Medical Center, 2020). These factors pushed Johns Hopkins Medicine International (JHMI) to choose CMC as one of its affiliate reputable medical institutions worldwide. JHMI has maintained a reputation for excellence for over one hundred years, unsurpassed by any healthcare institution globally, and ranked number one in healthcare (The Business Year, 2015).

This association provides CMC with access to the Johns Hopkins Medicine and Health System, whereby any patient in CMC can ask for the assistance of any professional from JHMI. More specifically, depending on the case's complexity, a professional from JHMI will travel at the hospital's expense and go to Lebanon to pursue a complicated medical procedure for a CMC patient (The Arab Hospital Magazine, 2019). Apart from the medical field, the patients enjoy first-class service in a 5-star hotel ambience with spacious furnished rooms, suites and comfortable waiting areas.

The best environment to relax is provided to the patients with access to digital entertainment, including satellite and Internet access. Indeed, the CMC aims to ensure that its patients receive the friendliest and most attentive service while highlighting the relevance of a sense of well-being in promoting recovery. CMC underlines the importance of visitors as an essential part of the healing process. Indeed, CMC welcomes visitors 24 h a day, seven days a week, by putting at their disposal a coffee shop and a gift shop (Clemenceau Medical Center, 2020). CMC- Dubai is a part of the Clemenceau Medicine International (CMI) network, which includes CMC Lebanon, Abdali Hospital (Jordan)) and CMC Riyadh (Kingdom of Saudi Arabia).

The continuous growth and success experienced by the CMI group made it one of the leading institutional healthcare providers in the region. This story as a top medical institution and health provider led the CMI group to be awarded different prizes, such as the Best Sustainable Hospital Project Award (2010), Best Facilities Management Service Strategy Award (2009), Best Sustainable Hospital Design Award (2009); Highly Commended for Best

Hospital Design (2009) and Best Interior Design (2009). Relatedly, CMC was included in the Medical Travel Quality Alliance's Top Ten Best Hospitals for Medical Tourists (2010) and hosted JHI Partners Forum in 2011.

4. Findings

Following a series of in-depth interviews four important parameters emerged on which Artificial Intelligence-based technologies have an impact. The relevant quotations from the interviews are included in Table 2, emphasizing AI's importance in increasing competitiveness. We conducted a first-order analysis identifying the main themes from the interviews. Thus, we distilled from them the themes helpful in exploring the phenomenon. We analyzed each theme and identified sub-themes useful in the second-order analysis that allowed us to identify our aggregate dimensions (Gioia *et al.*, 2013). The data structure is shown in the *Coding table* in the Appendix.

In particular, the findings allow us to highlight some relevant outcomes that can improve the patient experience that can be distinguished in: (1) clinical outcome (i.e. minimization of surgical errors and infections; maximization of patients' experience); (2) financial outcome; (3) organizational outcome (i.e. optimization resources' allocation) and d) technological outcome (i.e. mechanical improvements). First, innovative digital technologies enable hospitals to achieve better clinical outcomes and improve patients' overall experience. As Dr RM added, "For me, robotic surgery is the future. I will no longer pursue any single laparoscopic case, the world is advancing, people are exploring Mars and Venus so does the healthcare field. The robotic intervention represents a medical revolution we should all capitalize on". The future belongs to machine learning and AI. It is worth mentioning the importance of increasing physicians' and patients' awareness of the benefits of adopting a robotic surgical approach. Additionally, as explained by the director of the weight loss program Dr AH who mentioned, "While a conventional laparoscopy provides two-dimensional (2D) imaging of the operative field, a robotic system affords a 3D vision while allowing rapid camera zooming and panning of the. An effect called fulcrum is being created when the rigid conventional instruments pass through the incision, which will lead to inversion of movement from the surgeon's hand to the working end of the instrument". As stated by Dr EAK, "It is essential to work on the moral of the patient, especially for a lady, having a scar of 2 cm is much more welcomed than having a five plus cm scare".

Secondly, digital innovation also benefits healthcare facilities in better financial performance; as Dr PT stated, "The main concern of TPP is the satisfaction of their customers to retain their premiums accordingly when patients are choosing CMC Dubai over competitors this will reinforce and strengthen the company bargaining power with TPP and will lead to an increase in the base rate and automatically an increase in the total revenue". As Finance Manger attested, "Financially speaking, for a hospital averaging 30 robotic case a month, an amount of 500 K will financially improve our performance and we will be able to cover the cost of robot acquisition (14 M K) in less than 3 years, our expectations were to break even after 5 years however with the recent decrees from DHA and with the anticipated increase in workload we can make it much faster".

Despite the high investments required, Artificial Intelligence represents an essential source of profit for healthcare ecosystems and a tool to reorganize the allocation of resources and internal organization. As the Director of Nursing stated, "From a nursing perspective we prefer the robotic approach for many reasons starting from the number of staffs engaged in a robotic case (1) compared to 3 in a laparoscopic one, in addition to the operating room occupancy time which is 20% less when a surgery is being performed robotically which will reduce the cost of anesthesiologist and anesthesia technicians who are getting paid hourly and will definitely reduce the cost of materials used in the surgery because the more you spend time the more you consume".

Respondent	Quote	Clinical outcome	Financial outcome	Organizational outcome	Technological outcome
Director of Robotic program	*"For me robotic surgery is the future I will no longer pursue any single laparoscopic case, the world is advancing forward, people are exploring Mars and Venus so does the health care field, the robotic intervention represents a revolution in medicine that we should all capitalise"*	Minimization of surgical errors and infections	–	–	–
Director of obstetrics, gynecology and women health	*"For me going into a traditional laparoscopic case is only an option while the case cannot be performed robotically otherwise, I would rather use the robot for a single hysterectomy case because of the benefits that I will be adding to both patient safety and patient experience"*	Patient safety and Patient experience	–	–	–
Director of surgery and weight loss program-member of the robotic team	*"For a sleeve gastrectomy case performed robotically, the incision that I will make on the patient body is 20% less than the one I did in a traditional laparoscopic case"*	Better aesthetic result	–	–	–
Director of obstetrics, gynecology and women health	*"It is very important to work on the moral of the patient, especially for a lady, having a scar of 2 cm is much more welcomed than having a 5 plus cm scare"*	Better aesthetic result	–	–	–
Director of surgery and weight loss program-member of the robotic team	*"On the other hand, sending my patient home after a sleeve gastrectomy within 24 h is much more welcomed than admitting him for 72 h"*	Faster time of recovery and less percentage of pain and trauma	–	–	–
Director of Robotic program	*"Patient doesn't like to stay at hospital, everyone even myself, the idea of being at hospital is mentally intolerable by all human beings"*	Maximization of the patient experience	–	–	–

(*continued*)

Table 2. Representative quotes

Respondent	Quote	Clinical outcome	Financial outcome	Organizational outcome	Technological outcome
Director of surgery program in Emirates hospital	*"One of the major obstacles we are facing in pursuing a bariatric surgery while adopting the laparoscopic approach is patient feedback"*	Maximization of patient experience	–	–	–
Director of revenue cycle management	*"That's a huge milestone for us, the additional service fees will be help the hospital to cover the cost of acquisition of the robot and to increase the remuneration fees for physicians in a way that will attract top-notch physicians across the world to come and pursue cases in CMC Dubai"*	–	Better financial performance	–	–
Finance Manager	*"Financially speaking, for a hospital averaging 30 robotic case a month, an amount of 500 K will financially improve our performance and we will be able to cover the cost of robot acquisition (14 M K) in less than 3 years, our expectations were to break even after 5 years however with the recent decrees from DHA and with the anticipated increase in workload we can make it much faster"*	–	Better financial performance	–	–
Director of revenue cycle management	*"On the other hand, DHA are now revisiting the CPT codes issued on 2018 and will release a new version by 2022 which will take into account the robotic assisted approach, and this will automatically increase our DRG lumpsum amount and our base rate with third party payers"*	–	Better financial performance	–	–

Table 2. (*continued*)

Respondent	Quote	Clinical outcome	Financial outcome	Organizational outcome	Technological outcome
Director of revenue cycle management	*"The insurance companies along with third party payers treat hospitals on a base rate system which means for every case submitted the hospital will get reimbursed based on the agreed on base rate and usually this commitment is renewed on yearly basis"*	–	Better financial performance	–	–
Director of revenue cycle management and Finance Manager	*"The main concern of TPP is the satisfaction of their customers to retain their premiums accordingly when patients are choosing CMC Dubai over competitors this will reinforce and strengthen the company bargaining power with TPP and will lead to an increase in the base rate and automatically an increase in the total revenue"*	–	Increased profits	–	–
Director of clinical services	*"We need two circulating nurse and 1 nurse assistant while pursuing a laparoscopic case however we only need one circulating nurse while using the robotic approach*	–	–	Better management and utilization of resources and premises	–
Or manager at Emirates hospital	*"Laparoscopic cases are consuming my resources and making our OR schedule very busy and tight"*	–	–	Better management and utilization of resources and premises	–

(*continued*)

Table 2.

Respondent	Quote	Clinical outcome	Financial outcome	Organizational outcome	Technological outcome
Director of nursing at CMC	*"From a nursing perspective we prefer the robotic approach for many reasons starting from the number of staffs engaged in a robotic case (1) compared to 3 in a laparoscopic one, in addition to the operating room occupancy time which is 20% less when a surgery is being performed robotically which will reduce the cost of anesthesiologist and anesthesia technicians who are getting paid hourly and will definitely reduce the cost of materials used in the surgery because the more you spend time the more you consume"*	–	–	Better management and utilization of resources and premises	–
Director of surgery and weight loss program-member of the robotic team	*"While a conventional laparoscopy provides two-dimensional (2D) imaging of the operative field, a robotic system affords a 3D vision while allowing rapid camera zooming and panning of the. An effect called fulcrum is being created when the rigid conventional instruments pass through the incision which will lead to inversion of movement from the surgeon's hand to the working end of the instrument"*	–		–	Superior visualization and Mechanical improvements
Director of Robotic program	*"For an obese patient, there is more torque placed on an instrument and the rigid smaller caliber instruments, such as laparoscopes, may result in fracture"*	–		–	Superior visualization and Mechanical improvements

Table 2. **Source(s):** Authors work

5. Discussion and implications

5.1 Discussion

Our findings demonstrate the extent to which implementing Artificial Intelligence-based solutions inside healthcare ecosystems helps organisations gain a competitive advantage in the market, not just in terms of profitability but also in terms of hospital prosperity. Implementing sophisticated technologies such as AI-based enables healthcare ecosystems to find the right trade-off between high-quality care and cost containment. In the healthcare sector, digital innovation and technological advances would allow organisations to provide better care using state-of-the-art equipment and tools and to achieve better economic and financial results.

They also facilitate the necessary paradigm shift to respond to the needs of today's dynamic and changing socio-economic environment (Thuemmler and Bai, 2017; Prado-Prado *et al.*, 2020; Ferreira *et al.*, 2022). This highlights the need to embrace the changes brought about by digital transformation, not to lose one's competitive position (Ziyadin *et al.*, 2018).

The analysis conducted, as shown in Table 2, allows for identifying four competitive aspects on which Artificial Intelligence implementation has an impact. Digital innovations in the healthcare sector improve clinical results. Indeed, Artificial Intelligence in medicine reduces the number of surgical errors and infections. Furthermore, using a robotic technique means more excellent aesthetic vision, faster healing, less fluid loss during surgery, less anesthetic and radiation exposure and minor trauma and post-operative pain. Using the robot decreases the laparoscopic incision since the robot's hands give the surgeon higher precision and accuracy during the procedure. Furthermore, the robot allows the surgeon to maneuver the arm and camera to reach previously inaccessible locations.

Furthermore, the robotic approach has an advantage over the laparoscopic approach due to faster recovery and healing durations, shorter hospital stays and a smaller percentage of pain and trauma. This emphasizes the importance of robotics in healthcare and the significant paradigm shift these technologies bring to an already complicated business (Schiavone *et al.*, 2022). The advantages listed above enable healthcare facilities to improve the quality of service and delivery while also ensuring a better patient experience, highlighting how increasingly healthcare ecosystems must be oriented towards patients and their needs, placing them at the center of the decision-making process (Schiavone *et al.*, 2022; Håkansson Eklund *et al.*, 2019; Martins *et al.*, 2020). Thus, we can posit the following proposition:

P1. Using AI to improve the quality of care positively impacts organizations' competitive position.

Digitalization and Artificial Intelligence enable better economic and financial outcomes. Despite the high cost of acquiring and developing such technologies, which is not fully covered by insurance, the numerous advantages and benefits generated by the adoption of a robotic approach led the DHA (Dubai Health Authority) to approve the treatment of automated surgery cases in Dubai on a case-by-case basis, depending on the complexity and necessity. The imposition of a service fee on third parties (between 10 and 20 thousand euros) for each case to be treated. In addition to the DRG, each instance will be paid 20,000 euros. This provides healthcare facilities a more significant revenue stream, resulting in improved financial performance by drawing top doctors worldwide to monitor cases at the CMC in Dubai. Thus, we can posit the following proposition:

P2. Revenue stream positively impacts organizations' competitive position.

Finally, digital solutions enable healthcare ecosystems to achieve better organizational and technological results. Using digital tools allows for greater coordination between the actors involved, fostering better communication and, consequently, better overall performance

(Cristofaro *et al.*, 2022; Jatobá *et al.*, 2023). Compared to traditional surgical procedures, robotic technology allows for greater visibility, improved mechanics and the use of resources and permits. Indeed, one of the main objectives of today's healthcare ecosystems is the optimal allocation of scarce resources to ensure the best possible performance. Thus, we can posit the following propositions:

P3. Implementing AI to improve HRs management positively impacts organizations' competitive position.

P4. Implementing AI to stimulate technological advancement positively impacts organizations' competitive position.

The number of surgical robots is expected to increase over the next 2 decades. However, the sustainable advantage would remain with the early adopters of this approach due to several factors: firstly, the quality of the healthcare professionals they already have on board and the accumulated experience in dealing with complicated cases, in addition to the expertise of the surgeons, especially for surgeons who have been developing the program for years and who will undoubtedly have reached an increasingly advanced level of technical knowledge by then, which will always be in their favor and differentiate them from their current competitors. Developing a qualified robotic team, from nurses to technicians to surgeons, supported by a dynamic revenue cycle management team, will always give the organization the upper hand over the competition.

Finally, in highlighting the advantages of the robotic approach over the laparoscopic approach, we are not ignoring the fact that the introduction of the latter 20 years ago represented a significant evolution in surgical operations and contributed to an enormous level of success; However, technology continues to evolve, one innovation typically replaces another every day, it is essential to note that, to date, the robotic approach has not been able to take over all surgical activities. There are still some areas in oncology, hepatobiliary and spine surgery where only the open system approach can successfully tackle and repair clinical defects.

5.2 Implications

This study has significant implications, particularly for policymakers and practitioners. The analysis undertaken from a management standpoint demonstrates the numerous benefits of introducing innovative digital solutions in terms of care and, most importantly, in terms of the structures' success. This highlights the solid competitive potential of innovative technology. They must be viewed as resources to be utilized rather than obstacles to be conquered. The findings emphasize the need for managers to reflect on their strategies and resource allocations, highlighting how adopting innovative solutions increases the results' quality. Finally, the research provides food for thought for policymakers tasked with raising awareness of the benefits of advanced digital technologies by defining economic policies that encourage healthcare institutions to develop and employ digital tools.

6. Conclusion and research limitations

In conclusion, we can state that a surgical robot, and a robotic approach in general, have numerous advantages over laparoscopic surgery, ranging from improved clinical outcomes in terms of accuracy, minor trauma, shorter hospital stays and better aesthetic appearance to the visualization advantages provided using 3D techniques, as well as the financial and monetary benefits previously discussed. With that said, and given that we are in the internet of things and digitalization era, we can conclude that implementing a robotic surgery program in a healthcare setting can easily represent a competitive advantage that will help position the organization in the market, as well as a source of increased income and revenue

that will contribute to the hospital's prosperity and continuity, despite the high cost of acquiring a robot.

Aside from the short time to break even and the expected return on investment, it will undoubtedly represent a significant added value for any organization over the competition. Some challenges are associated with the surgical approach, such as the surgeon's expertise and the availability of competent and certified healthcare providers. Still, these can be overcome with good management and a competent talent question team capable of headhunting properly. These findings must be viewed in the context of a few fundamental limitations, which can be classified as financial and, to some extent, clinical. As stated in the previous section, the cost of acquiring the robot is enormous, and the associated instruments are considered expensive materials. The limitation resides in surgery from a clinical standpoint, which is ineffective using a robotic approach.

Our findings are context-specific in general, which may help explain the success of our findings in private healthcare institutions in the UAE and the conditions under which these insights might be generalized to public hospitals and other geographical locations. As a result, future research may consider the role of environmental and market factors (e.g. generosity, turbulence, competitiveness and cultural, political and technological characteristics) as well as chrono-based factors (e.g. global and national crises: leadership/ownership changes, business exits and M&A) in extending our conclusions.

Future study that examines variation in the meso-context, for as integrating sample businesses with varying leadership styles, customer orientations and governance arrangements, could provide insight into other factors influencing marketing tactics. Furthermore, our empirical investigation excluded the perspectives of patients and recipients of CMC's services. Comparing consumer and patient perspectives in private hospitals may illuminate the future of private healthcare organisations and how artificial intelligence deployment may contribute to their success.

References

Agrawal, A., Gans, J. and Goldfarb, A. (2018), *Prediction Machines: The Simple Economics of Artificial Intelligence*, Harvard Business Press.

Alvarez, S.A., Young, S.L. and Woolley, J.L. (2015), "Opportunities and institutions: a co-creation story of the king crab industry", *Journal of Business Venturing*, Vol. 30 No. 1, pp. 95-112.

Appio, F.P., Frattini, F., Messeni Petruzzelli, A.M. and Neirotti, P. (2018), "Digital transformation and innovation management: opening up the black box", *Journal of Product Innovation Management*, pp. 1-6.

Balogun, B. and Ogunnaike, O.O. (2017), "Healthcare Organizations in a global marketplace: a systematic Review of the literature on healthcare marketing", *Journal of Marketing Management and Consumer Behavior*, Vol. 1 No. 5.

Balta, M., Valsecchi, R., Papadopoulos, T. and Bourne, D.J. (2021), "Digitalization and co-creation of healthcare value: a case study in Occupational Health", *Technological Forecasting and Social Change*, Vol. 168, 120785.

Bohr, M. (2020), *Artificial Intelligence in Healthcare*, Elsevier inc, London.

Butt, I., Iqbal, T. and Zohaib, S. (2019), "Healthcare marketing: a review of the literature based on citation analysis", *Health Marketing Quarterly*, Vol. 36 No. 4, pp. 271-290.

Chakravorty, T., Jha, K., Barthwal, S. and Chakraborty, S. (2020), "Digital technologies as antecedents to process integration and dynamic capabilities in healthcare: an empirical investigation", *Journal of International Technology and Information Management*, Vol. 28 No. 4, pp. 84-111.

Chung, E. (2022), "Domain knowledge-based human capital strategy in manufacturing AI", *IEEE Engineering Management Review*.

Clemenceau Medical Center (2020), "Johns Hopkins medicine international", available at: www.cmc.com

Copeland, B. (2020), "Artificial intelligence", available at: www.britannica.com/technology/artificialintelligence

Cristofaro, C.L., Ventura, M., Reina, R. and Gentile, T. (2022), "Measuring healthcare performance in digitalization era an empirical analysis", in *Do Machines Dream of Electric Workers?*, Springer, Cham, pp. 137-147.

Davenport, T. and Kalakota, R. (2019), "The potential for artificial intelligence in healthcare", *Future Healthcare Journal*, Vol. 6 No. 2, 94.

Dubois, A. and Gadde, L.E. (2002), "Systematic combining: an abductive approach to case research", *Journal of Business Research*, Vol. 55 No. 7, pp. 553-560.

Eckrich, D.W. and Schlesinger, W. (2011), "An application of the marketing concept in healthcare services planning: a case report", *Journal of Management and Marketing Research*, Vol. 6 No. 1.

Farahani, B., Firouzi, F., Chang, V., Badaroglu, M., Constant, N. and Mankodiya, K. (2018), "Towards fog-driven IoT eHealth: promises and challenges of IoT in medicine and healthcare", *Future Generation Computer Systems*, Vol. 78, pp. 659-676.

Ferreira, J.J., Veiga, P.M., Fernandes, C.I. and Kraus, S. (2022), "B2B marketing strategies in healthcare management: intellectual structure and research trends", *Journal of Business and Industrial Marketing*, Vol. 37 No. 8, pp. 1580-1593.

Fiaz, M., Ikram, A. and Ilyas, A. (2018), "Enterprise resource planning systems: digitisation of healthcare service quality", *Administrative Sciences*, Vol. 8 No. 3, 38.

Gioia, D.A., Corley, K.G. and Hamilton, A.L. (2013), "Seeking qualitative rigor in inductive research: notes on the Gioia methodology", *Organizational Research Methods*, Vol. 16 No. 1, pp. 15-31.

Håkansson Eklund, J., Holmström, I.K., Kumlin, T., Kaminsky, E., Skoglund, K., Höglander, J. and Summer Merenius, M. (2019), "Same same or different? A review of reviews of person-centred and patient-centred care", *Patient Education and Counseling*, Vol. 1, pp. 3-11.

Hamet, P. and Tremblay, J. (2017), "Artificial intelligence in medicine", *Metabolism*, Vol. 69, pp. S36-S40.

Heart, T., Ben-Assuli, O. and Shabtai, I. (2017), "A review of PHR, EMR and EHR integration: a more personalised healthcare and public health policy", *Health Policy and Technology*, Vol. 6 No. 1, pp. 20-25.

Hong, K.S. and Lee, D. (2018), "Impact of operational innovations on customer loyalty in the healthcare sector", *Service Business*, Vol. 12 No. 3, pp. 575-600.

Huang, M.H. and Rust, R.T. (2018), "Artificial intelligence in service", *Journal of Service Research*, Vol. 21 No. 2, pp. 155-172.

Ivaschenko, A., Diyazitdinova, A.R. and Nikiforova, T. (2021), "Optimisation of the rational proportion of intelligent technologies application in service organisations", *Organizacija*, Vol. 54 No. 2, pp. 162-177.

Jatobá, M.N., Ferreira, J.J., Fernandes, P.O. and Teixeira, J.P. (2023), "Intelligent human resources for the adoption of artificial intelligence: a systematic literature review", *Journal of Organizational Change Management*.

Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S. and Wang, Y. (2017), "Artificial intelligence in healthcare: past, present and future", *Stroke and Vascular Neurology*, Vol. 2 No. 4.

Johnson, R.D., Stone, D.L. and Lukaszewski, K.M. (2020), "The benefits of eHRM and AI for talent acquisition", *Journal of Tourism Futures*, Vol. 7 No. 1, pp. 40-52.

Khan, O., Badhiwala, J.H., Grasso, G. and Fehlings, M.G. (2020), "Use of machine learning and artificial intelligence to drive personalized medicine approaches for spine care", *World Neurosurgery*, Vol. 140, pp. 512-518.

Kok, J.N., Boers, E.J., Kosters, W.A., Van der Putten, P. and Poel, M. (2009), "Artificial intelligence: definition, trends, techniques, and cases", *Artificial Intelligence*, Vol. 1, pp. 270-299.

Krakowski, S., Luger, J. and Raisch, S. (2022), "Artificial intelligence and the changing sources of competitive advantage", *Strategic Management Journal*.

Labianca, G., Gray, B. and Brass, D.J. (2000), "A grounded model of organisational schema change during empowerment", *Organization Science*, Vol. 11 No. 2, pp. 235-257.

Laurenza, E., Quintano, M., Schiavone, F. and Vrontis, D. (2018), "The effect of digital technologies adoption in healthcare industry: a case based analysis", *Business Process Management Journal*.

Leone, D., Schiavone, F., Appio, F.P. and Chiao, B. (2021), "How does artificial intelligence enable and enhance value co-creation in industrial markets? An exploratory case study in the healthcare ecosystem", *Journal of Business Research*, Vol. 129, pp. 849-859.

Li, P., Bastone, A., Mohamad, T.A. and Schiavone, F. (2023), "How does artificial intelligence impact human resources performance. evidence from a healthcare institution in the United Arab Emirates", *Journal of Innovation and Knowledge*, Vol. 8 No. 2, 100340.

Martins, S.M., Ferreira, F.A., Ferreira, J.J. and Marques, C.S. (2020), "An artificial-intelligence-based method for assessing service quality: insights from the prosthodontics sector", *Journal of Service Management*, Vol. 31 No. 2, pp. 291-312.

Mathai, N., Shiratudin, M.F. and Sohel, F. (2017), "Electronic health record management: expectations, issues, and challenges", *Journal of Health and Medical Informatics*, Vol. 8 No. 3, pp. 1-5.

Matheny, M.E., Whicher, D. and Israni, S.T. (2020), "Artificial intelligence in health care: a report from the National Academy of Medicine", *Jama*, Vol. 323 No. 6, pp. 509-510.

Mirowska, A. and Mesnet, L. (2022), "Preferring the devil you know: potential applicant reactions to artificial intelligence evaluation of interviews", *Human Resource Management Journal*, Vol. 32 No. 2, pp. 364-383.

Murphy, K.R., Jako, R.A. and Anhalt, R.L. (1993), "Nature and consequences of halo error: a critical analysis", *Journal of Applied Psychology*, Vol. 78 No. 2, 18.

Pagliarussi, M.S. and Rapozo, F.O. (2011), "Agency relationships in a Brazilian multifamily firm", *Family Business Review*, Vol. 24 No. 2, pp. 170-183.

Patton, M.Q. (2002), "Two decades of developments in qualitative inquiry: a personal, experiential perspective", *Qualitative Social Work*, Vol. 1 No. 3, pp. 261-283.

Pereira, V., Hadjielias, E., Christofi, M. and Vrontis, D. (2023), "A systematic literature review on the impact of artificial intelligence on workplace outcomes: a multi-process perspective", *Human Resource Management Review*, Vol. 33 No. 1, 100857.

Peteraf, M.A. and Bergen, M.E. (2003), "Scanning dynamic competitive landscapes: a market-based and resource-based framework", *Strategic Management Journal*, Vol. 24 No. 10, pp. 1027-1041.

Pillai, R. and Sivathanu, B. (2020), "Adoption of artificial intelligence (AI) for talent acquisition in IT/ITeS organizations", *Benchmarking: An International Journal*, Vol. 27 No. 9, pp. 2599-2629.

Plastino, E. and Purdy, M. (2018), *Game Changing Value from Artificial Intelligence: Eight Strategies*, Strategy & Leadership.

Prado-Prado, J.C., García-Arca, J., Fernández-González, A.J. and Mosteiro-Añón, M. (2020), "Increasing competitiveness through the implementation of lean management in healthcare", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 14, 4981.

Ragin, C.C. and Becker, H.S. (Eds). (1992), "What is a case?", in, *Exploring the Foundations of Social Inquiry*, Cambridge University Press.

Raisch, S. and Krakowski, S. (2021), "Artificial intelligence and management: the automation–augmentation paradox", *Academy of Management Review*, Vol. 46 No. 1, pp. 192-210.

Rialti, R., Marzi, G., Ciappei, C. and Busso, D. (2019), "Big data and dynamic capabilities: a bibliometric analysis and systematic literature review", *Management Decision*.

Rodríguez, R., Svensson, G. and Otero-Neira, C. (2019), "Future direction of sustainable development in private hospitals: general similarities and specific differences", *Journal of Business and Industrial Marketing*, Vol. 35 No. 3, pp. 537-550.

Rong, G., Mendez, A., Assi, E.B., Zhao, B. and Sawan, M. (2020), "Artificial intelligence in healthcare: review and prediction case studies", *Engineering*, Vol. 6 No. 3, pp. 291-301.

Schiavone, F., Mancini, D., Leone, D. and Lavorato, D. (2021), "Digital business models and ridesharing for value co-creation in healthcare: a multi-stakeholder ecosystem analysis", *Technological Forecasting and Social Change*, Vol. 166, 120647.

Schiavone, F., Tagliaferri, S., Cafiero, G., De Rosa, M. and De Angelis, R. (2022), "Health 4.0 for the elderly: new challenges and opportunities for a smart system", in *The Digital Transformation of Healthcare*, Routledge, pp. 90-102.

Sourdin, T. (2018), "Judge v Robot?: artificial intelligence and judicial decision-making", *University of New South Wales Law Journal*, Vol. 41 No. 4, pp. 1114-1133.

Stanley, D.S. and Aggarwal, V. (2019), "Impact of disruptive technology on human resource management practices", *International Journal of Business Continuity and Risk Management*, Vol. 9 No. 4, pp. 350-361.

Sturm, T., Gerlach, J.P., Pumplun, L., Mesbah, N., Peters, F., Tauchert, C. and Buxmann, P. (2021), "Coordinating human and machine learning for effective organizational learning", *MIS Quarterly*, Vol. 45 No. 3.

Teece, D.J. (2018), "Profiting from innovation in the digital economy: enabling technologies, standards, and licensing models in the wireless world", *Research Policy*, Vol. 47 No. 8, pp. 1367-1387.

Teece, D.J., Pisano, G. and Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18 No. 7, pp. 509-533.

The Arab Hospital Magazine (2019), "Interview with Dr. Mounes Kalaawi", available at: http://thearabhospital.com/interviews/dr-mounes-kalaawi-2/in February 2020

The Business Year (2015), "One stop health", available at: https://www.thebusinessyear.com/lebanon-2015/one-stop-health/vip-interview in January 2020

Thuemmler, C. and Bai, C. (2017), *Health 4.0: How Virtualization and Big Data Are Revolutionising Healthcare*, Springer, Berlin/Heidelberg, available at: https://link.springer.com/book/10.1007%2F978-3-319- 47617-9 (accessed on 9 July 2020).

Van de Ven, A.H. (1992), "Suggestions for studying strategy process: a research note", *Strategic Management Journal*, Vol. 13 No. S1, pp. 169-188.

Waring, J., Lindvall, C. and Umeton, R. (2020), "Automated machine learning: review of the state-of-the-art and opportunities for healthcare", *Artificial Intelligence in Medicine*, Vol. 104, 101822.

Yin, R.K. (1994), "Discovering the future of the case study. Method in evaluation research", *Evaluation Practice*, Vol. 15 No. 3, pp. 283-290.

Yin, R.K. (2003), "Case study research: design and methods", *Applied Social Research Methods*, Vol. 5.

Yorks, L., Rotatori, D., Sung, S. and Justice, S. (2020), "Workplace reflection in the Age of AI: materiality, technology, and machines", *Advances in Developing Human Resources*, Vol. 22 No. 3, pp. 308-319.

Yu, K.H., Beam, A.L. and Kohane, I.S. (2018), "Artificial intelligence in healthcare", *Nature Biomedical Engineering*, Vol. 2 No. 10, pp. 719-731.

Ziyadin, S., Ermekbaeva, B., Supugaliyeva, G. and Doszhan, R. (2018), "Transformation of basic indicators of socio-economic processes in the digital economy", *Proceedings of the 31st IBIMA 2018*, pp. 2009-2017.

Further reading

Andresen, E., Lundberg, H. and Wincent, J. (2014), "Processes in collaborative entrepreneurship: a longitudinal case study of how multiple actors exploit a radically new opportunity", *International Entrepreneurship and Management Journal*, Vol. 10 No. 4, pp. 713-726.

Banzhaf, G. (2020), *Genetic Programming Theory and Practice*, Springer Nature, Switzerland.

Baumgartner, R.J. (2014), "Managing corporate sustainability and CSR: a conceptual framework combining values, strategies and instruments contributing to sustainable development", *Corporate Social Responsibility and Environmental Management*, Vol. 21 No. 5, pp. 258-271.

Casprini, E., De Massis, A., Di Minin, A., Frattini, F. and Piccaluga, A. (2017), "How family firms execute open innovation strategies: the Loccioni case", *Journal of Knowledge Management*.

Elrod, J.K. and Fortenberry, J.L. (2018), "Formulating productive marketing communications strategy: a major health system's experience", *BMC Health Services Research*, Vol. 18 No. 3, 926.

Flyvbjerg, B. (2006), "Five misunderstandings about case-study research", *Qualitative Inquiry*, Vol. 12 No. 2, pp. 219-245.

Giovannoni, E., Maraghini, M.P. and Riccaboni, A. (2011), "Transmitting knowledge across generations: the role of management accounting practices", *Family Business Review*, Vol. 24 No. 2, pp. 126-150.

Hernandez, (2019), "Computer can now bluff like a poker champ", available at: www.usj.com/articles

Kennedy, M.M. (1979), "Generalising from single case studies", *Evaluation Quarterly*, Vol. 3 No. 4, pp. 661-678.

Lee, T.W., Mitchell, T.R. and Sablynski, C.J. (1999), "Qualitative research in organisational and vocational psychology, 1979-1999", *Journal of Vocational Behavior*, Vol. 55 No. 2, pp. 161-187.

Lipiäinen, H. and Karjaluoto, H. (2015), "Industrial branding in the digital age", *Journal of Business and Industrial Marketing*, Vol. 30 No. 6, pp. 733-744.

Purcărea, V.L., Gheorghe, I. and Gheorghe, C. (2013), "What is salient about marketing health care services?", *Procedia–Social and Behavioral Sciences, 3rd World Conference on Business, Economics and Mana*.

Russel, R. (2016), *Artificial Intelligence, a Model Approach*, 3rd ed., Harlow Pearson Education limited.

Siggelkow, N. (2007), "Persuasion with case studies", *Academy of Management Journal*, Vol. 50 No. 1, pp. 20-24.

Smith, R., Álvarez, M.M. and Chanda, R. (2011), "Medical tourism: a review of the literature and analysis of a role for bi-lateral trade", *Health Policy*, Vol. 103 Nos 2-3, pp. 276-282.

Wang, J. and Christensen, C.M. (2008), "Disruptive innovation in health care delivery: a framework for business-model innovation", *Health Affairs*, Vol. 27 No. 5, pp. 1329-1335.

Woo, E. and Schwartz, Z. (2014), "Towards assessing the knowledge gap in medical tourism", *Journal of Quality Assurance in Hospitality and Tourism*, Vol. 15 No. 2, pp. 213-226.

(The Appendix follows overleaf)

Appendix

Tabla A1.
Coding table

Main themes	Themes	Sub themes	Financial impact	Organizational impact	Technological impact	Clinical impact
Future of surgery	Robotic approach	Increased productivity				x
	Small incision					x
	Patient safety					x
Aesthetic approach	Less number stitches	Patient satisfaction		x		x
	Less Traumatic					
Surgeon's experience	Accuracy	Patient safety				x
	Minimization of surgical errors				x	x
	Minimization of surgical site infections		x	x	x	x
	Fastest recovery		x	x		
	Short stay in the hospital					
OR optimization	Short number of operating hours	Increased productivity and decreased cost	x	x		
	Less number of hours required for processing		x	x	x	
	Less number of hours required for sterilization		x	x	x	
Nursing involvement	Less number of nurses required	Nursing engagement and decreased head count	x	x		x
	Nursing time flexibility			x		x
Management of resources	Head hunting	Optimization of resources, increased organizational performance	x	x		x
	Qualified and certified physicians					
	Qualified and certified care givers					

(*continued*)

Tabla A1.

Main themes	Themes	Sub themes	Financial impact	Organizational impact	Technological impact	Clinical impact
Laparoscopic approach	More trauma More incisions and stitches Longer stay in the hospital Longer recovery	unpleasant patient experience	x	x		x
Era of Technology	Future involvement of AI and Machine learning	none			x	x
Reimbursement and remunerations	Better Base rate	Improved revenue, faster break even	x	x		
	Lumpsum for critical cases		x	x		
	Physicians' remunerations CPT codes		x	x		

Source(s): Authors work

	Introduction: Small abstract on the interviewee in terms of position, experience and years of expertise
1	What is the vision of the company?
2	What is the concept of robotic surgery, when was it introduced and how it works?
3	Is this concept approved by the health care authorities?
4	What is the portfolio of services offered in the robotic program?
5	What are the clinical advantages of adopting robotic surgeries?
6	How will robotic surgeries affect patient experience and how easy is to convince a patient to pursue robotic surgery?
7	What are the limitations of a robotic surgery?
8	To which extent nursing staff are being involved in the robotic program?
9	What is the normal OR procedure time for a robotic surgery compared to a laparoscopic one and how will robotic surgeries affect OR schedule, OR occupancy and manpower involvement?
10	From a human resources perspective, what are the challenges involved in implementing the robotic program? Any impact on the overhead and the payroll
11	What is the cash price difference between a robotic and a laparoscopic surgery
12	What is the difference in materials and instruments cost between a robotic surgery and a laparoscopic surgery?
13	Is there a difference in the insurance base rate reimbursement between both type of surgeries? What are the real challenges with third party payers
14	How much is the cost of acquiring a robot and what is expected ROI, in how many years you can break even
15	Is there any difference from the physician side in terms of remuneration related to the nature of surgery (robotic or laparoscopic?)
16	How do you segment your customers? Do you have any strategy related to robot surgeries?
17	How do technological innovations change the nature and impact of the marketing mix components in the health care sector?

Table A2.
Interview guide

Corresponding author
Anna Bastone can be contacted at: anna.bastone001@studenti.uniparthenope.it