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Medicine-technology and culture: historical interactions

Ioanna Maniou ^{1,*}, Maria Manola ² and Fotini Maniou ³

¹ *Medical School, National and Kapodistrian University of Athens and University of Lausanne.*

² *Department of Tourism and Management, University of West Attica, Greece.*

³ *Sustainable Urban and Regional Development, Harokopion University of Athens, Greece.*

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Abstract

This article examines the enduring relationship between medicine, technology, and culture, highlighting how historical, social, and cultural conditions have shaped the development of medical knowledge and practice. From Hippocratic medicine and early technological innovations in antiquity to the contemporary era of digital medicine, artificial intelligence, and robotic surgery, the study analyzes the interactions that have influenced both therapeutic methods and the perception of disease and health. Special emphasis is placed on the role of culture as a framework for interpreting and integrating technological advancements, as well as on the ethical and humanistic dimensions emerging at the intersection of medicine and technology. Through a historical and interdisciplinary approach, the article demonstrates that medical progress is not merely a technological achievement but the result of a continuous dialogue among science, society, and culture.

Keywords: Medicine; Technology; Culture; Human-Centered Approach; Cultural Entrepreneurship

1. Introduction

The advancement of medical science is intrinsically linked to technological innovation, the education of health professionals, and the broader cultural context in which these developments occur. The introduction of new diagnostic and therapeutic techniques is not merely a technological feat but a complex process that affects clinical practice, patient safety, and the formation of medical knowledge.

In contemporary medicine, the concept of the learning curve has emerged as a critical factor for the safe and effective integration of new technologies. Studies concerning the Breast Lesion Excision System (BLES) have shown that physician experience significantly influences both clinical outcomes and patients' quality of life, underscoring the need to balance surgical training and patient safety (Michalopoulos et al., 2012; Maniou et al., 2019; Maniou et al., 2011). Similarly, radiological diagnosis, such as pelvic MRI for endometriosis, demonstrates that technology alone is insufficient without adequate experience and proper medical training (Bruyère et al., 2020).

Moreover, medical practice extends beyond the narrow limits of technology and encompasses humanistic and social dimensions, such as supportive care for vulnerable populations, for example, during pregnancy in cancer patients (Zagouri & Maniou, 2016). These aspects highlight the role of culture, values, and ethics in medical decision-making.

Systematic study of physician training and experience, as reflected in academic research and doctoral dissertations (Maniou, 2024), shows that medical evolution is a dynamic process of continuous learning. Similarly, the analysis of cultural and entrepreneurial development in other fields, such as the Cinecittà film industry, demonstrates that technology and innovation thrive when creatively integrated into their cultural environment (Maniou et al., 2025a).

* Corresponding author: Ioanna Maniou

In this context, the present study aims to highlight the historical interactions between medicine, technology, and culture, arguing that medical progress is neither linear nor purely technocratic. Instead, it is the product of a complex interaction of scientific knowledge, educational practices, social needs, and cultural values, which shape how medicine is applied and evolves over time.

2. Culture, Cultural Entrepreneurship, and Well-being: New Interdisciplinary Approaches

The concept of culture, beyond its artistic and historical dimensions, increasingly emerges as a dynamic factor for social, economic, and psychosocial development. Within the contemporary scientific framework, cultural entrepreneurship serves as a bridge between cultural heritage, innovation, and sustainable development, directly influencing the quality of life and well-being of societies.

Studies focusing on emblematic cultural sites, such as Capri and Casa Malaparte, demonstrate how cultural identity can be transformed into a lever for creative entrepreneurship, enhancing both the local economy and international cultural visibility (Maniou et al., 2025b). Similarly, the transformation of Spanish saltworks from production sites into experiential cultural and natural destinations shows that cultural entrepreneurship can redefine traditional landscapes by incorporating sustainability, tourism, and cultural education (Maniou et al., 2025c).

The integration of painting heritage into cultural tourism, as in the case of Athens, highlights the role of art as a medium for narrating historical memory while simultaneously serving as a tool for entrepreneurial innovation (Maniou et al., 2025d). These practices underscore that culture is not a static repository but a living and evolving resource.

Furthermore, the contribution of literary festivals and literary parks to mental health and cultural development reveals a less obvious yet critically important dimension of culture. Participation in cultural activities has been linked to enhanced mental well-being, social cohesion, and creative expression, positioning culture as an essential factor in public health (Pagkalos et al., 2025e; Maniou et al., 2025f).

Within the scope of this study, these approaches support the view that the interaction between culture, entrepreneurship, and well-being shows significant parallels with the evolution of medicine and technology. Just as medical progress requires the integration of technology within a human-centered framework, cultural entrepreneurship succeeds when it respects cultural identity and social needs. This interdisciplinary convergence highlights culture as a determining factor in both scientific and social development.

3. New Technologies, Cultural Routes, and a Human-Centered Approach: Convergences between Medicine and Culture

The rapid development of new technologies has transformed not only medical science but also the ways in which culture is experienced, interpreted, and disseminated within contemporary society. In this context, digital technologies, information systems, and storytelling tools serve as a common ground for the intersection of medicine, culture, and society, highlighting a human-centered dimension of technological advancement.

The application of new technologies in literary tourism, as reflected in the study of travel texts, demonstrates that digital storytelling and interactive media enhance the user's experiential engagement, transforming knowledge into experience (Tsatalmpasoglou et al., 2024). Similarly, in medicine, the use of digital tools, simulations, and artificial intelligence extends beyond improving diagnosis and treatment, also enhancing communication, education, and patient experience.

The role of Information and Communication Technologies (ICTs) in the promotion and dissemination of cultural heritage, such as the Italian monuments in Kos, underscores the importance of technology as a means of preserving cultural memory and boosting tourist interest (Manola, 2024). This same logic is reflected in contemporary medical practice, where digital recording, telemedicine, and decision-support systems function as tools connecting knowledge, history, and clinical practice.

At the same time, cultural entrepreneurship, as highlighted through the study of Shakespeare's Italy, shows that cultural creation and storytelling can be transformed into contemporary forms of innovation and sustainable development (Maniou et al., 2024). The concept of the "journey," whether as a physical movement or a symbolic life path, as depicted in Greek song, is closely linked to the human experience of health, illness, and healing (Maniou et al., 2024). Medicine, in this sense, can be viewed as a continuous journey of knowledge, adaptation, and humanistic care.

Cultural routes and networks of cultural sites contribute significantly to the sustainable development of cities and regions, strengthening social cohesion and cultural identity (Manola & Vouglanis, 2024). Similarly, the holistic integration of natural, historical, economic, and touristic resources, as highlighted in contemporary sustainability studies, reflects the need for comprehensive approaches that are also present in modern medical care (Koltsikoglou et al., 2024; Manola, 2024).

In summary, this chapter demonstrates that historical interactions between medicine, technology, and culture continue to evolve through new digital practices and cultural routes. Technology, whether applied in health or culture, acquires meaningful significance when it serves people, enhances their experience, and contributes to the sustainable and human-centered development of contemporary societies.

4. Cultural Context of Technological Advances in Medicine

The introduction and application of technology in medical practice is not a neutral or automatic process, but requires systematic training, sufficient experience, and a deep understanding of the human-centered and cultural context of medicine. The concept of the learning curve is emerging as a central axis in modern medicine, as it links technological innovation with patient safety and the quality of care provided.

Studies on the Breast Lesion Excision System (BLES) have shown that the physician's experience directly affects the accuracy of the diagnosis, the reduction of complications, and the overall outcome of the treatment (Michalopoulos et al., 2012; Maniou et al., 2019). The need to balance surgical training and patient protection highlights that technology, however advanced, requires human skill, clinical judgment, and ethical responsibility.

Similarly, in the field of diagnostic imaging, the use of magnetic resonance imaging in endometriosis has shown that the radiologist's experience is a decisive factor in the correct interpretation of findings (Bruyère et al., 2020). This finding underscores that technological superiority does not negate the need for continuous education and specialization, confirming the timeless value of medical knowledge.

The historical approach to medicine, from Hippocratic thought to robotic surgery, demonstrates that technological progress always evolves in conjunction with the culture and social values of each era (Maniou et al., 2025g). At the same time, the interaction between medicine and literature reveals how illness, treatment, and human experience are reflected in discourse and collective memory, enriching our understanding of health beyond the limits of biomedical science (Maniou et al., 2025h).

The same logic of combining technology, education, and culture can also be observed in the field of cultural entrepreneurship. The use of new technologies to promote Italian monuments in Kos, the development of literary parks, and the cultural regeneration of areas such as Eleusis demonstrate that innovation acquires value when it is integrated into a broader cultural and social vision (Maniou et al., 2024a; Maniou et al., 2024b; Maniou et al., 2024c).

Overall, this chapter highlights that technological progress in medicine cannot be separated from education, experience, and culture. Medical practice is a field where science, technology, and humanistic values converge, forming a dynamic framework in which innovation must primarily serve humanity.

Lastly, we emphasize the significance of digital technologies in the field of education as well as for training and education in medical and cultural entrepreneurship. ICTs promote education for all, provide new ways to educate instructors effectively, enhance knowledge retention, foster teamwork, increase transparency, develop learner-centered approaches, develop innovative teaching strategies, and speed up knowledge acquisition. Additionally, use virtualization, mobilization, artificial intelligence, and new learning settings and worlds to support educational activities and processes and provide new instruments for knowledge representation. In particular, ICTs are highly effective and productive in entrepreneurship training, facilitating and improving assessment, intervention, and educational procedures through mobile devices that spread educational activities worldwide [23–25] and through a variety of ICT applications that are fundamental to education [26–30]. While games change education into a multimodal, amiable, and delightful interaction [32–33], the use of AI, STEM, and robotics raises educational procedures to new levels of adaptation, invention, and performance [31]. Furthermore, the adoption, development, and integration of ICTs with theories and models of metacognition, mindfulness, meditation, and emotional intelligence cultivation [34–39] places mental skills at the center of educational procedures and policies and speeds up and improves educational practices and outcomes, particularly in business and cultural entrepreneur training.

5. Content interpretation

The figure illustrates the **parallel and converging evolution of medical and cultural innovation** from Antiquity to the Digital Era. While cultural innovation appears consistently influential across historical periods, medical innovation demonstrates a steeper increase during the Industrial/Biomedical and Digital eras, reflecting the impact of technological acceleration, digitalization, and robotics. The convergence in the Digital Era highlights the growing interdependence between medicine, technology, and cultural frameworks.

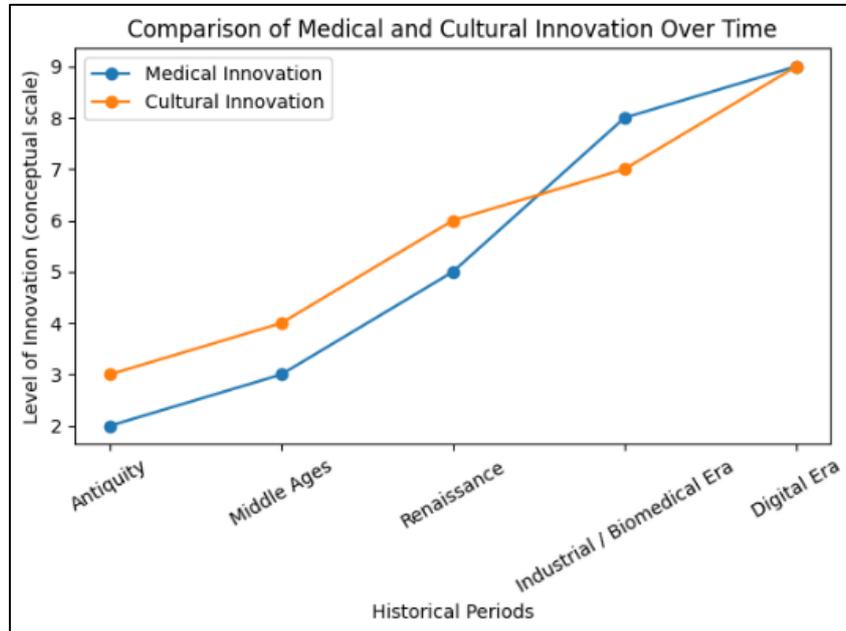


Figure 1 Comparison of Medical and Cultural Innovation Over Time

6. Conclusion

This study has shown that medical progress is not an isolated technocratic process, but the result of a long-term, multi-level interaction between technology, education, and culture. From Hippocratic thought to modern digital and robotic medicine, medical progress is shaped within specific historical, social, and cultural contexts.

Analysis of the learning curve in surgery and diagnostic imaging has shown that technology, however sophisticated, cannot replace human experience, clinical judgment, and continuous education. Patient safety and quality of care depend directly on the proper integration of technological innovation into structured educational and ethical frameworks.

At the same time, the connection between medicine and culture and the humanities highlighted the importance of storytelling, literature, and cultural memory in understanding illness and treatment. The medical experience is not limited to biological parameters, but extends to the experiential, psychosocial, and cultural dimensions of human beings.

A comparative approach with the field of cultural entrepreneurship and sustainable development showed that the same principles that govern successful innovation in culture also apply to medicine: respect for identity, human-centered design, and responsible use of technology. Technology acquires real meaning when it functions as a means of empowering people and not as an end in itself.

In conclusion, medicine, technology, and culture form a unified and interdependent system. Sustainable progress in medicine requires an interdisciplinary approach, continuous education, and a deep understanding of the cultural and humanistic values that accompany every technological innovation. Only through this synthesis can modern medicine effectively respond to the needs of individuals and society.

Compliance with ethical standards

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Disclosure of conflict of interest

The Authors proclaim no conflict of interest.

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