

Mapping the journey for the digital revolution in the sphere of education through examining the future progress of technology

Anna Roberta Gagliardi^{1,*}, *Pierpaolo Magliocca*², and *Francesco Caputo*³

¹Department of Economics, University of Foggia, Foggia, Italy

²Department of Law, University of Foggia, Italy

³Department of Economics, Management, and Institutions (DEMI), University of Naples 'Federico II', Naples, Italy

Abstract. This study examines the complex and diverse process of how educational institutions incorporate digital technologies. The study examines the widespread incorporation of digital tools and methodology, analysing their influence on teaching methods, administrative models, and the overall educational experience for all involved parties. This essay thoroughly examines developing trends to explore the factors, difficulties, and consequences of digitalisation in education. This article presents a thorough and versatile structure to facilitate the process of digitising education.

1 Introduction

The contemporary educational landscape is undergoing a profound transformation, characterised by the growing influence of technology as a pivotal force shaping the future of learning. This evolution, although in progress for some time, has been accelerated and rendered even more urgent in light of the global COVID-19 pandemic [1]. This pandemic has not only underscored the importance of human relationships within the educational context but has also accentuated the imperative role of technology in reshaping pedagogical approaches [2]. Amidst this transitional period, it has become apparent that traditional educational models are increasingly inadequate in addressing the evolving needs of students and educators. Consequently, there is a pressing need to adopt a systemic perspective for the comprehensive digitisation of education [3]. This article seeks to elucidate the paramount significance of digital literacy while simultaneously acknowledging the sociological and psychological dimensions underpinning technology integration into the educational system.

The unparalleled disruption wrought by the COVID-19 pandemic has brought to the fore the urgent necessity for an overhaul of educational strategies. This scholarly work aims to dissect the intricate relationship between technology and education by examining how technology was conceptualised and employed both prior to and during the pandemic [3, 4]. Preceding the pandemic, technology's role in education was predominantly viewed through

* Corresponding author: annaroberta.gagliardi@unifg.it

a lens of rationality and functionality, with a primary focus on its potential to enhance digital literacy. However, the sudden and extensive adoption of technology in education during the pandemic revealed the inherent inadequacies of the pre-COVID-19 models. Consequently, we currently stand at a juncture where a broader focus is necessary, one that encompasses the emotional and cognitive dimensions of technology adoption and the multitude of other factors that influence this intricate process.

In this dynamic milieu, this article endeavours to proffer a comprehensive and multifaceted framework for advancing the digitisation of education. It underscores the dire necessity of fostering digital literacy skills while concurrently addressing the intricate web of socio-psychological factors that significantly shape the successful integration of technology into the educational ecosystem. In doing so, the authors hope to establish the groundwork for a more nuanced and informed discourse that recognises the complex interplay between technology and education, ultimately fostering an environment wherein technology complements and enriches the learning experience while preserving the invaluable human connections that constitute the bedrock of education.

The article aims to delineate the critical characteristics of digital technologies in the intricate field of education to provide potential principles to aid researchers and practitioners in enhancing the shift from a utilitarian use of digital technologies to a comprehensive digital framework within the educational system.

Following a concise overview of the theoretical background (Section 2), this study will utilise the interpretive framework offered by research strands focused on the Technology Acceptance Model. This framework will serve as a conceptual model to elucidate the technology adoption process, specifically concerning digital technologies in education (Section 3). Section 4 will address the significant consequences of the reflections, as mentioned earlier, and outline the concluding findings and future research prospects.

2 Theoretical background

Integrating digital technology in educational institutions, including schools and universities, signifies a significant transformation in the learning environment, affecting many individuals involved, such as instructors, students, administrators, and parents. Digitisation allows educators to vary instructional approaches, accommodate various learning preferences, and promote interactive learning encounters via tools such as virtual classrooms or online materials. Nevertheless, this acceptance necessitates significant efforts to enhance one's skills to successfully navigate and utilise these technologies, frequently resulting in a challenging learning process [4, 5].

Digitisation provides students extensive access to material, encourages independent learning, and enables cooperation across different locations. However, the digital gap can worsen disparities since individuals without access to technology encounter obstacles to receiving fair and equal education. Administrators face the simultaneous task of overseeing infrastructure modifications and guaranteeing the congruence between technology investments and educational objectives [6].

Meanwhile, parents may worry about how much time their children spend on screens, the protection of their personal information, and the calibre of online material their children interact with. For example, whereas the incorporation of personalised learning software enables customised learning routes, it also prompts concerns about data privacy and algorithmic biases. It is essential to comprehend the diverse effects of digitalisation on different participants to guide its implementation in an inclusive, effective, and morally responsible manner.

3 Theoretical framework and discussion

The authors tried to create models and recommendations to facilitate the diffusion and utilisation of new technologies, acknowledging their disruptive impact on education at several levels, including economic and social aspects. The consolidated literature has contributed significantly to identifying risks, opportunities, conditions, and limitations associated with using new technologies in schools and universities, mainly digital technologies and their potential in the educational system. Currently, there is a lack of clarity about the mechanism by which digital instruments might "evolve," especially within the setting of universities. To enhance the ongoing discussion on this lack of information, the life cycle of technology adoption described by Rogers [7] is suitable and might have substantial consequences. This paradigm allows for classifying consumers of digital technology innovation into five categories: innovators, early adopters, early majority, later majority, and laggards. By utilising this paradigm, the authors propose that the five archetypal consumers of technological innovation correspond to five distinct socio-cultural domains in which technology is encountered, perceived, and handled in varying ways. The five domains may be conceptualised as stages in an evolutionary process, starting with innovators and eventually encompassing the entire population. This framework can also be used to implement digital solutions in the education sector. The essential assumption of the suggested concept is that technological advancements, particularly in the digital realm, gradually disseminate across the whole population through gradual transmission [8].

This contamination process is facilitated by two variables that research strands have defined, focusing on the technology acceptance theory. The first variable is Ease of Use (EOU), which refers to the extent to which an individual believes using a specific system would be effortless [9]. The second variable is perceived utility, which is measured in terms of "relative advantage" or the extent to which an innovation is perceived as superior to existing practices [10]. The relationship between the two variables of EOU and perceived utility concerning time can be examined. A three-dimensional model is created, representing the five actors or ideal types of adopters of technological innovation proposed by Rogers [7]. These actors are reinterpreted as stages in an evolutionary process, as depicted in Figure 1 below. The authors aim to present a contemporary portrayal of the process by which digital technological innovation is embraced in a specific setting, using the conceptual model shown in Figure 1. This model also helps understand how innovative tools are handled, intending to identify obstacles to their complete integration into the education system. Researchers and operators are closely studying digital solutions, recognising the lack of confidence among the actors involved. They emphasise the need to consider technology in terms of functionality, rationality, and social and cognitive aspects. Consequently, the authors assert that digital solutions are still in the early stages of their evolutionary processes.

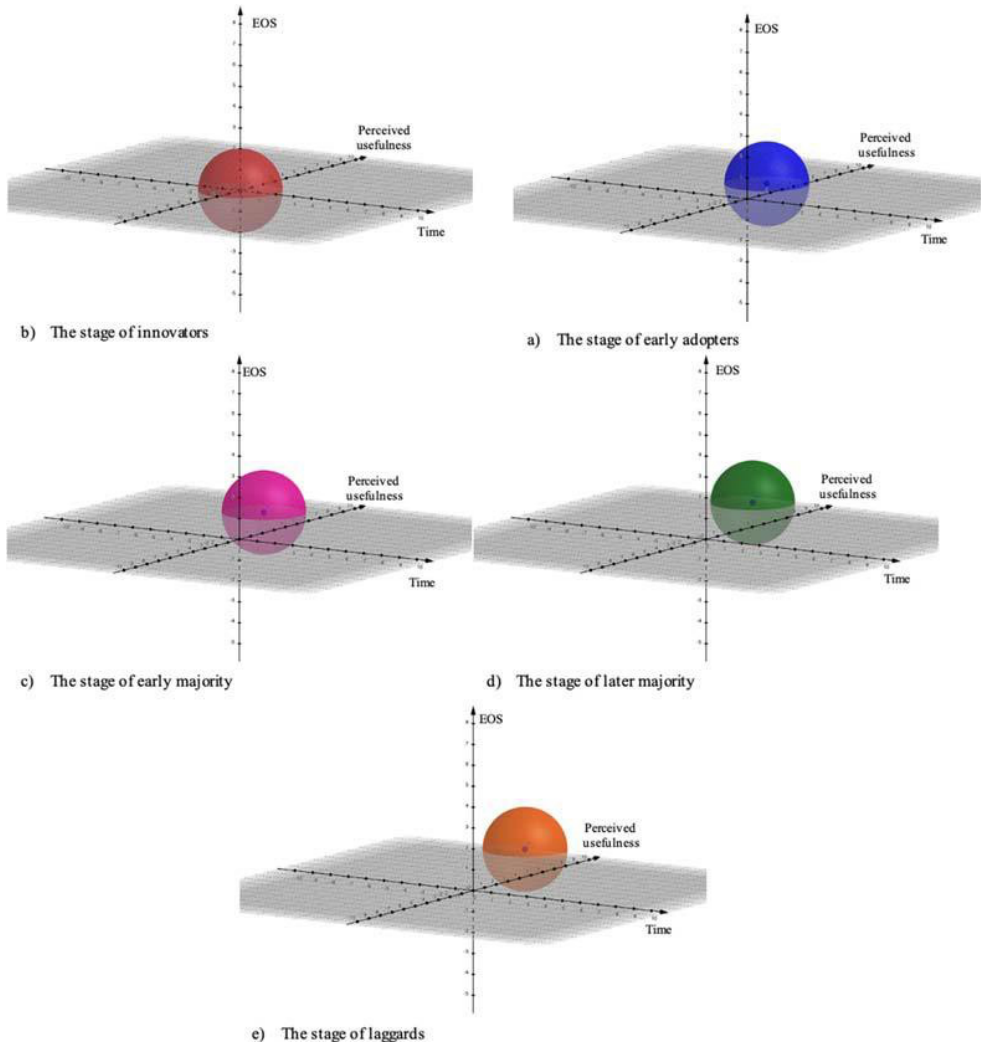


Fig. 1. The distinct phases of the evolutionary process of technology adoption. (Source: Authors' analysis.).

The conceptual model presented in Figure 1 stresses the need to define and promote targeted actions as a means to increase the awareness of actors on the EOU and their perceived usefulness as a necessary way to involve more social systems in the difficult process of digitising the education system, which could depend on the ability of the different actors to accept new technologies themselves. These actions can be implemented to increase the actors' awareness of the EOU and their perceived usefulness.

4 Future directions for research

Technology is the foundation for developing innovative methods, procedures, and strategies to generate shared value [11, 12]. The previous hindrance of insufficient knowledge and abilities on digital transformation among various participants in the educational domain is now a minor barrier to surmount; in fact, significant progress has been achieved in this realm since the onset of the Covid-19 epidemic. Hence, enhancing training and education in digital literacy is essential to enable leaders, managers, and agents to comprehensively understand how to render digital solutions as a service for educational institutions, making them accessible to a diverse range of stakeholders. The primary barrier to the widespread use of digital technologies in education by those interested in the field is the lack of a cognitive, social approach and the existing functional, logical approach. Consistent with Barile's findings [13], the human component facilitates value co-creation and innovation in codesign, codevelopment, codelivery, and colearning.

The essay aims to present a conceptual framework that describes the process by which technical breakthroughs can be disseminated within a well-defined socio-economic system. A three-dimensional picture has been produced by including two factors, ease of use and perceived usefulness, within the context of time. This image portrays five distinct sorts of actors based on the technical innovation described by Rogers [7].

5 Implications and Conclusion

The suggested approach might have several theoretical and practical ramifications. First, the proposed three-dimensional conceptual model, which combines the EOU and perceived Utility with the time variable, can serve as a foundation for conducting practical experiments to identify the individuals within the education system capable of perceiving and adopting new technologies at various levels.

Second, this study emphasises the necessity to reconsider and reinvent the methods by which factors such as user-friendliness and perceived usefulness may be assessed in crucial and indispensable fields like education.

Thirdly, this research study has the potential to assist policymakers and experts in establishing precise rules and optimal strategies for the widespread use of new technologies in educational institutions. Indeed, it is imperative to have a well-defined and robust business model centred around emerging technologies to effectively incorporate digital solutions into the everyday operations of educational institutions such as schools and universities, including activities such as lectures, tests, and workshops. Recognising the creative strategy of digital technologies is crucial for properly managing the culture of change.

References

1. M. Mailizar, A. Almanthari, S. Maulina, S. Bruce. Secondary school mathematics teachers' views on e-learning implementation barriers during the Covid- 19 pandemic: The case of Indonesia. *Eurasia Journal of Mathematics, Science and Technology Education*, **16**(7), em1860 (2020)
2. L. Mishra, T. Gupta, A. Shree. Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, **1**, 100012 (2020)

3. M. J. Ha. Learner reaction to non-face-to-face online lessons. *The Korean Society of Cultural and Convergence*, 189–199 (2020)
4. K.V. Pincus, D.E. Stout, J.E. Sorensen, K.D. Stocks, R.A. Lawson. Forces for change in higher education and implications for the accounting academy, *J. Account. Educ*, **40**, 1–18 (2017)
5. V. Damasiotis, P. Trivellas, I. Santouridis, S. Nikolopoulos, E. Tsifora, IT competences for professional accountants. A review, *Procedia - Soc. Behav. Sci.*, **175**, 537–545 (2015)
6. H.M. Al-Hattami, A.A. Hashed, K.M. Alnuzaili, M.A. Alsoufi, A.A. Alnakeeb, H. Rageh, Effect of risk of using computerized AIS on external auditor’s work quality in Yemen, *Int. J. Adv. Appl. Sci.*, **8**(1), 75–81 (2021)
7. E.M. Rogers. *Diffusion of Innovations*, Third ed, The Free Press, New York (1983)
8. F. Caputo. Towards a holistic view of corporate social responsibility. The antecedent role of information asymmetry and cognitive distance. *Kybernetes*, **50**(3), 639-655 (2021)
9. F.D. Davis. Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly*, **13**(3), 319-340 (1989)
10. M. Keil, P.M. Beranek, B.R. Konsynski. Usefulness and ease of use: field study evidence regarding task considerations. *Decision Support Systems*, **13** (1), 75-91 (1995) - S. Guha, S. Kumar., *Emergence of Big Data Research in Operations Management, Information Systems, and Healthcare: Past Contributions and Future Roadmap*, Production and Operations Management Society, **27**(9), pp. 1724–1735 (2017)
11. M.C. Leon, J.I. Nieto-Hipolito, J. Garibaldi-Beltr an, G. Amaya-Parra, P. Luque-Morales, P. Maga~na- Espinoza, J. Aguilar-Velazco. Designing a model of a digital ecosystem for healthcare and wellness using the business model canvas. *Journal of Medical Systems*, **40**(6), 144 (2016)
12. A. Marton. Steps toward a digital ecology: ecological principles for the study of digital ecosystems. *Journal of Information Technology*, **37**(3), 250-265 (2022)
13. S. Barile, M. Grimaldi, F. Loia. Technology, value co-creation and innovation in service ecosystems: toward sustainable co-innovation. *Sustainability*, **12**(7), 2759 (2020)