Lecture Notes in Networks and Systems 859

António Abreu · João Vidal Carvalho · Anabela Mesquita · Agostinho Sousa Pinto · Marcelo Mendonça Teixeira *Editors*

Perspectives and Trends in Education and Technology

Selected Papers from ICITED24, Volume 2

Springer

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ISSN 2367-3370 ISSN 2367-3389 (electronic)
Lecture Notes in Networks and Systems
ISBN 978-3-031-78154-4 ISBN 978-3-031-78155-1 (eBook)
https://doi.org/10.1007/978-3-031-78155-1

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

This book—Perspectives and Trends in Education and Technology Volume 2: Selected Papers from ICITED24—from the LNNS Series is composed of the best selected papers accepted for presentation and discussion at the 2024 International Conference in Information Technology & Education (ICITED'24). The ICITED is a multidisciplinary conference with a special focus on new Technologies and Systems in the Education sector and was held between July 11 and 13, 2024. The ICITED'24 was supported by the Pernambuco University, Recife, Brazil, and by IADITI—International Association for Digital Transformation and Technological Innovation.

The International Conference in Information Technology & Education is an international forum for researchers and professionals in the education sector, which enables the discussion of the latest innovations, trends and concerns in several areas, in the education sector, associated with information technologies and systems. It is an event for professionals in the sector, in search of technology solutions, where academics, IT experts and business managers meet to discuss new ideas that help them maximize the potential of learning processes through technology.

The ICITED'24 Scientific Committee is composed of a multidisciplinary group of 143 experts who assessed some 262 papers from 26 countries, received for each of the main topics proposed for the conference: (a) ICT and Virtual learning; (b) Pedagogical & Didactical Innovations; (c) Technologies issues in Education in the different scientific areas; (d) Quality in Education; (e) Technological Issues in Education and Research; (f) Educational Software and Serious Games; (g) Curriculum Design and Innovation and (h) University-Industry Collaboration; ICITED SUMMIT'24—Accelerator Program for EdTech Startups; SPECIAL SESSIONS: DTLP'24—Digital Transformation in the Teaching and Learning Process; EU-AIEdu'24—EXPERIENCES IN THE USE OF ARTIFICIAL INTELLIGENCE IN EDUCATION; E4TLI—EDUCATION FOR TECHNOLOGICAL LITERACY AND INCLUSION; EUROPROJECTS'24—European projects; FoE'24—Future of Education. Difree—Digital Freelancing European Erasmus Plus KA project. SPECIAL TRACKS: Digital Literacy x Media Literacy—New Literacies and Education in Brazil; Cultural Tourism, Education and Marketing—CulTurEM'24; New Technologies in Accounting Education; Internationalization in Higher Education as a challenge; Education and the problems of the contemporary world.

The papers accepted for presentation and discussion at the conference are published by Springer and will be submitted for indexing by ISI, SCOPUS, EI-Compendex, Google Scholar and SpringerLink. We thank all those who contributed to the ICITED'24 conference (authors, committees, workshop organizers and sponsors).

We deeply appreciate your involvement and support, which were crucial to the success of the conference.

July 2024

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Enhancing Classroom Dynamics: Exploring the Synergy of Social Marketing, Neuromarketing, and Artificial Intelligence

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Abstract. As a part of a research project, this paper refers to the assessment of the degree of knowledge integrating Social Marketing, Neuromarketing and Artificial Intelligence for sustainable economic development activities in Portugal. In addition, aiming to promote good behaviors and understand better the influence of Artificial Intelligence such as AI, VR, AR, big data, etc., on communications, social marketing can also explore neurometrics, biometrics and psychometrics factors to help individuals on their decision-making process. Furthermore, segmentation is a marketing technique that can be used to influence the decision-making process, even promoting good behavior.

Considering the assumption that good behavior is very important because it results in benefits not only the individual but also society and the environment, to promote these behaviors, social marketing must communicate through assertive messages. Using neuromarketing theoretical framework to support social marketing communications and understand better the decision-making process, this literature review presents a model which can help teachers as well as social marketeers to promote sports activities in higher education institutions.

Keywords: Sport activities · higher education institution · teaching-learning pedagogical practices

1 Introduction

Although knowledge and technologies have come a long way, teaching methodologies still do not integrate the content of the different areas [1]. In addition, perhaps because of a lack of resources, universities and polytechnic institutes do not use high technologies such as artificial intelligence, except occasionally.

Despite the lack of resources, imagining that before obtaining resources it's necessary to know what we need, the following question arises: what content should be integrated to achieve the best performance sport activities in classrooms in higher education institutions?

A. Abreu et al. (Eds.): ICITED 2024, LNNS 859, pp. 531–536, 2025.
https://doi.org/10.1007/978-3-031-78155-1_48

We already know that artificial intelligence has several features that can increase teacher performance [2]. Because of that, this investigation's assumption claims to understand better artificial intelligence to achieve the best performance in sport activities in classrooms in higher education institutions.

In addition, we also know that the decision-making process of students is complex [3]. However, our brain (reptilian) is responsible for controlling and reducing risks [4], which means that individuals can decide more intuitively than rationally [5]. In this sense, this project also considers it important to exploit neurometric, biometric, and psychometric factors [6] to help students in their decision-making process [3] to promote sports activities in classrooms in higher education institutions.

Finally, this research project also considered that communication is the core of the teaching process [7], as well as ethics and promoting good behaviors [8]. In this sense, this research is based on the assumptions of social marketing, which uses the same principles, techniques, and instruments of marketing to promote good behaviors [9] for the individuals, but also for society and the environment [10], to promote sport activities in classrooms on higher education institutions.

One example of good behavior is doing sports activities in a classroom in higher education institutions. However, for the sustainability of sports activities in classrooms, higher education institutions can exploit factors and resources of artificial intelligence in line with neuromarketing. In other words, this paper aims to exploit the influence of Artificial Intelligence, such as AI, VR, AR, bigdata [11, 12], etc., and neuromarketing, to achieve the best performance of sports activities in the classroom.

2 Theoretical Framework

This paper considered the assumption that good behavior is very important because it results in benefits not only for the individual but also for society and the environment. The objective of this research is to promote good behaviors, as well as understand better the influence of neurometrics, biometrics, and psychometrics factors on the decision-make process [3], using neuromarketing theoretical framework to support social marketing communications and understand better the decision-make process, Thus, this paper developed four theoretical frameworks: neuromarketing, artificial intelligence, social marketing communications, and decision-make process.

2.1 The Relevance of Segmentation for the Communication Process in the Social Marketing Field

Social marketing uses the same principles, instruments, and techniques of commercial marketing to promote good behavior [8] through the best communication process.

To promote behavior that benefits not only the individual but also society and the environment [9, 10], social marketing must communicate assertive messages [13].

Communication is the core, and social marketing needs to develop assertive messages [9, 10, 13]. In addition, segmentation is a marketing technique that can be used to influence the decision-making process of students [3], including promoting good

Table 1. Framework about the influence of Social Marketing communications on the decision-making process.

Variable	Description of Social Marketing (SM)	Indicators
Social Marketing (SM)	Social Marketing (SM) expects getting benefits for the individual, but also for society and the environment. Using the same principles, instruments, and techniques of commercial marketing, the objective is to promote good behavior through the best communication process, which means that SM needs to develop assertive messages In addition, segmentation is a marketing technique that can be used to influence the decision-making process, including promoting good behavior	Assertive messages should be sent
		Emotions associated to involving people
		Avoiding risk
		Benefits to myself
		Benefits to the environment
		Benefits to the society
		Antecedents and consequences of behaviour

behavior. Table 1 presents the influence of Social Marketing communications on the decision-making process, as well as their respective indicators.

As an important aspect of communication, social marketing uses segmentation techniques [9, 10] to improve the results of the teaching process. Consequently, the decision-making [3] should achieve the best performance.

2.2 The Relevance of Artificial Intelligence to Achieve the Best Performance in Sports Activities in Classrooms in Higher Education Institutions

To promote good behaviors, aiming to understand better the influence of Artificial Intelligence [2, 11, 12] on social marketing communications to influence the decision-making process of students [3], the evaluation of the degree of knowledge of artificial intelligence such as AI, VR, AR, segmentation and bigdata [12], is very important to achieve the best performance sports activities in classrooms on higher education institutions. Table 2 presents the influence of Artificial Intelligence on Social Marketing communications, as well as their respective indicators.

The influence of artificial intelligence on social marketing communications is important to improve the results of teaching process [11]. Consequently, the decision-making should achieve the best performance.

Table 2. Framework about the influence of Artificial Intelligence on Social Marketing communications.

Variable	Description of Social Marketing (SM)	Indicators
Artificial Intelligence (AI)	According to the Artificial Intelligence (AI) literature review, teaching communications can exploit tools such as Virtual Reality (VR) or Augmented Reality (AR), as well as segmentation techniques and bigdata	AI
		VR
		AR
		Segmentation techniques
		Bigdata

3 Methodology

Through a review of the literature on the three variables, Social Marketing (SM), Artificial Intelligence (AI) and Neuromarketing (NeuroMkt), this theoretical article presents a model which tries to describe the relationship between them.

3.1 The Proposed Model

As part of a research project, this article is a literature review. The methodology reflects the structure to be used by professors to achieve the best performance in sport activities in classrooms in higher education institutions. Figure 1 shows this relationship between social marketing, AI and neuromarketing.

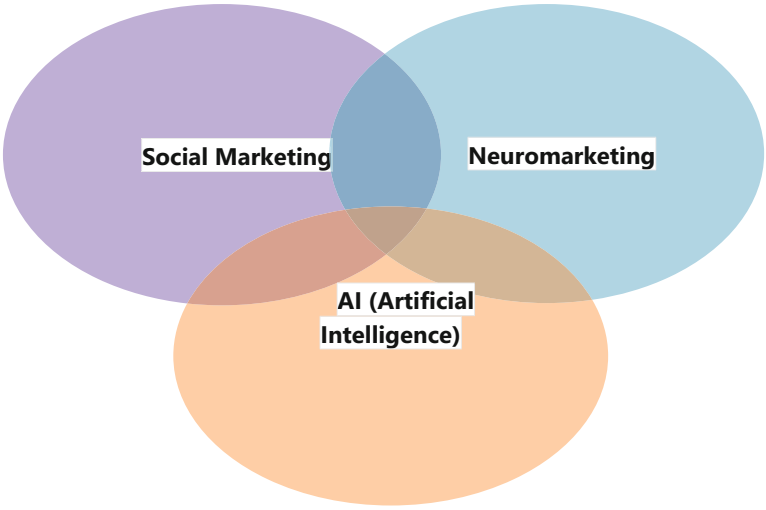

Fig. 1. Framework of AI and neuromarketing on social marketing communications.

- The overlap between Social Marketing and AI represents the use of AI tools and algorithms to analyse social media data, optimise social media campaigns, automate content generation, and improve targeting and personalisation.
- The overlap between AI and Neuromarketing represents the integration of AI technologies with neuromarketing techniques, such as using machine learning algorithms to analyse neuroimaging data, predict consumer behavior based on brain responses, and optimise marketing strategies accordingly.
- The overlap between Social Marketing and Neuromarketing represents the application of neuromarketing insights to social media marketing campaigns, such as crafting content that triggers specific emotional responses, designing user experiences that align with cognitive processes, and measuring the effectiveness of social media marketing efforts through neuroscientific methods.

This conceptualisation illustrates how social marketing, AI, and neuromarketing are interconnected and can complement each other to enhance marketing strategies and improve consumer engagement.

In other words, it is possible to use contributions and theoretical content from artificial intelligence and neuromarketing to improve the performance of social marketing.

4 Conclusions

The influence of neuromarketing, as well as the influence of artificial intelligence on the performance of social marketing communications depends on the adaptation of the model to the behaviour in question. In this case of sport activities, the influence of neuromarketing and AI can improve the results of teaching process through social marketing communications.

It is concerned with assessing the degree of knowledge to exploit factors and resources that integrate social marketing communication, neuromarketing and artificial intelligence to achieve the best performance in sport activities on classrooms in higher education institutions. In other words, social marketing can also exploit AI, VR, AR, segmentation techniques and bigdata, as well as neurometric, biometric and psychometric factors to help individuals in their decision-making process. As a result, this research aims to present a model which can help teachers as well as social marketeers to promote sport activities in higher education institutions.

It is possible to encourage teachers and marketeers to use contributions from other areas such as AI and neuromarketing to improve the performance of communication process. However, it's also important to analyse the influence of social marketing communications on the decision-make process.

Acknowledgements. We would like to thank the institutions Bragança Polytechnic University and Instituto Europeu de Estudos Superiores (IEES) for supporting this research, as well as everyone who gave their time and contributed to the results.

Funding. This work has been supported by Research Center in Basic Education, Instituto Politécnico de Bragança, within the Project: https://doi.org/https://doi.org/10.54499/UIDB/05777/

2020, as well as by the Research Unit on Governance, Competitiveness and Public Policies (UIDB/04058/2020) + (UIDP/04058/2020), funded by national funds through FCT - Fundação para a Ciência e a Tecnologia.

References

1. Marcelo, C., Yot-Domínguez, C.: From chalk to keyboard in higher education classrooms: Changes and coherence when integrating technological knowledge into pedagogical content knowledge. J. Furth. High. Educ. **43**(7), 975–988 (2019)
2. Sun, Z., Anbarasan, M., Praveen Kumar, D.J.C.I.: Design of online intelligent English teaching platform based on artificial intelligence techniques. Computational Intelligence **37**(3), 1166–1180 (2021)
3. Mengash, H.A.: Using Data Mining Techniques to Predict Student Performance to Support Decision Making in University Admission Systems. IEEE Access **8**, 55462–55470 (2020). https://doi.org/10.1109/ACCESS.2020.2981905
4. Gangloff, E.J., Greenberg, N.: Biology of stress. In: Health and welfare of captive reptiles (pp. 93–142). Cham: Springer International Publishing (2023)
5. Julmi, C.: When rational decision-making becomes irrational: a critical assessment and re-conceptualization of intuition effectiveness. Bus. Res. **12**(1), 291–314 (2019)
6. Küçün, N.T.: Neuromarketing vs. Brands. In: The Role of Brands in an Era of Over-Information (pp. 71–97). IGI Global (2023)
7. Bruggeman, B., Tondeur, J., Struyven, K., Pynoo, B., Garone, A., Vanslambrouck, S.: Experts speaking: Crucial teacher attributes for implementing blended learning in higher education. Internet High. Educ. **48**, 100772 (2021)
8. Fusar-Poli, P., et al.: What is good mental health? A scoping review. European Neuropsychopharmacology, 31, 33–46 (2020)
9. French, J., Gordon, R.: Strategic social marketing: For behaviour and social change. Sage, (2019)
10. Lee, N.R.: & Kotler, P. Behavior change for social good. Sage Publications, Social marketing (2019)
11. Chen, L., Chen, P., Lin, Z.: Artificial intelligence in education: A review. Ieee Access **8**, 75264–75278 (2020)
12. Huang, J., Saleh, S., Liu, Y.: A review on artificial intelligence in education. Acad. J. Interdiscip. Stud. **10**(206) (2021)
13. Rundle-Thiele, S., David, P., Willmott, T., Pang, B., Eagle, L., Hay, R.: Social marketing theory development goals: an agenda to drive change. J. Mark. Manag. **35**(1–2), 160–181 (2019)