TRANSFORMATION OF EDUCATION UNDER THE INFLUENCE OF THE DIGITAL ECONOMY: IMPLEMENTING BLOCKCHAIN TEACHING FOR STUDENTS OF NON-SPECIALIZED FIELDS

TRANSFORMAÇÃO DA EDUCAÇÃO SOB A INFLUÊNCIA DA ECONOMIA DIGITAL: IMPLEMENTAR O ENSINO BLOCKCHAIN PARA ALUNOS DE ÁREAS NÃO ESPECIALIZADAS

TRANSFORMACIÓN DE LA EDUCACIÓN BAJO LA INFLUENCIA DE LA ECONOMÍA DIGITAL: IMPLEMENTACIÓN DE LA ENSEÑANZA BLOCKCHAIN PARA ESTUDIANTES DE CAMPOS NO ESPECIALIZADOS

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ABSTRACT: The digital economy has accelerated the transformation of higher education, requiring new approaches to curriculum development in non-technical fields. This article explores the integration of blockchain education into university programs for students in economics and management, who often lack formal IT training. Through a comparative analysis of international teaching models and course structures, the study proposes a flexible, multi-level framework for blockchain instruction tailored to non-specialized learners. The model includes online courses, core subjects, and advanced electives, emphasizing economic applications over technical coding. The findings highlight the importance of adapting content to students' professional needs and institutional resources, while addressing challenges in faculty training and curriculum design. By incorporating blockchain into non-IT programs, universities can better equip students to navigate emerging digital systems and labor market demands. The proposed model offers practical guidance for higher education institutions aiming to modernize curricula in response to digital transformation trends.

KEYWORDS: Blockchain. Blockchain education. Study abroad. Host country. Sending country.

***RESUMO**: A economia digital acelerou a transformação do ensino superior, exigindo novas abordagens para o desenvolvimento curricular em áreas não técnicas. Este artigo explora a integração da educação em blockchain em programas universitários para estudantes de economia e administração, que frequentemente carecem de treinamento formal em TI. Por meio de uma análise comparativa de modelos internacionais de ensino e estruturas de cursos, o estudo propõe uma estrutura flexível e multinível para o ensino de blockchain, adaptada a alunos não especializados. O modelo inclui cursos online, disciplinas básicas e eletivas avançadas, enfatizando aplicações econômicas em detrimento da codificação técnica. Os resultados destacam a importância de adaptar o conteúdo às necessidades profissionais dos alunos e aos recursos institucionais, ao mesmo tempo em que abordam os desafios na formação do corpo docente e no design curricular. Ao incorporar blockchain em programas não relacionados à TI, as universidades podem equipar melhor os alunos para navegar pelos sistemas digitais emergentes e pelas demandas do mercado de trabalho. O modelo proposto oferece orientação prática para instituições de ensino superior que buscam modernizar os currículos em resposta às tendências de transformação digital.*

***PALAVRAS-CHAVE**: Blockchain. Educação sobre blockchain. Estudar no estrangeiro. País de acolhimento. País de envio.*

***RESUMEN**: La economía digital ha acelerado la transformación de la educación superior, lo que exige nuevos enfoques para el desarrollo curricular en áreas no técnicas. Este artículo explora la integración de la formación en blockchain en los programas universitarios para estudiantes de economía y administración, quienes a menudo carecen de formación formal en TI. Mediante un análisis comparativo de modelos de enseñanza internacionales y estructuras de cursos, el estudio propone un marco flexible y multinivel para la instrucción en blockchain, adaptado a estudiantes no especializados. El modelo incluye cursos en línea, asignaturas troncales y optativas avanzadas, priorizando las aplicaciones económicas sobre la programación técnica. Los hallazgos resaltan la importancia de adaptar el contenido a las necesidades profesionales de los estudiantes y a los recursos institucionales, a la vez que abordan los desafíos en la formación del profesorado y el diseño curricular. Al incorporar blockchain en programas no relacionados con TI, las universidades pueden preparar mejor a los estudiantes para desenvolverse en los sistemas digitales emergentes y las demandas del*

mercado laboral. El modelo propuesto ofrece una guía práctica para las instituciones de educación superior que buscan modernizar sus planes de estudio en respuesta a las tendencias de la transformación digital.

***PALABRAS CLAVE**: Blockchain. Educación en blockchain. Estudios en el extranjero. País de acogida. País de origen.*

Introduction

In the 21st century, many new tools and solutions have emerged in the ICT field, requiring an interdisciplinary approach (Osipov, 2023). One of these is blockchain, whose technology allows for the storage and transfer of information about transactions made over the internet (Quintana; Martínez; Verdezoto, 2022). The usefulness of blockchain technology, driven by its numerous advantages in the form of ready-made solutions, is rapidly gaining ground in many sectors of the economy, such as finance, insurance, retail, industry, healthcare, logistics, and public administration (Borovikova, 2023; Fosso Wamba *et al*., 2020). Publications on this topic agree on the possibility of significantly improving efficiency in almost all areas of human life and economic processes (Casino; Dasaklis; Patsakis, 2019; Ermakov *et al*., 2022). From a technical perspective, blockchain is relatively young, but its development is accelerating, as, in addition to economic stimulation, favorable regulatory conditions and supportive policies have emerged (Smirnov *et al*., 2024). Blockchain is constantly evolving (Leo; Margaretha; Lusianah, 2025), with new applications and projects being developed every month that overcome scalability and performance barriers while simultaneously surprising with lower costs for implementation and operation (Bellucci; Cesa Bianchi; Manetti, 2022; Castro *et al*., 2023; Guun-Yoo; Ortega-Castro; Campaña-Ortega, 2023).

One of the fundamental features of the information society is the need for continuous improvement of professional skills (Shvarts, 2024), ensuring ease and speed of retraining (Miethlich *et al*., 2020; Podolskiy, 2023). The more important and valuable a worker's position in the labor market, the more critical it is for them to enhance their knowledge and gain experience (Aji *et al*., 2022). In the world of high-tech professionals, changes happen very quickly. What was decisive yesterday and allowed us to gain a competitive advantage is no longer relevant today. From an employer's perspective, a specialist who does not continually learn something new becomes redundant (Kozma-Tóth; Bába; Fenyves, 2024).

New technologies, such as blockchain, have always been of interest to educators and higher education in general (Alekseenko, 2022; Shichkin *et al*., 2024). They have allowed for the improvement of the educational process, provided new opportunities for knowledge transfer, simplified and eased organizational tasks, and created new knowledge spaces that students could explore (Demboski; Silva; Costa, 2024; Fedorova; Skobleva, 2020).

Literature review

Many researchers believe that blockchain, as a new paradigm for managing digital data (Arvelo; Santos; Olvera, 2022), represents a mega-trend in the digital world (Crosby *et al*., 2016), which could play an important role in the educational process (Alammary *et al*., 2019; Alsulami; Baihan; Abugabah, 2024). Blockchain is actively used in the organization of education, for example, through the implementation of decentralized platforms (Gryshkun *et al*., 2023) containing grades, documents, or diplomas of graduates (Atienza-Mendez; Bayyou, 2019), or for the authentication and security of processes related to knowledge verification (e.g., exams) (Desplebin; Lux; Petit, 2021; Dwivedi; Vig, 2024). Moreover, blockchain itself represents valuable knowledge that can and should be the subject of education (Chen *et al*., 2018; Kartasheva; Trubina, 2024).

Researchers note that there is a wide variety of information available on the Internet, such as tutorials, forums, and videos, which allow for self-study of blockchain (Bortolin; Nauroski, 2022; Qasim; Kharbat, 2020). One of the most popular and extensive resources is IBM's official website dedicated to blockchain technology, which offers numerous free materials and tools, including publications, site content, webinars, YouTube videos, and newsletters (Montero; Guanare; Jiménez, 2024; Stratopoulos, 2020).

According to scholars, success in teaching blockchain can be achieved through collaboration between practitioners, economists, and computer science specialists (Desplebin; Lux; Petit, 2025). A combination of these three knowledge sources should be adapted to the specific field of study—some economics and much computer science for engineers, IT specialists, and technicians, and more economics, many case studies, and some computer science for future economists and managers (Gutowski *et al*., 2022).

Researchers believe that, considering the potential professional tasks in the future, only a small portion of business or management graduates will need to study complex cryptographic mechanisms or master advanced programming (Calderon; Stratopoulos, 2020). In order to work effectively in the market and participate in blockchain-related or blockchain-based projects, most people only need basic technical knowledge of the principles and possibilities provided by this technology (Ahmad *et al*., 2024; Dettling, 2018). According to scholars, graduates do not need to be computer science specialists or cryptographers responsible for developing specific platforms/applications/services, but rather managers who implement these solutions and seek market opportunities (Bheemaiah, 2015; Hrosul *et al*., 2023). The economic consequences and new contexts of application are more important for them than perfect

knowledge, understanding, and transformation of source code (Luhanga, 2020; Pankratova, 2023).

At the same time, scholars note that there are many obstacles that hinder effective and large-scale blockchain education (Ølnes; Knutsen, 2020). IT infrastructure deficiencies (unless they concern critical aspects such as lack of internet access) are not significant barriers (Wu; Jo, 2019). However, organizational and managerial barriers can prove very difficult to overcome and may undermine even the best educational strategies (Menzhulina; Gunko, 2023; Mutoko; Gande, 2021).

Despite the growing interest in blockchain applications for education, most studies focus on technical disciplines because they overlook the pedagogical challenges and curricular strategies for non-IT learners. Addressing this gap, our study proposes a teaching model for students of economics with management. The objective is to explore how educators can meaningfully adapt blockchain education to non-specialized contexts, as they consider institutional capacity as well as student profiles. This research contributes through a set model using world methods and a custom plan. This responds to the current lack of adaptable, pedagogically grounded frameworks within this field.

The goal of this work is to define ways to implement blockchain teaching for students in the fields of “Economics” and “Management.”

To achieve this goal, the following tasks must be solved:

- Analyze existing blockchain teaching models;
- Propose a blockchain teaching model for students in the fields of “Economics” and “Management.”

Materials and methods

Various research methods and techniques were used in preparing this article. In the theoretical part, a critical analysis of scientific literature was conducted to examine the features of blockchain teaching in higher education.

The selection of institutions for analysis was based on publicly accessible course offerings and formal university programs published online by accredited higher education institutions between 2020 and 2023. Preference was given to universities with clearly structured blockchain-related content, multi-level instruction, and content differentiation for non-technical students. The sample does not claim representativeness but was selected to provide a qualitative

overview of diverse educational practices. The data were collected through a structured review of institutional websites and course documentation, then organized into comparative categories. The interpretative analysis involved identifying patterns in course delivery, thematic focus, certification, and pedagogical structure, with attention to how these models could inform a new teaching framework.

In the results section of the study, in accordance with the task set, an analysis of existing blockchain teaching models was carried out. The search for educational institutions offering blockchain education was conducted exclusively online. The following aspects were taken into account:

1. The form of offered educational content – a course or an official field of study (other forms were considered unprofessional and unreliable, so they were excluded from these considerations);
2. The form of education – either exclusively online or the possibility of traditional classroom teaching;
3. The multi-level nature of educational content, i.e., whether the material is divided into beginner, intermediate, and advanced levels, or if there is one material for all categories of students;
4. Profiling of content – the division of the educational material into thematic groups according to the professional fields of study for students;
5. The availability of additional content: podcasts, webinars, videos, etc.;
6. The availability of an introductory course aimed at familiarizing students with the subject of study;
7. The inclusion of topics related to cryptocurrencies in the educational content;
8. The availability of a document confirming the completion of the course (certificate, diploma).

In solving the second task of the study, it is worth noting that the blockchain teaching model for students in the fields of “Economics” and “Management” was created based on the literature review, including analysis of educational programs related to blockchain offered by universities. A complete picture of the situation was supplemented by an overview of courses offered by, for example, commercial digital platforms. Due to limitations (such as the narrow

scope of the study), the model should be considered supplementary material indicating general directions of action.

Results

The institutions presented in Table 1 were selected based on the criteria outlined above and reflect diverse geographical and curricular approaches. Although the sample is limited, it offers valuable insights into trends and structures relevant to non-specialized programs.

Table 1 – Examples of blockchain teaching models

Educational Institution	Course (C) / Program (P) / Elective (E)	Classroom (Cl) / Online (O)	Multi-level	Content Profiling	Additional Materials	Introductory Course	Cryptocurrency-related Topics	Certificate/Diploma
IMD, Business School, Lausanne (Switzerland)	C	O	-	-	+	-	+	+
University of Cape Town	C	O	-	-	+	-	+	+
National University of Singapore	P/C	Cl/O	-	+	+	-	+	+
Massachusetts Institute of Technology	C	O	-	+	+	-	+	+
University of Zurich	E	Cl	-	+	-	-	+	+
Royal Melbourne Institute of Technology	P	Cl	-	+	+	-	+	+
California State University	C	O	+	-	-	-	+	+
University College London	P/C	Cl/O	-	+	+	-	+	+
Chinese University of Hong Kong	P	Cl	+	+	+	-	+	+
University of New South Wales, Sydney	P	Cl	-	-	-	-	+	+
Hong Kong Polytechnic University	P	Cl	-	+	+	-	+	+

Source: Elaborated by authors.

Blockchain Teaching Model for Students in the Fields of "Economics" and "Management"

The overall idea of the blockchain teaching model architecture for students in the fields of "Economics" and "Management" includes four main elements: human resources, students, teaching formula, and content.

Human Resources are the professors or lecturers who will implement the blockchain curriculum. Blockchain lessons for economics and management professors must include specialized training in the form of a focused educational course. Left to their own devices, few

of them would be able to carry out such a pedagogical task. Another issue is the thematic coverage of education in the context of blockchain. If it concerns only economic impact issues, the educational course seems to be a sufficient preparatory solution. However, if more advanced IT knowledge and skills are involved, deep retraining of professors is required, which seems undesirable, doubtful, or even impossible to implement.

Students are the ultimate beneficiaries of the developed teaching model, who must show a desire and willingness to acquire knowledge in blockchain. However, it is unclear where exactly this enthusiasm is concentrated and which specific topics it pertains to. Without this knowledge, one should rely only on the opinions of the professors, which may be misleading. However, some recommendations can be formulated: when students choose a particular field of study, they do so in accordance with their interests and competencies. Economics and management are part of the humanities, but these two fields are characterized by a high degree of assimilation, flexibility, and openness to interdisciplinary projects and research, especially those at the intersection of technology and business. If this is combined with students' openness and pro-technology stance, it can be confidently said that economic aspects related to blockchain technology and cryptocurrency markets can be of great interest and popularity. When it comes to more technical issues, special caution must be exercised to adapt the curriculum to available resources, infrastructure, and the potential and capabilities of the students.

The Teaching Formula should be flexible in relation to expectations and anticipated outcomes. Moreover, the message should, in most cases, be intended for specific recipients. The area of knowledge related to blockchain is vast and constantly expanding, and it is also convergent and multi-threaded.

It is proposed to consider three teaching formulas:

F1. An online course available to all university students for free, with completion of the course confirmed by receiving a certificate:

- Form of education: course hosted on any e-learning platform; redirection to the course on the university's official website; materials available in a mixed format, including electronic documents, lectures, podcasts, films, and webinars.
- Duration of the course: 30 hours.

F2. A core subject that is the same for all students studying in the fields of "Economics" and "Management" (bachelor's level):

- Form of education: lectures that can be conducted in person and/or online.

- Duration of the lectures: 30 hours.

F3. A specialized subject adapted to a specific field of study (master's level), addressed to students who have a certificate of completion of the online course or have passed the subject described in F2 at the bachelor's level:

- Form of education: lectures and practical sessions; in-person classes.
- Number of sessions: lectures: 15 hours, practical sessions: 30 hours.

These teaching formulas can and should be combined with each other, as they complement rather than replace one another. In our opinion, the first two subjects, F1 and F2, should be mandatory at every university for students in the fields of "Economics" and "Management," while F3, to maintain the appropriate quality, should remain fully elective.

Content. Table 2 presents the content that should be included in the curricula corresponding to the F1, F2, and F3 levels.

Table 2 – Blockchain Teaching Content in Learning Formulas F1, F2, and F3

Teaching Formula	Content
F1 F2	History, definitions, and basic knowledge of blockchain technology principles, as well as services and platforms utilizing this technology. Basic knowledge of cryptocurrencies, cryptocurrency markets, and exchanges. Threats and opportunities associated with cryptocurrencies. Legal regulation regarding blockchain and cryptocurrencies. Overview of the most well-known blockchain-based projects and enterprises.
F3	**Lectures**: The essence of crowdfunding. Overview of opportunities, threats, and rules related to the use of blockchain in the specific field. Examples of non-economic blockchain initiatives with universal applications (e.g., personalization and authentication). **Practical Sessions**: Analysis of blockchain-based projects, enterprises, and startups implemented in the relevant field (e.g., in logistics—supply chain monitoring using blockchain). Analysis and evaluation of business models and histories of these initiatives. Evaluation of practical sessions: project—concept of implementing blockchain technology in a selected institution or enterprise.

Source: Elaborated by authors.

It should be noted that blockchain is inextricably linked to cryptocurrencies. These topics cannot be taught completely separately (Endara; Ayala; Velasquez, 2022). If courses on cryptocurrencies are being conducted, the blockchain-related subject can be taught simultaneously or in the subsequent semester (Muradyan *et al*., 2023). In the absence of such courses, some hours of the "Blockchain" subject should be dedicated to studying the nature of digital currencies.

While the proposed model is grounded in international practices and current pedagogical reasoning, it remains conceptual and has not yet undergone classroom implementation. Future work should involve piloting this model in a controlled setting and evaluating its effectiveness using qualitative and quantitative feedback from students and instructors. The validation of the

model will require further interdisciplinary collaboration, especially between educators in economics, IT, and instructional design.

Discussion

Table 1 presents data related to specific examples of blockchain education. Occasionally, blockchain education was offered in formats other than a course or study program, such as in the form of electives—lectures on blockchain programming at the University of Zurich (Kutsev, 2023).

The courses at the universities considered were typically planned for a 5–6-week period, although some offered mini-courses lasting a few hours. These were not included in this list (for example, the Nanyang Technological University course series NTU-FTA—Enterprise Blockchain, which is 8 hours long and conducted online, ending with a certificate).

Universities offered programs with durations ranging from one to two years. The most balanced and transparent educational offering comes from University College London, which provides a free online introductory course (Introduction to Blockchain Technology and Distributed Ledger Technology – DLT), a certified professional course (DEC – Online Certifications for Blockchain, Digital Assets & Web3 Professionals), and specialized education for engineers (MSc in Emerging Digital Technologies) and economists (MSc in Financial Technology) (Kutsev, 2023). Only the Chinese University of Hong Kong offers a multi-level program, allowing for continued and deeper study in postgraduate and doctoral programs (Kutsev, 2023)

In 2021, the news platform CoinDesk34 surveyed 230 universities to create an overall ranking of blockchain education programs. Research institutions from all continents were represented. The methodology included evaluation across five criteria: quality and contribution to research in the field, blockchain educational offerings, collaboration with practitioners and businesses, tuition fees, and the academic reputation of the institution.

The largest clusters of active universities in the context of blockchain are located in the USA, Asia, and Europe, as indicated by the increased interest and the number of blockchain implementations in these regions. However, only 9% of cases resulted in the opportunity to obtain a degree: 6% for bachelor's degrees and 3% for master's degrees (Calderon; Stratopoulos, 2020).

When implementing blockchain education for students in the fields of "Economics" and "Management," universities and other educational institutions should aim to use their resources most efficiently, especially in terms of teaching staff. There must be a focus on preparing instructors adequately for the task. However, no pressure should be exerted on them to undergo retraining. If this proves unsuccessful, it would be worthwhile to consider collaboration with centers that have more experience and rely on their tested solutions, which would greatly facilitate the initiation of the first classes.

The issues of blockchain and cryptocurrencies are irreversibly linked (Kutsev, 2023). In universities where courses on digital currencies and money are offered, it is easier to overcome the content and organizational gap. If the organization of a blockchain course or subject proves too complex, it is advisable to first introduce classes covering cryptocurrency topics, which are more accessible to both students and instructors and serve as an excellent introduction to further blockchain studies (Plasencia *et al*., 2023).

When creating a course or defining the thematic scope of the subject, several rules must be kept in mind. In addition to correctly structured and adapted educational content, the communication itself should be maximized for optimization (Pankratova, 2023). This means diversifying communication formats to make them not only attractive to students but also accessible across various platforms and devices (Rednikova, 2023). For courses, flexible participation formats should be provided (Kaulin, 2023).

The presented content should contribute to achieving the goal of both theoretical and empirical understanding of the integration of blockchain technology into the learning process at higher education institutions in the fields of "Economics" and "Management."

Final considerations

The development of a blockchain teaching model led to conclusions on how to teach students studying economics and management advanced IT technologies; how much they should know about the technical aspects and how much they should understand the economic implications and effects of blockchain; and whether such topics should be taught in courses or educational institutions. Thus, it can be argued that the potential of blockchain technology has not yet been fully realized in the education sector, both in an administrative context and as a subject of study.

This article proposed a blockchain teaching model for students in economics and management, and it addressed a growing need for integrating emerging technologies into non-specialized university curricula. Drawing on best practices and international comparisons, the study identified structural components for student-centered, scalable, and flexible courses. Tiered instruction, from introductory to applied, is key, as findings highlight. Business contexts receive adapted content, and training for educators receives institutional support.

The study also revealed some gaps within the existing literature regarding pedagogical models intended for non-IT learners, and it offered a framework with which to begin closing that gap. In a live setting, however, the model still remains untested. Application and feedback from real-world contexts must refine and empirically validate future research.

The authors hope that this article will become a valuable source of knowledge for both theorists in educational management and practitioners, i.e., individuals in leadership positions in university departments. The authors also wish for this research to serve as a guide for teachers who plan to enrich the curriculum with the latest ICT knowledge, especially in the fields of economics and management.

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