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New trends in management
New trends in education

Table of Contents

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Dear "e-mentor" readers,

I am pleased to share with you the newest collection of diversified papers illustrating new trends in management and in education, with a focus on the international perspective.

The part dedicated to readers primarily interested in management begins with the study exploring the internet users' knowledge and awareness of cryptocurrencies and the determinants of their use in Poland. The discussion of new trends in management is continued with an article on memes, memetics and their applications, conceptual development of memes, identification how they are used in different fields, and a vision of memes in the near future. At the end of this section, readers will find out about the determinants and motives for implementing change management in healthcare.

Current trends in education cover the topic of transformative approach to developing global human resources. To make the study more interesting, the evidence comes from Japan. Readers can also reflect on various aspects of the challenges in remote education, including two cases studies: one from Turkey and another from the USA. Finally, three other articles reflect a modern approach to academic teaching methods, forms, and programs: the identification of critical success factors and risks in the academic course development process through the application of project management methodology; the development of curriculum that will integrate teaching guidelines covering the areas of application of AI technology in the financial and insurance sectors, and the presentation of the manifesto for academic teaching in Business Process Management education in Poland.

As mentioned above, in this issue we have a diversity of topics, as well as authors representing different backgrounds. The strategy of internationalisation supported by the Ministry of Science and Higher Education (Poland) with granted funds (RCN/SP/0361/2021/1) has led to cooperation between „e-mentor" and the foreign organisers of scientific conferences. We have observed an increase in the number of manuscripts submitted and, as the current issue clearly illustrates – a growing number of authors affiliated at foreign institutions. Our further efforts are focused on boosting the quality of published articles, increasing international visibility, raising transparency of the editorial process, and modernising the website. I sincerely hope that the planned improvements will satisfy not only our readers, but also authors and reviewers.

At the same time, I would like to cordially invite you to co-create „e-mentor" with us by becoming a reviewer or by submitting articles for publication. „E-mentor" is an open-access journal available for free, both online and in printed form. All scientific papers are peer-reviewed and we provide free proof-reading of papers accepted for publication in our English issues. Every article gets an individual DOI registered in Crossref, and the journal is indexed in several global databases, including Web of Science ESCI and EBSCO. There is **no publishing fee for the authors**. Further details are available online at http://www.e-mentor.edu.pl/eng/page/8/Info_for_Authors. Should you have any questions concerning publications in "e-mentor", please contact the editorial team at redakcja@e-mentor.edu.pl.

Małgorzata Marchewka
Editor

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Marek Zborowski

Witold Chmielarz

Identification of awareness of the conditions for using cryptocurrencies in Poland

Abstract

The primary aim of this article is to identify internet users' knowledge and awareness of cryptocurrencies and the determinants of their use in Poland. The study, which used the CAWI (Computer-Assisted Web Interview) method, was conducted on a group of 400 active Internet users selected through random and purposive sampling. In the survey, which was carried out in April/May 2022 in Poland, respondents were asked to evaluate cryptocurrencies taking into account the following criteria: familiarity with the concept of cryptocurrency, sources of information about the phenomenon, investment preferences, security awareness, and the respondents' knowledge of the advantages and disadvantages of cryptocurrencies. As a continuation of previous research undertaken in this area, the research demonstrated a strong understanding of the respondents concerning the lack of transparency associated with cryptocurrencies and the cryptocurrency market. The main concerns when using cryptocurrencies are: lack of protection against speculators, lack of supervision by a reputable financial institution, and lack of control of the cryptocurrency market by the National Bank of Poland (NBP). The conclusions and recommendations contained in this article may contribute to increasing knowledge and awareness of the phenomenon analysed, and increasing its popularity in society. Additionally, it provides insights for investors regarding the direction of cryptocurrency development.

Keywords: cryptocurrencies, awareness of cryptocurrency determinants, cryptocurrency usage factors, cryptocurrency characteristics, advantages of cryptocurrencies, disadvantages of cryptocurrencies

Introduction

Although cryptocurrencies are rapidly gaining recognition and usage in Poland, particularly among younger internet users, there are still conflicting opinions on the conditions of their use and the possibilities of using them. For this reason, a study was conducted to identify and evaluate the awareness of the existence and determinants of cryptocurrency use in Poland's economic reality. This study complements the authors' long-standing analysis of the online banking market and societal perceptions of new technologies (Chmielarz & Zborowski, 2020; Zborowski & Szumski, 2020).

The definition of cryptocurrency characterises it as "a virtual currency that is a specific means of exchanging value between its issuer and users" (Marszałek, 2019, p. 109). Its increasing use is mainly possible thanks to the Internet and the solutions built on it: e-commerce and e-banking (Chen & Wu, 2009; Ertz & Boily, 2019), and it is also seen as a financial innovation (Massó et al., 2021; Nieradka, 2018). This phenomenon presents several advantages, enabling the cheapest domestic and foreign transfer transactions, quick execution of funds transfer, independence from state governments and banking systems, use without currency exchange, convenient use, processing of transactions without intermediaries, a significant reduction in currency conversion time, cross-border use, transaction security (in an IT context, using blockchain technology), anonymity of transactions, and protection against control by state institutions. However, it also raises concerns that contradict these benefits, such as: lack of control by financial institutions, lack of control by central banks (money supply), lack of state guarantees

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regarding the stability and value of cryptocurrencies, high susceptibility to speculation, lack of trust in the business context (investors), attractiveness for criminals – anonymity, speed and lack of control and legal regulations.

The concept of cryptocurrencies and the possibility of their use also raise technological issues concerning blockchain (Wikarczyk, 2019) and distributed ledger (Piech, 2017; Przyłuska, 2016) as well as economic (Sierpiński, 2017) and legal concerns (Homa, 2015).

Research conducted by the Polish Economic Institute shows that 11.7% of Poles of working age declare that they have cryptocurrencies, 94.2% of respondents have heard of their existence, 83% of respondents agree with the statement that investing in cryptocurrencies involves a significant risk of losing funds, and 80% of respondents have purchased cryptocurrencies using centralised intermediaries (Łukasik & Witczak, 2023).

Undoubtedly, this new type of electronic payment based on new technological solutions is gaining popularity. Along with enthusiasm, the introduction of new technologies often faces social resistance due to a lack of understanding and awareness of their potential benefits. As stated in studies by national financial institutions: "New technologies can be viewed with apprehension, but technological progress cannot be restricted due to a lack of sufficient knowledge about them" (Piech, 2017, p. 9). When analysing the potential for the development of cryptocurrency usage in Poland, it is important to consider the perspective of awareness of the existence of such possibilities among potential users.

Therefore, in a way, investigating this area seems a natural prerequisite for increasing knowledge and awareness among the public, although, at the same time, the literature analysis carried out in section two (Chmielarz & Zborowski, 2018; Ertz & Boily, 2019; Huang et al., 2022; Kim, 2021) indicates that there is a research gap in this area. Our study aims to address this gap, and although it may not be possible to fully fill it given the extent and relevance of the problem, our goal is to at least reduce it.

To achieve this, the following structure of the paper was adopted. The next section analyses the literature on cryptocurrencies, as well as the awareness of their existence and use. The third section deals with the research methods used to investigate the issue, in particular the research procedure and the characteristics of the research sample. The fourth section presents analysis and discussion of the results obtained from the research sample. The final section provides a summary, draws conclusions, highlights the limitations of the study, and provides recommendations for further research in this area.

Literature review

The literature presents several perspectives on the issue undertaken in this study. An important aspect to consider is the analysis of how the perception of cryptocurrencies changed in the context of the COVID-19 pandemic's emergence. The article (Huang et al., 2022) refers to a strong factor shaping users' behaviour, i.e. the COVID-19 pandemic, showing that during uncertain economic conditions, such as the post-pandemic period, cryptocurrency assets can provide comparable benefits to those seen during more stable economic periods, such as the time before the COVID-19 pandemic, regarding diversifying investment portfolios. Another study (Kim, 2021) proved that during and after the COVID-19 pandemic, consumers are more likely to use Bitcoin – the most recognised cryptocurrency. The study considered factors such as antecedents (i.e. perceived behavioural control, subjective norm and financial self-efficacy) and consequence of use (i.e. behavioural intention to use Bitcoin), as well as consumers' overall attitudes towards money (i.e. power-prestige, retention time, distrust, quality and anxiety). There were also other studies (Nkrumah-Boadu et al., 2022), which included an examination of the correlation between cryptocurrencies and selected stock markets in Africa, and gold returns before and during the COVID-19 pandemic. The research showed, in addition to confirming that the COVID-19 pandemic had an impact on financial markets, that in the markets studied, selected cryptocurrencies were given little consideration in terms of diversifying investment portfolios, or perceiving them as a safe haven for funds or a form of security.

Another important factor in recognising the issue of cryptocurrencies and, more broadly, blockchain technology is its security. In the article (Navamani, 2023), the author pointed out that the issue of privacy and security of both identified and anonymous users is important, and cannot be overlooked in the context of its widespread use.

When considering cryptocurrencies, it is important to recognise the role of technology adaptation, for example investigating the factors influencing the propensity to use cryptocurrency. The research on the perception of the use of this technology in the case of the tourism industry (Treiblmaier et al., 2021) considered factors such as legislation and regulation, cryptocurrency acceptance, security, usability and costs, and found that factors contributing to the acceptance of the technology were: novelty, ease of use, safety and reliability, hedonic aspects, and trust. On the other hand, factors that negatively affected satisfaction included poor usability, low performance, volatility, and insecurity.

Similar studies (Arli et al., 2021) examined how knowledge of cryptocurrencies, the speed of transactions, and trust in the government affect trust in the solution under analysis and, consequently, loyalty to banks. In a similar manner, there are studies (Owusu Junior et al., 2020) indicating that gold and cryptocurrencies can help protect (hedge) investors against negative price movements of other conventional assets such as oil, fiat currencies or commodities.

A study of perceptions of the cryptocurrency issue was also conducted with the participation

of undergraduate students in Portugal (Almeida & Costa, 2023), with the study sample consisting of 196 undergraduate students enrolled in six courses in the area of engineering and social sciences. Analyses of the results showed that the overall level of financial literacy is heterogeneous, and that the acquisition of knowledge about financial solutions takes place through both official and unofficial channels. Additionally, it was found that awareness of cryptocurrency knowledge is high, while recognition of cryptocurrency exchanges (acquisition portals) remains low.

Research covering the Malaysian market (Sukumaran et al., 2023), seen as a pioneer in the implementation of cryptocurrency, considered the innovation diffusion model. Theoretical factors, such as compatibility, relative advantage, testability, ease of use and observability, were compared with elements of the consumer behaviour theory. The study focused on the perceptions of retail investors in the context of their perception of the risk of bringing value. The research above showed that compatibility, testability, ease of use, observability and perceived value have a significant impact on the intention to invest in cryptocurrencies. However, the impact of relative advantage and perceived risk associated with the intention to invest in cryptocurrencies is not as significant.

The COVID-19 pandemic had a significant impact on the cryptocurrency market. For example, in 2020, the lowest price of Bitcoin was around USD 5,000, while after the crisis caused by the COVID-19 pandemic and the introduction of restrictions leading to the closure of global markets, the price of this cryptocurrency increased to USD 12,000 in August (Spyra, 2020). The changes concerned not only Bitcoin but also the entire cryptocurrency market, where their capitalisation increased. Cumulatively, in mid-November 2021, the market value reached USD 2.9 trillion, and, later, there was a correction in the entire cryptocurrency market (Maciejasz & Poskart, 2022).

The literature analysis suggests that cryptocurrencies are not yet considered to be on the same level as other assets, whether fixed or financial. Furthermore, there is still a significant level of unfamiliarity with cryptocurrencies themselves and the markets for their trading, while existing models investigating the level of technology adoption also appear to provide inadequate answers. These findings confirm the results of the literature studies cited in this article.

Method

Research procedure

Based on previous studies, the following research procedure was adopted, consisting of the following stages (Chmielarz & Zborowski, 2018; Zborowski & Szumski, 2020):

- conducting literature research and seeking expert opinions on the awareness of the perception of the cryptocurrency phenomenon in society,
- constructing the first version of the survey form based on the literature study, consultations, and own observations of the studied phenomenon,
- verifying the questionnaire in terms of comprehensibility and relevance of the questions, and carrying out a pilot study involving a randomly selected group of respondents,
- creating the final survey questionnaire,
- selecting, at random, student groups to carry out the final research,
- making the questionnaire form (CAWI method – Computer Assisted Web Interview) available to the previously selected student groups,
- collecting the survey results, analysing and discussing the findings,
- drawing conclusions and identifying future directions for the development of cryptocurrencies.

The survey questionnaire, which included nineteen questions, was grouped into three sections (appendix). The first part contained four questions related to the perception of cryptocurrencies. The second one, consisting of five questions, focused on assessing the characteristics of cryptocurrencies from the point of view of potential and actual users. The third part of the survey contained nine questions identifying factors that influence the use of cryptocurrencies. The last part contained questions related to demographic data.

Characteristics of the research sample

Data for the survey was collected at the University of Warsaw, at the Faculty of Management, in April/May 2022. It covered 653 people, of whom 400 filled out the survey questionnaire correctly and completely, representing more than 61% of the total sample. The survey was voluntary and covered randomly selected years of studies and student groups. Among the responses analysed in the study, more than 68% were sent by women and nearly 32% by men, which corresponds to the gender structure of the average economic university in Poland.

The second characteristic studied among respondents was age. Due to the type of university, and the random selection of student groups among full-time and part time (extramural and evening) studies, the age distribution was not particularly diversified. Nevertheless, due to the largest number of answers given by those in the first years of their studies, nearly 96% of the respondents were aged 19–24, and only a little more than 4% were older. However, it is important to indicate that the respondents belong to the group of users who are undoubtedly the most active and most open to innovations (Batorski, 2015). During the pandemic, this group was even more active with regard to using new ICT technologies (studying remotely, increased online shopping, banking operations carried out exclusively on the Internet, etc.). Education of the respondents was correlated with their age. Over 80% of respondents held a high school diploma, nearly

Table 1
Characteristics of the study sample

Characteristics	% share
Gender	
Female	68.09%
Male	31.91%
Age	
19–24	95.98%
25–34	3.77%
35–55	0.25%
Education	
Bachelor's degree, undergraduate	18.84%
Secondary	80.15%
Higher	1.01%
Place of residence	
town with 21–50 thousand inhabitants	11.81%
city with 51–200 thousand inhabitants	5.53%
town with up to 20 thousand inhabitants	6.78%
city with more than 200 thousand inhabitants	57.54%
village	18.34%
Field of study	
social sciences, including psychology, sociology, economics, pedagogy, administration and law	93.97%
exact sciences, including mathematics, computer science, physics and chemistry	5.78%
technical/engineering studies	0.25%
Financial situation	
very good (I can afford everything I need, and I have some savings)	17.59%
good (I have no reason to complain but it could be better)	55.28%
sufficient (I can still make ends meet)	3.52%
I am a student, and I am not financially independent	7.79%
average (I have enough money to lead a frugal life)	15.82%
Educational status	
I am a student and I don't work	46.73%
I am a student and I do occasional work (a contract for a specific task/service contract)	30.65%
I am a student and I work on the basis of a full-time or part-time employment contract	21.86%
I am a student and I am self-employed	0.76%
Professional status	
I am a student and I don't work	46.73%
operators (e.g. machine operator, machine fitter, driver)	1.01%
office workers/clerical staff (e.g. secretary, clerk)	29.65%
semi-skilled/unskilled workers (e.g. porter, cashier)	3.27%
service workers (e.g. seller, guide, sales representative)	11.31%
farmers (e.g. breeder, grower, gardener, forester)	1.51%
specialists (e.g. IT specialist, engineer, physician, teacher)	3.52%
technicians (e.g. construction technician, IT technician)	1.26%
senior staff (e.g. executive, manager)	1.74%

Source: authors' own work.

19% had a Bachelor's degree, and just over 1% had a graduate degree.

The majority of respondents are from large cities (over 58%) and rural areas (over 18%). Among the fields of study, almost all respondents study or have studied social sciences (nearly 94%). The remaining share, more than 6%, study mathematics, technology, and other fields.

The material situation of more than half of the respondents (55%) is self-assessed as good, and in the case of 18% of the sample it is assessed as very good. Nearly 16% of study participants consider their material situation to be average, and none of the respondents regards it as bad. This is probably due to the fact that more than 52% of students declare working on a casual basis and having a full-time or part-time employment contract. Judging from the declaration, nearly 8% are not financially independent. Around 39% of the sample do not admit to having additional sources of income or state that they live together with their parents.

The majority (47%) of respondents are primarily students or pupils, while the remainder work mainly as office workers (30%) or service sector employees (11%). Some respondents are employed as professionals or do simple jobs (more than 3% each).

Analysis and discussion of the findings

The survey results allowed the authors to evaluate the phenomenon of cryptocurrencies in the Polish financial market, as assessing public awareness of this phenomenon enables determination of the degree and potential for using modern blockchain-based information technologies to create a sustainable society in the future.

As a result of the survey mainly covering young people from the academic community, there was not a single person among them who had not heard of the cryptocurrency phenomenon prior to this study. Interestingly, most of them (70%) got their knowledge from the Internet, and 20% from friends. The remaining 10% of respondents reported learning about cryptocurrencies from various sources, while 3% declared hearing about it from relatives, almost 3% at university, over 2% from television and radio, and nearly 2% at work. The survey findings reveal some interesting insights, particularly regarding two sources of information that received low percentages. Firstly, university as a source of information scored poorly, which could indicate that there is a gap in the coverage of the latest technological phenomena in

university programmes or by lecturers. The second low percentage was indicated in the case of TV and radio, which could suggest that either little attention is paid to cryptocurrencies in the content provided, or that programmes containing information about cryptocurrencies are not popular among the respondents.

It was assumed that "hearing" about a phenomenon does not mean fully understanding it. Therefore, the next question covered the definition of a cryptocurrency that most closely matched the respondent's perception. A total of four definitions randomly copied from the Internet (as the most important source of information about cryptocurrencies for respondents) were considered, with the responses fairly evenly distributed at the level of 20-30%, among which none had a significant advantage. Thus, the differences between matching definitions to the respondents' perception of cryptocurrency were not great, with a maximum of 12.8%. The results are shown in Table 2.

The next question examined the knowledge of cryptocurrencies used in the Polish market. Out of the twenty-four cryptocurrencies listed by the survey authors and completed by respondents, the first ten comprise more than 87% of all responses. The findings are presented in the table below.

The next question was related to investing in cryptocurrencies. The survey results showed that a mere 12% of the respondents currently invest in cryptocurrencies, although what is particularly noteworthy is that over 70% of the respondents reported actively monitoring opportunities related to cryptocurrencies. This is reinforced by the fact that repetitive announcements by the central bank – the National Bank of Poland – and financial institutions (Uważaj na kryptowaluty, n.d.), as well as comments on the Internet (Uważaj na kryptowaluty, n.d.), point to the dangers and risks related to trading in cryptocurrencies. On the other hand, according to those surveyed, as many as 32% believe that cryptocurrencies are rather safe, and nearly 4% feel sure of this. Unfortunately, opinions about their potential danger are similarly distributed. The phrase that they are rather dangerous was chosen by 30% of respondents, while the assessment that they are definitely not dangerous was expressed by nearly 5%.

What motivates people to invest in cryptocurrencies? According to 29% of respondents, the most important advantage is the security of transactions, which is not surprising given the messages discussed above. This view almost aligns with the assessment of the security of such transactions, which underscores the significance of blockchain technology in ensuring safe and reliable transactions. In second place (17%) was the protection from scrutiny by regulatory institutions, such as the state, which is likely related to unfavourable regulations for investors in certain countries, and the anonymity provided by cryptocurrencies for transactions. In third place is the convenience of

Table 2
Respondents' understanding of the concept of cryptocurrency

Definitions of cryptocurrencies	Percentage share
Cryptocurrencies are an innovative form of „virtual coin" in a distributed ledger system with advanced cryptography lying at the core of its creation. It is a system that stores information about the status of a specific wallet, in pre-approved units of cryptocurrency. The security key in this case is a token, and the foundation of everything is blockchain technology. (SOCIAL. ESTATE, n.d.)	31.9%
Cryptocurrencies – digital markers of value that are not issued by a central bank or public authority, nor are they pegged to fiat currency. They are widely accepted by individuals or legal entities as a means of payment, and can be transferred, stored, or sold electronically. (Komisja Nadzoru Finansowego, 2017)	27.1%
Cryptocurrencies are built on a distributed accounting system that uses cryptography to store information about the state of ownership in contractual units. Ownership status is associated with individual nodes of the system, commonly referred to as „wallets". Only the holder of the corresponding private key has control over a given wallet, preventing double-spending, as each unit of currency can only be spent once. (Surdyk, 2018)	21.9%
Cryptocurrencies are virtual money, created online with the help of cryptocurrency miners, which use strong cryptography to secure transactions. Based on the so-called proof of work. (*Kryptowaluta*, n.d.)	19.1%

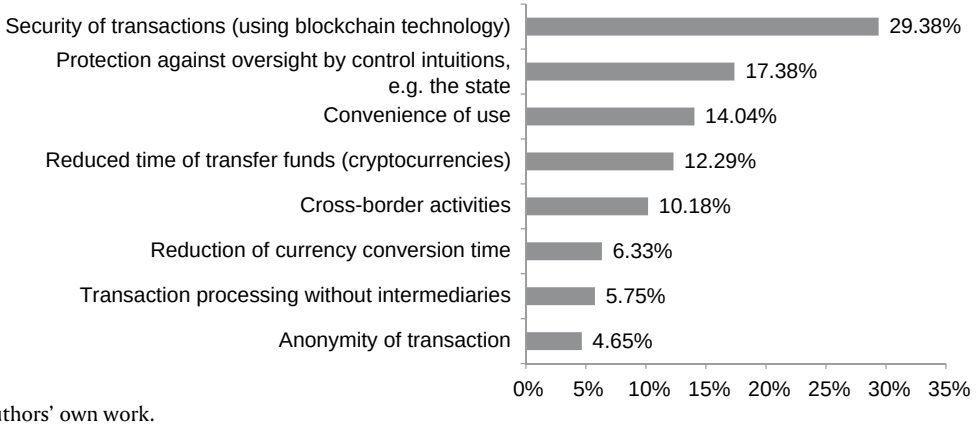
Source: authors' own work.

Table 3
Familiarity with cryptocurrencies on the Polish market among respondents

Cryptocurrency	% responses
Bitcoin – BTC	29.94%
Ethereum – ETH	15.01%
Bitcoin Cash – BCH	10.11%
Bitcoin Gold – BTG	7.16%
Lisk – LSK	6.79%
Dash – DASH	6.26%
PIVX – PIVX	3.85%
Litecoin – LTC	3.24%
Golem – GNT	2.79%
Zcash – ZEC	2.11%
Total	87.26%

Source: authors' own work.

Figure 1
Main advantages of cryptocurrencies



Source: authors' own work.

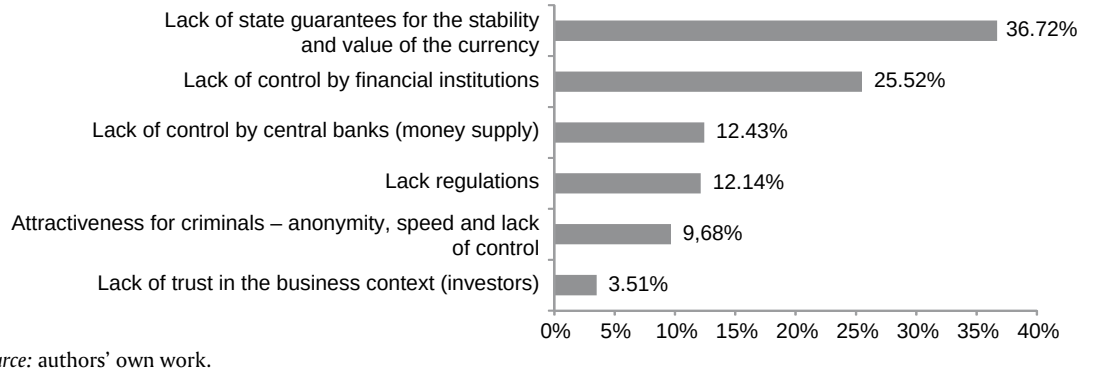
use (12%), which is specific to experienced users of online applications. Other factors driving investment in cryptocurrencies are highlighted in Figure 1.

Understanding the factors that drive investments in cryptocurrencies also requires identifying the barriers that limit their widespread use. In this context, the most significant barrier (37% of responses) is the lack of state guarantees of the stability and value of cryptocurrencies. In second place (26%), the lack of control by financial institutions contributes to a lack of trust in this type of currency, which collectively accounts for more than 60% of negative determinants. Other barriers include the lack of control by banks and legal regulations, each accounting for 12% of responses, and respondents also identified the potential attractiveness of cryptocurrencies to criminals (10%) and lack of trust among investors (nearly 4%) as additional barriers to adoption (as shown in Figure 2).

According to the respondents, the advantages and disadvantages of cryptocurrencies are primarily based on their observed characteristics. Although fast transfers were seen as the most important characteristic of cryptocurrencies by 42% of respondents, this advantage has not been fully recognised. The other characteristics evaluated by respondents align with the advantages of cryptocurrencies, with the second most important characteristic, according to 22% of respondents, being independence from governments and banking systems, which some consider a disadvantage. The economic aspect of enabling cheap transactions is rated next at 21%, anonymity, which is less specific and relevant to cryptocurrencies, was evaluated by 12% of respondents, while security, which is seen as less of an issue (or even taken for granted) in many financial systems, was rated by only 2% of respondents.

Despite the numerous advantages of cryptocurrencies, respondents show far-reaching skepticism when it comes to the widespread implementation of this technology on par with traditional currencies. The answer "never" was given by 23% of respondents, while, in contrast, more than 57% believe that they could be widely implemented and used similarly to fiat currencies in 10-20 years at the earliest, 16% believe this could take place in the next 20 years, and only around 3.5% believe it will happen in the near future. The skepticism surrounding the widespread use of cryptocurrencies is primarily due to the conditions that must be met for them to become a common means of payment, which are related to the security of cryptocurrency transactions. The most significant concern, according to 33% of respondents, is the protection of the cryptocurrency market from speculators to prevent large fluctuations in cryptocurrency

Figure 2
Main disadvantages of cryptocurrencies



Source: authors' own work.

prices. A further 22% of respondents believe that one cryptocurrency should be placed under the supervision of a reputable financial institution, while 21% of respondents believe that controlling the cryptocurrency market by state authorities or the inclusion of multiple cryptocurrencies under the supervision of a reputable financial institution could help. Respondents attach little importance to the increase in the use of cryptocurrencies in the B2B market, and they consider the introduction of control over the cryptocurrency market by the National Bank of Poland irrelevant, indicating deep distrust in the bank (as shown in Figure 3).

The subsequent survey questions were aimed at determining further conditions, other than institutional, that could be established to accelerate the widespread adoption of cryptocurrencies in economic practice. The first factor was to examine the degree of awareness and popularity of the phenomenon among respondents. Overall, more than half of the respondents answered that they observe a general awareness of cryptocurrencies, and that they are popular in many social circles. At the same time, 33% expressed the opposite opinion, and 15% had no opinion on the topic. A logical continuation of these answers was the question concerning the reasons for the lack of popularity among the public, which showed that the primary problem (43% of responses) is a low level of knowledge of cryptocurrencies and how to use them, with slightly fewer responses opting for too few places where they can be used to pay for products or services. Much less important (14%) were information campaigns (especially from government agencies) pointing out the significant risks of using cryptocurrencies, rather than pointing out the potential benefits of using them. Just under 7% indicated limited access to cryptocurrencies as one of the concerns to be considered.

The second significant factor affecting the adoption of cryptocurrencies was their official recognition as a means of payment. In the case of this question, 48% of participants agreed with the statement ("rather yes") and an additional 10% (totalling 58%) responded "definitely yes". Conversely, 15% of respondents answered "rather not" or "definitely not" with reference to the existing reluctance to use cryptocurrencies. A notable 27% of respondents did not have an opinion on the matter.

If the use of cryptocurrencies involved the need to learn how to use them (participating in appropriate specialised courses), the share of those willing to use them would be even higher. Some 12% of respondents expressed their full approval for this idea, while as many as 58% said they would rather do so (a total of 70%). There were similar proportions of shares for the response options of „rather no" – 12% and „I don't know what I would do in such a situation" – 21%.

Based on the literature (Almeida & Costa, 2023), the influence of the respondents' environment, particularly those they hold in high regard, appeared to be a significant factor, although less critical than the previous ones. Only 35% of participants expressed their inclination to take advantage of this opportunity, and nearly 6% were certain to do so, totalling 41%. 24% of respondents expressed the opposite opinion, and a substantial 35% had no opinion on the matter.

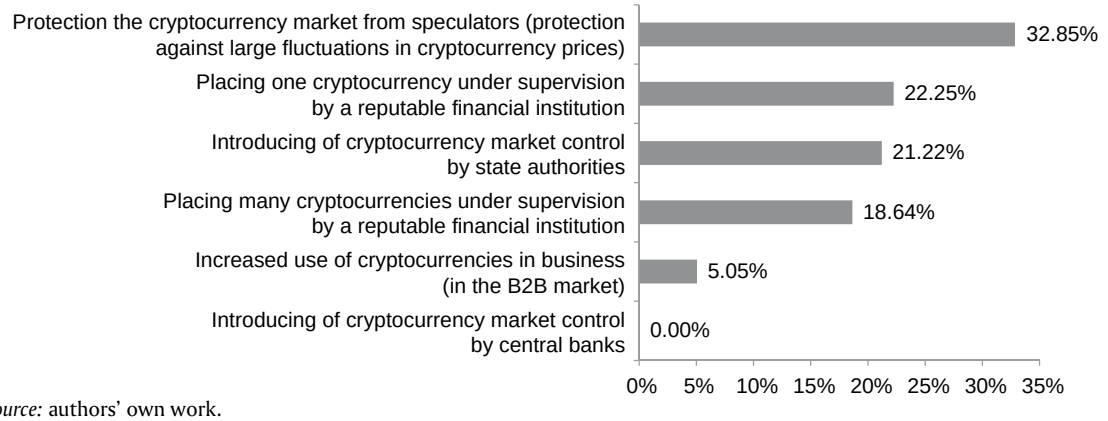
The best results were obtained when using a combination of institutional and economic reasons, concluding that if there was recognition of cryptocurrencies by central banks and states as an official means of payment (parallel to a fiat currency), businesses would accept cryptocurrency payments, and their rates would be stable. This is reflected in the fact that as many as 26% of respondents would adopt cryptocurrency, and a further 59% expressed their partial approval of the idea – "rather yes" (85% in total). The percentage of answers of "definitely no" and "rather no" declined to a total of 5%, and the size of the undecided group declined to 12%.

Differences in the situation before the pandemic and after the official lifting of COVID-19 pandemic restrictions were also examined in light of the pandemic experience. The results are presented in Table 4.

The literature indicates (Huang et al., 2022) that the COVID-19 pandemic impacted the use of all innovative technologies, especially those related to

Figure 3

Conditions for the implementation of cryptocurrencies



Source: authors' own work.

Table 4
Differences in attitudes towards using cryptocurrencies before and after removing COVID-19 pandemic restrictions

Response	Did you consider using cryptocurrencies before the COVID-19 pandemic?	After the COVID-19 pandemic restrictions were lifted, did you consider using cryptocurrencies?	Absolute difference
I don't know	3.27%	3.11%	0.15%
Rather no	41.21%	33.38%	7.83%
Rather yes	12.06%	25.36%	13.30%
Definitely no	35.68%	21.37%	14.31%
Definitely yes	7.78%	16.78%	8.98%
Total	100.00%	100.00%	

Source: authors' own work.

remote operations conducted on the Internet. The above table clearly shows that the percentage of respondents who strongly refused to use cryptocurrencies decreased significantly (by 21%), and the share of people who stated that they would probably not use them also reduced (by 8%), which is undoubtedly connected with the participants' responses indicating that they would probably use them (an increase of 13%) and would definitely use them (9%). Prior to the pandemic, 77% of respondents did not consider using cryptocurrencies, while after it, only 55% took that approach. Although the indicators are still slightly above 50%, the 22% decrease indicates a growing trend in this respect.

Conclusion

The results obtained lead to the following conclusions:

- the purposive selection of the research sample – mainly among those in the 19–24 and 25–35 age range – resulted in a very high level of awareness of the concept of cryptocurrency in this study, which is also evidenced by the correct understanding of the definition of cryptocurrency, as verified in the survey,
- knowledge of cryptocurrencies used on the Polish market is high. Respondents listed 24 such currencies, the top three, that is Bitcoin – BTC, Ethereum – ETH and Bitcoin Cash – BCH, being indicated by more than 55% of respondents. In contrast to the previous survey (Zborowski & Szumski, 2020), Litecoin LTC fell to ninth place, and Ethereum ETH moved up one place. The continued attachment to the cryptocurrency family and its high recognition of Bitcoin is due to the appearance of the Bitcoin Cash cryptocurrency as the first one on the Polish market,
- similarly to the previous survey, knowledge of cryptocurrencies was obtained primarily from the Internet (70%) and from friends (10%),
- only around 10% of the respondents are not interested in investing in alternative currencies, although 70% closely monitor opportunities related to their use,
- nearly 1/3 of respondents believe that cryptocurrencies are rather safe, and almost 4% are certain of it (which dramatically changes the opinion from three years ago when 3/4 were afraid of investing in alternative currencies),
- respondents' opinions pointed to the fact that the advantages of cryptocurrencies were shaped similarly to the determinants of the use of cryptocurrencies – the most important being the security of transactions, protection from inspection by regulatory institutions, the third being the convenience of use,
- in this context, the statements on the barriers to their use were interesting – the most significant barrier – receiving more than one-third of the responses – was the lack of state guarantees for the stability and value of such currency and the lack of control by financial institutions and central banks, which was exactly the opposite of their advantages,
- however, nearly of respondents believe – despite the advantages of cryptocurrencies – that they will never be equivalent to official currencies. This mainly stems from concerns about the lack of protection against speculators, the lack of supervision by a reputable financial institution, and the lack of control of the cryptocurrency market by the NBP,
- other determinants of the introduction of cryptocurrencies into general circulation are: the degree of awareness and popularity of the phenomenon among respondents; the desire to learn how to use them; their approval as an official means of payment; and the influence of the social environment. In these cases, respondents (35–85%) stated that they would support the introduction of a cryptocurrency market, although the best results approving the hypothetical introduction of cryptocurrencies would be achieved if a combination of institutional and social determinants occurred,
- the COVID-19 pandemic resulted in a twofold increase with regard to the approval for the use of cryptocurrencies (from 20% to 42%).

The survey results demonstrated that the respondents have a strong understanding of the lack of transparency associated with cryptocurrencies and the cryptocurrency market, and also revealed the factors that are important to the respondents when considering the adoption of cryptocurrencies, and the extent to which they prioritise these factors. Despite cryptocurrencies being a new and novel concept, the respondents showed a high level of familiarity with them, and were able to assess their specific attributes.

The results of this research can provide organisations looking to increase their investment participation in the cryptocurrency market, as well as those using cryptocurrencies in the market, with key information to support their initiatives.

The research had some limitations that should be noted. Firstly, the research sample was limited to the academic community. Secondly, the research was conducted in only one country. Thirdly, the research was restricted to the perspective of potential or actual users of cryptocurrencies, rather than considering the entire market, including the quality of tools such as cryptocurrency exchange websites. Fourthly, no comprehensive model approach has been developed as of yet that could be used in the study.

The above conclusions indicate the upcoming research directions for this problem, with the survey results stressing the need for further investigation into the factors that support the development and application of the solutions discussed in the article. To accomplish this, researchers could consider expanding the sample size, analysing and evaluating online portals that serve the cryptocurrency market both domestically and internationally, or building a model to understand the societal adaptation of this technology.

Given the preceding discussion, it is important to create a framework model of the logical impact of individual factors on the emergence of cryptocurrencies in the Polish market. The elements of such a model indicated by the respondents could include:

- psychosocial factors: the popularity and awareness of cryptocurrencies, the social environment of users,
- institutional and economic factors: recognition of cryptocurrencies as an official currency, recognition of cryptocurrencies by central banks and states as an official means of payment (parallel to a standard, fiat currency), entrepreneurs would accept payments with cryptocurrencies and their rates would be stable,
- educational factors: acquiring knowledge about cryptocurrencies and how to use them,
- random events: pandemic, war, natural disaster, etc.

The relationships between the various factors are complex, very often depending on unpredictable external factors such as: economic policy, the balance of political power, dominance of particular political fractions, relations with neighbouring states, etc. Given the financial nature of cryptocurrencies and their numerous connections with the world of state administration and political authorities, the framework model for their adaptation in Poland should consider unique conditions that differ from the most commonly used adaptation models such as TAM (Davis, 1985; Venkatesh & Davis, 2000), UTAUT (Williams et al., 2015), UTAUT2 (Alalwan et al., 2018; El-Masri & Tarhini, 2017; Morosan & DeFranco, 2016), or TRA (Almajali et al., 2022), and requires further comprehensive and detailed investigation.

The appendix is available in the online version of the journal.

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Memes, memetics and their applications: A systematic review of literature

Abstract

Memes are not new concepts, but they have garnered popularity recently. They are a prevalent form of communication on various social media platforms. However, due to a lack of concrete literature (Al Rashdi, 2020), there is still some initial scepticism surrounding them. This paper uses a systematic literature review to create a pool of research papers to be examined to chart the conceptual development of memes, determine how they are used in different fields, and present a vision of memes in the near future. It identifies eleven areas which were studied in parallel to memes, suggesting possible meme applications and development. It adopts the PRISMA 2020 framework to ensure systematic screening and reporting of relevant papers from various databases.

Keywords: meme, memetics, meme marketing, viral, internet memes, management, branding, advertising, communication

Introduction

In today's digital age, memes have emerged as powerful tools for communication and marketing (Shifman, 2013). They are generalized data, ideas or information. They seamlessly engage diverse audiences, as noted by Tuten and Solomon (2017), who emphasize their effectiveness in targeted communication, resulting in fruitful engagement.

Memes encompass text, images, graphics, or videos that are consumed, replicated, modified, and shared by like-minded people (Shifman, 2013). They are referred to as the "Unit of Transmission" (Castańo Diaz, 2013). They have become a popular way to express opinions, feelings, and ideas, often employing humour or satire (Hakokõngäs et al., 2020). Humour helps to spread their message without potentially hurting the sentiments of the reader. Memes have become so widespread in society that 'a distinct field of study has evolved, called *Memetics* (Oliveira et al., 2016; Shifman, 2013).

Although memes can engage audiences, amplify brand presence, and facilitate mass communication, empowering corporations and marketers for broader outreach (Marsden, 2002), they remain largely untapped by many firms, signalling a need for broader adoption and effective implementation (Ngo, 2021). This highlights the significance of thorough research on memes to enable marketers and businesses to comprehend their background, meaning, and usage fully. Such research necessitates a comprehensive understanding of the nature of memes and the diverse domains in which they can be effectively employed.

Related literature

Memes include a variety of concepts, from words, puzzles, and songs to social ethics. Dr. Richard Dawkins first introduced the concept of 'memes' in 'The Selfish Gene' in 1976 (Dawkins, 2016) in parallel with genes and their tendency to replicate and increase the rate of survival. He suggested that memes have the same characteristics as genes, and they act to transmit behaviour. They require artistic flair and creativity for successful imitation and variation (Shifman, 2013). Blackmore (1998) referred to memes as imitated traits passed on in the form of ideas or behaviour, such as religious practices like saying prayers before meals. Bjarneskans, Grønnevik and Sandberg (2008)

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quoted memes as a structure that carries information capable of being replicated, like slogans.

Dennett (1990) described a meme as an object with three essential qualities: variation, heredity, and differential fitness. A meme should consist of some variations in terms of content, mode of dispersal, and form, and evolve with the changes in the cognitive as well as social environment. Each meme should have heredity or a ground zero from which it is developed and to which it can be traced back. It should have a definite source. Also, for memes to attain longevity, they should be equipped or designed in a way that they can adapt to external environmental changes. Memes with these qualities are capable of surviving and growing with or without changes. They should stay with their hosts for a longer time and eventually morph into permanent habits, rituals, or beliefs.

They are expected to replicate themselves from one brain to another in ways corresponding to the way in which genes replicate themselves and multiply from one person to another. They should possess the quality of fecundity (Atran, 2001). They should be able to multiply and be passed on to live long enough in people's memories that they become a part of their lives. If not replicable, they are unable to multiply or be passed on to future generations and fade away with time.

The popularity of memes and their ability to reach a mass audience have prompted companies, researchers, scholars, and the marketing world to take serious note of their development and keep track of them.

The present state of affairs

In the current landscape, there is a surge of companies offering digital and social media marketing solutions. Corporations now delegate tasks like meme-driven brand awareness, online brand management, identity curation, and viral marketing to specialized agencies. Memes floating on the internet play a significant role in this landscape. Marketing firms are leveraging them to engage audiences on clients' social media platforms, leading to the rise of meme-focused content and popular brand-affiliated social media pages (Tuten & Solomon, 2017).

Also, numerous meme-based applications have emerged, providing various meme templates and a novel avenue for income generation through meme creation and dissemination. With platforms such as Meme Generator, MemeChat, and Meme Maker, … continue to proliferate, and individuals are actively crafting and sharing new memes and their variations. In line with this trend, a meme-centric dating application called 'Schmooze', founded by Stanford graduate Vidya Madhavan, has been launched. It utilizes humour algorithms to connect individuals based on shared comedic preferences, gaining traction among users (Nasdaq, 2021).

Furthermore, memes are also created as a form of craft, as they require creativity and imagination, giving them the status of an 'art treasure.' For the same reason, a meme museum, the first of its kind, was opened in Hong Kong in 2021, showcasing different memes, such as "disaster girl", "Salt bae", "Troll face", etc., which are famous worldwide (Times of India, 2021).

Moreover, meme-based cryptocurrencies such as "Dogecoin", introduced in 2013, attracted massive investment in January of 2021, leading to an increase in price and value (Tjahyana, 2021). Thus, summarizing the present state of affairs, memes are dominating social media marketing, utilized by numerous digital agencies to boost engagement and brand visibility. With meme-based applications proliferating for income generation, the future of memes appears promising. The following section discusses a few important meme-related terminologies.

Important terminology

The following paragraphs discuss the concept of Memetics, Memeplexes, Meme Marketing, and Internet Memes.

- **Memetics**: Memetics is a study of memes and related issues. "The science of memetics aims to understand the evolution of socially transmitted cultural traits" (Kendal & Laland, 2008, p. 1004). It is yet to take the form of complete science, as loose ends need to be explained and proven scientifically. One of the crucial issues is operationalizing memetics and putting it to practical use (Marsden, 2008). For memetics to develop as a fully accepted science, it needs a pragmatic background with a quantitative base capable of validating and falsifying claims on scientific levels. As Robert Aunger, Associate Professor, London School of Hygiene and Tropical Medicine said, "Memetics needs to come up with supported, unique predictions and/or existence proof to become valuable. The challenge to our speakers is to provide some support either theoretical or empirical for the meme hypothesis" (Aunger, 2002; Finkelstein, 2008, p.185).
- **Memeplexes**: This term, being analogous to Gene-complexes, was used by Susan Blackmore in 1998 (Blackmore, 1998) to identify the pool of memes of similar nature. They are the collective ideas that have gained stability over a period of time and would not be forgotten easily (Murray et al., 2014), such as good parenting habits or religious beliefs. Memeplexes, short for meme-complexes, relate to a specific school of thought or subject influencing the ideologies of Homo sapiens. These memeplexes fit people's existing mindset and can thrive for a long time.
- **Meme Marketing** refers to all the practices sellers, companies, and entities adopt in gaining attention, engaging the audience, communicating, and disseminating information through memes. As described by Ngo (2021, p. 1), "Meme Marketing (MM) is the practice of promoting a product or service using memes, an internet-based phenomenon involving viral

pieces of user-generated content, including images, articles, and video or audio clips." Meme marketing involves tapping into trends, moments, and current affairs, and generating memes out of them. It is an emerging form of social media marketing.

- **Internet Memes**: Internet memes refer to digital artifacts comprising various media formats. They are utilized by companies for customer engagement and communication. They aid in cultivating a positive brand image, enhancing goodwill, and facilitating cost-effective marketing. Numerous examples, such as "Ache din" by Modi Sarkar and "Sakth Launda" by Zakhir Khan, highlight their prevalence, often stemming from viral events that prompt widespread sharing and discussion.

Purpose of the study

The objective of this research is to conduct a systematic review of current literature on memes and memetics, aiming to analyse their definitions, trace their evolution, and explore current and potential applications. Additionally, the study seeks to identify future research directions in this field. Subsequently, the following section delves deeply into the research methodology.

Research methodology

This paper endeavours to examine how the evolutionary trajectory of memes transpired, and to what extent they have been applied and can be used across varying domains. The research methodology adopted in this study is a systematic literature review of the existing papers and academic work. A systematic literature review assesses predefined research objectives by systematically gathering relevant literature through defining, planning, collecting, screening, and retaining papers meeting the study criteria (Moher et al., 2009). It ensures unbiased selection of the papers due to a meticulous process of selection and reporting (Petticrew & Roberts, 2008).

A research plan was put into action, taking the review process through different stages. The first stage was **planning**, which included activities like identifying the scope of the research and its objectives. The second stage was **organizing**, which included activities like creating and organizing a pool of resources, including papers, books, theses, and articles important for the research. The third and final stage of the systematic literature review is **analysing** the resources collected and presenting a summary of the information synthesized from the review.

For conducting the review and reporting the findings, the PRISMA 2020 guideline for reporting systematic review was adopted (Page et al., 2021). PRISMA 2020 provides a step-by-step procedure and is divided into different stages, such as identification, screening, and inclusion, making it easier to gather resources. The initial phase involved searching and identifying resources using keyword searches across bibliographic databases including Springer, Emerald, SAGE, and DOAJ. Table 1 presents an overview of and the corresponding number of articles retrieved. Theses, deemed foundational for the paper, were also considered. A preliminary pool of 4,805 research articles was compiled, inclusive of keywords specified in Table 1, such as "Meme," "Meme theory," "Memetics," and "Meme marketing." Only open-accessed and peer-reviewed papers within the timeframe spanning from the 1960s to 2023 were included.

Once the articles had been identified, all the references of the identified articles were imported into Mendeley software. Duplicate records were removed from the pool of articles created, using the "check for duplicates" option in the tool menu in the Mendeley software. This reduced our article count to 2,829. In the next step of screening, few inclusion and exclusion criteria were used for filtering out the relevant papers. These criteria are mentioned in Table 2.

Subsequently, papers were assessed for accessibility, alignment with the study's theme, and abstract relevance. Finally, through full text examination,

Table 1
Word search results on different databases

Word search	Emerald	Springer	DOAJ	SAGE
Meme	1000	781	614	335
"Meme" + " theory"	20	781	35	7
memetics	0	2	0	3
"Meme" + "marketing"	850	369	6	2

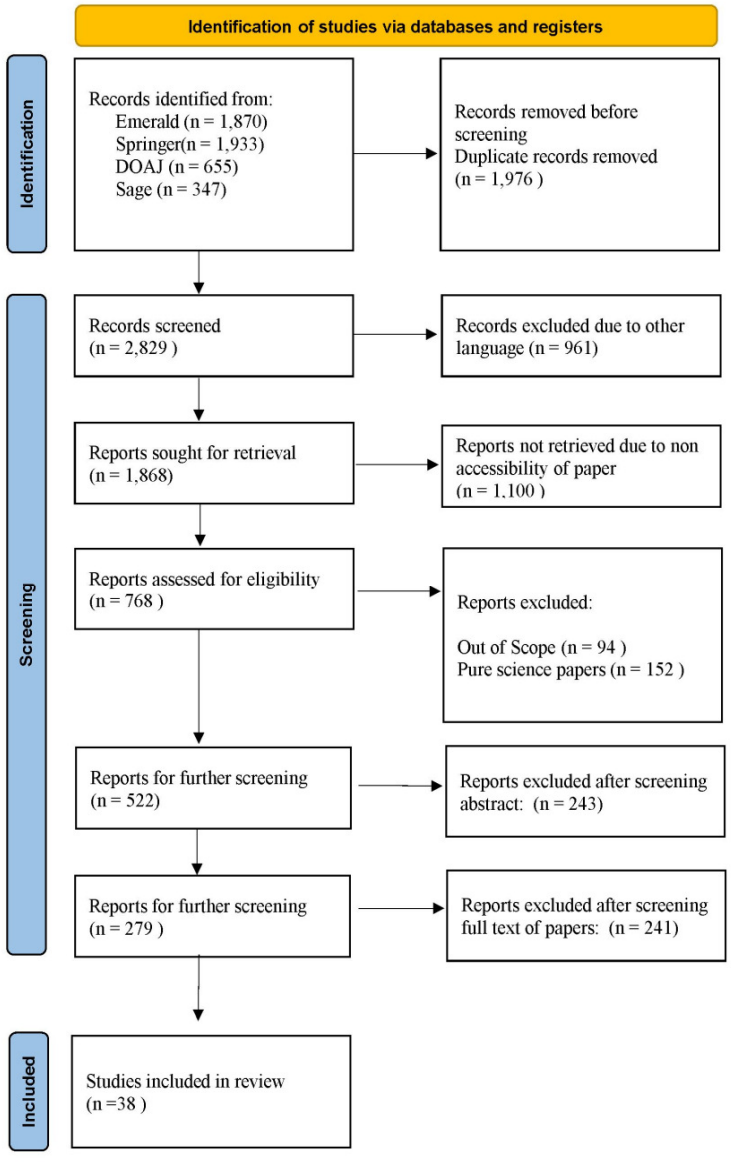
Source: authors' own work.

Table 2
Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
• Studies on the topic, suggesting future research areas.	• Language other than English.
• Research articles, books, a thesis written in the English language.	• Research paper on memes related to biology and other pure sciences.
• Focus on memetics and a meme application.	• Accessibility of research paper.
• Focus on definitions and theoretical development of memes and memetics.	• Essays, commentary papers, and summaries were excluded.

Source: authors' own work.

Figure 1
Flow chart depicting the research process



Source: authors' own work. Guideline: "The PRISMA 2020 statement: an updated guideline for reporting systematic reviews", M. J. Page, J. E. McKenzie, , P. M. Bossuyt, I. Boutron, T. C. Hoffmann, C. D. Mulrow, L. Shamseer, J. M. Tetzlaff, E. A. Akl, S. E. Brennan, R. Chou, J. Glanville, J. M. Grimshaw, A. Hróbjartsson, , M. M. Lalu, T. Li, E. W. Loder, E. Mayo-Wilson, S. McDonald….. & D. Moher, 2021, *Systematic Reviews*, *10*(1), 89 (https://doi.org/10.1186/s13643-021-01626-4).

38 studies were deemed pertinent in addressing the research questions. The studies included in this research highlight the scope of memes and chart their evolution and application in various domains. Figure 1 shows the PRISMA 2020 flow chart.

Result

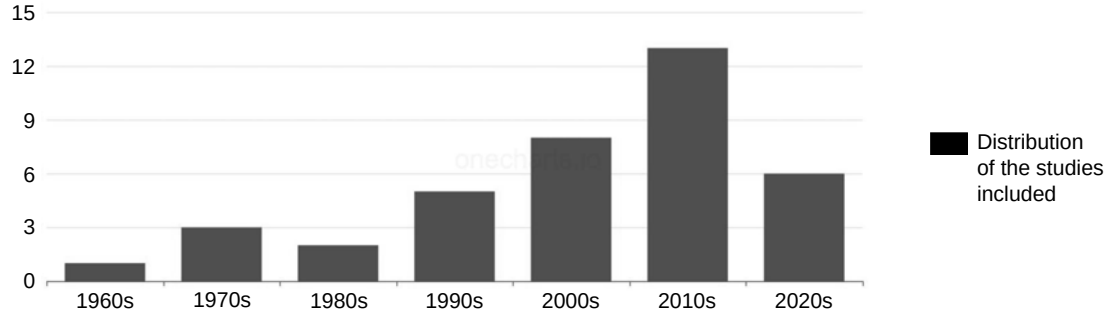
Derived from the literature review, various definitions of memes and their usage, substantiating their evolutionary path, were identified. This segment explores different meme definitions and their applications across diverse fields.

Conceptual development of memes

The review found uneven meme research progress. Despite introduction in 1976, substantial studies emerged in the late 2000s and early 2010s with the rise of internet memes. Figure 2 shows the distribution of 38 studies analysed in this research, spanning from the 1960s to the 2020s. Studies which illustrate memes' scope, evolution, and application across domains were included. This shows that a majority of studies are from the 2010s (13) and the 2000s (8), with a minimal number from the 1960s (1). In other decades, there were three studies from the 1970s, two from the 1980s, five from the 1990s, and six from the 2020s.

Although coined in 1976, similar concepts can be traced back in history to multiple occasions. For instance, in 1880, the Atlantic Monthly published William James' essay „Great men, great thoughts, and the environment," which addressed cultural and social change through meme-like entities (James, 2020). In 1904, the German Biologist Dr. Richard Semon used a similar term 'mneme' in his work 'Die mnemischen Empfindungen in ihren Beziehungen zu den Originalempfindungen'. He formulated a mneme theory in

Figure 2
Decade-wise distribution of studies (1960s–2020s)



Source: authors' own work.

which individuals encounter various stimuli, forming impressions or „engrams" in their memory. Through repetitive stimuli, these engrams accumulate, shaping an individual's mneme, potentially influencing their behaviour (Semon, 1909). These engrams became memes in modern times.

Numerous authors have endeavoured to articulate definitions of memes to address the ambiguity of the term. A few authors stressed learning and sharing by replication and imitation as the basis for deciding whether something can be categorized as a meme, and a few authors have gone beyond the inclusion criteria and considered "anything that can be the subject of an instance of experience" as a meme (Gabora, 1997, p. 8).

Table 3 gives definitions created by some researchers who have shown a keen interest in the development of memetics as a subject. This table contains excerpts from original works, stating the year in which they were published.

Table 3
Definitions given by various experts

Name of the researcher	Work and year	Definition
Richard Dawkins	The Selfish Gene Dawkins, 2016	"Meme is a replicator, a noun that conveys the idea of a unit of cultural transmission, or a unit of imitation. Memes propagate themselves in the meme pool by leaping from brain to brain via a process which, in the broad sense, can be called imitation. Some examples of memes are tunes, ideas, catch-phrases, clothes fashions, and ways of making pots or of building arches." (Dawkins, 2016, p. 192)
Daniel Dennet	Memes and the exploitation of imagination. Philosophy after Darwin, 1990.	"Memes are the name of any item of cultural evolution characterized by variation, heredity, and differential fitness." (Dennett, 1990, p. 127)
John S. Wilkins	What's in a meme? Reflections from the perspective of the history and philosophy of evolutionary biology, 1998.	"A meme is the least unit of sociocultural information relative to a selection process that has favourable or unfavourable selection bias that exceeds its endogenous tendency to change." (Wilkins, 1998, p. 21)
Susan Blackmore	Imitation and definition of meme, 1998.	"When you imitate someone else, something is passed on. This 'something' can be passed on again, and again and so take on a life of its own. We might call this thing as an idea, an instruction, a behaviour, a piece of information. Fortunately, there is a name to it 'meme'." (Blackmore, 1998, p. 160)
Henrik Bjarneskans, Bjarne Grønnevik and Anders Sandberg	The lifecycle of memes, 2008.	"A meme is a (cognitive) information-structure able to replicate using human hosts and to influence their behaviour to promote replication." (Bjarneskans, Gr nnevik & Sandberg, 2008, p. 128)
Gary Boyd	The Human agency of meme machines. An extended review of: Blackmore's The Meme Machine. A Memetics Compendium, 2008.	"Meme is a bounded set of modulations on any carrier which when received by an animal has by virtue of its configuration a high probability of being transduced into neuronal group and synapse threshold representations which result in effectively identical replications of the meme as outputted modulations on other carriers via other animals." (Boyd, 2008, p. 256)

Source: authors' own work.

The above table was created from various sources, including the work of Carlos Mauricio Castańo Díaz (2013), Dr. Robert Finkelstein (2008), Dr. Susan Blackmore (2000). From the definitions given, a meme is seen as a cultural information replicator that spreads through imitation and variation, including ideas, behaviours, or pieces of information. One meme is the story of Little Red Riding Hood, which has traversed geographical and temporal boundaries through oral communication and been adapted with slight variations into various forms such as movies, bedtime stories, images, audio-video compilations, and plays, enduring in the collective consciousness over time. Memes as a cognitive element influence behaviour for cultural replication, revealing complex cognition-behaviour dynamics. However, these definitions remain incomplete and warrant further consideration.

Application of Memes in various areas

Memes and memetics can have applications in various areas. They can be a medium to stimulate consumer engagement (Ngo, 2021), further propagating brand image (Teng et al., 2022) and affordance-based brand awareness (Williams, 2000), eventually leading to the evolution of the brand (Wu & Ardley, 2007). Memes can be also used as a broadcasting tool, disseminating material of a political nature (Mukhongo, 2020); as a campaign aid for creating awareness around sociocultural issues (Iloh, 2021), as a tool for raising awareness of global health hazards such as COVID-19 (Msugheter, 2020) and as a linguistic persuasive tool providing vernacular flexibility (Caliandro & Anselmi, 2021).

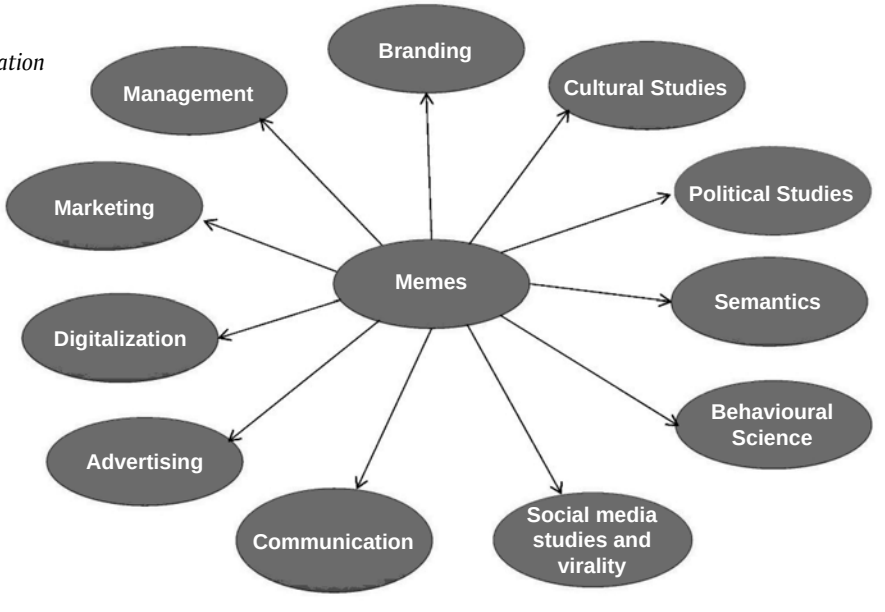
In his work, 'Critique and defense of Memesis', researcher Onar Aam (2008) identified a list of areas where memetics should be applied and developed. These areas included phenomenology, behaviourist sciences, systems theory, communication theory, and cognitive sciences. He further stated that the list was incomplete and would grow with time. In accordance with the above, figure 3 shows the areas identified following the systematic literature review. All these areas are discussed in this paper below.

Major areas identified

1. **Memes and Advertising:** Corporates can motivate social media users to generate and share content revolving around their brands. In a case study of Kentucky Fried Chicken (KFC) by Laestadius and Wahl (2017), it was observed that five percent of user-generated brand-related posts took the form of memes, indicating their potential for brand promotion.
   Besides user-generated content, corporates can opt for paid meme content available through trusted sites and platforms. This content is pre-designed according to the company's goals, objectives, and strategies. Hence, they have a high chance of becoming successful. Their quality, accessibility, and congruity increase online traffic and views, establishing credibility and reach (Wolk & Theysohn, 2007).
2. **Memes and Communication:** Memes help in communicating and enhancing consumer engagement. Companies can share images and memes through their brands' pages or pages owned by others to connect with the users (Dolan et al., 2017). These companies can post memes related to their brands, accentuating brands' unique selling propositions, or they may combine the prevalent trends with their propositions and address the ethics, motos, and virtues that the company stands for. Either way, they can leverage the communication, situation, and perceptibility in their favour. They can also advocate in current affairs, national and global issues, and environmental issues.

Figure 3
Areas identified for meme application

Source: authors' own work.



3. **Memes and Digitalization**: Memes can be categorized and grouped on various bases (Langrish, 2008), such as appearance, combination, subject matter, medium, and underlying emotion. All these distinct memes can be converted into digital artifacts using the Internet. Subsequently, with the recent rise in internet usage and innovation, people's online participation has increased, leading to participatory culture and spreadable media (Mukhongo, 2020).
   With memes getting popular, content creators can monetize from creating original memes. However, they must be aware of copyright and authorship policies (Soha & McDowell, 2016).
4. **Memes and Semantics**: Memes as a tool of expression rely on underlying emotions and themes to gain attention. Most memes are laced with humour (Mukhongo, 2020). Apart from humour, other themes commonly observed in memes are history, a motto, news, symbolism, and mythology (Hakokoöngäs et al., 2020).
   Memes allow users to modify the text, aesthetics, and context as they wish. They provide users with grammar and vernacular flexibility, leading to brand engagement (Caliandro & Anselmi, 2021). People like to follow a trend, and memes help them to be a part of one through modalities of slang, grammar, and textual combinations. They also lead to acceptance by persuasion by repeatedly iterating the same thing, using assertive language.
5. **Memes and Branding**: Marketers can deploy various online marketing strategies to grow their brands, including brand promotion through memes (Lim et al., 2016). Memetic brand posts, sharing similar templates and resonating with specific product experiences, foster brand awareness and affordance-based relationships (Caliandro & Anselmi, 2021). These posts, circulated within meme-based brand communities or pages, unite like-minded factions. Memetics analysis facilitates meaningful brand-customer connections by aligning brands with societal values (Marsden, 2002). For instance, meme-driven campaigns may associate brands with nationalism or philanthropy, tapping into consumer emotions and values.
6. **Memes and Social Media Studies**: Memes can be shared on various digital platforms, such as Twitter and Instagram, which increases their reach and allows them to become an in-joke or urban myth. An example of this was seen with the video meme 'Harlem Shake', which went viral on YouTube and Reddit (Soha & McDowell, 2016). Each platform has its own tools and purposes, making them unique for studying memetic-like artifacts, such as the case of Instagram (Caliandro & Anselmi, 2021). Further, most research papers cover only one or two social media platforms rather than taking a comprehensive approach, thus suggesting the need for further research.
   a. ***Memes and Virality:*** Memes are a complex type of contagion that can spread like a disease in communities (Weng et al., 2013). A variety of measures, including community concentration, reinforcement (Weng et al., 2013), image composition, subject, and audience (Ling et al., 2021), potentially impact their virality. Psychological factors, like brain hardwiring and adaptation to evolution, can explain memetic success, with potential applications in business, fashion, and advertising.
7. **Memes and Cultural Studies**: Memes are considered a unit of cultural transmission. They are the means through which languages, rituals, and customs have thrived and stayed with human beings for so long. Jokes, urban legend, folklore, and native lullabies result from spreading of memes (Lord, 2012). They are the reason behind the norms of behaviour. Memes enable collective coping, initiate social movements, and serve as an aid for cultural transformation. Memes help in mitigating stress and bringing society together in difficult times. People can demonstrate their emotions, especially fear and doubt. They are a safe space to share (Flecha Ortiz et al., 2021).
8. **Memes and Behavioural Science**: Memes can be used to understand consumer behaviour. They are like an entity that is passed on by imitation. People generally imitate each other's behaviour. Marketers should study this imitating behaviour in creating new products and demands, which are sometimes based on copying and following the trend instead of making conscious choices (Marsden, 2008). Memes and memetics are developing paradigms, and more investigation of their role in understanding customer behaviour is required (Williams, 2002).
9. **Memes and Political Studies**: Memes can convey political thoughts and ideas. They indulge in bitter humour or sarcasm to spread information through the poly-vocal structure of the Internet (Hakokoöngäs et al., 2020). They can create political pressure through continuous persuasion and motivate individuals to take part in expressing political opinions, sharing political meme-based posts, standing in political contestations, and supporting online protests (Mukhongo, 2020).
10. **Memes and Marketing**: Many researchers like Paul Marsden and Russell Williams hinted at the use of memes in marketing and business decision-making. Memes can supplement relationship marketing strategies and electronic word of mouth (Kurultay, 2012). Local businesses can also utilize marketing through memes and increase their reach by tapping into local iconicity. *Iconicity* refers to the harmony and cohesiveness between the meme's text, image, form, and meaning. However, caution is advised while collaborating on the right meme in the right context conveying the right words to increase the chance of positive consumer reactions (Ngo, 2021).

11. **Memes and Management**: Memes are an innovative tool that businesses should adopt to mimic and promote the best practices at all levels of the organization (Pech, 2003). Good conduct and performance can be fostered using memes, and they can be pro-biotic or life-saving, but should also be handled carefully in order to avoid hurting the organization's image, product, sales, and profit. Meme study can also help manage organizational change (Lord, 2012).

Discussion

Memes have the power to revolutionize the world in many ways. They are all-pervasive. Therefore, it is essential to understand their ambit. Through this paper, the attempt has been made to study, analyse, and contribute to the field of memes and memetics. Their origin, definitions, conceptual development, and usage in various areas are noted.

Researchers have recognized memes' potential as marketing tools, essential for branding strategies to shape company images and influence consumer behaviour and perception. They carry cultural, behavioural, and miscellaneous knowledge from one generation to another. They help to preserve a long-established modus operandi, the accepted social conduct, and the civilities one is expected to observe. For instance, all eating habits, rituals, cultural customs, languages, and scientific notions are passed on only through these knowledge bytes. They can be preserved in scriptures, journals, and books, or followed as a practice and imparted to future generations.

Moreover, they can also be used to promulgate information of a political and social nature. This can consequently help in change management through adoption of desired behaviour, which can lead to the implementation of commendatory practices at the office and bring organizational change.

Future of Memes and memetics

The future of memes and memetics appears bright. Memes have taken over websites, social media platforms, chats, and conversations. This small and contagious idea has become part of our lives. From websites like knowyourmeme.com, which acts as a meme cloud, to a billionaire like Mr. Elon Musk, CEO of Tesla Motors, supporting the cause and importance of memes by commenting on the following tweet through his Twitter handle, on 26 June, 2020, "Who controls the memes controls the universe", increasing the gravity of the situation. The following paragraphs briefly discuss the future of memes.

Memes can be considered as a display of 'Modern Art'. Numerous Non-Fungible Tokens (NFT) have been used for them, and are for sale in the NFT market. A Non-Fungible Token is a blockchain based digital object. These digital affordances come with a digital certificate of ownership (Chalmers et al., 2022). In the coming years, the world will witness an increase in meme-based NFT trade.

The future will bring blockchain integration in memes, emergence of meme-based cryptocurrencies, a rise in market capitalization, use of memes as NFTs, and evolution into a contemporary art form. This growth fosters memetics as both a science and art, necessitating comprehensive research to establish its epistemological, scope, and scientific foundation.

Memes are inching towards becoming a feedback collection mechanism, as they provide an easy and jocular way to convey information. They will soon be used as part of a questionnaire or survey, collecting feedback, opinions, thoughts, and suggestions in a playful manner (Iloh, 2021).

There will be a surge in the number of political, social, art-based, cultural, corporate, advertising, and marketing meme-based campaigns. All these developments would entail the establishment of a code of ethics, rules, and legal framework for limiting any sort of discrimination through meme or meme-based entities.

The future of memes will witness and mandate the requirement and adoption of the following actions for a stable meme-enabled world:

1. Setting of advertising standards for meme-based marketing and communication.
2. Adoption of meme marketing and meme marketing plans by big and small organizations.
3. Development of means to measure the reach and engagement level of a meme, in short, to measure and analyse the return on investment of a meme.
4. Regulation of meme-based coins by enacting laws and adopting acts defining the memorandum for meme-based cryptocurrencies.
5. Provision of institutional and infrastructural support for creation, circulation, and encashment through meme and meme-based entities.

Conclusion

In conclusion, the evolution of the term 'meme' from its simple origins to a complex phenomenon underscores its multifaceted nature, as evidenced by its diverse interpretations. The synthesis of meme definitions highlights their profound role as conveyors of information, sustained by imitation and variation. This research has pinpointed key traits for meme longevity and identified diverse formats like ideas, slogans, audio, and tweets. They wield a significant influence on human behaviour. Additionally, the investigation of memes as online phenomena and their incorporation into marketing strategies has underscored their widespread influence on modern society. Furthermore, the elucidation of concepts such as memetics, memeplexes, and meme marketing has broadened our comprehension of the far-reaching implications and practical applications of memes in diverse contexts.

This study highlights memes' immense potential, spanning diverse fields such as management and semantics. With versatile applications, memes engage consumers, enhance brands, broadcast political

messages, drive sociocultural awareness campaigns, and persuade linguistically with cultural adaptability, impacting various facets of human life across cultural, social, political, business, religious, and behavioural realms.

The study infers that a solid foundation needs to be established in this field to facilitate future scholars' comprehension of its fundamentals. This systematic review serves to delineate the scope of a meme, representing a comprehensive effort to enrich and expand upon the theoretical framework of this burgeoning area of study.

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The full list of references is available in the online version of the journal.

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Danuta Bąk

Sylwia Bąk

Change management in healthcare – a scoping literature review

Abstract

The healthcare sector is constantly changing due to many different factors, both external and internal, such as regulatory, organizational, technological, personnel, financial, and geopolitical change. Change management methods and tools are useful for effectively planning, implementing and monitoring change. The important issue is in which areas and to what extent change management is utilized in healthcare. The aim of this text is therefore to conduct a scoping literature review on change management in healthcare and to develop, based on the results of this research, a theoretical model of determinants and motives for implementing change management in healthcare. A scoping review of the literature was conducted to determine the extent to which change management is applied in healthcare organizations. Texts meeting the inclusion criteria were searched for in four databases: PubMed, Embase, Scopus, and EBSCO. The search was limited to texts published in English. Of the 247 publications screened, 73 met the inclusion criteria. Additionally, 1021 keywords were selected from the screened publications, of which 137 met the inclusion criteria and were approved for the keyword analysis. The keywords formed seven thematic clusters: human, change management, organization and management, leadership, healthcare delivery, hospital management, and productivity. There are a number of motives for using change management in healthcare, and all centre around a few determinants that can be divided into those directly related to the specifics of the healthcare sector and those directly related to management processes. These determinants and motives were included in the theoretical model.

Keywords: change management, healthcare, hospital, medicine, scoping review

Introduction

The healthcare sector is one of the most important sectors of the global economy, and indispensable for its stable functioning (Boyce & Brown, 2019). Today, its role is even more accentuated, particularly due to the past COVID-19 pandemic, which caused a number of diverse problems for entities in this sector (Jedynak & Bąk, 2021). For several decades, in times of systemic changes, crises, and reforms of the healthcare sector, changes have been introduced in various regions of the world to increase the quality of health services provided, improve access to them, introduce upgrades and innovations in line with technological advances, and improve the efficiency of the operational tasks carried out by healthcare organizations (Deloitte Global, 2022).

To make these changes more effective, advanced management methods and tools need to be implemented in the healthcare sector (Bąk, 2022). What attracts considerable attention due to its effectiveness in this as well as other sectors, is the methods and tools of change management, which enable professional management of planning, implementing, and monitoring operational, strategic, and systemic changes in healthcare organizations (Harrison et al., 2021).

The results of many scientific studies (e.g. Al-Abri, 2007; Igoe, 2021; Yousefi et al., 2022) indicate that change management is vital in the healthcare sector, particularly in times of turbulence and crisis. However, change management methodologies are not yet widely used in reforming the healthcare sector globally. In contrast, where professional change management in healthcare organizations is used, it has proven to be very effective and has been welcomed by healthcare managers and executives as well as employees and patients (Nilsen et al., 2020).

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In order for healthcare organizations to better understand and take advantage of change management methods and tools, identification and diagnostic studies in this area are needed. This scoping review aims primarily to identify areas of healthcare where changes, improvements, and enhancements are implemented using management methods based on change management.

Methods

The main aim of the research was to identify existing research evidence regarding change management in healthcare. With respect to the research area under consideration, an approach to the analysis of the literature in terms of its existing scope seems most reasonable. To achieve the main research aim, two specific aims were set:

- to conduct a scoping literature review on change management in healthcare,
- to develop a theoretical model of determinants and motives for implementing change management in healthcare.

The main method used in the research procedure was therefore a scoping review of the literature on the subject (Armstrong et al., 2011; Munn et al., 2018). Consequently, the authors followed the methodological rigour of this research method (Arksey & O'Malley, 2005; Levac et al., 2010; Peters et al., 2015). Furthermore, during the final analysis of the substantive content of the texts, the authors used the method of logical categorization, satisfying the criteria of exhaustiveness and separability required by the rigour of this method when creating categories (Bailey, 1994; Saran, 2014):

– exhaustiveness:
  - all keywords were included in a substantively adequate cluster (Table 1),
  - all texts were included in a substantively adequate category of scope (Table 3).
– separability:
  - each keyword is allocated to only one cluster (Table 1),
  - each text is allocated to only one category of scope (Table 3).

In order to develop a theoretical model of determinants and motives for implementing change management in healthcare, an exploratory approach to research was adopted (Saunders et al., 2009). Using this research approach, the determinants of change management in healthcare were defined based on clusters of keywords of the analysed texts identified in the research process. Moreover, based on the categories of scope of the analysed texts identified in the research process, the motives for implementing change management methods and tools in healthcare were defined. Then, the authors determined the relationships and activities connecting the defined determinants and motives, and thus an original theoretical model of change management in healthcare was created.

Search strategy

The authors searched for the literature on the subject in four databases: PubMed, Embase, Scopus, and EBSCO. The choice of databases was not random. In view of the fact that the research area under consideration is multidisciplinary and is a point of intersection between healthcare and management, the authors selected two medical databases and two multidisciplinary databases in order to increase the probability of finding most of the scientific texts on the topic of change management in healthcare published to date. The authors applied the following initial search criteria: 1) articles and peer-reviewed conference proceedings in English only, 2) the occurrence of established headwords at the level of text titles. The authors compiled a list of 36 headwords representing exhaustive possibilities for identifying the topics of articles the authors were interested in. On this basis, the authors established search queries tailored to the search systems in the respective databases. The overall strategy adopted for searching texts in the databases is shown in Figure 1.

Article selection

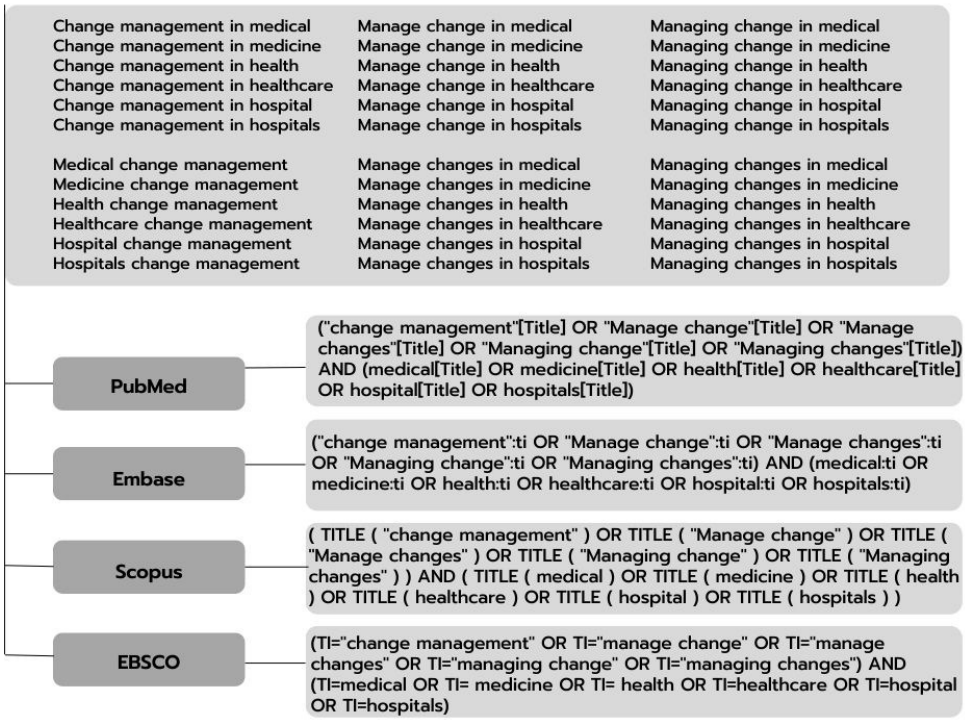
The final number of texts to be examined was selected in two steps (Step I and Step II).
Step I – in the first step, the texts retrieved from the databases, based on the strategy presented in Figure 1, were purged of duplicate items.
Step II – in the second step, from the list of publications created in Step I, the authors selected only those available in Open Access. Then, from the remaining texts available as the full text, the authors eliminated texts with specific subject matters not directly relevant to the research issue under consideration.

Data extraction and analysis

The authors continued the process of data extraction and analysis, using also a two-step scheme (Step I and Step II).
Step I – in the first step, the texts approved at the article selection stage underwent a quantitative and qualitative keyword analysis based on the VOSviewer software. The qualitative analysis concerned the substantive assessment and the meaning of keywords, while the quantitative analysis concerned the frequency and repetition of individual keywords and subtraction of those keywords that did not pass the substantive assessment: the set of the keywords gathered from all the texts was cleared of those that were not relevant to the research objectives. The remaining keywords were grouped into thematic clusters adequately reflecting the scope of the research topic under analysis. The authors presented these clusters according to frequency of occurrence in the texts and the network of relationships among the keywords, as well as in chronological order.
Step II – in the second step, the authors analysed the texts approved at the article selection stage in terms of their substantive content. For this purpose, the authors performed a logical categorization.

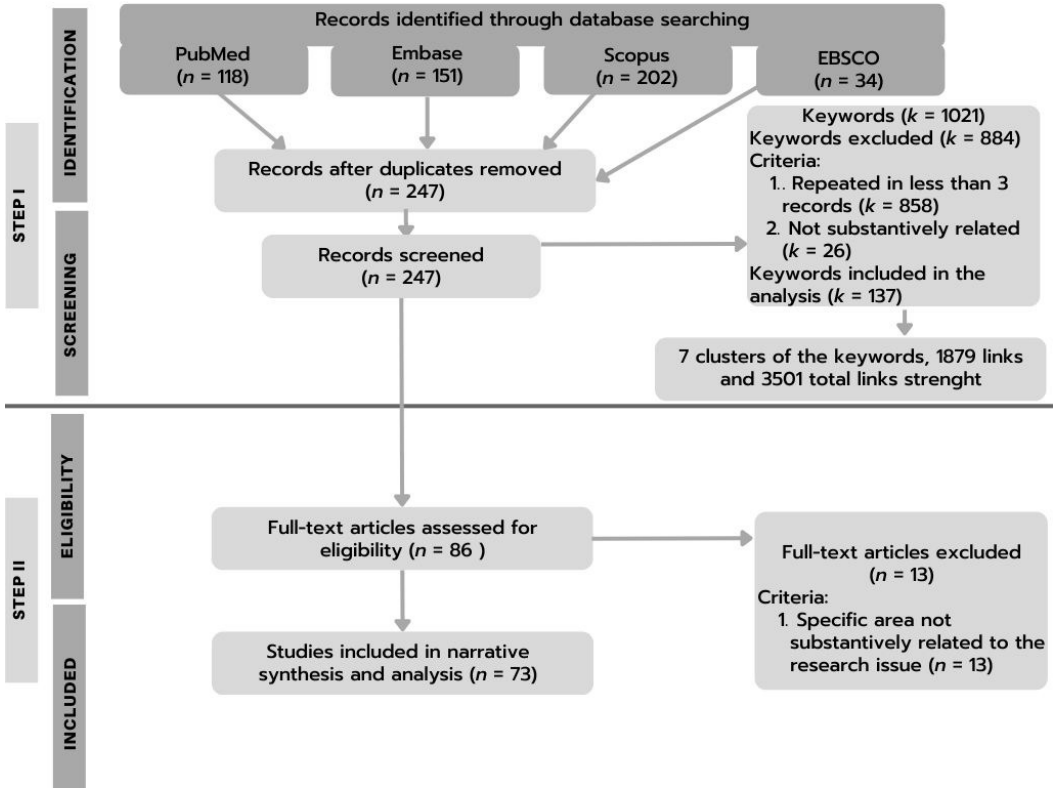
The study selection process is presented in detail in Figure 2.

Figure 1
Search strategy



Source: authors' own work.

Figure 2
Flow chart showing the text selection process



Source: authors' own work.

Results

Search results

The results of the search and application of the defined inclusion and exclusion criteria of the retrieved texts were consistently divided into Step I and Step II, according to the established research procedure (Figure 2).

Step I – in the first step, using a keyword search strategy (Figure 1), the authors retrieved from the databases a total of 505 publications with at least a title, abstract, and keywords available. The number of the publications obtained from the respective databases was as follows: PubMed (118), Embase (151), Scopus (202), and EBSCO (34). The database search process was carried out in June 2023. After eliminating duplicate items (258), the authors were left with a publication list of 247 items meeting the inclusion criteria indicated above (Figure 2).

Step II – in the second step, from the list of the publications accepted in Step I, the authors deleted all texts that were not available as the full text (161). Thus, the authors identified 86 publications available in Open Access for further analysis. The authors then analysed the texts' titles and abstracts with regard to their substantive content and excluded those that were of a specific nature, not directly related to the issue of change management in healthcare. These were, for example, texts on veterinary medicine or bio-medical ontologies. On this basis, the authors eliminated thirteen texts from the list and, consequently, approved 73 texts for the final analyses.

Scope

The analysis of the scope of the collected publications was also performed in two steps (Step I and Step II). The scope was determined based on a quantitative-qualitative analysis.

Step I – the search for keywords in all 247 publications produced a total of 1021 items. The authors then filtered out the keywords that were repeated in three or more texts, considering their repetition as a criterion of representativeness. On this basis, the collected list of keywords was reduced to 163 items approved for further analyses. Following individual selection after excluding keywords with no substantive connection to the subject matter under examination, such as country names, article, review, etc. (26), the authors eventually included 137 keywords in the scope analysis. These were categorized in the VOSviewer software and divided into seven thematic clusters. Each cluster showed network links and relationships between the keywords contained within it. Altogether, the authors identified 1879 links and 3501 total link strength. At the centre of each cluster were the following keywords:

Cluster 1 – human (occurred in 103 texts),
Cluster 2 – change management (occurred in 91 texts),
Cluster 3 – organization and management (occurred in 61 texts),
Cluster 4 – leadership (occurred in 32 texts),
Cluster 5 – healthcare delivery (occurred in 21 texts),
Cluster 6 – hospital management (occurred in 14 texts),
Cluster 7 – productivity (occurred in four texts).

The keyword clusters are presented in Table 1.

Table 1
Keyword clusters

Total link strength	Occurrences	Keyword	Cluster	Keyword	Occurrences	Total link strength
48	5	Clinical practice	5	Community care	8	60
71	7	Consultation	5	Controlled study	5	43
32	4	Cooperation	5	Decision making	5	29
21	4	Economic aspect	5	Education program	4	28
57	5	Financial management	5	General practitioner	3	28
22	3	Government	5	Healthcare delivery	21	148
101	14	Healthcare management	5	Healthcare organization	14	98
106	13	Healthcare quality	5	Healthcare system	8	68
34	3	Health program	5	Health promotion	3	10
148	19	Health service	5	Health services research	6	55
34	3	Hospital care	5	Medical care	7	13
89	13	Medical education	5	Medical profession	4	41
33	4	Medical school	5	Medical staff	3	29
52	6	Medical student	5	Mental health	3	21
100	10	Patient care	5	Pharmacist	3	18
38	4	Physician attitude	5	Primary Healthcare	5	31
44	6	Public health	5	Public hospital	4	25
41	3	Society	5	Teaching	4	46

Table 1 – continue

Total link strength	Occurrences	Keyword	Cluster	Keyword	Occurrences	Total link strength
39	4	Work environment	5			
23	3	Adaptive behaviour	3	Administrative personnel	3	24
44	4	Behaviour	3	Evaluation study	4	40
		Healthcare facility	3	Healthcare planning	8	77
110	15	Healthcare policy	3	Hospital organization	10	74
17	4	Hospital subdivisions and components	3	Information system	3	15
77	8	Interpersonal communication	3	Medical informatics	7	36
35	4	National health service	3	Nurse administrator	4	43
439	55	Organization	3	Organization and management	61	495
36	5	Personnel management	3	Professional standard	4	40
46	5	Public relations	3	Social change	4	29
49	6	Standard	3	Workforce	5	51
48	3	Cost	6	Database	3	52
22	3	Delivery of Healthcare	6	Documentation	3	55
89	8	Economics	6	Health facilities	14	113
81	6	Health personnel attitude	6	Hospital cost	3	53
97	8	Hospital department	6	Hospital information system	4	64
123	14	Hospital management	6	Humans	7	66
59	5	Mass communication	6	Medical record	5	62
94	7	Nursing stuff	6	Operating room	5	42
57	4	Organizational innovation	6	Practice guideline	5	61
82	6	Psychological aspect	6	Software	5	42
120	11	University hospital	6			
27	3	Case report	1	Change	3	10
38	4	Coronavirus disease 2019	1	Emergency care	5	50
46	4	Follow up	1	General hospital	3	24
21	3	Healthcare cost	1	Human	103	795
44	7	Human experiment	1	Information processing	9	84
23	3	Organizational culture	1	Pandemic	5	38
46	6	Procedures	1	Program development	3	23
55	8	Qualitative research	1	Quality control	4	30
30	3	Retrospective study	1	Skill	4	37
13	3	Strategic planning	1	University	3	31
28	3	Vision	1			
28	3	Adoption	4	Check list	4	37
39	3	Clinical audit	4	College	3	32
110	11	Education	4	Electronic medical record	5	55
31	3	Funding	4	Healthcare personnel	8	54
143	16	Hospital	4	Hospital administrator	4	23
302	32	Leadership	4	Manager	7	75
92	8	Nurse	4	Physician	11	121
33	3	Planning	4	Risk	3	33
38	5	Teaching hospital	4	Telehealth	3	13

Table 1 – continue

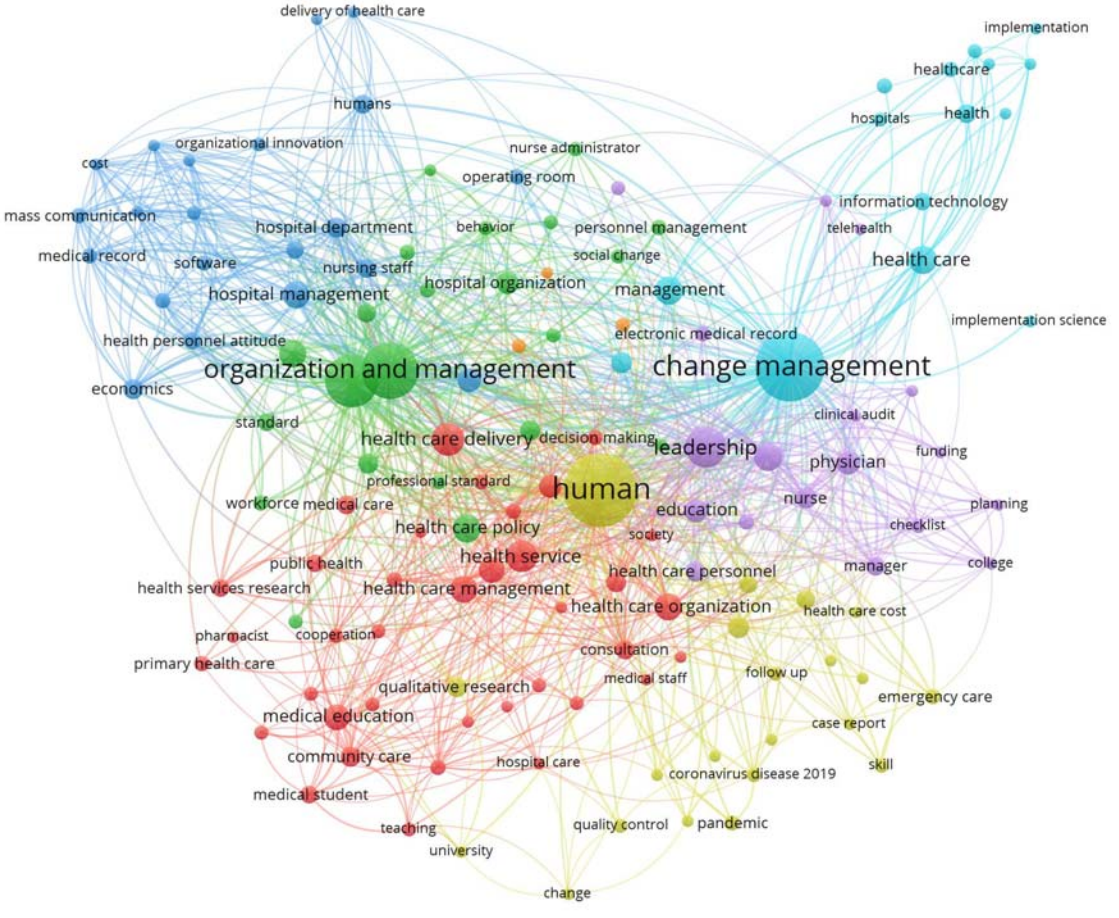
Total link strength	Occurrences	Keyword	Cluster	Keyword	Occurrences	Total link strength
472	91	Change management	2	Change management process	3	14
31	7	Health	2	Healthcare	16	93
9	3	Healthcare system	2	Healthcare	5	10
9	4	Hospitals	2	Implementation	3	9
9	3	Implementation science	2	Information systems	5	26
32	6	Information technology	2	Information use	4	19
91	15	Management	2	Organizational change	5	6
83	9	Total quality management	2			
31	4	Job satisfaction	7	Organizational structure	3	20
45	4	Productivity	7			

Source: authors' own work.

The network of links in the thematic clusters of the keywords is presented in Figure 3.

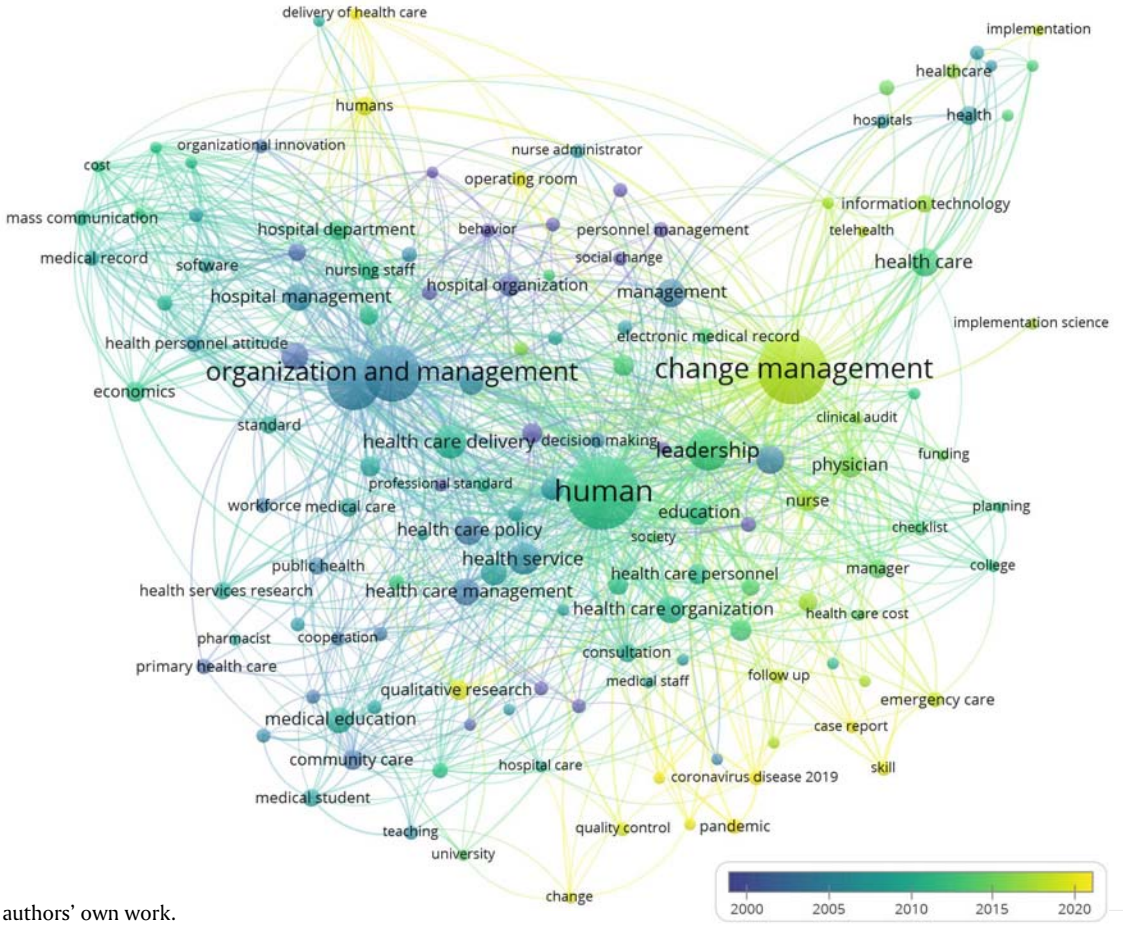
In determining the scope of the literature on the area under analysis, it is extremely important to arrange the thematic content appearing in the selected texts chronologically. The 247 texts selected and included in the analyses in Step I had publication dates beginning in 1969 and ending in 2023, which

Figure 3
Network of links among the keywords



Source: authors' own work.

Figure 4
Chronological distribution of the keywords



Source: authors' own work.

confirmed the continuous development of the issues in scientific literature. The chronological changes in the emerging keywords are shown in Figure 4.

Table 2 shows the chronological distribution of the texts approved for the keyword analysis in Step I, divided into single-author and multi-author texts.

Step II – After obtaining the final number of texts approved for the final analyses (73), the authors categorized them by scope, creating factual categories of healthcare areas in which change management was evidently applied. This scope categorization is presented in Table 3.

The analyses determined that the substantive areas of the texts approved for the analyses formed coherent categories, adequately reflecting the areas of healthcare change management methods and tools were applied effectively. A majority of the analysed texts (23%) concerned change management in healthcare in the areas of digital transformation and implementation of innovations. The authors observed an intensification of this trend from 2020, i.e. the year of the COVID-19 pandemic, during which digitalization, innovation, and the development of telemedicine became some of the most important areas of change

Table 2
Chronological distribution of the selected texts

Time span	Number of publications	Single-author texts	Multi-author texts
1969–1979	7 (3%)	6 (86%)	1 (14%)
1980–1990	17 (7%)	13 (76%)	4 (24%)
1991–2001	31 (13%)	23 (74%)	8 (26%)
2002–2012	75 (30%)	31 (41%)	44 (59%)
2013–2023	117 (47%)	29 (25%)	88 (75%)

Source: authors' own work.

Table 3
Scope categorization

Category	Publications (in chronological order)		Number of publications	
			number	%
Digital transformation and innovations	Shaban-Nejad & Haarslev (2007); Hutchinson (2023); Shoolin (2010); Swecker et al. (2010); Kulhanek (2011); Takian (2012); Grandpierre et al. (2016); ChePa et al. (2017); ChePa et al. (2018); Ileri & Arik (2018); Ningtyas et al. (2020); Threatt et al. (2020); Hospodková et al. (2021); Razmak et al. (2021); Ferrara et al. (2022); Martens et al. (2022); Yusif et al. (2022)		17	23
Fundamental management processes and employees	Al-Abri (2007); Allen & Stevens (2007); Mazur et al. (2010); Lee et al. (2011); Macphee & Suryaprakash (2012); Shipton et al. (2014); Gibbons et al. (2021); Harrison et al. (2022); Turja (2022); Pachamanova et al. (2022); Yousefi et al. (2022); Harris (2023); Webster (2023)		13	18
Education	Godbolt et al. (1997); Thistlethwaite (2000); Agius et al. (2008); Chandran et al. (2013); En chescu & Trapiel (2014); Al-Moosa & Sharts-Hopko (2017); Barker et al. (2020); Ward et al. (2020); Vickers et al. (2021); Karimi et al. (2022); Li et al. (2022); Torkzadeh & Mohtaram (2022)		12	16
Medical specialization modules	Cardiology	Alsunbuli (2020)	11	15
	Pharmacology	Deavin et al. (2023)		
	Oncology	Divaris & Srigley (2012); Sale et al. (2019)		
	Surgery	Neuwirth et al. (2021); Farrelly (2022)		
	Neurology	Karlsson & Nordström (2022)		
	Psychiatry	Kingsley (1993); Ritson & Waterfield (2005)		
	Pediatrics	Law et al. (2011)		
	Gynecology	Sobkowski & Opala (2014)		
Implementation of professional management methods	Soft Systems Methodology	Augustsson et al. (2019a; 2019b)	5	7
	Lean Healthcare	Maravi-Cardenas et al. (2020); van Rossum et al. (2016)		
	Action research	Margulies (1977)		
Disparities in healthcare	Coombe (2008); Pratt et al. (2012); Odaga et al. (2016); Betancourt et al. (2017); Carman et al. (2019)		5	7
Reforming of healthcare	Casebeer et al. (2000); Villalbí & Farrés (2005); Kiernan & Tunney (2016); Javanparast et al. (2018)		4	6
Financing of healthcare	Carlson (2009); Ruhl & Klöss (2012); Walsh (2016)		3	4
Standardization	Appleby & Tempest (2006); Bourke et al. (2016); Harrison et al. (2021)		3	4

Source: authors' own work.

in healthcare. The second area in which change management was applied in the healthcare sector was fundamental management processes in the management of healthcare facilities, mainly related to changes in procedures concerning individual groups of employees. Medical education and medical specialization modules constitute two further healthcare areas undergoing intensive change implementation processes. The subsequent categories relate to the use of change management tools for: 1) implementing professional management methods (e.g. Lean Management or Action Research) in healthcare, 2) addressing disparities in healthcare, 3) reforming the healthcare system, 4) healthcare financing, and 5) standardizing procedures in healthcare.

Discussion

The most frequently adapted change management models in healthcare include Lewin's 3-Stage Model (Mind Tools, n.d.) and Kotter's 8-Step Model (Kotter, 1995). These models have an application and practical dimension, which means that in many cases they are used to implement change management tools in specific dimensions of the functioning of healthcare units, e.g. optimizing the work of doctors and nurses, improving the efficiency of operating theaters and hospital wards, improving the quality of patient care, etc. These models are currently successfully implemented in various projects to improve healthcare units (Harrison et al., 2021).

The model that includes the determinants and motives of change management in healthcare, which was developed by the authors of this text (Figure 5), differs from the practical models discussed above, because it has a theoretical dimension. It is the result of modelling the scope of use of change management tools in healthcare. It does not cover the analysed topic fragmentarily, but holistically, and indicates paths for the possible use of change management in the examined sector. It is therefore the basis for designing application solutions that can be implemented in healthcare units. Therefore, this model can be considered the first step in planning modern solutions that improve how the sector functions based on professional change management methods and tools.

Modelling the scope of change management in healthcare

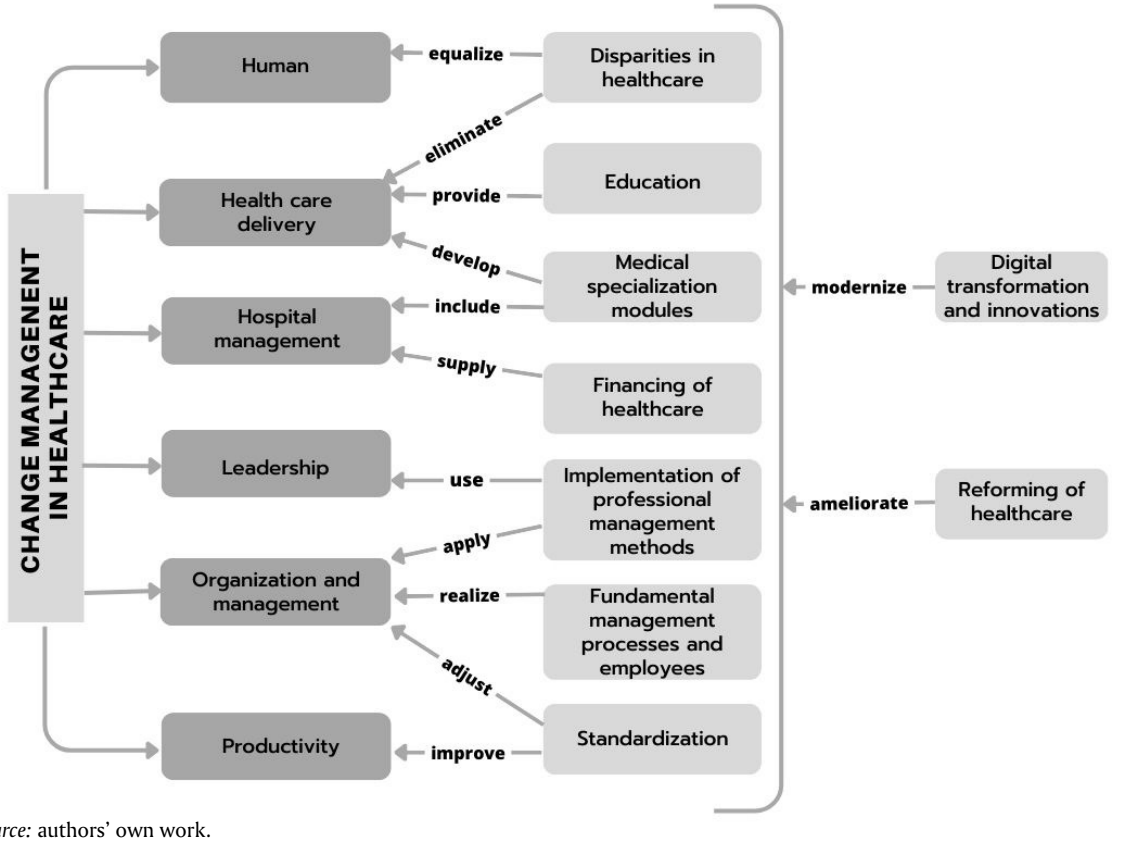
The articles analysed in the review presented in this paper made it possible to determine clearly the scope of the texts in the thematic area of change management in healthcare. By categorizing their topics and analysing their keywords, it is possible to model not only the scope of the scientific literature on this topic, but also the main motives for using professional change management methods to improve and develop the healthcare sector. The authors therefore undertook to create a model reflecting the main determinants of and motives for change management in healthcare (Figure 5).

The main determinants of change management in healthcare can be divided into those directly related to the specifics of the sector and those directly related to management processes. Sector-specific determinants include patients, delivery of healthcare, and management of healthcare entities, while those directly related to management include organization of management processes, system productivity, and leadership.

The analysis identified the following the motives for implementing change management in healthcare:

- reforming the entire healthcare system in order to correct inadequacies in the delivery of healthcare services, as well as improving the management procedures in healthcare entities,
- implementing digital transformation and innovations across the healthcare sector with a view to extending the scope and improving the quality of healthcare services, and modernizing management methods and techniques,
- redressing inequalities in patients' access to health services and eliminating other disproportions in their delivery processes,
- ensuring an adequate range and level of education of medical personnel, which determines the continuity of healthcare delivery and quality improvement,

Figure 5
Determinants of and motives for change management in healthcare – a theoretical model



Source: authors' own work.

- developing medical specialization modules in the provision of increasingly sophisticated healthcare services,
- basing the management of healthcare entities on medical specialization modules, which should constitute the core of the functioning of the whole system,
- ensuring access to sources of funding allowing for the continuous development of healthcare entities,
- implementing professional management methods in organizational leadership development,
- applying professional management methods as a standard procedure in the organization and management of healthcare entities,
- performing all basic management processes in the management of healthcare entities with particular focus on the processual nature of the fulfilment of duties by individual groups of employees,
- applying proven standards for the development of management processes,
- utilizing the advantages of standardization in improving the operational and strategic efficiency of healthcare entities.

Limitations

This scoping review has several limitations. Firstly, it comprised searches for texts based on keywords appearing in their titles. Thus, despite a very deliberate strategy to search for texts in as many as four databases, there must have been other texts meeting the inclusion criteria that were not indexed in the selected databases and, consequently, were not included in the review. Another limitation of the conducted research may be the inclusion of only scientific texts published in English in the analyses.

The fact that not all texts were available on an open access basis can be considered a further limitation. The option of reading the full version of a given text in order to gain a precise understanding of its factual content was one of the inclusion criteria for approving selected papers for the final analyses. Thus, a number of texts were not included due to accessibility constraints, and their inclusion in the study could have broadened the scope of the final conclusions.

Conclusions

The conducted research achieved both the main research aim and two intended specific aims. This review succeeded in identifying the scope of the scientific literature on the topic area of change management in healthcare. Furthermore, through keyword analysis and the categorization of the keynotes of the texts included in the analyses, it was possible to create a model indicating the main determinants of and motives for using change management in correcting, developing, and improving the healthcare sector. Thanks to the conducted research, it was possible to fill the research gap regarding the deficit of scientific texts indicating the scope of literature on change management in healthcare and modelling the motives for implementing change management in this sector.

The theoretical framework resulting from the performed analyses can be used by healthcare managers and decision-makers in various practical applications as well as academics and researchers specializing in healthcare management. This is extremely relevant at the present time, when the healthcare sector worldwide is recovering from the pandemic crisis, while simultaneously facing the challenges of digitalization. In addition, problems with access, coverage, and quality of healthcare services in different regions of the world are still evident. Therefore, it is particularly important to develop new research threads regarding correcting and improving management in healthcare units. New methods of change management, risk management, and quality management implemented in healthcare should therefore constitute the directions of future scientific research.

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The full list of references is available in the online version of the journal.

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We recommend

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The Cohesion Tribe influencers from those EU member states have an audience that was, until now, hard to reach for political and European based content makers. On the scene, they made videos, stories and photos to share with all their followers. But for the continuation it is important to raise awareness especially for this new generation.

Read more at: **https://cohesionstory.prowly.com/308600-trailblazing-across-europe-influencers-illuminate-eu-funded-projects-in-10-day-adventure?preview=true**

Robinson Fritz

A transformative approach to developing global human resources: An interdisciplinary framework for promoting personalised learning in Japanese universities

Abstract

Japanese government internationalisation initiatives in recent years have aimed to create undergraduate courses that nurture "global human resources". These initiatives involve objectives associated with developing skills, attitudes, and knowledge related to foreign language skills and intercultural understanding. However, educators at Japanese universities responsible for their development and implementation often lack adequate guidance to achieve such objectives. To address this gap, the author employed an interdisciplinary approach to establish a framework for cultivating global human resources, by means of a qualitative inquiry involving visual and narrative methods carried out over a one-semester period. The study's results emphasise the transformative and personal relationships that learners establish when engaging in the development of global human resources, a perspective that is mostly absent in the intercultural competence literature. Moreover, this study underlines the importance of producing and implementing interdisciplinary educational solutions that encourage university students to become personally invested in developing global human resources, contributing to the advancement of knowledge in the field.

Keywords: global human resources, transformative learning, personalised learning, foreign language and intercultural development, curriculum design

Introduction

The challenges of the 21st century have uniquely impacted Japan, including globalisation, a declining population, and reduced competitiveness, leading to economic stagnation (Qiu et al., 2023; Yonezawa, 2020). To address these issues, the Japanese Ministry of Education, Culture, Sports, Science, and Technology (MEXT) has initiated several university initiatives aimed at cultivating global human resources. However, educators tasked with implementing these initiatives have pointed out the lack of an adequate description of what the concept of global human resources entails, as well as how they could be developed in the classroom (Fritz & Sandu, 2020; Hofmeyr, 2023). This paper addresses the gap by introducing an interdisciplinary foreign language and intercultural development (FL & ID) framework. Drawing from foreign language education, intercultural education, second language motivation, and transformative learning theory, this framework emphasises holistic development, including skills, attitudes, knowledge and experiences, viewing development as an internal, transformative process influenced by individual experiences and perceptions.

To assess the framework's impact on nurturing global human resources and identifying inner shifts in participants, the one-semester study involved twelve Japanese undergraduate students. The research questions: 1. What are the participants' perceptions and experience of FL & ID before and after the intervention? and 2. What are the shifts in the participants' perceptions and experience of FL & ID during the intervention? This study contributes to the literature by providing educators with

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a structured approach to understanding the personal and transformative aspects of foreign language and intercultural development while aligning with government initiative objectives.

Background of the study

In recent years, MEXT has promoted the internationalisation of its universities through several initiatives aimed at "cultivat[ing] the ability of students to deal with globalization" (MEXT, 2023). These initiatives advocate the cultivation of "global human resources", which the Council on Promotion of Human Resource for Globalization Development (CPHRGD) defined as individuals who possess (i) linguistic and communication skills; (ii) self-direction and positiveness, a spirit for challenge, cooperativeness and flexibility, a sense of responsibility and mission; and (iii) understanding of other cultures (CPHRGD, 2011). However, an obstacle hindering these initiatives in Japan is the promotion of English-medium programmes and the misconception that proficiency in the English language alone determines the ability to act on a global scale (Bradford, 2019; Sakamoto & Roger, 2023). The author also shares this perspective, and emphasises that communicating and collaborating with individuals or organisations on a global scale is essentially a transformative experience, one that requires a 'cognitive, emotional, and cultural shift' (Leaver et al., 2021, p. 2). Hence, this study takes a holistic approach by adopting an interdisciplinary stance that recognises the diverse skills, attitudes, and knowledge that collectively shape individual learners in response to the multifaceted nature of the global human resources development challenge.

Overview of the study

The study was conducted at a Japanese national university over a single semester, comprising sixteen 90-minute English-medium instruction sessions. This elective course was part of an undergraduate programme designated by the university to cultivate global human resources, and was advertised as a personalised approach to acquiring the skills, attitudes, and knowledge necessary for global human resource development through foreign language and intercultural development. Convenience sampling was employed to recruit participants, and written instructions in Japanese and English outlined participants' roles, assuring them of anonymity in future publications and offering the option to withdraw without affecting course credit. Twelve second-year undergraduate students (five male and seven female), aged nineteen to twenty-two, enrolled in the course, and all agreed to participate.

Methodology

The framework embraces an interpretivist perspective rooted in social constructivist epistemology, informing theory and concept selection in the interdisciplinary framework. Consequently, this study emphasises the importance of comprehending individual subjective meanings and experiences in their social and cultural contexts, aligning with human capital development. To explore these nuances, a phenomenological approach, as described by Ros & Solé (2016), was chosen, highlighting personal and reflective aspects, providing an emic perspective to extract participant meanings (Miles et al., 2014), and recognising the coexistence of valid accounts of the world, as well as also acknowledging learners' diverse constructions of FL & ID. The study thus prioritises customised solutions for educators in their unique contexts rather than seeking generalisability or transferability.

The Ideal Intercultural Self framework

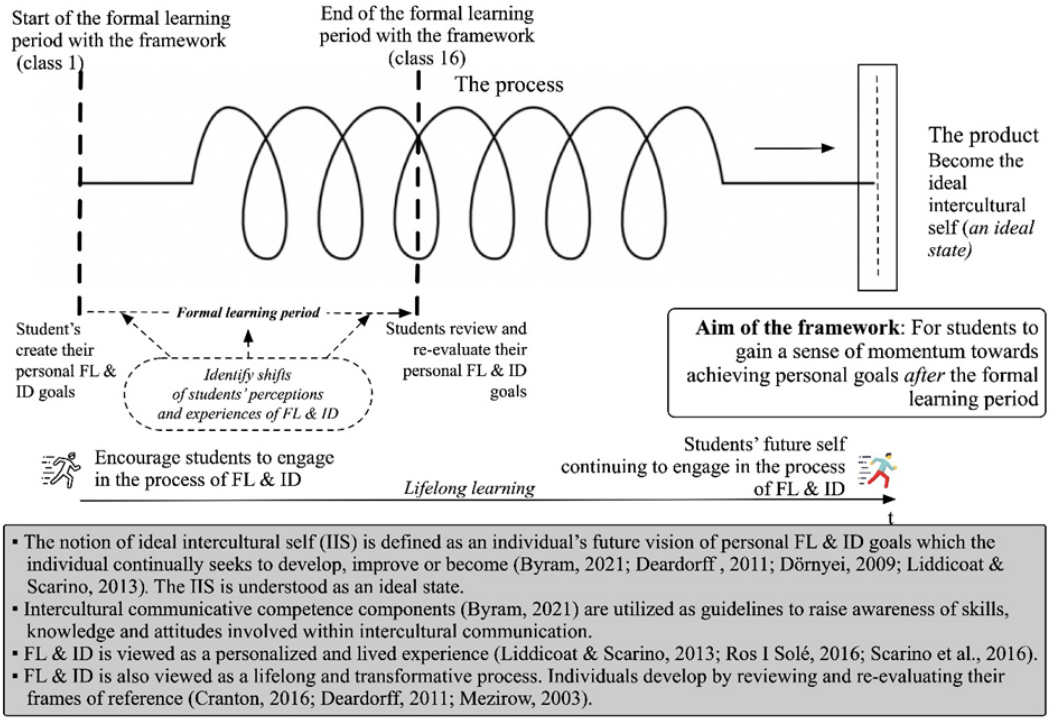
The study presented in this paper is a continuation of previous research carried out by the author using the same framework (Fritz & Sandu, 2020). As previously described in that article, the author developed the framework, known as "The Ideal Intercultural Self" (henceforth IIS), as a context-specific solution for the development of global human resources. The framework consists of four components: 1) conceptualisation of FL & ID; 2) a classroom approach; 3) a syllabus; and 4) an assessment method. A visual representation of the IIS framework is shown in Figure 1 below.

The framework aims to utilise a single semester, consisting of sixteen 90-minute classes, to assist students in advancing towards their post-semester FL & ID goals. It achieves this by promoting active engagement in FL & ID through a motivating and personalised classroom approach. At the semester's outset, students visualise and establish their ideal intercultural self, reflecting their FL & ID aspirations, while throughout the term they develop awareness of how to progress toward their IIS using the framework's transformative and personal approach. Narrative data is collected to monitor shifts in students' perceptions and experiences of FL & ID, aiming to evaluate transformation. By the semester's conclusion, students review and reassess their initial IIS. Becoming the ideal intercultural self is seen as an ongoing journey involving continuous self-review and re-evaluation, a process actively encouraged during the semester's classroom approach.

The IIS framework: The conceptualisation of foreign language and intercultural development

The IIS framework emerged by aligning FL & ID with the aforementioned definition of global human resources provided by the CPHRGD (2011). The author believes that the mindset described by the CPHRGD transcends language competency and necessitates shifts in awareness, attitude, behaviour, and perception. Drawing from Byram's (2021) intercultural speaker notion and Liddicoat and Scarino's (2013) intercultural orientation to language learning, the framework encompasses skills, attitudes,

Figure 1
A visual representation of the Ideal Intercultural Self framework



Source: author's own work.

and knowledge beyond language competence. To address the lack of clarity in explaining the process of becoming an intercultural speaker, the framework incorporates constructivist and phenomenological approaches, prioritising personal experiences and insights into transformative development (Ros & Solé, 2016).

This process integrates transformative learning theory, influenced by Mezirow (2003), identifying shifts in learners' perceptions and experiences of FL & ID. Mezirow (2003) suggests that adults' knowledge and experiences shape their perceptions, requiring shifts in thoughts, feelings, and actions for worldview alteration (Cranton, 2016). Shaules (2023) describes the transformative process as reacting to adaptive demands, indicating that foreign language learning initiates inner change by compelling learners to respond to foreign language and cultural patterns. Thus, this study views the development of global human resources as a process-oriented and adaptive approach.

The framework intends not to indoctrinate learners but foster long-term transformative change, acknowledging the transformational challenges that Japanese university students face. While previous research identified transformative outcomes, such as deeper cultural understanding (Crane & Sosulki, 2020; Deveci, 2014), this study aims to identify shifts during formal learning, offering pedagogical insights for educators fostering global human resources through personalised curricula and learner-centered methods.

The IIS framework: classroom approach and syllabus

The IIS framework's classroom approach and syllabus were tailored for a one-semester course, aimed at bridging theory and practice to nurture global human resources. Initially inspired by Dörnyei's (2009) work on motivating language learners, the L2 Motivational Self System was adapted within the IIS framework to encompass the (inter)cultural dimension. This adaptation encouraged learners to envision their ideal future selves, align with intercultural speaker qualities, and actively engage in bridging the gap. The framework, known as the 'Ideal Intercultural Self,' thus defines an individual's envisioned future self with FL & ID goals.

The classroom approach prioritised promoting active engagement with the FL & ID process, and facilitating the transformation of participants' perceptions and experiences. To achieve this, the study draws from Scarino et al. (2016) six language characteristics, informing a phenomenological and transformative pedagogical approach. Personalisation is emphasised, recognising subjectivity and encouraging awareness of FL & ID perceptions through group and pair work. FL & ID is viewed as a multilingual experience, prompting learners to explore language and culture features in authentic English and Japanese sources (e.g. YouTube videos, internet articles), and facilitating reflection, discussion, and exploring hidden perceptions related to FL & ID. Teaching and learning extend beyond acquiring language skills, and the classroom approach emphasises intercultural understanding through transformative pedagogy. Further, reflection and

Table 1
Syllabus table

Class and topic	
1. Introductions	9. (class 8 continued)
2. First Ideal Intercultural Self (IIS)	10. What is flexibility?
3. About the intercultural speaker	11. About flexibility and empathy
4. Macrofactors influencing your IIS	12. (class 11 continued)
5. (class 4 continued)	13. Role models: meet senior students who are becoming their own IIS (part 1)
6. Microfactors influencing your IIS part 1	14. (class 13 continued)
7. (class 6 continued)	15. Review your first IIS
8. Attitudes to become an intercultural speaker part 1	16. Course review and the next steps to become your IIS

Source: author's own work.

reflexivity are encouraged, allowing learners to engage in a lifelong developmental process. Classroom materials, homework, and assessments address these facets, enhancing learners' development in aesthetic, emotional, attitudinal, linguistic, meta-linguistic and reflective aspects. The syllabus remains unchanged from a previous study (Fritz & Sandu, 2020), as it effectively achieved MEXT's global human resources objectives.

In the initial class, the syllabus outlined course objectives and themes, promoting group cohesion by encouraging participants to share their current FL & ID perceptions and experiences. Course learning outcomes included: 1) setting personal FL & ID goals; 2) identifying gaps in present and future FL & ID skills, knowledge and attitudes; 3) creating a plan to achieve personal goals. Teaching methods, materials, and homework assignments were aligned with the earlier-discussed classroom approach. In the second class, participants started developing their Ideal Intercultural Self (IIS), and in the third class, the concept of the intercultural speaker was introduced. Classes four to fourteen aimed to raise participants' awareness of the gap between their current selves and their envisioned IIS, fostering transformative reflection and evaluation guided by the revised FL & ID conceptualisation. In sessions 13 and 14, senior students who had previously participated in the study and returned from studying abroad shared their experiences, linking them to their previously created IIS. Course grades were determined based on class involvement, homework completion, and the submission of the first and second IIS. To ensure fairness, full marks were given for both IIS submissions, regardless of their quality. However, participants were encouraged not to submit subpar work, as this could hinder their own developmental progress.

Data collection methods

Three different qualitative research methods were employed to explore the participants' FL & ID perceptions and experiences pre-intervention, during, and post-intervention, following literature recommendations (Dörnyei & Kubanyiova, 2014; Hadfield & Dörnyei, 2013; Melo-Pfeifer, 2015). Data triangulation was used to enhance the accuracy and credibility of the study (Creswell & Poth, 2018).

1. A web-based Questionnaire: This was administered after the first class via Google Forms to capture pre-intervention FL & ID perceptions and experiences, and provide support in answering the first research question. This open-ended questionnaire aimed to collect insider interpretations (Punch, 2005) and complement visual/narrative data, enhancing triangulation.
2. Ideal Intercultural Self (IIS) Visualisation: Participants created their IIS vision before and after the intervention, guided by Deardorff's (2011) learning contracts concept. Visualisation techniques inspired by sports psychology (Paivio, 1985) were used during the second class by the author to guide the participants in visualising their IIS and submitting their vision. Visualisation methods are supported in the literature, particularly for language learners (Fukuda et al., 2011; Magid & Chan, 2012). By comparing the themes and patterns from each participant's first and second IIS, the focus was on identifying shifts in the participants' perceptions and experiences of FL & ID. This helped find evidence of the framework encouraging development in terms of transformative learning.
3. Narrative Writing: Participants submitted written paragraphs after the ninth class, providing insights into their evolving perspectives on recent intercultural experiences, and supporting the exploration of the second research question. Written narratives were chosen over interviews to facilitate effective English expression, aligning with literature and favouring written narratives in exploring subjective language learning and intercultural understanding aspects (Rudolph, 2016).

Ethical considerations

Despite the research's low-risk nature, ethical considerations, particularly the author's dual role as a practitioner, were addressed, as the teacher's authority in the classroom can influence student participation (Esmaeili et al., 2015). To address this, verbal explanations clarified that participation wouldn't affect grades, with an ethics committee-approved document in English and Japanese reiterating this assurance. Also, framing FL & ID as an interpretive and personal endeavor faced challenges within the traditional Japanese classroom culture, which is typically teacher-centered. Therefore, trust-building and creating a safe environment for open expression were crucial. Learner-centered pedagogy, aligned with Dörnyei and Murphy (2003) and Dörnyei and Kubanyiova (2014), was adopted to encourage collaboration, student empowerment, and open dialogue.

Results and discussion

The analysis and findings for each data collection method are introduced in the following sections. For anonymity, participants are referenced with random numbers (e.g. 4A, 4B). Due to space limitations, a curated dataset is presented here; supplementary data can be found in the appendix. Additionally, the pre-intervention questionnaire items and results are detailed in appendix A.

First data collection method: Pre-intervention questionnaire

These results provided corroborating data supporting an overall understanding of each participant and substantiating whether the framework successfully encouraged FL & ID development. Analysis of the questionnaire identified common themes regarding participants' FL & ID experiences in Japan and abroad (see appendix A Table 4). The questionnaire revealed participants' limited engagement with FL & ID in both contexts. While their primary overseas intercultural experiences occurred in non-academic settings, meaningful intercultural experiences in Japan were associated with formal education. Participants predominantly associated meaningful intercultural experiences with personal relationships rather than global frameworks such as religion, economy, or politics.

Second data collection method: IIS Visualisation

Inductive content analysis was used to extract personal perceptions, beliefs, and values related to FL & ID from participants' first and second Ideal Intercultural Self (IIS) descriptions. This analysis aimed to generate themes for comparing participants' FL & ID before and after the one-semester intervention. Following Elo and Kyngäs' (2008) content analysis process, the initial step involved data preparation, where each participant's first IIS was reviewed, and codes were assigned to categorise data excerpts, facilitating subsequent analysis. Two rounds of analysis were conducted to comprehend the data and validate findings. The first round established categories like "family," "people," "career," "travel abroad," "attitudes," "skills," and "self-perceptions," while the second round aimed to generate sub-categories, refining the coding scheme. This process was repeated twice more to validate subcategories and identify common themes for narrative interpretation, and the same content analysis process was applied to code and analyse participants' second IIS. The coding scheme and identified themes for the first and second IIS is available in appendix B.

Pre-intervention results: First Ideal Intercultural Self

All twelve participants submitted their first IIS. Table 2 below introduces the final categories of themes found in all of their first IIS, which resulted from the content analysis.

The common theme found in all the participants data was that they considered FL & ID integral to their future lives. The inductive analysis revealed personal beliefs and values often overlooked in intercultural competence literature. The "Personal Focus" theme in Table 2 emerged from central images, larger images, and written descriptions on their IIS, signifying personal significance. Themes spanned "family," "interracial marriage," "home life," and "developing humour." A common theme was that participants linked their future careers to their ideal intercultural selves. For example, participant 4B envisioned working in an international company work in Japan: "I work in a Japanese food company and my job is promoting the company's products to other countries... To achieve this goal, I go to many countries to get to know their culture, atmosphere and life" (Participant 4B).

Seven participants saw working abroad as crucial for their IIS. The second prevalent theme was the importance of future families. Eight participants referenced parents, spouses, or children, using pictures or famous people's images to represent family connections. For example: "I have a husband and two children. I am a flight attendant with ANA (All Nippon Airways) and when I was working on international flights, I met him. Now I can speak not only English, but also Korean" (Participant 4G).

A third common theme was that five participants expressed a desire to travel abroad, communicate in English and other languages, and make friends internationally, reflecting their curiosity about diverse cultures and interpersonal connections. However, corroborating with results from the pre-intervention questionnaire, themes relating to worldwide frameworks, such as politics or religion, were less prominent.

Participant 4F's first IIS is indicative of the major themes identified in all the participant pre-intervention data. Participant 4F, a 19-year-old Japanese female with around seven years of formal English learning and beginner-level Chinese proficiency, had limited foreign language and intercultural experiences. She visited two countries briefly, with more significant experiences abroad, including having a „non-native

Table 2
Participants' pre-intervention perceptions of foreign language and intercultural development

	Where						Who with?			When?	Connect to the world	Personal focus
	Study abroad	Work abroad	Work home	Travel abroad	Travel home	Family	Friends	Work colleagues	Customers			
4A		•				•	•	•		35YO	Using English and Chinese	Career / Family
4B		•	•			•		•	•	32YO	From career	Home life
4C		•					•			N/A	Using English and Chinese	Develop open-mindedness
4D		•	•	•		•				30YO	From career	Family / Home life
4E		•	•	•					•	31YO	From various experiences	Learn from experiences
4F	•		•	•	•	•				29YO	From various experiences / Using English, Japanese and Chinese	Develop from study abroad / Interact with others
4G	•	•				•	•		•		From career/ Using English, Korean and	Meet many people all over the world
4H		•								N/A	Interact with others	Improve self / Interact with others
4I					•		•		•	N/A	From career	Home life
4J					•	•	•	•		N/A	From career / Using English	Friends / co-workers
4K			•	•		•	•		•	N/A	From career / Using English and Chinese	Learn from travel
4L			•	•		•	•			N/A	Using English	Improve self

Source: author's own work.

friend" and engaging in „socio-cultural experiences." Her first IIS data is shown below in Figure 2. More examples of participants' first IIS data are collected in appendix C.

Participant 4F embodies the two of the three main pre-intervention themes. She wants to work "on some kind of position related to international business". Also, she mentions that she is aiming to travel within Japan and abroad to connect with people from different backgrounds. 4F values English, Chinese and Japanese as tools for engaging locally and globally. Her forthcoming overseas study experience is expected to boost her confidence, allowing her to speak English effortlessly and nurture self-love. On the one hand, 4F reveals a self-critical narrative, but shows a central and prominent image of a future self, radiating positivity and confidence, implying her aspiration for self-transformation.

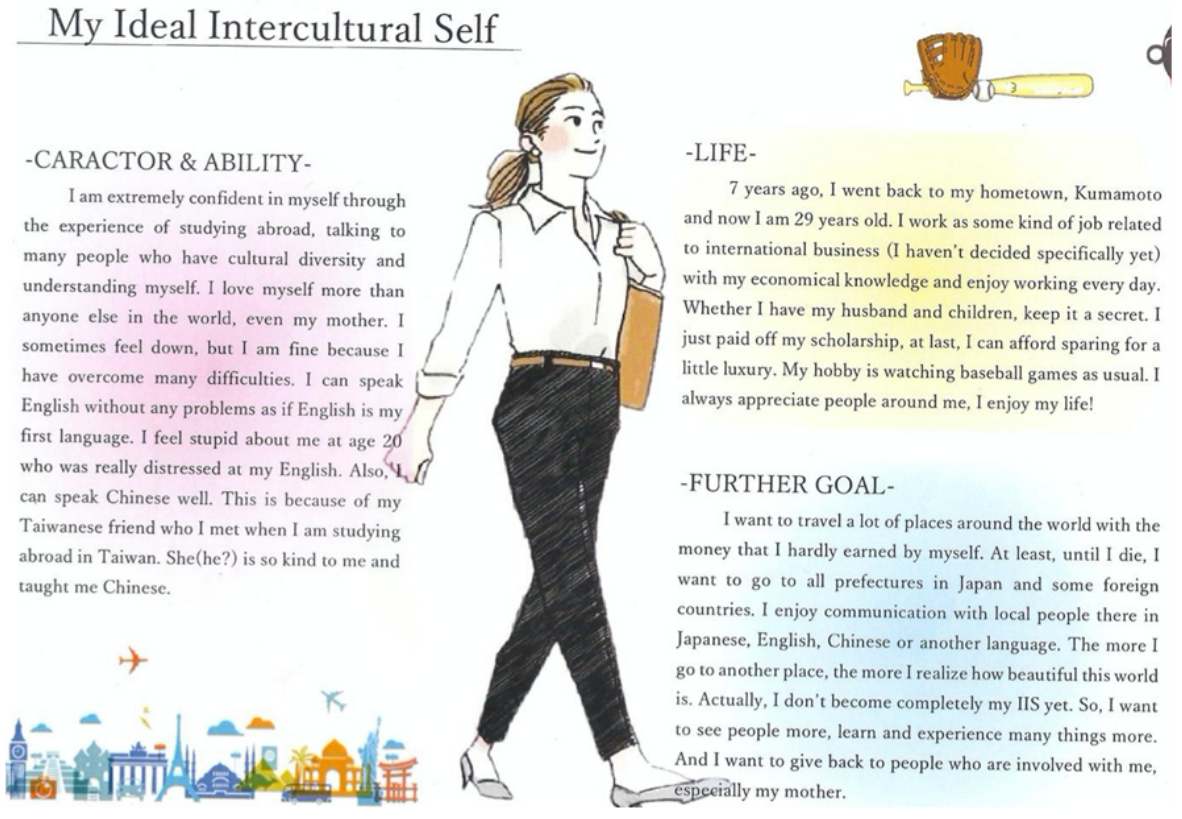
Post-intervention results: Second Ideal Intercultural Self

Post-intervention results for the second IIS addressed the first research question: What are the participants' perceptions and experience of FL & ID before and after the intervention? An inductive analysis, guided by Elo and Kyngäs's (2008) content analysis process, focused on identifying new goals, attitudes, and skills in participants' second IIS. A deductive analysis, following Liddicoat and Scarino's intercultural learning process (2013), examined FL & ID changes through interaction, reflection, noticing and comparison. The inductive analysis revealed increased self-awareness among participants, along with a desire for personal growth and changes in attitudes and skills. Deductive analysis identified two common themes within the participants' second IIS:

Theme #1) Enhanced self-reflection: Participants expressed greater self-awareness and recognised the need for attitude, skill, and behavior changes on their journey to becoming ideal intercultural selves. For instance, participant 4A acknowledged rejecting new and strange things, but highlighted self-improvement and newfound self-efficacy:

> I am still not open-minded and flexible. I [have] realised that I am rejecting new things or strange things subconsciously. This problem [has] influenced my attitude to learn about foreign countries and culture...[however] I learned

Figure 2
Participant 4F's First IIS



Source: author's own work.

> many things from the classes about macro factors, my autopilot [and] self-efficacy. [So] my attitudes [have] changed a lot. I believe I [can be able] to find answers on my own. From now I can be a bridge person. (Participant 4A)

Theme #2) Personal engagement with foreign language and intercultural development: Several participants demonstrated engaging with FL & ID in terms of Liddicoat and Scarino's (2013) interacting process of intercultural learning, including noticing, comparing, reflecting, and interacting. Compared to their first IIS, most participants focused on interaction with others, self-analysis, and self-evaluation of their values and beliefs. They shared personal interests, hobbies and plans to engage with FL & ID, indicating a developed personal interest resulting from the intervention.

For instance, Participant 4L, a 20-year-old Japanese female with seven years of formal English learning and basic Korean proficiency, had limited FL & ID experiences, as indicated in the pre-intervention questionnaire. She had visited only one country for a one-week period, and identified her most significant overseas intercultural experience as "socio-cultural experiences," particularly enjoying the local food. For her home country intercultural experience, she mentioned a "non-native teacher." Her second IIS is shown in Figure 3.

Participant 4L embodies both main themes. Her IIS presents a self-reflective and self-critical narrative. Her recent interactions and experiences with international students at the university appear to have ignited her engagement in noticing, comparing, and reflecting. Despite her self-critical narrative, she maintains a positive outlook by setting future goals to cultivate her FL & ID, fostering the required attitudes, skills and knowledge.

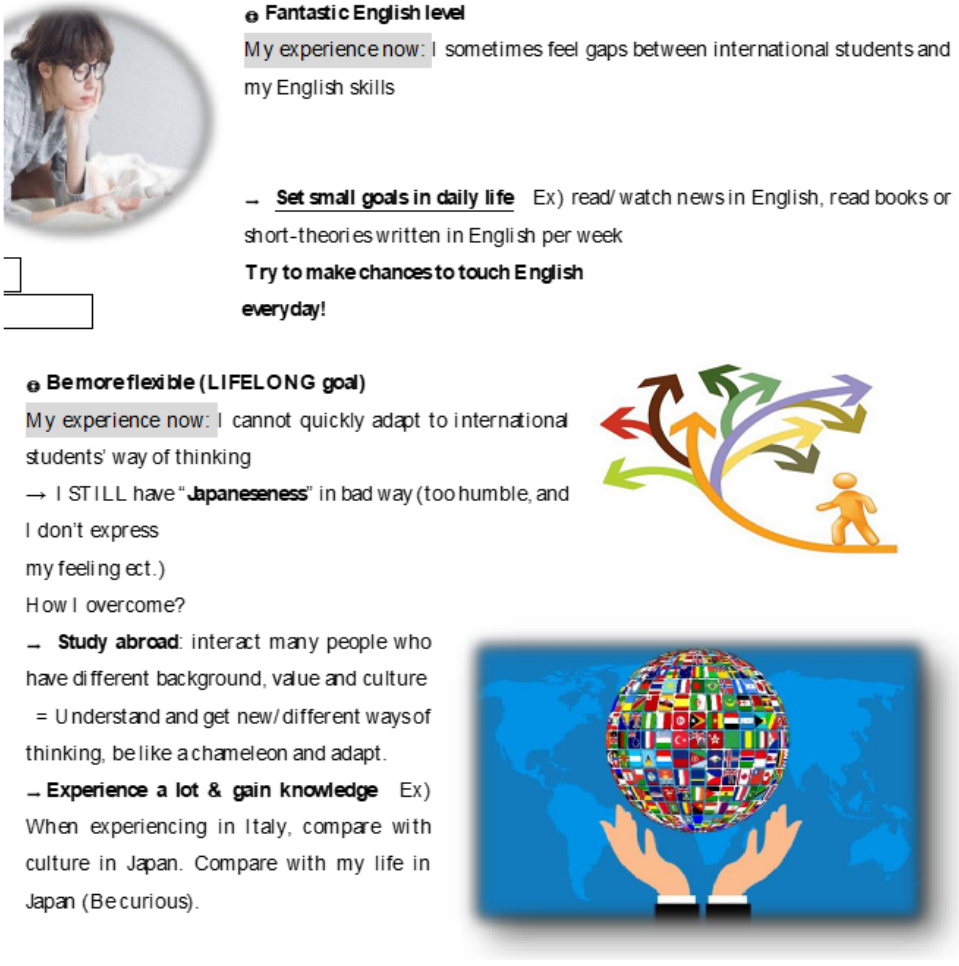
Narrative writing

After the ninth class, nine out of the twelve participants submitted a written paragraph to the following prompt. There was no word limit, in order to allow free expression:

> Q. Describe an intercultural experience from the past year. Share the location and details of the experience, reflect on any lessons learned or personal development resulting from it, and discuss how this experience may have impacted you.

A deductive analysis of each participant's narrative was conducted. The first level aimed to familiarise with the data and identify factors contributing to transformative learning in FL & ID. The second level

Figure 3
Participant 4L's Second IIS



Source: author's own work.

applied Mezirow's (2003) ten phases of transformative learning to pinpoint shifts in participants' FL & ID perceptions. The identified shifts are compiled in Table 3. Due to space constraints, individual narratives are omitted, with a thematic analysis of the three common themes presented after Table 3. A sample of participant narratives is available in appendix D.

Theme #1: Participants viewed intercultural experiences as transformative dilemmas.

Mezirow (2003) posits that a disorienting dilemma has the potential to trigger transformative processes, fundamentally altering the self, behaviour and worldview. Hence, recognising the participants' intercultural

Table 3
The identified shifts of foreign language and intercultural development of each participant

Transformative phases	4A	4B	4C	4D	4E	4F	4G	4H	4I	4J	4K	4L
1. A disorienting dilemma	•	•	N/A	•	•	N/A	•	•	•	•	N/A	•
2. Engaging in reflection	•	•		•			•	•	•	•		•
3. Critical assessing personal assumptions	•	•		•				•	•	•		•
4. Relating discontent to similar experiences of others				•			•	•		•		•
5. Identifying new ways of acting within the role				•	•		•	•		•		•
6. Building personal confidence and competence					•			•		•		
7. Planning a new course of action					•							
8. Acquiring the knowledge and skills necessary to implement this new course of action												
9. Trying out the planned action												
10. Reintegrating into society with the new perspectives												

Source: author's own work.

experiences as initial dilemmas marked a crucial phase in fostering critical self-reflection and developing new perspectives. All participants who submitted paragraphs characterised their intercultural experiences as dilemmas, using terms like 'new,' 'shocking,' or 'unexpected.' Most demonstrated evidence of re-evaluating their initial perspectives. For example, participant 4A shared an experience from a university field trip to the Philippines six months prior (see appendix D), emphasising differences between Japan and the Philippines, and showcasing his ability to engage with FL & ID processes.

Theme #2 The majority of the participants re-evaluated their original perspectives.

Table 3 shows that most participants experienced the initial three phases of the transformative process, serving as catalysts for potential transformation. These phases involve recognising and examining one's assumptions (phase two), followed by critical assessment (phase three). Participant 4B's reflection on a university field trip to the Philippines (see appendix D) exemplifies this process. She engaged in self-review and re-evaluated her assumptions about Filipino attitudes toward using English. Her realisation of Filipino students using English among themselves prompted critical reflection and evaluation of her beliefs about using English, showcasing a transformed perspective.

Theme #3: Limited articulation of future FL & ID development.

Most participants didn't progress beyond the initial phases of transformative learning, as seen in Table 3. Only four (4E, 4H, 4I, 4L) expressed confidence in continuing development or detailed strategies in their narratives. For instance, participant 4J (see appendix D) shared her experience during a university field trip to the Philippines, and proposed ideas for further development upon returning to Japan, although she didn't implement them.

Discussion and conclusion

This study offers significant insights, demonstrating the intervention's efficacy in empowering participants to develop self-sustaining attitudes, skills and knowledge towards fostering global human resources objectives. Adopting an emic perspective underscores the importance of acknowledging Japanese university students' personal interests, needs, perceptions and experiences in the pursuit of global human resource development. The framework provided a structured and safe space for participants to adapt to the challenges of cultivating global human resources, aligning with Hoggan and Kloubert's (2020) stance on transformative learning theory's potential to design adaptive support structures and pedagogies.

Findings reveal that the majority of participants experienced increased self-awareness and a strengthened sense of agency, fostering a deeper personal connection with their FL & ID pursuits. This aligns with previous research emphasising the impact of transformative pedagogies in education (Eisenchlas & Shoecraft, 2024; Fritz & Sandu, 2020). The detection of initial transformative shifts in participant data highlights the intervention's potential. However, the one-semester timeframe did not provide an opportunity to identify skills, attitudes and knowledge associated with a self-sustaining approach to transformative learning.

Furthermore, the interpretivist methodology and qualitative techniques prioritised in this study aimed to capture the nuanced experiences and perceptual shifts among participants, thereby acknowledging the constraints on the generalisability of the findings. Implementing personalised learning on a larger scale

poses limitations and challenges across educational settings, encompassing logistical issues and the demand for flexibility by policymakers or administrators familiar with standardised methods. Despite this, this study emphasises the critical role of practitioner-led, research-based interventions in addressing individual learning needs and responding to government educational initiatives, while also encouraging further exploration of the introduced themes and concepts by practitioners, administrators and policymakers alike.

In conclusion, this research contributes to both theoretical understanding and practical approaches in the development of global human resources. A phenomenological approach effectively highlighted the subjective experiences of learners undergoing foreign language and intercultural development, advocating for a curriculum that embraces learner diversity and integrates personal growth into global human resource development initiatives. Future longitudinal studies could provide additional validation of FL & ID as inherently personal, transformative and process-oriented. The collaboration among various stakeholders – educators, policymakers, administrators, and learners – is essential in fostering global human resources, underscoring the profound influence of educators on student learning outcomes. Professional learning communities play a pivotal role in promoting reflective, inclusive and growth-oriented practices, with an emphasis on interdisciplinary collaboration to enhance global human capital.

The appendices are available in the online version of the journal.

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Challenges in remote education: analysis of social interaction, motivation and engagement

Abstract

This article analyses selected challenges of remote education, focusing on the impact of the COVID-19 pandemic. It is divided into a theoretical part, synthetically explaining the key challenges related to remote education: social interactions, students' motivation and engagement, and an empirical part, presenting the results of a survey conducted on 1828 students at the Cracow University of Economics. The empirical research enabled analysis of the impact of selected distance education factors on the level of perceived learning outcomes by students, with a particular focus on social interactions (both between teachers and students, and among students), student motivation, and engagement in remote learning environments. The data was collected through a survey distributed in 2020 and 2022, using the Computer Assisted Web Interviewing (CAWI) technique via Google Forms. The results indicate moderate improvements in social interaction and motivation over time, with a slight decrease in the perceived effectiveness of remote learning. The literature review and empirical study reveal changes in the quality, motivation, and engagement of interaction, emphasising the need to adjust teaching strategies in the areas considered to increase the effectiveness of remote education. This study enriches the current literature by addressing gaps and providing suggestions for directions of future research, additionally providing practical recommendations for teachers and educational institutions to improve the efficacy of remote learning.

Keywords: remote education, social interaction, motivation, engagement, challenges in remote education

Introduction

Remote education has become an integral part of the modern educational system, with its importance significantly increasing as a result of global events such as the COVID-19 pandemic (Saliba, 2023). The higher education system has also recently undergone transformational change, accelerated by the pandemic, which elevated remote education to the dominant position of the main educational approach for a vast number of students worldwide. This rapid change has highlighted numerous challenges and opportunities that define remote learning environments, with particular emphasis on the nuances of social interaction, motivational dynamics, and the crucial importance of student engagement (Adedoyin & Soykan, 2020).

Although remote education was studied prior to the pandemic, its urgency and scale during the crisis have amplified its importance (Karakose et al., 2022; Krzyżak & Walas-Trębacz, 2021; Maini et al., 2021; Martin, 2023; Svatos et al., 2022; Tsang et al., 2021).

This article aims to provide nuanced insights into the evolving challenges of remote learning, focusing on teacher-student and student-student interactions, motivation, and engagement.

Social interactions in remote classes are often perceived as inferior to traditional settings, highlighting the need for improved communication dynamics (Abbasnejad et al., 2023; Ryan et al., 2020). Motivation and engagement are pivotal for effective learning, and their impact in remote contexts varies, influencing educational outcomes. Understanding how these challenges differ over time has practical implications for educators,

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e-course designers, educational authorities, and university authorities. For example, gaining knowledge about achieving differentiated outcomes can help tailor pedagogical practices and teaching materials to the needs of current students (Deng, 2022).

The methodology of this study includes a survey of students at the Cracow University of Economics during two different time periods, in 2020 and 2022, strategically chosen to capture the initial adaptation to remote learning and the subsequent period of continued reliance on this mode of education. The longitudinal approach allows for an analysis of changes and trends over time, offering insights into the persistence of the phenomena observed and the evolving nature of the challenges associated with remote education.

The study contributes to academic discourse by providing empirical evidence on the impact of social interaction, motivation, and engagement on learning outcomes in remote contexts, particularly amid pandemic-induced transitions. Practical implications include recommendations for improving remote education quality, aiding in pedagogical practices, curriculum design, and policy implementation (appendix 1).

The structure of this article has been designed in a systematic way to provide an in-depth understanding of selected challenges of remote education. The article begins with an introduction discussing the topic's rationale, research context, objectives, and study scope and limitations, before proceeding to review theoretical aspects of remote education, social interaction, motivation, and engagement. The research methodology is then outlined, presenting results that address key challenges: social interaction, motivation and commitment. The discussion section interprets the obtained results, connecting them to existing literature and highlighting their theoretical and practical implications. Finally, the study concludes by summarising findings and suggesting future research directions.

Literature review

Understanding interactions in remote education

This section aims to introduce existing theoretical frameworks facilitating further analysis and interpretation of online interactions, motivation and engagement during online education.

Social interaction in online education is pivotal for its quality and effectiveness (Karakose et al., 2022; Sitnicki et al., 2023), while understanding online education interactions requires a multidimensional approach, drawing from theoretical frameworks such as social constructivism, the transactional distance theory, the social presence model, and the self-regulation theory. Within the realm of social constructivism, online interactions are central to negotiating meaning and constructing knowledge. L. S. Vygotsky's zone-of-proximal-development theory underscores the importance of interactions with more experienced individuals in skill and knowledge development (Vygotsky, 1978). In the transactional distance theory, M. G. Moore posits a "distance" between teachers and students in remote education, necessitating educational interactions to minimise this (Moore, 1993). The social presence model emphasises the need for participants to feel a sense of "presence" in the virtual environment, achieved through interactions such as dialogue and non-verbal communication (Garrison et al., 1999). The self-regulation theory views online interactions as mechanisms for students to manage their learning process, particularly crucial in asynchronous remote education models (Zimmerman, 2000). Integrating these perspectives offers a holistic understanding of social interaction mechanisms in the online environment, which is crucial for optimising educational practices in remote contexts (Tsang et al., 2021; Yan, 2021).

Effective interaction with teachers is critical for remote learning (Karakose et al., 2022), where teachers serve as mentors guiding students through programme content. However, challenges such as maintaining effective communication and resolving technological issues can hinder interaction quality (Svatos et al., 2022). Student interaction is integral to remote education, facilitated by Learning Management System (LMS) platforms and online communication tools (Pappas, 2019; Sitnicki et al., 2023; Yan, 2021). Nonetheless, limited physical presence may impact interaction quality, and creating an environment encouraging active student interaction remains a challenge (Saliba, 2023) (appendix 2).

The role of motivation in remote learning

Motivation to learn plays a crucial role in remote learning outcomes, often demanding self-discipline and organisation, which can be challenging for some students (Krzyżak & Walas-Trębacz, 2021). The shift to online learning methods has propelled remote education to the forefront of research (Martin, 2023).

One of the key models explaining aspects of motivation in education is the Self-Determination Theory developed by E. L. Deci and R. M. Ryan, in which the authors highlight that autonomy, competence, and social relationships as fundamental to intrinsic motivation in education (Deci et al., 2017; Ryan et al., 2020). The Achievement Goal Theory proposed by C. Dweck, on the other hand, is one of the better-known approaches in psychology, focused on understanding the variety of goals that learners can set for themselves in an educational context (Dweck, 1986) (appendix 3). Understanding this theory in the context of remote education can have practical implications, as appropriate support mechanisms can be used to promote mastery-oriented goals, which in turn can increase learner motivation and engagement (Martin, 2023). The Expectancy-Value Theory developed by J. Eccles and others proposes that motivation for learning is a function of expectations of success and the value attributed to the task (Eccles et al., 1983). Self-monitoring mechanisms, on the other hand, are necessary to maintain high levels of motivation in the process of self-directed learning, according to the self-regulation theory (Zimmerman, 1990). In the context of distance education, the Self-Regulation

Theory becomes particularly relevant. Remote environments require learners to be more independent and self-disciplined, which make self-regulation skills even more important, the development of which can be supported by appropriately designed learning materials, interactive platforms and continuous feedback (Krzyżak & Walas-Trębacz, 2021) (appendix 4).

Engagement during online education

Engagement in remote studies is a key factor affecting the quality and effectiveness of the teaching and learning process, both in traditional and online contexts (Thompson et al., 2023). In the context of remote education, engagement is of particular interest because of unique challenges such as social isolation, lack of face-to-face interaction with teachers and peers, and varying access to educational resources (Bergdhal, 2022). Engagement in remote education can be defined as an active and purposeful process of student participation in learning tasks that leads to understanding and assimilation of knowledge (Fredricks et al., 2004). Its three main dimensions are most often mentioned: behavioral engagement, affective engagement and cognitive engagement (Appleton et al., 2008).

In remote education, measuring engagement is particularly complicated and requires multidimensional assessment tools (Maini et al., 2021; Thompson et al., 2023). Several commonly used tools can be listed as follows: analysis of the e-learning platform, surveys and questionnaires, teacher evaluations and qualitative methods (interviews and observations) (Carmona-Halty et al., 2019). Understanding the impact of engagement on remote education effectiveness is crucial for developing effective pedagogical and technological strategies (Abbasnejad et al., 2023), emphasising the need for engaging teaching materials and activities and monitoring students' engagement (Tsang et al., 2021).

Research methodology

Remote education has become a common method for transferring knowledge, which was especially visible during the COVID-19 pandemic. However, despite its growing popularity, there are numerous challenges related to social interaction, motivation and student engagement.

To reliably investigate and analyse the main challenges of social interaction, motivation, and engagement in remote education, the study was divided into three main stages: conceptual, empirical, and deductive (Kreamer et al., 2023; Sułkowski et al., 2021), with each stage playing a key role in obtaining practically useful results.

The first stage of the research process involved conducting a review of Polish and foreign literature using four publicly available databases: EBSCO, Scopus, Web of Science, and Emerald. The literature review formed the basis for the formulation of the research problems to which answers were sought and addressed three issues (the focus of the research): interaction, motivation and engagement during remote education. This analysis made it possible to determine the types of research problems addressed so far by different authors and to identify the existing research gap in the field.

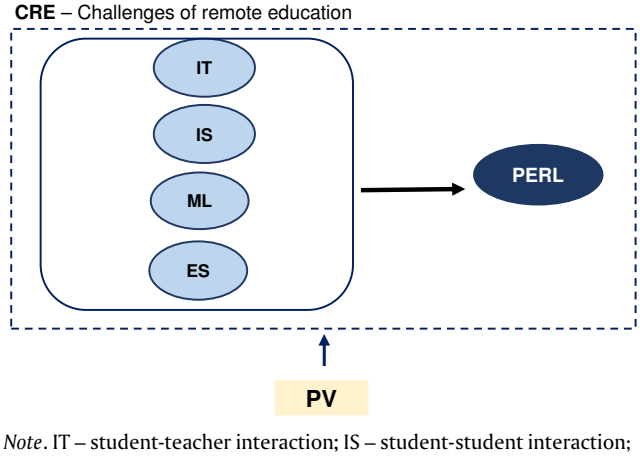
The empirical study was designed to determine how remote education affects students' perceived effectiveness, focusing on challenges associated with remote education. Aspects such as the quality of social interactions between participants in the educational process, the level of motivation to learn, and the degree of engagement in the distance learning process were considered. The study aimed to investigate longitudinal changes in interactions, motivation, engagement and effectiveness of remote learning during and after the peak of the COVID-19 pandemic.

To help understand the phenomenon under study, and also guide the research process, a research model was developed (see Figure 1).

In the conceptualisation stage, the task was to prepare the research tool, namely a survey questionnaire. The survey design aimed to collect data that directly answers the research questions posed, while ensuring ease of analysis and interpretation of the results. The survey was designed to elicit detailed information about students' experiences of remote learning, taking into account both positive and negative aspects. The questions were formulated in such a way as to obtain data on the quality of student-teacher interaction, student-student interaction, students' level of motivation to learn, and their level of involvement in the educational process.

The questionnaire was divided into two main sections: the first section relied on six demographic questions, and the second section contained 17 specific questions. The questions were closed-ended, and respondents answered each question using a scale of

Figure 1
CRE-PERL research model



Note. IT – student-teacher interaction; IS – student-student interaction; ML – motivation for remote learning; ES – engagement in remote study; PERL – the perceived effectiveness of remote learning; PV – temporal context (year 2020 and year 2022).

Source: authors' own work.

1–5 (where 1 meant very poor, 2 – poor, 3 – average, 4 – good, 5 – very good). This article focuses on the analysis of five selected questions from an extensive research project.

The questionnaire sheet was reviewed using a diagnostic survey for its accuracy and understanding of the questions by three experts in the field under study. After gathering the opinions of the experts and making minor adjustments to the questionnaire form, a target group (the size of the research sample) was established, paying attention to representativeness (Flick, 2020). The improved version of the questionnaire was used in the framework of proper research, which was quantitative in nature.

In the next stage, research was conducted among deliberately selected respondents in two periods: in the summer semester of 2020 (648 students) and in the winter semester of 2022 (1,180 students). To achieve the research goal, a purposeful sampling method was implemented, characterised by a conscious selection of study participants. The purposive sampling was justified by its specificity, as well as by constraints, such as the time available. The selection criteria were closely related to the research assumptions and were of key importance for achieving the intended research goal. The survey targeted students from various institutes of the Cracow University of Economics, who took part by responding to a questionnaire. The survey was conducted exclusively online, using a platform known for its security and ease of use to ensure maximum participation and an accurate representation of the university population. Participation in the study was voluntary and anonymous, and all respondents agreed to share their opinions on the challenges and expectations in the context of remote education during the pandemic. The Computer Assisted Web Interviewing (CAWI) technique and Google Forms were chosen to conduct the survey, due to several key advantages of these methods in the context of this study, namely: a high level of accessibility, assurance of anonymity, and efficiency and ease of analysis (Sułkowski et al., 2021).

Once the data was collected, data processing and statistical analysis was undertaken using the Statistica PL 13.3 package (George et al., 2016).

The final (deductive) stage undertook the formulation of practical recommendations and conclusions (Sułkowski et al., 2021), which can be of relevance to teachers, e-course designers, and educational authorities.

Characteristics of the research sample

The survey was conducted twice among 1,828 students at Cracow University of Economics, representing different forms of study, majors, and years of study.

The structure of the participants is shown in Table 1, which includes the six key criteria according to which the respondents were divided (appendix 5).

Table 1

Characteristics of the surveyed respondents according to different breakdown criteria

Parameter		2020		2022	
		N	%	*N*	%
Gender	Women	394	60.80	825	69.92
	Men	254	39.20	355	30.08
Age	18–19 years old	216	33.33	309	26.19
	20–22 years old	229	35.34	609	51.61
	23–24 years old	148	22.84	169	14.32
	Over 24 years old	55	8.49	93	7.88
Year of study	Little study experience (1st year of studies)	216	33.33	551	46.70
	Medium level of study experience (2nd year of studies)	193	29.78	371	31.44
	Extensive study experience (3rd and 4th year of studies)	239	36.89	258	21.86
Forms of study	Full-time studies	355	54.78	790	66.95
	Part-time studies	293	45.22	390	33.05
Attendance at remote classes during the last semester	Attendance up to 25%	1	0.15	4	0.34
	Attendance 25–50%	11	1.70	18	1.53
	Attendance 51–75%	59	9,10	87	7.37
	Attendance above 75%	577	89.05	1071	90.76
Remote learning equipment	Exclusive equipment	613	94.60	1117	94.66
	Equipment shared with others	35	5.40	63	5.34

Source: authors' own work.

Research results

The presentation of results includes descriptive statistics and correlation analysis. The study was conducted over two separate periods – 2020 and 2022 – to identify changes in students' perceptions of remote education and assess how the challenges of remote learning have evolved.

The results on the CRE-PERL model variables (see Figure 1) are presented in Tables 2 and 3, which expose the most important changes observed between the two research periods.

In Round II of the study (2022), some interesting trends can be observed compared to the data from Round I (2020). The mean value of student-teacher interaction during remote classes in Round II ($M = 2.40$; 95% CI [2.34, 2.45]) was slightly higher than in Round I, where it was 2.34. Moreover, the standard deviation in Round II ($SD = 1.01$) indicates slightly less variation in the responses compared to Round I ($SD = 1.11$). Similarly, the mean value of student interaction in Round II ($M = 2.12$; 95% CI [2.06, 2.18]) was also higher compared to Round I, where it was 2.00. The variation in responses remained similar, with a standard deviation of 1.04 in Round II and 1.10 in Round I. Regarding the motivation to study remotely, the mean value in Round II ($M = 2.72$; 95% CI [2.66, 2.78]) was higher than in Round I, where it was 2.60. The standard deviation in Round II ($SD = 1.09$) was also slightly lower than that in Round I of the study ($SD = 1.16$). A similar trend can also be observed in the category of involvement in remote studies, where the mean value in Round II ($M = 2.71$; 95% CI [2.65, 2.77]) is slightly higher than in Round I, where it was 2.70, while the standard deviation ($SD = 1.07$) is similar to Round I ($SD = 1.14$). Regarding the remote learning effects, the mean value in Round II ($M = 3.05$; 95% CI [2.99, 3.11]) was slightly lower than in Round I of the study, where it was 3.21. The standard deviation in Round II ($SD = 1.07$) was also lower than that in Round I ($SD = 1.22$).

In summary, the results of Round II of the survey suggest an overall, albeit small, improvement in aspects such as social interaction and motivation, with a slight decline in the perceived effectiveness of remote learning. The smaller standard deviations in Round II of the survey may indicate less variation in the respondents' answers. It is also worth noting that both rounds of surveys present moderate to positive attitudes toward remote education in various aspects.

The empirical study focused on analysing the impact of remote education on learning outcomes, taking into account key aspects such as social interaction, motivation to learn, and engagement in the distance learning process (see Figure 1). The analysis of the results presented in Table 4 relates Kendall's Tau correlations between the variables and the effects of distance learning in the first and second research rounds, with correlation values statistically significant at the $p < 0.05$ level, suggesting that these relationships are not random.

In Round I of the study, the correlation between students' interactions with the teacher during remote classes and the effects of remote learning was 0.411, while in Round II it was 0.402. This is a moderately positive correlation, suggesting that the quality of interaction with the teacher affects the effectiveness

Table 2
Descriptive statistics of IT, IS, ML, ES and PERL variables for 2020

Variable	Descriptive statistics (I Round of research)									
	N	*M*	–95.000% CI	95.000% CI	Me	Min	Max	Q1	Q3	SD
IT	648	2.34	2.26	2.43	2	1	5	2	3	1.11
IS	648	2.00	1.92	2.09	2	1	5	1	2	1.10
ML	648	2.60	2.51	2.70	3	1	5	2	3	1.16
ES	648	2.70	2.61	2.79	3	1	5	2	3	1.14
PERL	544	3.21	3.11	3.32	3	1	5	2	4	1.22

Source: authors' own work.

Table 3
Descriptive statistics of IT, IS, ML, ES and PERL variables for 2022

Variable	Descriptive statistics (II Round of research)									
	N	*M*	–95.000% CI	95.000% CI	Me	Min	Max	Q1	Q3	SD
IN	1180	2.40	2.34	2.45	2	1	5	2	3	1.01
IS	1180	2.12	2.06	2.18	2	1	5	1	3	1.04
ML	1180	2.72	2.66	2.78	3	1	5	2	3	1.09
ZS	1180	2.71	2.65	2.77	3	1	5	2	3	1.07
PERL	1173	3.05	2.99	3.11	3	1	5	2	4	1.07

Source: authors' own work.

Table 4

Kendall Tau correlations for the impact of distance learning on learning outcomes: comparison between 2020 and 2022

Variable	Kendall's Tau correlation, BDs removed in pairs (Round I of research: 2020) and (Round II of research: 2022). Marked correlation coefficients are significant with $p < 0.05000$	
	PERL (2020)	PERL (2022)
IT	0.411093	0.401538
IS	0.413304	0.425641
ML	0.512150	0.549584
ES	0.478344	0.526915

Note. IT – student-teacher interaction; IS – student-student interaction; ML – motivation for remote learning; ES – engagement in remote study; PERL – the perceived effectiveness of remote learning.

Source: authors' own work.

of remote learning, although it is not the only determining factor. In the case of inter-student interactions during remote learning, the correlation in Round I was 0.413, and 0.426 in Round II. The correlation is slightly higher in Round II, which may indicate the increasing importance of student interaction in terms of students' perceived effectiveness of distance learning. A significant correlation was observed for motivation for remote learning: 0.512 in Round I and 0.550 in Round II, and was the highest correlation of all the variables studied, increasing over time, suggesting that motivation is a key factor influencing respondents' perceived effectiveness of remote learning. The correlation between engagement in remote studying and perceived effectiveness of remote learning was also significant, at 0.478 in Round I and 0.527 in Round II. There is a noticeable increase in this correlation over time, suggesting that engagement is becoming an increasingly important element in the effectiveness of remote education.

In summary, all of the studied variables showed statistically significant, moderate-to-strong correlations with the effects of remote learning, with the highest correlation observed for motivation for remote learning, highlighting its key role in the context of the effectiveness of remote education. The correlation values in Round II were generally higher, which is a possible indication of the increased importance of these factors in remote education in the long term.

Discussion

As part of the empirical study, the focus was on analysing the impact of remote education on students' perceived learning effectiveness. Kendall's Tau correlation analysis, presented in Table 4, showed statistically significant relationships between the quality of social interaction, level of motivation, degree of engagement and learning effectiveness in remote environments, findings that are reflected in the theoretical frameworks discussed in the literature review (Karakose et al., 2022; Maini et al., 2021; Sitnicki et al., 2023; Svatos et al., 2022), in particular the theories of social constructivism, transactional distance, the social presence model and self-regulation theory (Garrison et al., 1999).

The statistically significant correlation between the quality of social interaction and learning effectiveness (correlation for IT and IS in both study rounds) confirms the assumptions of social constructivism and the social presence model (Vygotsky, 1978). These findings highlight the importance of building a strong online learning community, where student-student and student-teacher interactions are central to the knowledge construction process, which provides empirical support for the implementation of pedagogical practices that support active discussion, group work and mutual support in a remote environment (Svatos et al., 2022; Tsang et al., 2021; Yan, 2021).

It can be assumed that the change in the perception of social interaction (teacher-student and student-student) in the context of remote classes may be due to numerous factors, both individual and structural. At the individual level, participants may adapt to the new educational format and become more proficient in the use of remote communication technologies. Ultimately, it is the understanding of the mechanisms and tools available on educational platforms that can influence the positive evaluation of interactions with teachers and other participants in remote classes (Martin, 2023).

From a structural perspective, improvements in technology or changes in teaching methods can also play a role, for example, teachers can introduce interactive elements such as surveys, quizzes, or group discussions to increase engagement and social interaction. In addition, universities can offer training for teachers on effective pedagogical practices in remote education, which in turn can affect the quality and level of social interaction (Amon, 2021; Pons et al., 2013; Svatos et al., 2022). It is also possible that the social dynamics of the student group evolve, resulting in better interactions and a greater sense of community. This sense of connectedness can influence positive perceptions of social interactions, even in the context of remote education (Ober & Kochmańska, 2022; Xhaferi & Xhaferi, 2020). It is also worth noting that external circumstances, such as a pandemic or other socio-political events, can affect the overall atmosphere in which remote

education takes place, and thus the perception of social interaction. In summary, the change in the perception of social interaction is multifactorial, and may be the result of an interaction between changes at the individual, structural and contextual levels (Karakose et al., 2022; Saliba, 2023).

The strong correlation found between motivation and learning effectiveness (ML in both study rounds) is consistent with the assumptions of the self-regulation theory (Zimmerman, 2000), which highlights how critical it is to design remote courses in a way that engages students and reinforces their intrinsic motivation to learn. This suggests that educational practices should focus on autonomous goals, providing constructive feedback and allowing students more control over their learning (Ryan et al., 2020; Lisady et al., 2023; Martin, 2023).

The observed increase in motivation to learn remotely over the time period studied can be attributed to several factors. Firstly, study participants could become more competent in using e-learning platforms and tools, reducing stress levels and increasing their motivation to actively participate in class (Abbasnejad et al., 2023). Secondly, the adaptation process may also involve adaptation to new forms of interaction with instructors and coursemates, which in turn can foster a sense of community and increase the desire to learn (Karakose et al., 2022). Students with low levels of motivation may show less engagement in remote education, which could be related to the lack of the physical presence of others and, consequently, greater susceptibility to the distractions inherent in the online environment (Krzyżak & Walas-Trębacz, 2021). The impact of modifications in teaching methodologies made by educational institutions or individual teachers to improve the quality of remote education also cannot be ruled out, such as including more interactive forms of learning or adapting materials to online specificity, which could consequently increase the motivation to learn (Svatos et al., 2022; Tsang et al., 2021; Yan, 2021).

However, this is an issue that requires further research and analysis, which may also consider other variables, such as personal and social factors affecting motivation, including support from others, or stressful situations that may affect motivation levels, such as the need to continue remote classes due to an ongoing pandemic.

The observed increase in the correlation between engagement and learning effectiveness (ES in both study rounds) indicates the increasing role of engagement in the context of remote education. These findings are in line with the transactional distance theory (Moore, 1993), which points to the need to minimise the psychological and pedagogical distance by increasing interactivity and teacher support. This points to the need to develop teaching and assessment methods that promote students' active participation, providing them with a sense of being an integral part of the learning community (Deng, 2022). Similar to the motivation to study remotely, the increase in commitment to studying remotely may be the result of students' adaptive mechanisms in a remote education environment. For example, students may become more committed to studying as they begin to see the potential benefits of remote learning, such as flexibility in time management or access to online learning resources (Maini et al., 2021; Martin, 2023). Nevertheless, the small nature of this change may also suggest that existing barriers, such as lack of infrastructure, problems concentrating in the home environment, or limited opportunities for social interaction, remain important factors affecting engagement in remote studying (Krzyżak & Walas-Trębacz, 2021). Further research is needed that would consider other potential variables, such as students' educational preferences or personal and social factors that could influence engagement in remote studying (Krzyżak & Walas-Trębacz, 2021), as only then will a more accurate understanding of the dynamics and determinants of engagement in remote education become possible.

However, the observation of a lower average value regarding the effects of remote learning in the second round of the survey compared to the first round may have several potential causes that require further analysis. The decline in this indicator suggests that students' expectations regarding the effectiveness of remote education have decreased over time.

The first factor that could affect the drop in expectations is the novelty effect. At the beginning of the pandemic and the introduction of remote learning, students may have been interested in the new form of education and its potential benefits. However, over time, initial enthusiasm may have faded, especially if the educational experience did not meet initial expectations (Hopp et al., 2022; Martin, 2023). Secondly, students may feel thrown out of their routine and may lack regular face-to-face contact with their teacher and other class participants. Remote education limits opportunities for social interaction and live discussions, which can reduce the effectiveness of the learning process (Ahshan, 2021). A third factor may be the lack of access to adequate educational resources, such as laboratories, libraries, or specialised equipment, which is particularly important in technical disciplines (Ibrahim & Hidayat-Ur-Rehman, 2021; Svatos et al., 2022). A fourth possible reason is the adaptation to remote forms of teaching without the simultaneous adaptation of didactic methods. If didactic teaching methods are not adapted to the specifics of remote education, the effectiveness of the process may decrease (Estrada et al., 2022). Finally, it is also worth noting that the drop in expectations may be a result of experience – students who have already participated in remote education may have more realistic expectations and be more aware of its limitations. These findings suggest the need for further research considering these and other variables to more accurately understand the effectiveness of the dynamics of remote learning (Sitnicki et al., 2023).

In summary, the results of both rounds of research suggest generally stable, although slightly different, opinions of students regarding remote education. These differences may be the result of adaptation to remote

studies or changes in the implementation of this form by educational institutions.

Based on the results of Kendall's Tau correlation analysis from the two rounds of research, several important conclusions can be drawn regarding the effectiveness of remote learning and related factors:

1. Firstly, a moderate but consistent correlation was observed between the quality of student-teacher interactions and the perceived effectiveness of remote learning. This moderate correlation, which remained similar across both rounds of research, suggests that although these interactions are important, they are not the only element affecting the effectiveness of remote learning. An increase or decrease in this correlation could be a topic for future research to understand how teachers can more effectively engage students in the remote learning process.
2. The second observation concerns the correlation between student interactions and the perceived effectiveness of remote learning. Firstly, a moderate but consistent correlation was observed between the quality of student-student interactions and the perceived effectiveness of remote learning. This correlation was slightly higher in Round II of the study, which may suggest the increasing importance of inter-student interactions in terms of remote learning effectiveness, and may also suggest that adaptation to a remote form over time increases the importance of student collaboration and interaction.
3. The most important observation, however, was the significant and increasing effect of motivation on the perceived effectiveness of remote learning, with the highest correlation in both rounds, which suggests that maintaining and increasing motivation may be key factors in optimising the effectiveness of remote education. Based on these results, interventions to increase motivation for remote learning may have significant benefits.
4. The correlation between engagement in remote studying and the perceived effectiveness of remote learning also increases over time, which may suggest that engagement is an increasingly important element in the effectiveness of remote education, sending an important signal to educational institutions regarding the need to monitor and increase student engagement in remote education.

In summary, these results underscore the complementary nature of the various factors that influence the effectiveness of remote education. All the variables analysed – quality of interaction with the teacher, inter-student interaction, motivation, and engagement – are important, and their impact on learning outcomes appears to increase over time, which suggests that a comprehensive approach to remote education considering multiple aspects of educational experience is most promising for achieving high educational effectiveness (Lamanauskas & Makarskaité-Petkevičienë, 2021).

Conclusions

The results of this study can serve as practical guidelines for teachers and policymakers, as well as a basis for further research, which in turn can have a broad impact on shaping future educational practices. The following are key suggestions (guidelines) for three groups: teachers, policymakers and researchers, contributing to the quality level of remote education.

I. For Teachers:

1. Detecting and understanding the dynamics of remote student interactions is key, and the ability to use various pedagogical tools to increase the level of social interaction can have a positive impact on the effectiveness of remote learning.
   Here are some examples:
   - discussion platforms and forums: these allow the dialogue between students and teacher to continue outside the classroom, stimulating continued interest in the topic and discussion;
   - survey and quiz software: tools such as Kahoot, Google Forms or Quizlet can be used to interactively assess students' knowledge and understanding of material;
   - collaboration software: applications such as Google Docs or Microsoft Teams allow people to work on documents or projects simultaneously, increasing interaction and group understanding;
   - participation management systems: software such as Zoom or Teams, which offer hand-raising, polling, or subgroup functions, can help teachers better understand student needs in real time;
   - real-time feedback: tools that offer automated feedback can be useful for both students and teachers, enabling immediate understanding and improvement.
2. Student motivation and engagement are variables that can be susceptible to influence from teachers, as motivation and student engagement techniques can enhance the effectiveness of remote education.
   Here are some examples:
   - interactive whiteboards: tools such as Miro or Padlet allow collaborative note-taking and brainstorming in real time, which can increase engagement and learning efficiency;
   - simulations and educational games: these can be used to put theory into practice, often making complex concepts easier to understand;
   - blogs and wikis: these allow students to create and edit content, which can not only increase their interest, but also support a deeper understanding of the material;

- video and multimedia: interactive video activities in which students can answer questions or make decisions, increasing their engagement and understanding;
- directed research tasks: tasks that require students to independently seek information and analyse and present results can increase their engagement and depth of understanding.

II. For Decision Makers:

1. The results indicate the need for continued research, as well as the possibility of adapting teaching methods and tools to increase the effectiveness of remote education.
2. Investment in technology and support for teachers in the skills needed to effectively use remote education platforms are key.

III. For Researchers:

1. The noticeable dynamics in variables such as motivation, commitment, and interaction suggest the need for further research taking into account a variety of contextual variables.
2. Kendall's Tau correlations between different variables indicate complex relationships that can be explored further to better understand the mechanisms that affect the effectiveness of remote education.

Further research can also focus on identifying best practices and their application in different educational contexts.

Summary

Remote education presents numerous challenges with regard to student interactions, teacher-student relationships, motivation, and engagement. Understanding and addressing these challenges are crucial for enhancing remote learning outcomes, and this article offers a thorough examination of these dynamics, particularly accentuated by the COVID-19 pandemic.

Theoretical frameworks, such as social constructivism, the transactional distance theory, the social presence model, and the self-regulation theory provide insights into the challenges of remote education, emphasising the importance of interaction quality, motivation and engagement.

Grounded in theoretical exploration and empirical data from students at The Cracow University of Economics, the study focuses on understanding the impacts of remote education on learning effectiveness, specifically examining social interaction, motivation and engagement. The results from the research conducted in 2020 and 2022 with 1,828 respondents revealed modest improvements in social interaction and motivation over time, albeit with a slight decline in perceived effectiveness of remote learning, highlighting the need for nuanced adjustments in pedagogical strategies to optimise remote learning to effectively address the challenges. Empirical results underscore the importance of adjusting teaching strategies to address the challenges analysed, indicating that significant differences exist in the quality of interactions, levels of motivation, and degrees of engagement within remote education contexts. The study contributes to the body of knowledge by identifying gaps and offering practical recommendations for educators and institutions to improve remote learning efficacy, before concluding with several recommendations for educators, policymakers and future research. For educators, it emphasises the importance of employing diverse pedagogical tools and techniques to enhance social interaction, motivation and engagement in remote learning contexts, while for policymakers, it suggests continued investment in technological infrastructure and teacher training. Lastly, for researchers, it highlights the need for further studies exploring the complex relationships between different variables affecting remote learning effectiveness and the identification of best practices applicable across various educational settings.

Overall, the article provides insights into the crucial challenges and dynamics of remote education, offering a basis for future research and practical interventions aimed at improving the quality and effectiveness of remote learnings.

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The appendices are available in the online version of the journal.

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Murat Kiliç

Alev Ateş-Çobanoğlu

Online teaching readiness of staff during the COVID-19 pandemic: Ege University sample

Abstract

The instant transition to online learning during the pandemic led to some neglections in instructional design and planning, with online teaching readiness seen as a major issue within this context. The authors of this study therefore believe that the readiness of instructors for providing online learning is a critical concern for such a transition and its future implications. In this survey/descriptive study, the authors investigated instructors' online teaching readiness through an adapted version of Chi's Online Teaching Readiness Questionnaire, which includes both open-ended and multiple-option questions, with code-theme relationships also presented. The data collection tool was administered to 200 instructors from different faculties working at Ege University, which is a western state university in Turkey. The findings from the questionnaire show that to a large extent, the instructors feel ready for online teaching. The authors share their suggestions on future research and applications in the last section of the paper.

Keywords: emergency remote learning, online learning, online teaching, perceptions, readiness

Introduction

In this study, the readiness of instructors for online teaching is discussed. During the contingency remote learning process, many attempts were made to improve online teaching. Examples of these are the establishment of learning management systems by universities, internet infrastructure work of governments, and orientation studies of universities for online teaching. However, although these studies can be considered as necessary criteria in online teaching, they are not sufficient to prepare a suitable ground for this type of teaching. The majority of the literature consists of studies on student readiness in the context of online learning. Existing and future studies concerning instructors will provide more opportunities for researchers to diagnose the problems faced in online teaching (Hoşgörür & Adnan, 2018). The success of online learning and teaching environments depends on the qualifications of the instructors (Tabata & Johnsrud, 2008). An Online Learning Consortium report states that one of the main reasons for not achieving the targeted success in online learning is that instructors do not find online learning valuable enough (Allen et al., 2016). In addition, studies show that previous use of online learning environments by academics positively contributes to their attitudes toward using instructional technologies (Adnan & Boz, 2015). In parallel, analysis of online learning studies between 2002-2018 shows that evaluation of learning, teacher beliefs and identity, teaching in transition to e-learning, an effective teaching process, and teachers' online competencies are the most popular topics (Cutri & Mena, 2020).

Many faculties lack experience in online teaching, and in the specific case of the pandemic, institutions were caught off-guard when it comes to online teaching. With teaching, it is important to develop content for instructors, create a comprehensive institutional system that will support them technically and administratively, and measure the attitudes and readiness of instructors with regard to online distance education, each as a source for education planning (Hoşgörür & Adnan, 2018). Readiness of instructors varies from institution to institution, making it very valuable to use data obtained

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in-house while providing support training on online teaching to instructors. The aim of the study is to examine the readiness of Ege University faculty members for online teaching during the COVID-19 epidemic. An assumption was made that the readiness of instructors for online teaching and their views on the subject will guide the remedial interventions to online teaching and the instructional technology training conducted[1] institutionally. On the other hand, the fact that there are a very limited number of studies available in which the readiness levels of the instructors are examined, and the majority of them include only students in the study sample, adds originality to the study. The readiness values examined are interpreted within the framework of the Technology Acceptance Model (TKM) and adult education, with a goal to explain these values as comprehensively as possible. It has been revealed that many institutions were not prepared for online teaching during the COVID-19 pandemic process, and therefore had insufficient preparation for supporting their instructors (Adiyarta et al., 2018; Farazkish & Montazer, 2019). In this process, it was observed that temporary improvement attempts, such as online teaching seminars, digital tool promotion and social responsibility projects increased. However, a solid foundation for online teaching requires a needs analysis of institutions and intervention design based on the data. With the findings obtained from this research, we aim to reveal the readiness of the instructors for online teaching and support them by determining their needs in this context.

Online teaching readiness

Online teaching readiness involves a variety of factors, including technology proficiency, instructional design, and pedagogical knowledge. Teachers need to be proficient in using various digital tools, such as learning management systems and video conferencing platforms, in order to effectively deliver online instruction. Additionally, teachers must possess strong instructional design skills, including the ability to create engaging and interactive online learning materials. Finally, pedagogical knowledge is critical for effective online teaching, as teachers need to understand how to adapt their teaching strategies to the online environment to ensure that students achieve optimal learning outcomes. Therefore, being prepared for online teaching requires a holistic approach taking into account all of these important factors.

Research questions

1. What is the level of perceived readiness of the instructors to teach online?
   As readiness is measured through tools that reflect the self-perceptions of the participants, this research aims to bring instructors' readiness to light. The participants will fill out a questionnaire that reflects their readiness levels to teach online.
2. What are the instructors' views on online teaching?
   Instructors' views will be gathered via the same questionnaire, allowing the authors to compare instructors' self-perceptions of their readiness and their current beliefs and performance in online teaching. This comparison is critical and makes the study unique, providing a new perspective to investigate readiness in educational studies.

Method

This is a mixed-method study incorporating quantitative descriptive outcomes of online teaching and qualitative results of instructors' views on online teaching. "A mixed methods research design is a procedure for collecting, analysing, and mixing both quantitative and qualitative methods in a single study or a series of studies to understand a research problem" (Creswell & Plano Clark, 2011). Convergent parallel design is preferred to collect quantitative and qualitative data at the same time, and merge the data to understand a research problem (Creswell & Guetterman, 2011). In this case, it is utilised to explain readiness levels of Ege University faculty members to teach online. For the quantitative data, descriptive tables are preferred in order to present the results in a plain way. For qualitative data, code-theme relationships are established to analyse qualitative questions.

Sample and procedure

The study group consists of lecturers who teach at Ege University. Ege is a research/research intensive university that had 59925 students and 3283 instructors in the 2022-2023 semesters, and has gained full accreditation institutionally. Academically it is one of the leading universities in terms of publications in various fields, especially the field of medicine, providing a valuable sample for the study.

Before the study, the participants attended online training organised by the institution. The instruments are shared with each member of each faculty via e-mail. Due to a too low response rate, the authors continued to collect data by distributing the instruments face-to-face. In total, the authors reached out to 200 academics.

The data shows that the majority of the participants (69.2%) are women (see appendix Table 1). Professors stand out the most, with 32.3% in terms of title. On the other hand, lecturers in the 35-45 age range seem to be the dominant age category. In addition, the highest participation in the study is from the field of health sciences.

[1] This study is a part of master's thesis of the corresponding author, with the second author as the supervisor.

Data collection tools

In the study, Online Teaching Readiness Questionnaire developed by Chi (2015) and adapted into Turkish by Hoşgörür and Adnan (2018) is used to measure the readiness of the instructors for online teaching. The internal consistency of the questionnaire was calculated as 0.91. The sub-dimensions of the questionnaire are respectively; learning-teaching process, social bond and student participation, technology support for instructors, course design and instructional design, and assessment and evaluation. The adaptation study includes items with 63 options, 13 open-ended, and 2 structured statements.

Data analysis

The authors applied descriptive analysis (frequency, percentage) regarding the demographic information of the instructors and the descriptive questions of the measurement tools used. Analysis of the research data is made via SPSS for the quantitative part, for the answers obtained from the qualitative questions, by establishing code, category, and theme relationships, which were analysed descriptively. After the establishment of the code-theme relationships, these relationships were validated by an expert researcher from educational sciences.

Results

In this section, results regarding instructors' online teaching readiness will be presented through descriptive tables, as well as paragraphs explaining qualitative answers of the measurement tool. The data presentation follows the order of the tool's 5 dimensions, which are namely: Teaching and Learning, Social and Student Engagement, Faculty and Technology Support, Course Development and Instructional Design, Evaluation and Assessment. The tables involve items and the frequency and ratio of the responses. After the presentation of results, the data will be discussed in the conclusion and discussion section of the article.

Teaching and learning dimension

Table 2 contains the answers given by the instructors to the questions related to the learning-teaching processes (see appendix Table 2). According to Table 2, in the learning-teaching process, the majority of the instructors were able to integrate technology into their lives both in their work and non-work situations and are open to learning new things on this subject. In addition, instructors mostly believe that student success in the 21st century depends on learning to use technology.

In table 3, although the statement "I disagree" stands out for "online teaching will take less time than face-to-face teaching", other expressions are also highly preferred, and these different opinions are represented in statistical terms (see appendix Table 3). On the other hand, online teaching is thought to provide flexibility and personal growth as per the instructor's answers.

According to Table 4, considering the factors motivating them to teach online, 102 instructors answered "yes" and 94 instructors answered "no" for their colleagues' online teaching (see appendix Table 4). This gave a score of 122 to 75 for the factor of the number of students choosing the course, 87 to 105 for the factor that online teaching is a programme priority, 132 to 64 for the factor that it is a response to field requirements, 139 to 55 for the factor that students have the necessary skills in online classes, and 74 to 120 for the factor that the leaders in the school have expectations about online teaching.

Table 5 discusses participants' views on situations that increase their willingness to teach online (see appendix Table 5). In this context, the ability to decide on the form of the online course and the institutional acceptance of online teaching stand out the most. On the other hand, participants stated that guidance, reducing the course load to develop online courses, financial support to develop online courses, grant opportunities, and the fact that online teaching works in academic promotions do not increase their willingness.

In Table 6, the majority of respondents stated that while they think that classroom management is more difficult in online teaching, on the other hand they are able to teach online effectively, the current business environment motivates them, and they felt more competent in online teaching during the pandemic process (see appendix Table 6).

Table 7 shows theme, category, and code relationships of the participants' views on the strengths of online teaching. In total, 192 answers were included into these relationships. Themes are determined based on the answers and divided into two groups as technological strength and learning-teaching process, because the participants' views on the strength of online teaching came either directly from a technology/device aspect or contributions to learning and teaching process. For both themes, the answers displayed similar patterns and categorized under four categories in total. Flexibility category involved codes such as freedom in terms of time and location, learning a comfortable setting, time management and saving time, and reducing the risks of contamination during the pandemic. In accessibility category, quick and easy access to asynchronous or synchronous courses and materials and reaching out to large audiences were highlighted by the participants. On the other hand, the participants stated that options for limitless and varied resources, using multimedia content such as videos, visuals, and finding quality contents are among the strengths of online teaching. Lastly, some participants stated that there is no distraction for teachers or learners, there are better interaction and communication opportunities, they can improve autonomy levels of learners in online teaching. However, this category (class management & teaching) consists of fewer answers compared to other categories.

Table 7
Instructors' views on the strengths of online teaching

Themes	Categories	Codes
Technological Strength	Flexibility	No time constraint No location constraint Comfortable setting Time Management Reduces contamination risks
	Accessibility	Quick and easy access Recorded & accessible materials Large audience
Learning-Teaching Process	Resources & Materials	Unlimited & varied resources High Quality content Multimedia use
	Class Management & Teaching	No distracting element & participation Interaction & communication Facilitates learner autonomy

Source: authors' own work.

Table 8 displays themes, categories, and codes emerged from instructors' views on limited aspects of online teaching. The answers were compiled under two themes which are technical & infrastructure challenges and learning-teaching process. As majority of the instructors stated students can have a hard time accessing internet, and schools can fail to provide strong infrastructure for the online setting, two categories namely technology access, and system failures & weak infrastructure were emerged under technical & infrastructure challenges theme. On the other hand, instructors mainly complained about the challenges of interaction, communication, assessment, participation, monitoring and managing the classroom, and teaching of experimental or practice-based courses. Hence, these answers were complied under four themes namely difficulty in practical and applied learning, assessment & evaluation challenges, communication & interaction, and classroom management. As the answers include references for multiple theme and category, it isn't possible to present the data in a descriptive frequency-percentage table.

On the other hand, the most noteworthy and comprehensive answers to this question are given below.

1. Being under more stress due to internet connection interruptions.

Table 8
Instructors' views on limited aspects of online teaching

Themes	Categories	Codes
Technical & Infrastructure Challenges	Technology access	Not every student can access to internet or a good internet and device.
	System Failures & weak infrastructure	Technical infrastructure issues cause problems. Internet connection can be instable.
Learning-Teaching Process	Difficulty in Practical and Applied Learning	Failure to perform experimental practice. No room for skills development.
	Assessment & Evaluation Challenges	Reliability is a problem. It is hard to understand if students actually learned.
	Communication & Interaction	Ineffective communication due to differences in online and face to face communication (using body language). Little to no feedback in courses. Reduced interaction levels. Inability to display, receive and read emotions due to the virtual envorinment. Students do not participate even if they joined the lesson. Reduced participation.
	Classroom Management	Crowded sessions are not effective. It is not possible to control and monitor students to see if they are actively listening as they don't open their camera.

Source: authors' own work.

2. "The lack of feedback and participation in the lesson, students can't see me and the material at the same time, they cannot read my body language and hear my voice with the expressive power of the material, we cannot create the rhythm of the narration and use it to direct the attention of the students online, rather completely losing control over the attention and interest of the student... In short: Not being able to teach but be more of a radio announcer."
3. The lack of directness and dynamism brought by face-to-face education, hence the lack of motivation caused by the communication problem. Online teaching does not fit into the spirit of university education.

Accordingly, it is revealed that the teaching staff generally do not find online teaching as effective as face-to-face teaching, they have problems in interaction and student participation, and have difficulties in applied courses. The major reasons behind this are presented below.

Social bond and student engagement dimension

In this section, the answers of the instructors to the questions and items they encounter regarding the social bond and student participation sub-dimension are presented through descriptive tables showing items and the frequency and ratio of the responses.

Table 9 includes the responses of lecturers on social and student participation. Accordingly, most faculty members have positive views toward student-student interaction, collaborative activities, online discussions and conversation activities in online teaching. In addition, it is not generally believed that high-quality learning experiences can be created without face-to-face interaction with students.

Technology support for instructors Dimension

This section includes the items that reveal the need for technology support of the instructors and the responses to these articles. The results are displayed through descriptive tables that include technological tools, and the frequency and ratio of their use. On the other hand, the results of the qualitative data are presented in the paragraph below the table explanation.

Table 10 describes varying levels of adoption and preference for different educational tools. LMS is highly preferred in online teaching as it is a requirement to provide online teaching in Ege university. Apart from LMS, software & apps, web sources, and projectors were the most used tools by the participants. On the other hand, computer labs, student response systems, smartboards were the least preferred tools by the participants.

When faculty members were asked how often they needed help using the technologies provided by the Distance Education Centre (UZEM), 8 answered never (4.0%), 54 rarely (27.0%), 109 sometimes (54.5%), 20 usually, and seven answered always. On the other hand, when asked whether the support offered by UZEM met the needs of the instructors, it was revealed that 3 instructors felt that never (1.5%), 22 rarely (11.0%), 46 sometimes (23%), 106 usually (53.0%) and 22 instructors answered that always.

The instructors attended professional development training and certificate programmes provided by UZEM and the Coordinator of Instructional Technology (CSR), they participated in courses, training, etc. on the use of technology in teaching. For the statement "My institution provides the necessary hardware-software infrastructure and support for online education/training processes", 6 of the lecturers stated that they strongly disagree (3.0%), 22 do not agree (11.0%), 55 slightly agree (22.5%), 75 agree (37.5%) and 41 strongly agree (20.5%). For the item "My institution provides an adequate professional development programme on the use of technology for learning", 4 instructors strongly disagree (2.0%), 18 disagree (9.0%), 67 slightly agree (33.5%), 79 agree, and 31 strongly agree. On the other hand, for the last item of this sub-dimension, "My institution offers an adequate professional development programme for the use of technology for learning.", 12 strongly disagree (6.0%), 24 disagree (12.0%), 49 slightly agree (24.5%), 82 agree (41.0%) and 32 strongly agree (16.0%).

Table 9

Instructors' answers to questions about social ties and student participation

Items	I strongly disagree		Disagree		I Slightly Agree		I Agree		I Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*F*	%
Student interaction and collaborative activities should be at the heart of teaching.	4	2.00	6	3.0	18	9.00	88	44.00	84	42.00
Online discussions can be used for teaching purposes.	6	3.00	13	6.5	52	26.00	96	48.00	33	16.50
Online chat activities can be used for teaching purposes.	8	4.00	17	8.5	51	25.50	90	45.00	34	17.00
High-quality learning experiences can be experienced without face-to-face interaction.	40	20.00	45	22.5	63	31.50	38	19.00	14	7.00
I can provide the necessary information online.	14	7.00	35	17.50	54	27.00	71	35.50	26	13.00

Source: authors' own work.

Table 10
Technological tools used by instructors in their courses

Items	Never		Rarely		Sometimes		Usually		Always	
	F	%	*f*	%	*f*	%	*F*	%	*F*	%
LMS	8	4.04	23	11.62	38	19.19	66	33.33	63	31.82
Web Resources	4	2.01	7	3.52	24	12.06	99	49.75	65	32.66
Software & Apps	19	9.74	19	9.74	44	22.56	75	38.46	38	19.50
Screenshot Taking Software	46	23.83	32	16.60	37	19.17	53	27.45	25	12.95
Virtual Classrooms	52	26.94	40	20.73	44	22.80	37	19.17	20	10.36
Video Conferencing	40	20.83	46	23.96	46	23.96	34	17.71	26	13.54
Smart Board	104	54.74	39	20.53	19	10.00	22	11.58	6	3.15
Projector	26	13.47	16	8.29	17	8.81	59	30.57	75	38.86
Video Processing Systems	46	23.96	39	20.31	38	19.79	45	23.44	24	12.50
Student Response Systems	96	50.53	34	17.89	33	17.37	17	8.95	10	5.26
Computer Labs	103	54.21	27	14.21	26	13.68	23	12.11	11	5.79

Source: authors' own work.

Course design and instructional design dimension

This section includes the findings of the instructors' responses to course design and instructional design.

The instructors were asked which techniques and methods they use in their courses, with the findings revealing that direct-teaching (presentation), discussion, question-answer and case study techniques were used more than other techniques (Table 11). For the direct teaching technique, 54.5% of the instructors chose always and 38% answered usually. For question and answer, 38.5% chose always, 44% usually, for the discussion method 29% chose always, 35% usually, and for the case study 24% answered always, 39% usually. The least used techniques were primarily drama with a 58% never, and educational play, which followed with a 52.5% never response.

The answers to the question "Is there technology (hardware, software or application) that you would like to use in your courses?" show that platforms such as Adobe Connect and Microsoft Teams, specific software prepared for the needs of this field, and web 2.0 tools that can be used for content and material support are highly regarded. Instructors look for tools that enable them and their students to connect simultaneously, and tools that meet specific needs of the course, such as online lab experiments, or virtual health science applications, as these courses require hands-on experience with equipment, settings, and experiments.

On the other hand, most of the instructors who had undergone training/certification related to online teaching were confident that they knew and used best practices in this form of teaching (Table 12). In terms of online course experience, a balanced distribution is observed, although online discussion and quizzes are less preferred than online chat tools. The findings for the use of learning management systems, which are mandatory to be used when online education is carried out, reveal that instructors tend to find themselves at least intermediate, if not above level.

Measurement and evaluation dimension

In the responses to the item "Please specify the technologies you use to monitor the learning status of your students", electronic quiz, discussion and learning management systems responses stand out. The answers to another question, related to a scenario where the use of technology in assessing the learning process can improve students' learning outcomes, and how this benefit can be achieved, show that the development of tools, technology and material are a recurring theme 17 times, including infrastructure facilities. In another theme, the "learning-teaching process", feedback was repeated 5 times, student participation and follow-up 6 times, research 11 times, and recommendations for assessment and evaluation 15 times. Notable answers to the question in the form of a full sentence are given below.

1. Instructors need to receive more practical training related to distance education design.
2. Course content needs to be properly restructured, with the duration reduced.
3. All students need to be able to access the services used by universities on equal terms. Apart from this, it is also important that the paid software used in the departments should be free for students.

Conclusion and discussion

Within the scope of this study, the readiness of the instructors working at Ege University for online education is descriptively discussed, with a total of 196 instructors from 15 faculties participating in the

study. Data obtained from the online teaching readiness survey reveals that the participants generally felt quite ready for online teaching. The online learning-teaching process, which is the first dimension of the survey, shows that approximately 80 percent of the participants can use technology in their lessons or for extracurricular activities in the online teaching process, support the use of technology, and enjoy learning new technologies in this context. It is thought that the training given to the instructors by the Ege University Coordinator of Instructional Technology was effective in this finding during the pandemic process. The fact that the majority of lecturers had participated in the training provided by units such as UZEM and CSR affiliated with the university, and that they had responded at medium and higher levels to "I know how best practices are designed in online teaching" in the survey, shows that the level of readiness perceived by the instructors is high. On the other hand, instructional design is a field of study that creates its own unique models by feeding from many different disciplines and is only possible to specialise in with programmes such as bachelor's and master's degrees. For this reason, it can be said that teaching staff only have a positive self-assessment regarding online instructional design.

From technology acceptance model perspective, the trainings can boost the perceived ease of use dimension. The perceived benefit dimension brings positive contributions, such as flexibility in terms of time, space and content according to the answers given to the question of the strengths of online teaching. The decision to use technology is not a choice, but a necessity. In Koloğlu's (2016) study, the readiness of instructors for distance education was determined as medium, which was mainly due to the fact that the answer to questions about readiness were predominantly „I am undecided". Central tendency bias is a risk of accumulation of responses in the center (Alkharusi, 2022; Westland, 2022). Hence, this can be considered as a limitation for likert scales, especially 5-point likert scale as Symonds (1924) claimed that 7-point likert scale has the optimal reliability.

Adiyarta et al. (2018) determined in their studies that there was no high level of readiness in any sub-dimension of the readiness scale, and that support was needed in all categories. In their study, Farazkish and Montazer (2019) determined that more than 60% of academics scored "below average". In this study, it is revealed that the majority of the lecturers felt ready for online teaching compared to other studies of the above-mentioned literature. The studies stated in the literature show that the level of readiness of the instructors is high (Junus et al., 2021) or at a medium level (Bolliger & Halupa, 2021), meaning that the findings should be evaluated in particular for samples or study groups, and that generalisations should be avoided. We believe that the details that are not included in the studies, such as training given during the research and the exposure time to online teaching, may be related to the findings to be obtained. Therefore, according to the studies in the literature, the readiness levels of instructors working in different institutions for online teaching differ from each other.

According to another finding of the study, teaching staff have different opinions on the issue of whether online teaching takes less time than face-to-face teaching, although they largely agree with the idea that online teaching gives flexibility in terms of programme, course, content, etc. The fact that different answers between face-to-face and online instruction were given by a significant number of participants may indicate a lack of awareness of online teaching. This situation is also encountered in preferred teaching techniques, where participants believe that online teaching contributes to professional development, development of new ideas, and intellectual development. So it seems that participants have some positive views of online teaching, and this may have positively affected their sense of readiness. Similarly, in the literature, in the study conducted by Ýnan (2013), it is stated that the faculty members feel that online education provides equal opportunities.

In this study, analysis of the factors that most motivate the participants with regards to online teaching and increasing their willingness shows that students have acquired the skills needed in online teaching, that online teaching reaches a lot of students, and that online teaching responds to many needs, especially related to this field. The insights highlighted here may indicate some of the concerns that the faculty members had when switching to online teaching early in the pandemic. Since it is known that these concerns are eliminated with positive experiences and trainings in the process, it can be inferred that they are effective in motivating. On the other hand, the institutional acceptance of online education and the ability to decide on the form of the course are among the most approved items. With this in mind, it becomes clear that participants appreciate that their work is accepted and approved by institutions, and that they have more freedom over course design. While the majority of the faculty members think the institution they work for motivates them to teach online, that they feel more competent in this process, and that they can teach effectively, they also stated that classroom management is often more difficult than face-to-face lessons. The basis of the difficulties experienced in classroom management may be the reasons why the instructors do not have enough skills and experience related to this new teaching style, do not receive enough institutional support, students experience difficulties in this transition process, etc. These studies can therefore play a critical role in terms of determining the situation and producing solutions for the needs.

The strengths of online teaching have emerged as two themes, flexibility, and the learning-teaching process. In the context of flexibility, answers such as programme, flexibility and diversity of time, space and materials, technological possibilities, time man-

agement, accessibility, and instant solutions were frequently repeated, while interaction, cooperation, motivation, autonomy, and tools were among the frequently provided answers in the other theme. On the other hand, the two themes that form the weaknesses of online teaching are infrastructure and the learning-teaching process. In the infrastructure theme, the keyword that the most repetitive answers are related to seems to be "connection". Regarding the learning-teaching process, low active participation, motivation, difficulty in assessment and evaluation, inability to make experimental applications, inability to develop skills, impossibility of supervision and observation, distraction, feedback, interaction, and communication are frequently repeated responses. Lee et al. (2021) point out that instructors feel dissatisfied even if they deliver knowledge online due to the lack of interaction with students. In the study, although the concept of motivation was on both sides, it was predominantly stated as a weak aspect. In particular, participants working in medicine, nursing and engineering faculties stated that they were not satisfied with the lack of practice in their courses and that this teaching style is not suitable for their courses. Therefore, it may be more effective to follow blended learning styles for applied courses in online learning.

Sunarto (2021) stated that faculty members evaluate the strengths of online teaching with access to supporting practices and materials, and the weakness of online teaching as a lack of understanding of online philosophy. The concept of online philosophy in Sunarto's (2021) study can be considered as instructional design and online learning theories. The transition to emergency distance learning with the pandemic may have created problems in instructional design, although online learning theories are based on constructivism, and lecturers who had not mastered this theory may have experienced problems in determining their own position and using tools. This study revealed that presentations are among the teaching techniques most used by instructors. The presentation technique is a component incompatible with constructivism and therefore with online instructional design. As a direct teaching technique presentations place teachers at the centre, which is a basic problem of adaptation. It is evident that the participants are trying to adapt the techniques they apply in face-to-face teaching to the online environment. Interaction and motivation stand out when it comes to the positive and negative aspects of online teaching. At this point, it is thought that the instructors are aware of the interaction opportunities brought by technological tools, but they have problems using them in their courses and have difficulty in reflecting the motivation they provide face-to-face to online teaching. Bolliger and Halupa's study on online teaching readiness (2021) reveals that there is no difference between experienced and novice teachers in terms of technical skills, but instructors with prior online teaching experience have significantly higher scores than those inexperienced in terms of course design, course communication, and time management, and especially novice instructors with 0-2 years of experience had lower scores than instructors with 7 or more years of experience. Similarly, Lim (2023) states that technological readiness has no impact on confidence or satisfaction with online teaching. Martin et al. (2019) support these findings by claiming that experienced teachers had the chance to learn what works well when teaching online over time, whereas new teachers often concentrate on simply putting their course materials online (Kumar et al., 2019).

The Social Bond and Student Participation dimension reveals that the majority of academics believe students should be at the centre of education, that online discussion and conversation environments contribute to teaching, and that the information needed can be given online. Although the findings obtained from this dimension are positive both in terms of online teaching design and readiness, it is revealed that the instructors have opposite experiences during the implementation phase, with the answers to the question on the weaknesses of online teaching supporting this directly. According to the findings on technology support to instructors, the most frequently used tools in their courses were learning management systems, web resources, software/applications and projection devices. The fact that Ege University has its own portal, and that all courses are managed from here, can be a factor in the prominence of the learning management system. The instructors sometimes require help when using the technologies provided by the CSR, and the support provided by the CSR mostly responds to their needs. Teaching staff largely believe that their institutions provide the necessary hardware and software infrastructure and support in the online teaching process, as well as providing adequate professional development programmes for the use of technology for learning-teaching purposes. However, when the instructors were asked about the suggestions they would like to add, it is seen that requests such as a training course for online teaching, were very common. In addition, they offered suggestions that basic necessities such as online meeting tools should also be provided free of charge by the university. In his study, Gay (2016) revealed that there are deficiencies in the accessibility of support teams in the view of teachers, especially in the pre-class stage, which affects teacher satisfaction. In line with Gay's (2016) findings, it is thought that the fact that the faculty members find the support provided by the CSR sufficient may be related to their satisfaction with the process.

According to the findings in the dimension of Course Design and Instructional Design, the most used techniques by academicians are presentations, question-answer, discussions, case studies and problem-solving, which are actually used in face-to-face education and can be adapted to online teaching by instructors. In the transition from face-to-face teaching to online teaching, the situation in the previous paragraphs of the discussion is again evident. Although the extent to which these techniques are applied is a critical factor

for both participants and their students, neither do this nor other studies on readiness address this. The related literature shows that the previous use of online learning environments by academicians has positively changed their attitudes towards using these technologies (Adnan & Boz, 2015). In this study, participants stated they had previously taken one or more online courses at intermediate and higher levels in online learning, received training, completed a certified instructor programme for online learning, knew how to create best practices in online teaching, and were able to use the learning management system, electronic quiz, online discussion and chat tools in their courses. On the other hand, since there was no expert team of external observations in the study and only self-evaluations were included, it should be remembered that this finding is based on self-reporting. There is a need for external measurement and evaluation with valid tools in terms of readiness (Akbana et al., 2021), with the responses of the instructors to the positive and limited aspects of online teaching supporting this. In addition, Sunarto's (2021) findings are in line with this inference. It does not seem reasonable to expect an instructor who is not trained in the field to become an expert in instructional design with only a small amount of training. However, as mentioned earlier, these confidence-reflecting statements may explain why participants felt ready. Participants highlighted remote connection applications for the tools they may want to use in their courses, software specially prepared for the needs of the field, web 2.0 tools that can be used for content and material support. The need for field-based material support shows that instructors have difficulty in creating content due to potential reasons such as limited time, technical competence and lack of multimedia design knowledge. As a result, it can be said that area-specific material pools are needed.

Findings of assessment and evaluation dimension show that e-quiz, discussion and learning management systems are mainly used to monitor the learning levels of the students. Among the opinions expressed about the use of technology in evaluating the learning process, it stands out that instructors should take courses on online instructional design and that universities should provide the necessary paid software and tools. It has been determined in almost every relevant study in the literature that faculty members should receive support in online teaching (Adiyartal et al., 2018; Altýnay et al., 2020; Almahasheer et al., 2021; Callo & Yazon, 2020; Hoşgörür & Adnan, 2018; Paliwal & Singh, 2021; Sunarto, 2021; Velasco & Cańada, 2020). A study by Khairi et al. (2021) also revealed a finding that the necessary equipment should be provided for lessons and training, and therefore the suggestions made by the instructors in this study, as well as the suggestions in many related studies in the literature, are in parallel. Training should be prepared for the needs of the instructors.

According to the findings of the Readiness to Online Teaching questionnaire, the lecturers have many positive opinions about online teaching and have expressed their willingness to use online tools, learn new tools and techniques, and even improve themselves in this area. To this regard, the training and institutional support that the instructors participated in at the beginning of the COVID-19 pandemic may have been effective. However, sub-dimensions of the survey show contradicting results in terms of teaching techniques, methods and their perceptions on the limitations of online learning.

Recommendations

Based on the results of this study, below are the recommendations for research on online teaching readiness for online teaching practitioners.

Instructors' perceptions of online teaching readiness were surprisingly positive. Considering the limitation of the measurement tool based on self-reporting, data can also be collected through interviews and observations on readiness determination. In addition, awareness training can be increased so that instructors can understand how to benefit from online teaching. This study lacks "experience" as a variable to compare readiness levels, hence it is recommended that experience can be measured as a variable to do comparative analysis. Both this study and other studies in the literature show that instructors need support in the context of online teaching. To this end, online teaching support should be increased. Although the participants developed an internal understanding of teaching with the experience and were able to realise the possibilities of the use of tools, the findings show that there is a need for expertise in subjects such as educational philosophy, learning theories, teaching methods, measurement, and evaluation beyond the learning-teaching process. Finally, instructors can be supported by collaborative activities in which knowledge is formed among learners by taking advantage of the theory of adult education, providing the autonomy they need and placing them at the centre of learning.

The appendix is available in the online version of the journal.

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Andrzej J. Gapinski

Teaching in a time of pandemic: The case of the EMET Program at Pennsylvania State University – Fayette

Abstract

The author shares his experiences of university teaching during the time of restrictions imposed on teaching and learning modes due to a pandemic. The relative scarcity of literature analyzing the response in the fields of science and engineering to the pandemic served as motivation. After providing general background information about the pandemic's impact on educational systems worldwide, the article provides qualitative research with a narrative model for a case study of an engineering program at an American university. The analyzed case concerns the teaching and learning methodologies implemented in an electro-mechanical engineering technology bachelor's degree program at Pennsylvania State University – the Fayette campus in the academic years 2020-22. Pennsylvania State University's chosen teaching modes in the time of the pandemic to be used by instructors provide an example of adaptability of a higher education institution to the changing teaching and learning circumstances. The pedagogical approach to preparing, delivering, and assessment of learning effectiveness in engineering courses with a laboratory component is described. The article also shows how to use the learning management system, Canvas, with its analytical utility tool, to improve effectiveness and responsiveness of the teaching and learning process. The shortcomings and unexpected benefits of learning online pedagogy are shared and discussed. To assess the students' perception and the study mode and their preferences in this regard, an anonymous, closed-ended, nominal-polytomous questionnaire was conducted, and its findings are analyzed. Further, to compare the students' preferences as regards study modes depending on the academic discipline, engineering students were contrasted with students studying business as their major. The surveys also provide answers to trends in the longer term in students' expectations for delivery of programs by higher education institutions.

Keywords: educational system, teaching modes, online learning, pandemic, engineering program

Introduction

From elementary schools to university level, irrespective of the geographical location and country, education systems were impacted by pandemic-related restrictions with various levels of severity. The effects of COVID-19 on education worldwide have been described in various publications in economics, pedagogical, and educational literature. Even by April of 2020, the World Economic Forum (WEF, 2020) had reported that 1.2 billion students worldwide found themselves [locked] out of the classroom in 186 countries impacted by school closures. Countries worldwide, responding to the pandemic, established different policies and educational guidelines to follow, which consequently affected the educational processes and their outcomes differently (Bozkurt et al., 2020; Pokhrel & Chhetri, 2021). In the case of the USA, the individual states pursued their own policies, under the federal legal system, which had various implications for educational processes and measured outcomes. All fifty of the states closed schools for face-to-face or in-person instruction at some point at the beginning of the pandemic, in spring 2020 (Ballotpedia, 2022). While some states in the USA such as

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Florida, Montana, and Wyoming (Ballotpedia, 2022; Freeman, 2020) opened their schools earlier after some delays due to changing pandemic circumstances in late 2020 or early in 2021, the majority of states kept schools closed for much longer (Ballotpedia, 2022). As Ballotpedia (2022) reports, "by the end of the 2020–20021 academic year, about 66% of students were in states that left closure decisions to schools or districts (most of them were closed), 33% were in states with state-ordered in-person instruction, and 1% were in states with state-ordered regional school closures."

In August 2021, the U.S. Department of Education (U.S. Department of Education, 2021) released a "Return to School Roadmap" that provided "key resources and supports for students, parents, educators, and school communities to build excitement around returning to classrooms this school year", and outlined "how federal funding can support the safe and sustained return to in-person learning." Many states kept schools closed well into the 2020/21 school year and beyond, causing students' deficiencies regarding basic skills such as math and reading in K-12 education, which are either hard to make up or completely irreversible. In a report assessing student learning done remotely or via hybrid methods, throughout the pandemic, McKinsey& Company (Dorn et al., 2021) analyzed data for 1.6 million elementary school students across more than forty states in the USA, comparing students' performance in spring 2021 with the performance of students prior to the pandemic, and found that "students testing in 2021 were about ten points behind in math and nine points behind in reading." Translating this information into school-time or month of learning, McKinsey& Company (Dorn et al., 2021) reported that "students are five months behind in math and four months behind in reading."

Naturally, the negative impact encompasses both tangible and intangible losses, both being definitely intertwined. For the former, The Wall Street Journal (Chapman, & Belskin, 2022) reported that the "pandemic learning loss could cost students 70,000 (U.S. dollars) in lifetime earnings" due to a degraded skill set and consequently lower productivity in later years. Furthermore, a study by Stanford University economists (Hanushek & Woessmann, 2020) projects possible losses for the overall USA economy of USD 28 trillion over the rest of this century. Worldwide, according to the Stanford study (Hanushek & Woessmann, 2020) "For nations, the lower long-term growth related to such losses <due to closed schools> might yield an average of 1.5 percent lower annual GDP for the remainder of the century."

McKinsey& Company (Dorn et al., 2021) reported that the harm caused by the pandemic goes well beyond academics: "Roughly 80 percent of parents had some level of concern about their child's mental health or social and emotional health and development since the pandemic began" with "35 percent of parents very or extremely concerned about their child's mental health…social and emotional health."

School openings worldwide: the road back to in-person teaching

Worldwide, Denmark was one of the first countries to open schools, as far back as spring 2020, with some restrictions, which were only gradually relaxed (Kingsley, 2020). Many other countries pursued much more restricted policies well into the 2020/21 academic year (Bozkurt et al., 2020). As far as the USA is concerned, as mentioned, a U.S. Department of Education document from August, 2021 specified the guidelines for school districts to prepare for the academic year 2021/22 with its "Return to School Roadmap," which "will lay out actionable strategies to implement the Centers for Disease Control and Prevention's (CDC) updated guidance for K-12 schools, so that schools can minimize transmission and sustain in-person learning all school-year long." The guidelines focused on three priorities: "(1) prioritizing the health and safety of students, staff, and educators, (2) building school communities and supporting students' social, emotional, and mental health, and (3) accelerating academic achievement." Due to various levels of administrative and legal dependence of the states and their school districts on governmental mandates, the school districts and universities pursued different policies regarding the pandemic.

Learning technologies and COVID-19

Even prior to the COVID-19 breakout, countries worldwide were spending a substantial amount of money on educational technologies. The World Economic Forum (WEF, 2020) reported that prior to the pandemic "there was already high growth and adoption in education technology, with global edtech investments reaching USD 18.66 billion in 2019 and the overall market for online education projected to reach USD 350 billion by 2025." From the moment of COVID-19, expenditures on educational technologies and their usage only increased. These educational tools include virtual tutoring, video conferencing tools, online learning software, and language apps.

There are articles presently in the literature that describe in detail how different countries and their educational systems on different continents responded to the new challenge of adapting to a new online learning environment (Bozkurt et al., 2020; Rabiega-Wiśniewska et al., 2022; WEF, 2020). The education institutions responded to new requirements of remote learning [by prohibiting] face-to-face contact in classrooms. Consequently, education institutions have changed significantly, relying mostly on online learning, whereby teaching was undertaken remotely and on digital platforms (WEF, 2020). Many authors (Abdrasheva et al., 2022; Bakker & Wagner, 2020; Bozkurt et al., 2020; WEF, 2020) point out the "digital divide" among different countries and among different groups within specific countries and societies that affected the availability, access, and effectiveness of online learning processes.

Higher learning institutions' response to the pandemic: initiatives, online learning, challenges

Similarly to other parts of the educational systems, higher education institutions were forced to shift suddenly from the classroom to an online learning environment worldwide in spring 2020. To facilitate the transition, governments and higher education institutions developed initiatives to support students, including providing students with SIM cards, providing devices for online learning, [providing/enabling] direct cash transfers, [enabling] late payment for tuition fee or tuition cuts, and providing food vouchers, interest-free loans, etc. (Abdrasheva et al., 2022). The effectiveness of the transition to online learning was dependent, in general, on many factors, including the availability of the needed infrastructure for remote communication, technological support provided by institutions, and a faculty's level of familiarity and experience with online learning technological tools (Abdrasheva et al., 2022; Gapinski, 2020, 2023; Pokhrel & Chhetri, 2021; WEF, 2020).

Turnbull et al. (2021) provided an early report on higher education institutions' response to the pandemic with respect to educational technologies in use and the challenges encountered by staff and students. In their analysis, they considered only papers in English with empirical findings. They found that most papers were health-related or general in nature, and lacked specific academic discipline focus. A scarcity of papers on higher education institutions' response to the pandemic was reported for science and engineering.

The factors that the RAND Corporation determined as key indicators of pandemic preparedness and consequently efficient transition to online learning were: "1. Providing devices (such as laptops and tablets); 2. Training teachers on delivering online instruction; 3. Using an LMS; 4. Providing fully online or blended learning courses; 5. Establishing plans to deliver instruction during a prolonged school closure" (Eadens et al., 2022) higher education institutions seem to be much better prepared than K-12 education, due to having a longer period of experience in online learning, and academically much more mature students.

Does the selected dominant online learning mode chosen by higher education institutions restrict the development of vital skills of the receivers on the other end of communication links? Educational researchers (Bakker & Wagner, 2020; Lv et al., 2022; WEF, 2020) worry that new technology with online learning will lead to a return to less favorable pedagogy – transmission of knowledge at the expense of fostering analytical and critical thinking abilities. Bakker and Wagner (2020) noted that most of the challenges facing education due to the pandemic are transdisciplinary in nature, but "some have unique characteristics for mathematics learning." The same authors point out the consequences of the pandemic for research activities and the way the researchers are modifying their activities due to new circumstances, and also draw attention to the unexpected benefit and importance of forced pausing and reflection on scientific endeavor and discovery. They made an eloquent comparison between situations imposed during the pandemic of the [….] unknown to Dante's *Divina Commedia* scenario, written in the 1300s, and an inability "to find the right way '*la diritta via*'." Abdrasheva et al. (2022) reported that "roughly 58% of global researchers experienced significant disruptions and delays in their research projects since they had no access to laboratories and specialized equipment."

The ramifications of the changing educational environment in times of a pandemic go beyond the selection of proper and most effective teaching methodologies. In 2020, Erduran (2020) pointed out that the COVID-19 pandemic placed additional responsibility on science education due to "growing mistrust in science" in general due to misinformation or conflicting messaging disseminated by the mass media, online, or even by governmental agencies.

A World Economic Forum publication (WEF, 2020) points out the benefits of online study, citing evidence that online study is conducive to retaining 25–60% more information compared to 8–10% in a classroom environment, and that online study requires 40–60% less time to learn than traditional face-to-face settings (WEF, 2020). According to the authors (WEF, 2020), in online study, students learn at their own pace, retrieving the needed information whenever desired.

Pennsylvania State University: teaching modes

Similarly to other U.S. universities, Pennsylvania State University (PSU), commonly referred to as Penn State, switched fully to online mode after the academic Spring Break of March 2020. The initial teaching methodology of remote learning either in synchronous or asynchronous mode was enhanced, in the consecutive semesters, with a hybrid delivery method that combined online components with traditional face-to-face teaching but with strict distancing and mandatory mask procedures. At the PSU-Fayette campus, the electro-mechanical engineering technology program (EMET, n.d.) maintained the online, hybrid delivery method in the 2020/21 semesters, returning to face-to-face classes in spring 2022 in most classes. Pennsylvania State University responded to the pandemic by offering various options regarding the teaching mode early on in 2020, and for fall 2022, after some changes in the original settings, the following options were available to instructors (PSU-Registrar, 2022):

- In Person (P): the class meets in person on the days and at times listed. Instructors can offer up to 25 percent of an in-person class remotely (synchronously or asynchronously), and have flexibility to manage their own absences, whether due to illness or other unavoidable circumstances, during travel, or for pedagogical reasons.

- Hybrid: 25–50% Remote (H2): the class meets meet in person and remotely. 25–50% of the class will be taught remotely, synchronously or asynchronously.
- Hybrid: 51–74% Remote (H5): the class meets in person and remotely. 51–74% of the class will be taught remotely, synchronously or asynchronously.
- Hybrid: 75% and up Remote (H7): the class meets in person and remotely. 75–99% or more of the class will be taught remotely, synchronously or asynchronously.
- Remote Asynchronous (RA): the class meets remotely. 100% of the class will be taught remotely, asynchronously.
- Remote Synchronous (RS): the class meets remotely on the days and at the times listed. 100% of the class will be taught remotely synchronously. Instructors can offer up to 25 percent of a Remote Synchronous class remotely asynchronously, and have flexibility to manage their own absences, whether due to illness or other unavoidable circumstances, during travel, or for pedagogical reasons.
- Video-Receiving (VR): a shared class that a campus receives on the days and at the times listed. 100% of the class will be taught remotely synchronously. Instructors can offer up to 25 percent of a Remote Synchronous class asynchronously, and have flexibility to manage their own absences, whether due to illness or other unavoidable circumstances, during travel, or for pedagogical reasons. This only applies to the Digital Learning Cooperative (DLC).
- Remote Blended (RB): the class meets 100% remotely. The class will be taught remotely, combining asynchronous and synchronous (on days and at times listed) instruction. 50% or more of the class will be taught asynchronously.

Electro-Mechanical Engineering Technology program at Pennsylvania State University – Fayette

The electro-mechanical engineering technology (EMET) four-year degree program (EMET, n.d.), interdisciplinary by nature, combining electrical and mechanical engineering areas of study, prepares graduates for industrial and manufacturing environments in product design, development, and production. Penn State – Fayette (one of the campuses of Pennsylvania State University) EMET program learning objectives correspond to the Accreditation Board for Engineering and Technology (ABET) (ww.abet.org):

- an ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve a broad range of engineering problems appropriate to the discipline,
- an ability to design systems, components, or processes meeting specified needs for a broad range of engineering problems appropriate to the discipline,
- an ability to apply written, oral, and graphical communication in a broad range of technical and non-technical environments; and an ability to identify and use appropriate technical literature,
- an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes,
- an ability to function effectively as a member as well as a leader in technical teams.

EMET pedagogy, teaching / study modes and technologies

The EMET courses were offered online in the middle of spring 2020, due to breakout of the pandemic and, after a few semesters of online and hybrid delivery, there was a return to mostly face-to-face activities in the fall of 2022. Naturally, throughout 2020, there were substantial difficulties, especially for instructors facing a heavy laboratory program component in multiple courses in their transition to delivery completely online. In particular, the author of the article was required to deliver EET 275 PLC Controls, EMET 230 Computerized I/O Systems (Introduction to concepts of structured programming, data acquisition, computerized interfaces, and graphical user interfaces), EMET 330 Measurement Theory and Instrumentation (Fundamentals of measuring, transmitting, and recording temperature, pressure, flow, force, displacement, and velocity; the laboratory component emphasizes systems used in manufacturing), EMET 410 Automated Control Systems (Introduction to analog feedback control theory and computer simulation and analysis using MATLAB; laboratory study of feedback systems), and EMET 403 Electromechanical Senior Design Project, among others, initially in spring and summer 2020 completely online, and later in hybrid, and face-to-face mode, subject to required distancing.

These courses with intensive laboratory components required from the author the preparation of rather extensive instructional material to be posted using the Learning Management System (LMS) Canvas. The materials included detailed instructional guides for the labs, video recordings for all laboratory assignments and material, and other class material with 24/7 access by students (see Figures 1 and 2 in the online version of the journal). In the case of laboratory assignments, the lab kits were provided by the campus to students, and the students [created, set up] labs at their home with guidance provided by the instructor in either synchronous or asynchronous mode, depending on the needs. The online delivery of lectures or laboratory activities was performed via a video-conferencing tool, Zoom (https://www.zoom.us). The Zoom sessions were accessed through LMS Canvas, which provided proper log-in authorization. The author's class sizes varied during the 2020–2022

semesters, between seven and seventeen. Despite the challenging teaching and learning environment, the EMET students were successful in completing their course work and finalizing their education senior design projects throughout the pandemic years 2020–22 (Milasi & Gapinski, 2023).

Based on the author's observations, online class delivery is more suitable for academically mature students, while academically weak students struggle, especially with more mathematically advanced content. This realization motivated the author, based on his long experience with either hybrid or online delivery modes (Gapinski, 2012, 2013, 2020, 2023) to create an extensive library of video recordings on dedicated topics of various duration for students to review asynchronously, as needed. Most of the recorded instructional videos were from twenty to thirty minutes in duration. In each of the classes taught by the author, well over sixty dedicated video recordings on specific topics were prepared by the author and posted on the LMS Canvas-Media Gallery for 24/7 access by students (see Figure 2). Figure 2 shows a sample of the author's video recordings made for the EMET 410 Automated Control Systems class, such as Process Control with PID, MATLAB Simulink, Manual PID Tuning with MATLAB simulations, Minimum vs Nonminimum Phase Systems, Solving ODEs, Wind Turbine PID Control System, and Stability of Closed-Loop Systems. The total number of instructional video recordings created by the author for this class reached over sixty. The author of the article received positive students' comments about the pedagogical approach that allowed students to review rather difficult material at their own convenience, 24/7. The following are samples of the comments given: "I liked the lab portion of the class. Because there was a lot of information, the lab helped me understand the lectures. He also made in-depth videos on each topic which was very helpful." (Fall 2022), "The notes were helpful, and the published material online was the most helpful." (Spring 2022).

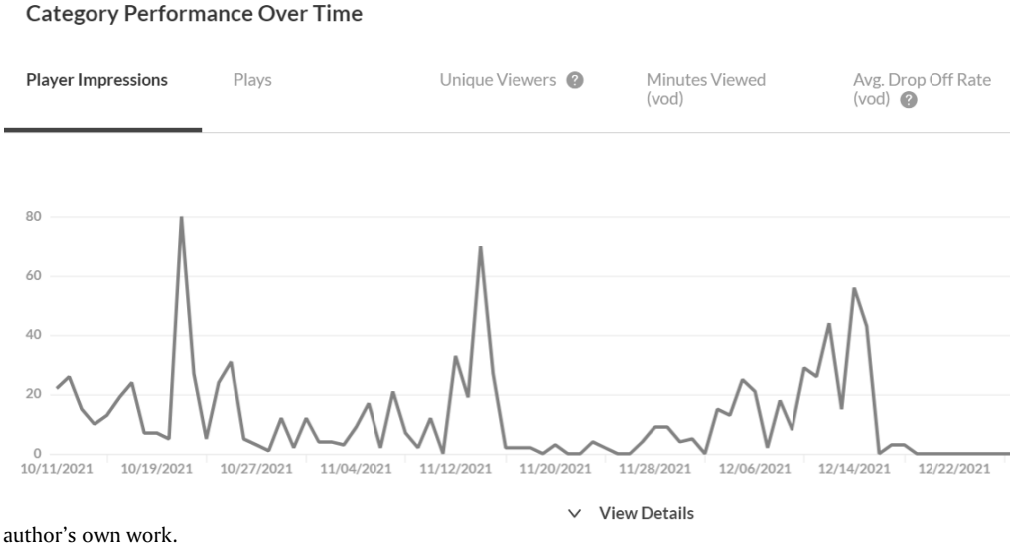
In courses that have pre-requisites, which is normal for engineering disciplines, the material posted on LMS Canvas played, in the author's eyes, an important role for a student's educational success. The LMS Canvas material, with its extensive instructional coverage, prepared by the author, allowed students to work and correct their own deficiencies, on their own time schedule, in the privacy of their homes. Naturally, the material posted on LMS Canvas enabled the instructor to provide the "flipped classroom" class format for students to learn material prior to classroom discussions and other related activities.

Pedagogy – taking advantage of the LMS Canvas Data Analytics

The Learning Management System (LMS), Canvas, has a built-in data analytics utility, which allows an instructor to monitor the access and usage by students of the instructional material posted on Canvas. This feature provides, in the author's view, a vital tool to monitor students' Canvas activity and provides information that can be useful when developing the right pedagogy in addressing specific topics. Furthermore, it provides the instructor with needed information on students to give specific students encouragement with a "gentle push" (see Figure 3 and 4). The Canvas monitoring feature, providing information on student usage, combined with the observed students' performance in class, allowed the instructor to adjust the lecture time devoted to specific topics as needed. Thus, the instructor was more nimble in addressing students' needs to better understand the material by tailoring class pedagogical methodologies that included engaging students in active learning individually or in groups.

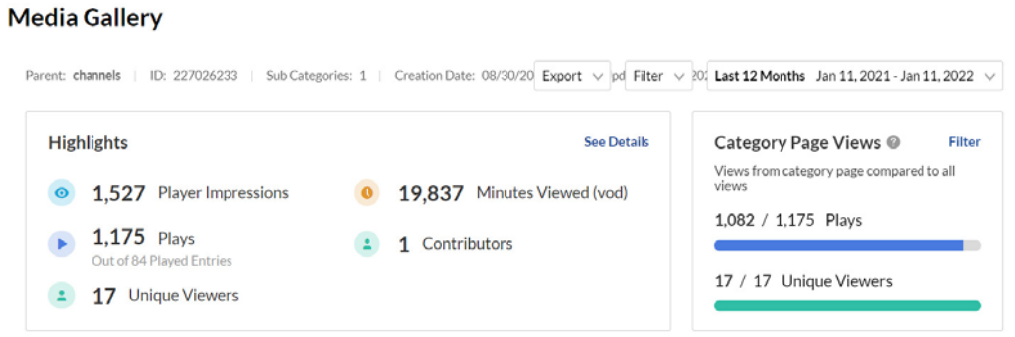
Figure 3

Canvas – Media Gallery. Data Analytics. Student usage time. Fall 2021. EMET 410 course



Source: author's own work.

Figure 4
Canvas – Media Gallery. Data Analytics. Student usage time. Fall 2021. EMET 410 course



Source: author's own work.

Figures 3 and 4 demonstrate the capability of the Canvas data analytics utility by showing data from the EMET 410 class, taught by the author in the fall of 2021. Namely, Figures 3 and 4 show the data collected for the EMET 410 course attended by sixteen EMET engineering students in the fall 2021 semester. As seen in Figure 4, the amount of time spent by sixteen students viewing the author's instructional video-recordings amounted to a total of 19,837 minutes (330 hours). This time does not include the time spent by students viewing other course instructional material posted on Canvas. This course, EMET 410, was a four-credit course, with five contact hours per week for lecture and associated laboratory activities. Figure 3 shows student usage of the video recordings prepared by the author during the semester with three clearly visible peaks before examinations, as one might expect. The assigned textbook for this course was *Modern Control Systems* by Dorf and Bishop (2017). Consequently, the instructional material posted by the author on LMS Canvas served as an additional resource available to students.

The Canvas data analytics utility allowed the author to monitor student usage of the Canvas resources on a weekly basis throughout the semester. As such, it provided vital information that enabled the author to formulate the pedagogical teaching methods to get more effective outcomes.

The author observed a strong positive correlation between the instructional viewing time, students' understanding of the material during the semester, and their final course grades. Students' understanding and comprehension of the material was assessed based on performance in examinations, pop-quizzes both online and in-class, homework assignments, laboratory work, student engagement, and class observations.

Quality assurance in the PSU-Fayette EMET program

As regards the issue of how to assure quality with the increasing number of online courses offered by universities and colleges, Swaak (2023) addressed this issue in a recent article that used a survey of college officials, performed by the nonprofit group Quality Matters and Encoura's Eduventures (Quality Matters, 2022). In the article, Swaak writes that while the "vast majority have quality standards, only a minority – 42 percent – reported that they always use them to evaluate new or heavily revised online courses."

Teaching at a higher learning institution naturally involves two parties: an instructor and a student. With a background in electrical engineering and computer science, the author participated in many pedagogical and instructional workshops and conferences throughout his academic career and has significant experience in using various software and educational technologies used in online and hybrid delivery methods. Students may initially have various levels of familiarity and knowledge of IT tools available on the campus, but at the junior level they are quite proficient in using them.

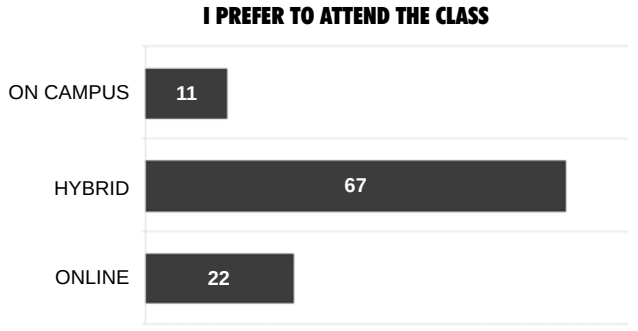
The discussed EMET program is ABET accredited, and as such has a detailed assessment protocol, which incorporates both qualitative and quantitative evaluation methods with performance indicators irrespective of the delivery method (face-to-face on campus, hybrid, online) to assess the meeting of designated learning outcomes. This involves the industry input on program contents and laboratory equipment, participation of industrial board members in senior project presentations, industry input about graduates' proficiencies, etc. Each EMET course has specific learning objectives and expected outcomes, and assessment rubrics listed by classes' syllabi. The assessment data are submitted by instructors for the comprehensive assessment reports. The reader is referred to ABET documentations and their assessment criteria.

The assessment of attainment of teaching and study objectives using the pedagogical methodologies described in the article in delivering EMET courses proved their educational utility value.

Student surveys: preferred teaching/study mode

To assess the students' perception and preferences as regards the study mode, an anonymous, closed-ended, nominal-polytomous questionnaire was administered and its findings are reported here. The EMET program students were asked about their

Figure 5
Engineering students' teaching mode preferences as a percentage. EMET 330 class. Spring 2021



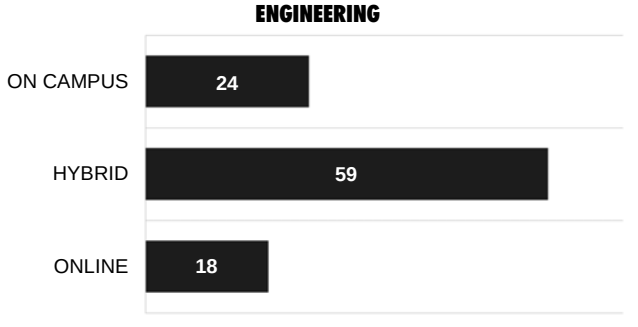
Source: author's own work.

preferred teaching/study mode with three options: on campus face-to-face, hybrid, or online. The survey was conducted among seniors of the PSU-Fayette EMET program in the spring of 2021 for seventeen students. Figure 5 shows the results of a survey among EMET senior students. The results show that students have a preference for the hybrid format due to the fact, in the author's view, that most students were adult students working either part time or even full time, so the time issue was essential for them, and they wanted to reduce travel time to/from campus. Many were working in the industrial park adjacent to the campus, in high-tech companies. The survey's online mode was understood as synchronous mode.

Does academic discipline affect the students' preferred teaching/study mode?

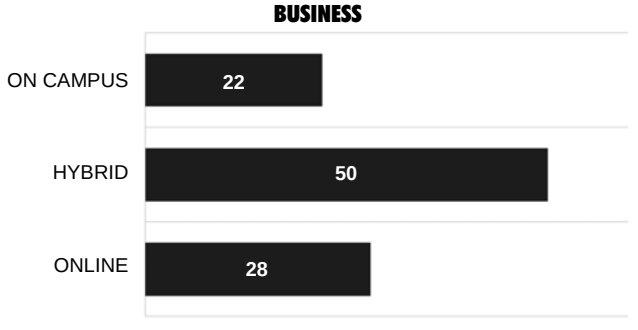
It was interesting for the author to check the students' preferences as regards the teaching and study mode (either on campus face-to-face, hybrid, or online) based on their academic major or discipline of study. Consequently, another academic discipline of business was chosen to compare and to contrast students' preference between the two different majors. Consequently, two academic disciplines were compared: the mentioned engineering program of electro-mechanical engineering technology at Pennsylvania State University – Fayette (EMET, n.d.) and business major at the University of Pittsburgh – Greensburg (UPG, 2022). The UPG Business program students were from general management, management information systems (MIS), and management accounting business majors. Most of the courses are quantitative in nature, in both the EMET program at PSU-Fayette and Business Management at UPG. However, as an engineering major, EMET has many more calculus-based courses. Both programs offered similar styles of teaching based on lectures delivered either on campus or online, instructional material posted on LMS Canvas for each course of comparable quality, and similar students' aids provided by campus IT staff assistance. The results of the anonymous, closed-ended, nominal-polytomous questionnaires are shown in Figures 6 and 7. On each campus, circa forty students were surveyed. The UPG campus was chosen due to the vicinity [due to proximity] and the fact that the research collaboration was already agreed with the UPG business faculty member.

Figure 6
Engineering students' preferences as regards the teaching mode as a percentage. PSU-Fayette. Spring 2022 semester



Source: author's own work.

Figure 7
Business students' preferences as regards teaching mode as a percentage. UPG. Spring 2022 semester



Source: author's own work.

In both cases, the Penn State University – Fayette and University of Pittsburg at Greensburg campuses, the students' preferred option was the hybrid teaching mode as of spring 2022, with 59% and 50% of responders, respectively. Furthermore, considering the second preferred option, while 24% of the surveyed PSU-Fayette students preferred campus face-to-face instruction, 28% of the surveyed UPG students preferred online delivery to instruction on campus. In the case of PSU-Fayette engineering students, based on the author's conversations with students, campus delivery was preferred to purely online mode due to the difficulty of mathematically-oriented contents of classes. Consequently, in the students' view, face-to-face sessions were more conducive to learning. In the case of UPG business students, based on the author's conversations with the UPG business faculty, most of the business students were working part-time, so travel time was a major concern for them. Consequently, their second preferred option was the online teaching mode. 18% of surveyed engineering students selected online delivery as the third option, while 22% of business students chose campus instruction as their third preferred option.

The results may be surprising, but the experiences of the students of the two programs during the years 2020–2022, during and after the COVID-19 pandemic, may provide some answers. It seems that the pandemic increased the level of anxiety about health issues in society in general, including within the student population. The combination of health-related concerns and the need for students to economize by reducing travel time to and from campus explains the selection by students of both programs of the hybrid format of class delivery as a mixture of on-campus and online instruction. Therefore, it is rather understandable that after the pandemic restrictions and difficulties students now expect more flexibility in class delivery methods.

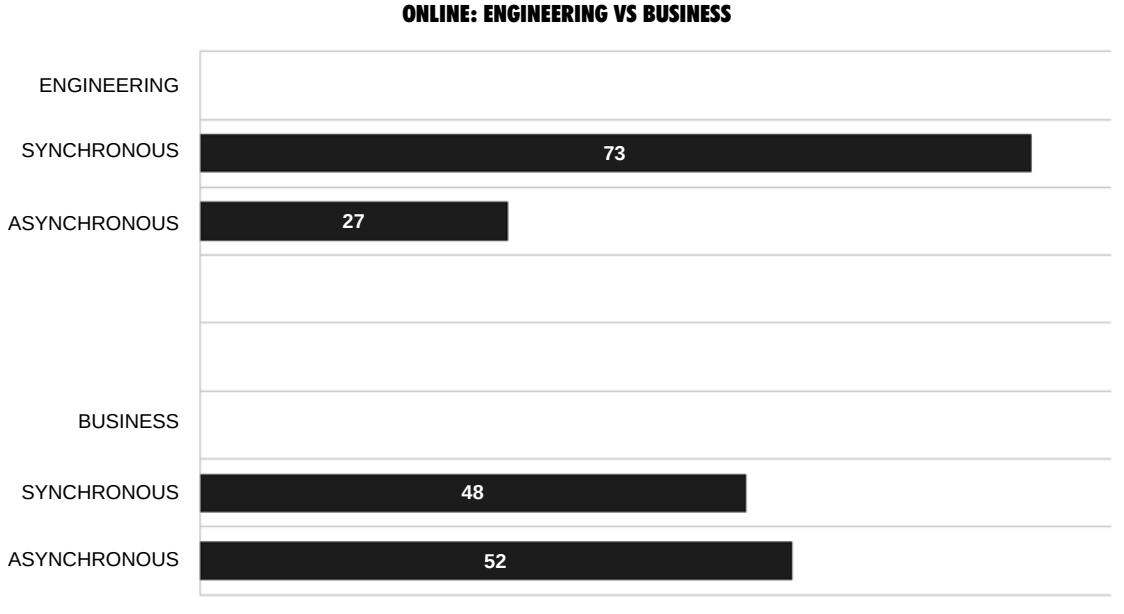
The survey results align with the subject of an article recently published by Hall (2023) in the Chronicle of Higher Education, where she reports that even with higher education institutions returning to campus face-to-face study, students, irrespective of age, expect convenience and flexibility in the courses offered online, and "didn't want online- and hybrid-learning options to disappear."

An interesting question for the author was what type of online format, whether synchronous or asynchronous, is the preferred choice of students of both [the two] majors. Consequently, the students of [the two] programs, engineering, and business, were asked about their preference between the online synchronous and online asynchronous mode of delivery. The results of the anonymous, closed-ended survey of students' preferences as regards online instructions in either synchronous or asynchronous mode are shown in Figure 8.

While the PSU-Fayette campus engineering students decidedly preferred a synchronous mode, with 73% of participants, 52% of the responding UPG business students preferred an asynchronous mode, see Figure 8. PSU-Fayette engineering students preferred the synchronous regular sessions with a video conferencing tool, Zoom, for two-way communication due, in the author's opinion, to rather difficult mathematical class content. Therefore, in the case of an unclear matter/issue, the synchronous online sessions allowed students to actively participate in the online sessions, and pose questions, in which case the unclear issue

Figure 8

Engineering vs business. Students' preferences as regards online teaching mode: synchronous vs asynchronous as a percentage. Spring 2022 semester



Source: author's own work.

was resolved almost instantly. In the case of business, based on a discussion with the business faculty member, the business students selected the asynchronous mode, with 52% responders preferring the synchronous mode, 48%, due mainly to the convenience of 24/7 access to the posted material.

The results of the surveys indicate longer-term trends in students' expectations regarding academic program delivery that have to be addressed by higher education institutions to provide viable options to students. Students expect and demand greater flexibility and convenience in teaching and study modalities, often involving online components, and other current learning technologies from higher education institutions, and these students' expectations are here to stay.

Conclusions

The goal of the article was to describe the ways the educational systems with higher education institutions responded to the challenges created by the pandemic worldwide and in the USA. In particular, the electro-mechanical engineering technology (EMET) program at Pennsylvania State University – Fayette was chosen by the author and a faculty member of the EMET program as a case study to explain the author's pedagogical journey undertaken for the last three years since the breakout of the pandemic to facilitate learning and meeting the teaching objectives in an ABET accredited program. The article provides qualitative research for the case of a U.S. engineering program using mostly narrative model [mostly using a narrative model/using a mostly narrative model] and consequently addresses the issue of scarcity of publications, as reported in literature, that focus on science and engineering during the pandemic. The implemented pedagogical methodologies that enable and support teaching and study in various modes in the engineering program are described. The article outlines the challenges the pandemic created for educational systems, and surprising if not unexpected benefits of the new ways of studying. The article also shows how to use the learning management system, Canvas, with its analytical utility tool to enhance pedagogical methodologies to improve effectiveness and responsiveness of the teaching and learning process. Furthermore, the paper analyzes the engineering students' perception and preferences as regards a teaching and study mode based on an anonymous, closed-ended, nominal-polytomous questionnaire. The article compares the students of different academic disciplines, namely engineering and business, in their preference as to teaching mode as well. It reveals the longer-term expectations of the post-pandemic generation of students, who require greater flexibility and convenience in program delivery methods offered by higher education institutions.

The long-term effects of the impediments to the teaching and learning environment due to the pandemic on students and graduates, changing preferences of students as regards teaching/study modes, and how higher education institutions and administrations at various levels can be better prepared for unexpected events are a few of the topics to be considered for further research.

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Jolanta Bieńkowska

Identifying critical success factors and risks in the academic course development process through the application of project management methodology

Abstract

Improving the educational process through evaluation requires adopting new concepts and approaches. In addition to the traditional methodologies applied in this field, such as observation or surveys, business methods are increasingly being implemented, including the Deming cycle or selected elements of project management methodologies. Their application allows for a holistic and unbiased view of the quality of teaching and learning.
This article aims to illustrate and evaluate the usefulness of project management methodologies in identifying Critical Success Factors (CSFs) and risks in creating and evaluating academic courses. The subject of the research was the course "Creativity and Decision-making", and the main method of the research, which was conducted in four cycles from 2020 to 2023, was the Deming cycle (PDCA). Data collection was based on data triangulation, including unstructured interviews with students and experts, as well as participant observation. Content analysis with a categorisation key was used to analyse the data, with the results presenting lists of extracted critical success and risk factors determining the quality of the course.
The implemented procedure represents an innovative approach to the evaluation of academic courses, at the core of which is the creation and updating of two substantively opposing lists: the determinants of learning successes and failures constituting of a map of strategic control points, and a basis for the improvement of the educational process.

Keywords: critical success factors (CSF), risk management, project-based learning (PBL), project management methodology (PMM), Deming cycle (PDCA)

Introduction

The priority of education has to be providing high-quality teaching and learning, which refers to the extent of valuable and efficient experience delivered to learners throughout the educational process (McLean & Ashwin, 2016; Zajda, 2021), enabling effective education that contributes to knowledge acquisition and develops students' skills and attitudes (Netshifhefhe et al., 2016). The quality of teaching commences with concept and curriculum planning (Richards, 2013), whereby lecturers select teaching and learning methods appropriate to the needs of the programme delivery and the requirements of the students (Toufaili, 2018). A further significant determinant of quality directly related to planning is the monitoring of task completion, the progress of students, the assessment of their work, and the evaluation of the whole process (Raza et al., 2015). Accomplishing that range of activities can improve the teaching and learning process (Ifeoma, 2022; Yambi, 2018), while the essence of evaluation is to provide feedback (Hounsell, 2003) that would assist in identifying the strengths and weaknesses of the educational process. Using this as a basis, lecturers may undertake measures to optimise their syllabuses, methods, and teaching and learning techniques to comply responsively with the needs of the students and enhance their learning efficiency (El-Hassan & Al-Hroub, 2013). In addition to traditional teaching and learning

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evaluation forms, which include observation, surveys, performance analysis and teacher self-evaluation (Anh, 2018), there is an increasing tendency to implement business methods, which, in particular, include PDCA, benchmarking, Six Sigma, etc. (Chen, 2012). Applying business methods in evaluating the teaching and learning process leads to a more holistic and unbiased approach to assessing the quality of teaching (Zuluaga-Ortiz et al., 2022).

Adopting business methods in the evaluation process is also prompted by the popularisation of the project approach (Kokotsaki et al., 2016). Treating the teaching course as an academic project increases the effectiveness of both the teaching and learning process by enriching the students' experience and thereby enhancing their engagement with the tasks and challenges assigned to them (Eckardt et al., 2020). With the project-based approach, students can learn by acting, experimenting and solving real-life problems, thus allowing the practical application of knowledge and the development of practical skills (Sumarni, 2015). Educational projects stimulate greater creativity and innovation in teachers and students (Johnsen et al., 2023), providing an environment to experiment with different methodologies and explore innovative solutions (Krajcik & Shin, 2014; van Rooij, 2007). However, the teaching and learning methodology mentioned above is not explicitly related to the project management methodology and its constant vital elements that determine the quality and efficiency of a project (Crawford & Pollack, 2007), even though there is a commonality between them that justifies their integration.

Project management methodology (PMM) in education is being applied at the level of the "approach" (van Rooij, 2009), using general assumptions and principles, without strictly following a systematic set of rules, regulations, procedures, and tools resulting from the methodology (Liegel, 2004). Among the few works illustrating the use of PMM in higher education is the described learning project for postgraduate students in the digitisation of solar energy building design (Gunarathna et al., 2023) and the results of research on the design of virtual team communication in undergraduate psychology courses (Chiocchio, 2007). An exception is eduScum, which methodology follows closely from PMM (Fernandes et al., 2021). However, it is mainly used to learn software development (Neumann & Baumann, 2021).

A key element of project management methodology are critical success factors, which define the conditions necessary to achieve project goals and ensure high-quality results (Melton, 2011) in order to identify areas that require special supervision and management during the project. Risk plays a significant role among the critical success factors (Ruzic-Dimitrijevic & Dakic, 2014). Their identification, assessment, mitigation strategies, and threat action plans enable better preparation for potential problems and challenges, allowing for more effective project management and increasing the likelihood of success. The introduction of an innovation consisting of developing a list (with a description) of CSFs and risks in the course description enables the effective implementation of teaching objectives and effects. Illustrating the proposed solution with a case study may encourage other lecturers to implement it, while investigating its effectiveness and sharing the results would help fill the current research gap in this area, and integration of project-based learning and PMM can improve the teaching process. Educational institutions could develop guidelines and frameworks for integrating CSFs and risk management into course evaluation processes, emphasising the importance of these elements in ensuring the quality and success of educational projects.

Background

The application of project management methodologies improves the management of the learning process, attains the intended educational goals, optimises the use of resources, minimises risks, and ensures effective evaluation (van Rooij, 2009). The project approach, when developing a course, enables focusing on the aim and the context in which it is set, enabling a complete understanding of the problem (Peraza & Furumura, 2022). Students' work is regularly monitored, which allows for ongoing control and reaction, correcting actions and performing the retrospective analysis (Kokotsaki et al., 2016). The domain of the project approach is to gather the knowledge needed to improve future projects.

Successful project management, including educational projects, depends on several factors that affect the execution process and the final results (Project Management Institute, 2004), including activities such as identifying objectives, planning, allocating resources, setting a budget, involving participants, etc. These, in turn, are also areas for defining critical success factors, which are an essential element in project management (Alias et al., 2014), representing factors that must be fulfilled or adhered to for a project to succeed (Zwikael & Globerson, 2006). On the other hand, insufficient consideration or disregarding them could lead to failure.

Critical success factors (CSFs) significantly impact the evaluation process in assessing activities' effectiveness and efficiency (Charvat, 2003), contributing to an overall understanding of whether objectives have been achieved, to what extent, and what steps should be undertaken to improve performance.

CSFs may vary following the context of the project/organisation. In education, they are vital to providing a valuable and high-quality teaching and learning experience (Nadim & Al-Hinai, 2016). CSFs in education comprise:

- Students' engagement and motivation are crucial to leading to effective learning experiences. Students are more likely to participate actively in classes and assimilate knowledge more efficiently when motivated.

- Qualification level of lecturers – proficient, well-qualified lecturers have the requisite skills, knowledge and experience to teach the material to students comprehensibly and engagingly.
- Individualised approaches in education allow for adapting the methodology and content to the individual needs of each student of their learning patterns, pace of knowledge acquisition and performance level.
- Utilisation of modern technology can augment the learning process and make it more gripping and interactive for students.
- Content and curriculum quality guaranteed by thoroughly designed and revised materials and curriculum are crucial in delivering a complex education.
- Effective assessment methods are used to verify students' progress and obtain insight into whether they are accomplishing their intended goals and learning objectives.
- Continuous improvement of the didactic process to alter needs and demands.

A prominent role amongst CSFs belongs to risk management (Dandage et al., 2017), with risk in a project pertaining to the possibility of unexpected events that can negatively affect the project (Schieg, 2006). Nevertheless, risk is an intrinsic part of any project that may originate from factors such as market uncertainty, ambient fluctuations, technological challenges, financial concerns, lack of resources, team issues, etc. (Lavanya & Malarvizhi, 2008). Furthermore, risk management is key to successful project design and implementation (Wideman, 1992).

Effective risk management covers the identification, analysis, assessment, preventative and reactive action planning, and project tracking and management of risks (Cagliano et al., 2015). Adopting appropriate risk management strategies can diminish the adverse potential effects of risk, reinforcing the chances of project success (Crispin, 2020).

Risk in an educational project pertains to potential threats or opportunities that may affect the achievement of the project's learning objectives (Kirk et al., 2022). The following are some examples of risks posed by an educational project:

- Engagement and motivation of students: Getting students involved in the learning process is key to an effective learning experience. Students are more likely to participate actively in classes and assimilate knowledge more efficiently when motivated.
- Qualification level of lecturers: Proficient, well-qualified lecturers have the requisite skills, knowledge, and experience to teach the material to students understandably and engagingly.
- Individualised approach in education: Students differ in learning patterns, the pace of knowledge acquisition, and performance level. The tailor-made teaching approach has the advantage of adapting the methodology and content to the individual needs of each student.
- Utilisation of modern technology: Implementing modern technological tools can augment the learning process and make it more gripping and interactive for students.
- Content and curriculum quality: Thoroughly designed and revised materials and curriculum are crucial in delivering a complex education.
- Effective assessment methods: Effective assessment methods verify students' progress and obtain insight into whether they are accomplishing their intended goals and learning objectives.
- Continuous improvement: Professional lecturers constantly strive to improve and adapt their practices to altering needs and demands.

To sum up, it is vital to incorporate risk identification and its analysis throughout the planning and execution of an academic project, as employing suitable risk management strategies can mitigate the negative effects of risk and enhance the chances of a successful educational project (Jones & Fevre, 2021). Monitoring progress regularly and adjusting strategies in response to new challenges are the core components of effective risk management in an educational project (Helsloot & Jong, 2006; Marchewka, 2010).

The identification of CSFs has been popularised in education, including higher education, although it is most often used at the organisational level. It solves problems, e.g. changing the university's operating model (Saleh et al., 2015). In the didactic sphere, it is used, among others, in the implementation of a new form of education (Cheawjindakarn et al., 2012; Min & Yu, 2023), in the analysis of online course resources (Soong et al., 2001), or in assessing the effectiveness of e-learning (Alhabeeb & Rowley, 2018; Puri, 2012).

However, there is a gap in applying the CSFs in academic course evaluation. Among the advantages of its application in this respect are setting clear and measurable learning objectives; actively involving participants in the learning process; providing relevant resources, such as learning materials, technology, etc.; evaluating the project's progress regularly; collecting reviews and feedback from project participants. These arguments are valid for implementing the CSFs method in academic projects concordant with the PMM and the business approach.

In contrast, identifying educational risks has yet to find widespread application in teaching and learning practice (Kirk et al., 2022). When building the quality of education, attention is focused on issues that predict quality improvement (O'Mahony & Garavan, 2012). Issues enabling the identification of potential failures and problems related to changes in educational processes, which would allow for adequate preparation for changes and minimising adverse effects, should be analysed in detail (Ruzic-Dimitrijevic and Dakic, 2014). On the contrary, within business project management, it is a top priority affecting each task in detail (Berg, 2010). Still, there is a gap in the way of thinking, a pragmatic business mindset is preoccupied with the need, if not necessity, to anticipate anything that could go wrong and to prepare a contingency

plan accordingly. The difference may be attributable to the low emphasis in the educational systems on ensuring the golden triad of the project: quality, time (work schedule), and cost (budget).

Research design

Purpose

The research aimed to apply project management methodology (PMM) to identify critical success factors (CSFs) and educational risks – key elements in the process of designing and evaluating an academic course.

Problem

How can the quality of education be improved when implementing practical academic courses aimed at generating innovative solutions?

Research question

How do the elements of project management methodology: critical success and risk factors apply to the design and improvement of an academic course?

Setting

The research was conducted based on a quality cycle (Plan-Do-Check-Act (PDCA)), a quality management method that is being successfully applied in education (Pietrzak & Paliszkiewicz, 2015). Alternatively, it may be considered an evaluation instrument (Mergen et al., 2014). The evaluation within the PDCA cycle provides a continuous flow of feedback and data supporting evidence-based decision management. This facilitates the improvement of processes, the elimination of errors, and the continuous refinement of operations. The procedure pattern to achieve better results consists of four steps, iterated systematically: 1. to plan, 2. to do, 3. to check, 4. to act (Divjak & Redjep, 2015).

The application of the PDCA framework in the following research project is presented in the list below.

Plan
- Determining: the purpose of the research, the method of achieving the goal, the method of collecting and analysing data, and the method of measuring results.

Do
- Conducting research among students, invited experts, and observations by the lecturer.

Check
- Data analysis according to the categorisation key.
- Measuring the results.

Act
- Improving the course framework and introducing it to the next edition.

The starting point for preparing the plan was to diagnose the problem: students fail to understand the proposed solution fully, missing critical details that determine the solution's usefulness, as well as the whole range of factors that impact its implementation. It was observed during the realisation, in 2018 and 2019, of a one-semester course called „Creativity and Decision-Making", an elective course for management students with a major in project management (Faculty of Management, University of Lodz, Poland).

A concise description of the course is presented on the course card below.

Content analysis was used to analyse the data, which aims to systematically understand and interpret the content of a text (White & Marsh, 2006). The starting

Table 1
Course card

The course aims to provide knowledge of the conditions for creating and implementing innovative solutions and the drivers of the decision-making process thereon.
The main task is to develop innovative business ideas in teams of 2–3 people and present them to business experts.
The principal method for designing a solution is Design Thinking.
Managing the project was based on a linear (waterfall) approach characterised by the emergence of a final product at the end of the entire development process and its presentation in front of a team of 3 experts at the final stage of the course. The teams were working independently during the semester, consulting with the lecturer.
The evaluation was based on an oral and written (descriptive) project presentation. The evaluation **criteria** are the usefulness and originality of the solution, its potential implementation possibilities, relevance, clarity, and attractiveness of the message (oral and written).
The initial outline of the course: 1. Introduction 2. Creativity – originality vs usefulness 3. Empathising with the customer 4. Idea generation 5. Idea presentation 6. Prototyping 7. Testing 8. Refinement of the project 9. Presentation of projects/assessment of the invited three experts 10. Conclusion of the course.

Source: author's own work.

point is coding, i.e. identifying key thematic categories or issues that will be analysed in the content, which should result from the research objectives. The following study used closed coding with a categorisation key, assigning previously defined categories or codes to specific text fragments (Zhang & Wildemuth, 2005). A list of potential critical success factors (CSF) and threats was used to create a categorization key, developed based on assumptions regarding the organisation and implementation of the course (Table 2).

Table 2
Data categories model / categorisation key

CSFs	Risks
• work organisation • lecturer-student relationships • role of experts	• empathise • define • ideate • prototype • test • results/project presentation

Source: author's own work.

Data was collected based on data triangulation using various data sources (Flick, 2018). The research below used a method of participant observation and free-form interviewing undertaken:

- with the students who expressed a wish to take part in the survey both during and after the course,
- with invited experts/judges.

Participant observation involves the active participation of the researcher in the group or community under study to comprehend and analyse its behaviour, values, norms, social interactions and other aspects of life (DeWalt & DeWalt, 2002). This method of collecting information lets the researcher gain insight into the perspective and viewpoint of the respondents (Kawulich, 2005).

A non-structured (free-form) interview, in contrast to a structured interview where questions are pre-prepared and imposed, therefore allows for a spontaneous response from the respondent (Arksey & Knight, 1999). If necessary, the researcher may ask for further clarification or elaboration of the respondent's answers (Zhang & Wildemuth, 2009).

The data collection period spanned from 2020 to 2023. The table below shows the number of respondents participating in unstructured interviews each year.

Table 3
The number of respondents in each year

Year	Number of students	Number of experts
2020	22	3
2021	18	3
2022	12	3
2023	18	3

Source: author's own work.

Results

As a result of the content analysis using a categorisation key, CSFs and risks determining the quality of education during the implementation of the course "Creativity and Decision Making" were identified. The information obtained during the evaluation was assigned to a specific thematic category and synthesised, and this process was repeated after each edition in 2020–2023. The presented results are the result of recent research.

Critical Success Factors

The figure below shows the list of four CSFs established for the course under research with their synthetic description.

Figure 1
List of critical success factors (CSF)

Course introduction

- At the first meeting, it is essential to thoroughly present the concept of the class and discuss the principles of project implementation, which allows students to build the right attitude.
- Two primary criteria for assessing innovative solutions should be discussed in detail: originality and usefulness. The need to balance them is difficult for people without experience in designing innovative solutions. They often lean towards new things, ignoring various limitations and barriers affecting the functionality of the proposed solutions.

Schedule divided into stages/sprints

- A schedule divided into stages/sprints is critical to the creative design process. It allows for optimisation of expected effects and better control over work progress.
- Stage reviews take place with the participation of an expert/practitioner, enabling independent verification of assumptions and influence on the team's work.
- Comments and conclusions from the reviews influence the further work of the team, promoting open cooperation and exchange of opinions.
- Awarding points to teams for completed stages strengthens commitment and enables ongoing assessment of progress.

The lecturer's role

- The lecturer assumes the role of a facilitator, supporting the team in organising work and removing obstacles.
- A lecturer can facilitate around 15 projects, which requires significant flexibility and knowledge in many areas.
- In an educational project, partnership relations with a moderate distance are essential, enabling control, security and negotiations.
- Taking on the role of facilitator by the lecturer facilitates the introduction of experts to whom the lecturer delegates responsibility for assessment. Transferring the assessment responsibility to experts allows the lecturer to play a supporting role in the project.

Expert participation

- Experts comment on projects, acting as evaluators.
- Practitioner participation supports creating innovative solutions by providing practical perspective and domain experience.
- Practitioners evaluate the results of design work with a fresh perspective, which supports creating innovative solutions.

Source: author's own work.

Identification of educational risks

The research identified four didactic risks. Their categories, descriptions, and ways of dealing with them are presented in the following two figures below. Knowing and monitoring them is aimed at effectively dealing with problems that may occur during the implementation of an educational project.

Improved framework

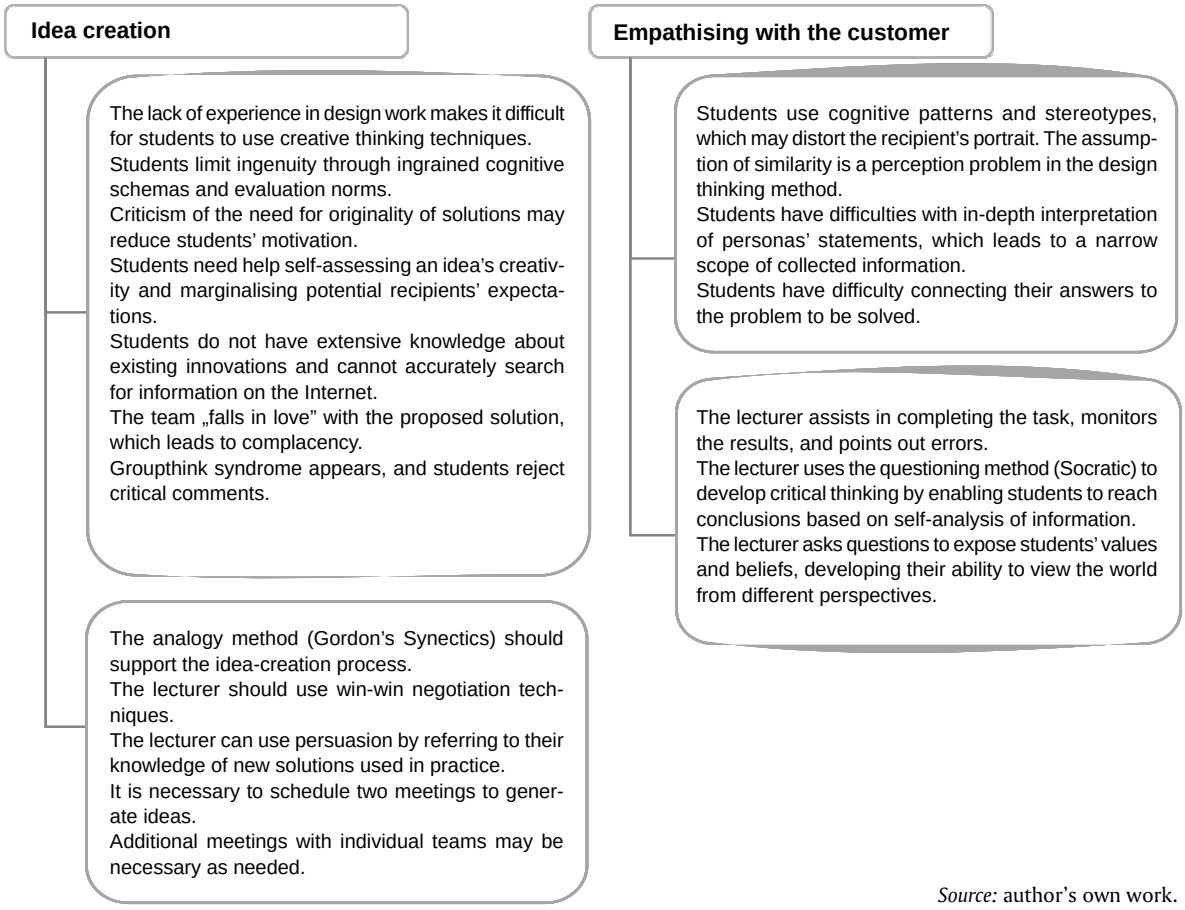
Analysis of the identified CSFs, including risks, has prompted a change in course management from a traditional, linear approach to an agile one, which was associated with the addition of meetings with experts/practitioners throughout the semester. As a result, elements of the eduScrum methodology were adopted. The programme was divided into sprints culminating in a meeting with the experts and a presentation to them of the output achieved during the sprint (review), where students receive expert feedback, further serving as a basis for determining potential problems or areas for improvement. Students receive feedback on the product from potential solution users, thus helping the project team recognise possible problems or areas for improvement. The acquired feedback, reviews and analysis of the sprint results are used to improve measures and plan upcoming sprints.

The evaluation is based on a threefold oral presentation of the project, supplemented by a written (descriptive) presentation. Presentations are graded on an incremental scale: 6-point idea presentation, 10-point prototype presentation, and 20-point final presentation.

Improved course schedule:

1. Sprint
   a. Start of the project: Introduction
   b. Creativity – originality vs. usefulness
2. Sprint
   a. Empathising with the customer (interviews with invited persons)
   b. Idea generation
   c. Idea presentation
3. Sprint
   a. Prototyping
   b. Presentation of prototypes/expert evaluation (sprint review)
4. Sprint
   a. Testing
   b. Presentation of projects/expert evaluation (sprint review)
5. Conclusion of the project: summary of classes

Figure 2
Lists of educational risks



Source: author's own work.

Impact of programme improvement on solving the problems

The description was adopted as a method for measuring the results of implementing research results into the next edition of the course. This research project is based on a qualitative descriptive methodology, which implies and justifies this choice (Zhang & Wildemuth, 2005).

Based on the results by analysing the observations of the students' current work, the final results of the innovative propositions and the content of the students' and experts' oral contributions, the following conclusions were drawn:

- students delve into the details of the suggested solution,
- after the first sprint review, the teams that have received negative feedback declare their willingness to modify the direction of the project,
- the level of self-reflection and the desire for self-development intensify,
- the heightened interest in understanding the proposed solution and the way it works,
- the growing need to understand the context of implementation, its conditions and barriers,
- students are more open to communication with the lecturer.

Discussion

The practical value of this research is thus to propose an approach to designing and evaluating an academic course with a particular focus on CSFs, including risks, an approach that involves creating and updating two substantively opposing lists, representing a map of strategic control points and a basis for improving the educational process. These are expected to vary according to the specific characteristics of each course as well as its objectives and expected outcomes.

Since the above study proposes an innovative approach to using PMM elements, such as CSF and the risks for the development and evaluation of academic courses, it is one of the few available in the literature that highlights the benefits of implementing PMM in education. They are consistent with those emphasised by other researchers: strengthening creativity, critical thinking, and problem-solving (Gunarathna et al., 2023), improving work organisation by dividing the programme into stages (Chiocchio, 2007), improving the efficiency of information flow, including obtaining information necessary to improve performance (Fernandes et al., 2021). These findings provide insight into the complexities and nuances of designing and implementing innovative solutions in academic contexts. They can be a reference point for innovative design and evaluation of academic activities, research, and sharing results with other lecturers. The value of the above research is therefore new knowledge in developing academic courses designed with an emphasis on acquiring professional competences.

Limitations of the research include the lack of reference to potential challenges or limitations in implementing the proposed strategies across different academic institutions, course types, or cultural contexts. Additionally, no quantitative measures of student performance were used in this research project.

Further, the implementation of the recommended approach to the didactic project is limited by the knowledge about PMM and other business methods that can be used in the teaching and learning process, which is not widely disseminated among lecturers outside the fields of business, management, and IT, and which can be used in the teaching and learning process (Ahtee & Poranen, 2009; Boehm et al., 2002).

Conversely, the research/evaluation method employed in the above-described research project, the Deming cycle, is widely applied in education at every level (Miller, 1991), and is implemented directly to refine teaching and learning processes, and as a tool to facilitate the subject/course evaluation process (Aggarwal, 2020). The limitation of this method is the duration of the standard academic cycle, impacting the prolonging of the research process, and providing the material for an extensive analysis of the issue and an effective solution for dealing with it.

The limitations of using PDCA in education include the difficulty of defining clear and measurable improvement goals due to the complexity of educational outcomes and, therefore, the pursuit of simplification and excessive standardisation. However, qualitative indicators can be used in PDCA, such as: subjective assessments, descriptions, quality of relationships, etc. (Dam et al., 2020). A single PDCA cycle is linear, but the method is designed to proceed iteratively. Once one cycle is completed, it can be repeated for continuous improvement. Thus, iterativeness is a key element of PDCA, allowing for experimentation and continuous improvement (Morgan & Stewart, 2017). Additionally, while PDCA is often associated with improving and optimising existing processes, it can also be used to suggest and implement innovative solutions. A key aspect is a flexible approach to each stage of the PDCA cycle, which allows the method to be adapted to various needs, including innovative projects (Hakim et al., 2020).

Further research on utilising PMM in developing academic courses should focus on the degree and scope of implementation and effectiveness evaluation, including developing quantitative metrics for student outcomes.

The continued investigation into the application of project management methodologies in the course development process should specifically examine the extent to which these methodologies have been implemented. It is crucial to analyse the degree and areas in which specific project management elements have been incorporated into the course development process. Research will help identify areas where these methodologies are most effective and allow their adaptation to specific educational needs.

Additionally, research should assess the effectiveness of applying PMM in creating academic courses, covering various aspects such as achieving educational

goals, student satisfaction, resource utilisation efficiency, and the overall quality of the teaching and learning process. Developing quantitative metrics for student outcomes is also essential to objectively assess the educational achievements resulting from applying project management methodologies.

Conclusion

The above article presents the importance of critical success factors and didactic risks that influence the design and evaluation of a project-oriented academic course. In the "Creativity and Decision Making" course under research, lists of these elements were distinguished. Aspects related to course introduction, schedule, role of the lecturer, and participation of experts were classified as CSFs. The risks were categorised according to the key elements of the course: idea creation, client emaptisation, prototyping and testing, and preparation of the final presentation.

They were introduced into the teaching and learning process, which allowed for optimising learning outcomes. Therefore, the research results presented above can serve as an example of the effective integration of business methods into academic education. They also provide new course design and assessment knowledge, proposing innovative approaches.

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Transversal skills in applied Artificial Intelligence – the case of the financial sector

Abstract

Different aspects of modern society can be transformed by the deployment of Artificial Intelligence (AI). AI-powered tools have promoted changes in the financial industry by applying inventive methods for data analysis and automating processes, efficiency enhancement, cost reduction and more personalised services to customers. However, AI algorithms may activate significant ethical and regulatory concerns that should be addressed by the industry and society as a whole. In line with the Erasmus+ project Transversal Skills in Applied Artificial Intelligence – TSAAI (KA220-HED – Cooperation Partnerships in higher education), which aims to establish a training platform, this paper focuses on an analysis of study programmes in formal tertiary education across consortium countries (Spain, Estonia, North Macedonia, Croatia, Germany, and Slovenia) with a special focus on applied artificial intelligence and development of curriculum that will integrate teaching guidelines covering the areas of application of AI technology in the financial and insurance sectors. To this end, a Systematic Review of Literacy (SRL) on the web methodology identifying the existing employability requirements in AI and the Learning-Centred Syllabus (LCS) methodology for curriculum development was applied, with the presented curriculum expected to serve as a framework to develop teaching materials to help students, academics and employees enhance their professional skills, thus satisfying labour market needs.

Keywords: transversal skills, artificial intelligence, curriculum development; teaching platform, financial sector

Introduction

The rapid advancement of Information and Communication Technology (ICT) has ushered in a digital era, transforming various sectors of society and the economy (WIPO, 2019; Xu et al., 2021). At the forefront of this transformation is Artificial Intelligence

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(AI), technology that promises unparalleled benefits and poses unique challenges. AI's impact spans healthcare, transportation, education, environmental management, and many other domains (Shiohira, 2021). However, its transformation is particularly significant in the financial sector, where AI revolutionises operations, decision-making and risk management. Harnessing the power of AI, new paths have been opened for data analysis and process automation to reduce costs, enhance efficiency, and deliver highly personalised services to clients. AI-powered technology has the potential to drive economic growth and create new job opportunities (WIPO, 2019; 2021). Market analyses have shown a rapid increase in the application of AI technologies in finance. In 2022, AI in Banking, Financial Services and Insurance (BFSI) participated with the highest 16.82% market share compared to the other economic sectors, and this trend is expected to continue until 2032 (Precedence Research, 2023).

In this context, our paper explores the concept of "transversal skills" within the realm of AI (Egana del Sol & Joyce, 2021), particularly in the context of the financial sector. Transversal skills, often referred to as cross-cutting skills, are competencies that transcend specific domains or disciplines, encompassing a wide range of abilities, including problem-solving, critical thinking, communication, adaptability and teamwork. These skills are essential in today's dynamic and AI-driven world, enabling individuals to navigate complex challenges and work effectively across various fields and contexts (OECD, 2021b). Transversal skills empower individuals' success in various domains, foster personal growth, and contribute to a more adaptable and innovative society. Cultivating and honing these skills should be a priority for individuals, educators and organisations. Due to the fast development of Natural Language Processing (NLP) and Machine Learning (ML) as subsets of AI, digital skills have become crucial skills required in various jobs. This is of particular importance, as long-life learning is redirecting the focus on "real-world contexts and work-based learning", which have been demonstrated to "motivate learners more than traditional approaches" (OECD, 2021b).

Artificial Intelligence (AI) is not a new field, with studies and research in AI having been performed for almost five decades (WIPO, 2019; Xu et al., 2021), and an advance in computational theories and models has been noticed. Over the last few years an Applied Artificial Intelligence (AAI) boom in the industry, especially in the private sector, has been observed (WIPO, 2019). It is worth mentioning that technological companies worldwide, such as IBM, Google, Apple and Facebook, have led the research and development of the application of computer models to solve real problems in the industry. However, Applied AI has been very distant from the needs required today.

Considering that AI is a transversal discipline (Egana del Sol & Joyce, 2021), we can assume that the demand for employment of such profiles has grown and will continue to experience noteworthy growth in the coming years. Nevertheless, the research in AI has been restricted to a small number of universities (WIPO, 2019), with regards to the number of patent applications, and it would not be possible to cover a wide range of application areas if restricted to the national level only. Raising this issue to the rank of the European Union, the possibility increases for finding a higher number of universities experienced in AI applications covering an extended spectrum of economic sectors (Egana del Sol & Joyce, 2021).

Our hypothesis centres on the pivotal question that frames our paper: To what extent are areas associated with Applied AI incorporated into the currently accredited curricula within universities in the consortium countries participating in the Erasmus+ project "Transversal Skills in Applied Artificial Intelligence" (TSAAI)? This inquiry serves as the overarching thesis for our research. Our goal is to investigate accredited ICT study programmes, with a particular emphasis on AI, in the TSAAI consortium countries. We aim to identify the degree to which these programmes integrate Applied AI concepts, particularly within the domain of the financial sector.

Our methodology involves a systematic review of the literature (SRL) available on the web in order to analyse existing study programmes and their alignment with the objectives of the TSAAI project. We also employ the Learning-Centred Syllabus (LCS) methodology for curriculum development, ensuring that the educational content aligns with the needs of students and the dynamic AI landscape.

The contribution of this paper lies in its potential to shed light on the current state of AI education and the presence of transversal skills in accredited curricula, specifically in the financial sector. This analysis is vital for several reasons. Firstly, the financial industry's reliance on AI is growing rapidly, necessitating a workforce equipped with the right skills. Technology based on AI algorithms is enhancing user experiences in various domains. As encouraged by users, Generative AI systems and Natural language processing enable applications like GPT-4, ChatGPT and similar OpenAI tools to create various forms of text, images or other content, including advanced chatbots, virtual assistants and language translation tools. By early 2023, some emerging generative AI systems had garnered a user base exceeding 100 million (Darktrace, n.d.). Marsh McLennan Insurance company officially introduced a trademarked AI assistant known as LenAI across their business units in autumn 2023, and within one month they reached 15 000 different users (UK Finance, 2023). AI-based algorithms also power personalised recommendations on e-commerce platforms, streaming services and social media, tailoring content to individual preferences (OECD, 2021a). Systems based on AI technology can analyse vast amounts of data, optimise operations, and identify opportunities for cost savings and process improvements, leading to increased productivity (WIPO, 2019; 2021). A pioneered AI-based anti-money laundering solution launched by HSBC, one of the largest banking

and financial institutions in the world, in partnership with Google Cloud in 2021, showed the AI system outperforming compared to traditional monitoring systems not only in enhanced accuracy and efficiency, but by reducing the data processing time from one month to two-three days (UK Finance, 2023). Secondly, ensuring a balance between AI-driven innovations and ethical considerations is paramount for society's well-being. Lastly, closing the skills gap and promoting continuous learning are essential for individuals to thrive in an AI-driven economy.

In the subsequent sections, we will delve into a detailed analysis of the identified study programmes, the current state of the ICT industry in the TSAAI consortium countries, and the proposed teaching platform "FuturIA". By doing so, we aim to provide valuable insight into the evolving landscape of AI education and its intersection with transversal skills. Readers can expect a comprehensive exploration of these topics, with implications for academia, industry and policymakers in the AI and financial sectors.

Benefits and drawbacks of Artificial Intelligence in finance

The remarkable development of Information and Communication Technology (ICT) has caused a high of digitalisation of business operations and standard working processes in both public and private organisations (Shiohira, 2021). Digitalisation and Artificial Intelligence undoubtedly alter our world, significantly affecting our personal, occupational and societal lives (WIPO, 2019; 2021). Whether aware of it or not, we are all witnessing the infiltration of AI in numerous spheres, such as healthcare (Lekadir et al., 2022), transportation and logistics, education (Shiohira, 2021), environmental and energy network management (Nti et al., 2022), etc. AI technology is increasingly being used for automation, guiding workforce transformation (Shiohira, 2021).

With the emergence of AI, the financial industry is among the most prominent sectors experiencing a significant transformation. AI systems can identify patterns, trends and anomalies that humans may miss, allowing financial firms to make data-driven decisions with greater precision and efficiency. It is collaboration between humans and machines, where AI assists human judgment rather than taking over completely. This approach enables technology advantages while supporting responsibility and control in decision-making. It may be necessary to prioritise the human role in decision-making (Zarsky, 2016), especially in critical use cases, such as lending decisions, to ensure that human judgment retains its significance and influence (OECD, 2021a). With continuous monitoring and analysing of vast amounts of real-time data, AI-powered algorithms can detect and mitigate risks more effectively. The assistance of AI technology in conforming to complex regulatory requirements is accomplished by monitoring transactions, detecting suspicious activities, and ensuring compliance with anti-money laundering regulations (OECD, 2021a).

The influence of AI in finance is seen in many aspects, such as asset management, investment analysis, trading (OECD, 2021a) and crediting (Albanesi & Vamossy, 2019), accompanied by fraud detection, risk assessment and customer support. AI-powered technology has the potential to drive economic growth and create new job opportunities (WIPO, 2019; 2021).

Analyses of the market have shown a rapid increase in the application of AI technology in finance. In 2020, the market value of AI in banking was $3.88 billion, according to Allied Market Research, and it is projected to reach an astounding $64.03 billion by 2030 (Business Wire, 2022). Other estimations, e.g. that of Statista (n.d.), predict even higher values, expecting the Asia Pacific region alone to generate $99 billion by 2030. Regardless of which prediction we choose, it is clear that AI will continue to be widely implemented in finance, which could bring substantial revenue growth.

Achieving the right balance between innovations and ethical consideration is critical in shaping the future of AI and its impact on society. While AI can potentially automate routine and repetitive tasks, resulting in increased efficiency and productivity, concerns about job displacement arise (Shiohira, 2021). It becomes imperative to reskill and upskill the workforce through continuous learning to adapt to the changing demands of an AI-driven economy.

The Randstad Report (2021) predicts that adopting AI in companies worldwide will lead to a 34% increase in employability. Companies need to develop a workforce with the necessary skills, one that will effectively address AI technology (OECD, 2021a; Southworth et al., 2023). However, the current pace of training and education programmes falls short of meeting this growing need, underscoring the urgency to bridge the skills gap and equip individuals with the necessary expertise (Shiohira, 2021).

Another important aspect is the transformation of roles in job profiles due to the digitalisation of business processes and standard operations in private and public organisations. One of the drawbacks that the social agents highlight with impetus is the destruction of employment from the digitalisation and automation of some tasks, especially in private companies. Transforming these roles into empowering digital positions is vital to mitigate the devastating effects of job loss; and investing in upskilling and reskilling these individuals is undeniably the optimal solution we should wholeheartedly rely on (European Commission, 2022).

Research objectives

The Erasmus+ project "Transversal Skills in Applied Artificial Intelligence" (TSAAI) – KA220-HED aims to support the horizontal priority of the endeavour "Addressing digital transformation through the development of digital readiness, resilience, and capacity." This paper is part of the TSAAI project,

which aligns with the EU strategy on digitalisation and reinforcement in technology, particularly in artificial intelligence. In line with this objective, the project seeks to establish a teaching platform called FuturIA, which includes pedagogical resources for instructors in higher education who want to experience and incorporate transversal competencies in AI in their teaching. Furthermore, the platform can benefit companies with a high demand for AI profiles, undergraduate and postgraduate students of diverse degrees who are interested in training and working in AI profiles, as well as adults who require vocational training reconversion to align their skills with the digitalisation demands of the job market. Additional priorities include the teaching material that covers competencies demanded in the business field not taught in accredited curricula in higher education.

The initial phase of this paper involved identification of the existing employability requirements in the field of AI across consortium countries (Spain, Estonia, North Macedonia, Croatia, Germany, and Slovenia) from social, educational and business perspectives. The choice of partner entities was made based on their knowledge and experience in Applied Artificial Intelligence in order to be able to meet a broad spectrum of fields of application in the different sectors of the industry. Knowledge in e-learning was also taken into account, research experience in IIA to Industry 4.0 with its project in energy efficiency in industrial and residential facilities (controlling a district heating plant that uses biomass), as well as the automated recognition of defects in road pavements, nanomedicine applied to cancer and other health applications, expertise in digital voice and image processing and deep learning in medical image analysis and explainable artificial intelligence in medicine, as well as expertise focused on business intelligence for process optimisation in companies. The geographical position of the countries covers most of the economic regions in Europe, with Spain belonging to south-western Europe, Germany to the western part, Slovenia and Croatia to central-southern Europe, Estonia to the north-east and North Macedonia belonging to the south-east region of Europe, while at the same time being part of the Balkan region. With the exception of North Macedonia, all the other countries are members of the European Union. We feel that the findings in these countries reflect the trend in the wider region, i.e. the whole European region. The differences among the countries refers to their geographic position, living standard, GDP, income per capita, education, healthcare, transportation, communication systems, industrial, infrastructural, and technological advancement, etc.

The objectives of this paper relate to the analysis of the study programmes related to ICT, with a specific focus on AI in the countries participating in the TSAAI project, to identify the extent to which they integrate Applied AI concepts, especially in the context of the financial sector, and to propose a teaching programme centred around the finance sector.

Study methodology

To address the major research objectives of analysis of study programmes related to Applied AI and creating curriculum frameworks to develop professionals, we addressed the analysis of data available on the web, known as the Systematic Review of Literacy (SRL) (Kitchenham et al., 2009; Lame, 2019). We tried to exclude the programmes concerning general AI and to include only those concerning applied AI topics. The analysed study programmes are shown in Table 1 in the Appendix.

This stage of the project follows the phase of the deep analysis of available data via SRL on the web (Kitchenham et al., 2009; Lame, 2019), including the following phases: 1. Analysis of the evolution of ICT in general, and AI in particular, relying on reports on the employment of ICT specialists obtained from the Labour Force Survey (LFS). 2. Information from public institutions, national employment services, public services of employment, national chambers of commerce, and international employment services.

In the systematic review method, the previous research's findings are observed to identify reliable and repetitive data. The well-managed and highly organised qualitative analysis, where researchers tend to cover fewer materials from fewer databases, differentiates SRL from the conventional literature review process (Tinmaz et al., 2022).

Well-defined forms were prepared and used by our partners to collect data related to the current status of the ICT industry classified into indicators as follows:

1. General macroeconomic indicators (Nominal Gross Domestic Product (GDP), GDP growth rate, GDP per capita, unemployment rate, and average monthly wage).
2. General ICT performance (Number of economically active companies and the share of companies in the ICT industry in the total number of companies).
3. Employee-related performance (Number of employees in the ICT industry, distribution of persons employed as ICT specialists by gender, education attainment level, age, the average annual rate of change for the number of employees in the ICT sector, the share of the labour force with an ICT education by labour status, the share of employed persons in the labour force with an ICT education, the average annual rate of change for the number of employed persons with an ICT education by educational attainment level, and education/training provider in the ICT industry).

Learning-Centred Syllabus (LCS) methodology will be used in the development of the curriculum and later in the preparation of teaching units (BYU, 2021). This practice will focus on students' needs and learning processes, with particular attention to obtaining significant academic progress.

The results related to the current position of the ICT industry in the partner countries obtained from

the ICT specialist employment report, as well as information from public institutions, was already presented (Porjazoska Kujundziski et al., 2023). Here, we will briefly elaborate on some of the key observations.

Current state of employability in the ICT sector

Previous studies (Porjazoska Kujundziski et al., 2023), based on the SRL on the web, summarised the current position of the ICT sector in the six countries, our partners in the TSAAI project. Through an analysis of general ICT reports (Eurostat, 2022), we focused on three main divisions of indicators: 1. General macroeconomic indicators, including the Nominal Gross Domestic Product (GDP), the GDP growth rate, GDP per capita, the unemployment rate, and the average monthly wage. 2. General ICT performance, involving the number of economically active companies and the share of companies in the ICT industry among the total. 3. Employee-related performance in the ICT industry, covering aspects such as the number of employees, gender distribution, education attainment, age, etc.

Due to the unavailability of specific statistical reports on AI, we relied on statistics linked to the general ICT industry, assuming that the trends in this sector reflect the position of AI application across various areas in the countries – partners in the TSAAI project.

Here we will present the indicators showing the general performance of the ICT sector in the six partner countries, while the indicators related to the general macroeconomics, such as the nominal Gross Domestic Product (GDP), the GDP growth rate, GDP per capita, the unemployment rate, and the average monthly wage, were elaborated in our previous work (Porjazoska Kujundziski et al., 2023). Yet, these and other indicators such as inflation, industrial production, retail sales for the real sector, trade, exchange rates, stock prices, and others, recognising the level of financial development in a country, are not part of this analysis.

The status of the overall performance of the ICT sector streamlines the determination of the necessary strategies for creating a favourable business environment in a country. The highest growth rate of the number of economically active ICT companies compared with the total number of economically active companies for the period 2020–2021 is about 90% for Spain, 16% for Estonia, 6.98% for Croatia, 6.3% for North Macedonia and 5% for Slovenia, as indicated in Table 2 (see appendix) (Bitkom, 2022; DZS, n.d.; GZS, n.d.; HGK, 2021; INE, n.d.; ITA, 2024; MAKSTAT, n.d.; MINECO, n.d.; Porjazoska Kujundziski et al., 2023; Statistics Estonia, n.d.).

The analysis addressing the inconsistency between the number of qualified employees needed and the output that the educational system provides is very challenging if one is concerned about the current status of the business environment (Eurostat, 2022; Porjazoska Kujundziski et al., 2023).

Table 3 (appendix) presents part of the data related to the general ICT performance. The share of employees in the ICT industry in the total number of employees was between 2.3% and 4% for all countries in 2020, showing an increasing trend in 2021 (Bitkom, 2022; DZS, n.d.; GZS, n.d.; HGK, 2021; INE, n.d.; ITA, 2024; MAKSTAT, n.d.; MINECO, n.d.; Porjazoska Kujundziski et al., 2023; Statistics Estonia, n.d.).

The appendix presents information about employee-related performance in the ICT sector for the partner countries in Tables 4 and 5. All the countries showed an unbalanced gender distribution of ICT specialists (Eurostat, 2022; Porjazoska Kujundziski et al., 2023) in the period 2012-2021. The highest percentage of ICT specialists, around 56% on average, was observed in North Macedonia, while in the case of the other countries the highest share concerned employees over 35 years old.

As indicated in the ICT report from 2021 (Eurostat, 2022; Porjazoska Kujundziski et al., 2023), Estonia has the highest share (96.8%) of the labour force holding ICT education, with the share of the labour force declining among the countries in the following order: Slovenia (96%), Croatia (91.2%), North Macedonia (87.7%), and Spain (73.91%). A rise of 15.3% in employed ICT specialists in ten years (2012-2021) was observed for North Macedonia, whereas for other countries it was significantly lower, ranging between 3.7 and 6%.

The level of education is often a measure of the developed skills of a labour force. Most ICT industry employees in Germany and North Macedonia, Table 4 (appendix), acquired their skills in non-tertiary education, while in the other countries, tertiary education provided the demanded competencies (Eurostat, 2022; Porjazoska Kujundziski et al., 2023). This observation aligns with the companies' readiness report on their participation in the informal education of the ICT labour force, Table 5 (appendix). Vocational education training centres are the leading providers of ICT skills in North Macedonia and Croatia. For Spain, this is the role of business institutions and national chambers of commerce. These observations are in line with those on the increasing digitalisation of business (Randstad Report, 2021; WIPO, 2019; 2021), presenting the ICT sector and applied AI technologies as an essential part of developed societies.

Analysis of the current status of the ICT industry indicates its impact on the economy, influence on the development of national strategies to satisfy the need for qualified professionals, and how to support internationalisation and education. In the context of the full progress of the digital age and the use of artificial intelligence (AI) in companies, job automation will increase by over 30% by 2030 (OECD, 2021b), impacting the high demand for employment in artificial intelligence profiles that cannot be covered by the existing curricula in the formal education and at the training rates we have today (MASIT, 2021). The shift toward digitalisation requires modifications in formal educational programmes and more significant support from the business sector. Consequently, the FuturIA teaching platform of the TSAAI project will facilitate the achievement of this objective.

Education programmes analysis

In line with the above-mentioned mission of the TSAAI project, an all-encompassing educational portal with a comprehensive curriculum will be developed, the main objective being to make the extensive training content available to many interested individuals.

The main focus of this initiative is to provide a comprehensive interdisciplinary AI training programme covering fundamental AI technology, practical applications in computer science and other fields, and addressing societal, ethical and legal aspects. This ambitious goal, along with the previous ICT industry analysis, involves analysing accredited study programmes related to AI, especially master's degree programmes, in the participating countries of the TSAAI project: Spain, Estonia, North Macedonia, Croatia, Germany and Slovenia. The aim is to bridge the gap between fundamental AI knowledge and the increasing demand for specialists in specific AI techniques. Table 1 (appendix) lists all the analysed programmes.

Analysis of the study programmes related to AI in higher education in Spain focuses on two bachelor's degrees and ten master's degrees. With regard to undergraduate studies, the analysis has shown that some programmes refer not only to Artificial Intelligence but also to Data Science. More focus on Artificial Intelligence could be applied in master's programmes – between 30 and 60 ECTS – where a block considering areas of application in biomedical informatics, linguistic engineering, web science, natural language processing, and automatic planning is offered. Some master's programmes have a clear orientation to Deep Learning, focusing on Neural Networks and specifications in training, testing, and validation, and practices with predefined models. Degrees focused on Software Engineering mainly cover theoretical components of AI, and include parts of education, finances, health, autonomous vehicles, Natural Language Processing (NLP), smart cities and manufacturing, and even entrepreneurship in AI. This is a model worth following. On the other hand, some universities follow a programme divided into modules concentrated on Linguistics and Cognitive Neuroscience, Cryptography and Security (including Biometric identification), and Neural Computation. Although some courses still require a deeper focus, they can give an idea of the wide range of applications of AI, e.g. focusing on shape recognition applications.

An analysis of the educational programmes at universities in Estonia reveals that they primarily focus on Computer Science, Systems, Computer Engineering and Software Engineering. Master's programmes typically last for two years (120 ECTS). Subjects covering various aspects of AI, including data mining, Machine Learning, computer vision, speech processing and applied data science in the energy sector, are part of the Computer Science curriculum. However, only a few courses in Computer and Software Engineering programmes address the application of AI in smart and intelligent systems, robotics and other disciplines.

Undergraduate programmes in North Macedonia typically span either 3 or 4 years, amounting to 180 or 240 ECTS, respectively. Likewise, graduate programmes last either 1 or 2 years, providing students with 60 or 120 ECTS, respectively. The first-cycle study programmes focused on Machine Intelligence and Robotics delve into topics of probability, linear systems and stochastic processes. They introduce the fundamental principles of cognition, automatic reasoning, and search decision theory, underlying courses covering basic and advanced training in robotics. In the second cycle of these programmes, the focus shifts to the Control of Systems and Processes, Computer Engineering techniques applied across various technical disciplines, medicine, management and more.

In Croatia, the second-cycle programmes typically last for two years and require the completion of 120 ECTS. Programmes in computing primarily focus on subjects such as programming, algorithms and data structures. However, they also offer elective modules that contain Machine Learning and its practical applications, such as robotics, image processing, and speech and language processing. Programmes in Computing, with a specialisation in Data Science, provide wide-ranged knowledge of Data Science techniques for management, analysis of Big Data, and application in several fields. The Programme of Computer Science – Internet of Things and Artificial Intelligence in the second cycle of studies orients toward building skills in data science and full-stack Internet of Things (IoT) developer roles, from the design and implementation of intelligent solutions to data analytics and hardware management.

Undergraduate programmes (3.5 years with 210 ECTS) offered at German universities focus on applied Artificial Intelligence, providing a comprehensive and scientifically grounded education in modern AI technologies, including Machine Learning, Deep Learning, visual analytics and autonomous systems. In addition to the principal skills for AI practitioners, the study programme also addresses powerful aspects, such as AI security, robustness, and ethical and legal considerations of intelligent systems. The curricula in Computer Science master's programmes focus on software architectures, parallel computing and Artificial Intelligence. The Business Information Systems curriculum offers courses in data science and Applied AI. Master's programmes specialising in Machine Learning and Data Analytics provide education on various Machine Learning techniques and their correct and efficient application. Moreover, the programmes address ethical and societal aspects related to AI.

The undergraduate programmes available at universities in Slovenia in Computer Science and Informatics/Information Technology primarily focus on programming and algorithms, and include blocks dedicated to Artificial Intelligence, Informatics, Software, Computer Systems and Networks, and Media technologies. The Artificial Intelligence specialisation offers courses in intelligent systems, development of intelligent systems, machine perception and data

mining. Third-cycle programmes deliver knowledge in evolutionary algorithms, data mining and knowledge discovery, intelligent systems and agents, and the application of AI in other disciplines.

Following the analysis of programmes in the partner countries of the TSAAI project, one could conclude that AI's knowledge builds in broader fields of computer science, computer and system engineering, information and communication technology, or the practical application of AI technologies in various disciplines. However, ICT programmes linked to the application of AI are not in line with the type of profiles created in formal education and the skills demanded by the business sector.

Following the review of the ICT study programmes, specifically those focused on Artificial Intelligence, and the study on the requirements for profiles in business applications of AI across various industry sectors, the TSAAI project consortium has suggested a curriculum consisting of nine modules for an Expert Course, with each module being allocated 2 ECTS. The curriculum is structured into three blocks, each comprising three modules.

Development of the curriculum

The curriculum suggested by the TSAAI consortium is concentrated around three key components:

- a theoretical introduction to the world of AI,
- a practical introduction to general AI,
- AI applied to specific Fields.

The phases of curriculum and teaching material creation use Learning-Centred Syllabus (LCS) methodology (BYU, 2021; Machac, 2022), which maintains a permanent focus on two key points: proximity to the profile and environment of the student, and maximum interest in the topics to be developed without falling into unnecessary complexities. The teaching guides will emphasise the competencies acquired, mainly transversal and specific, in line with the European Higher Education Area (EHEA, n.d.).

Figure 1 visualises this breakdown, where the three central boxes represent these main components, while the nine prominently outlined boxes represent the proposed modules.

This project aims to train graduate students from different academic backgrounds (Southworth et al., 2023) in applied AI to a wide diversity of fields so that they can discover the sectors in their institutions that will benefit from the application of Artificial Intelligence. They are also expected to recognise the data sources to support AI applications, which is why the pillars will be developed to have different loads.

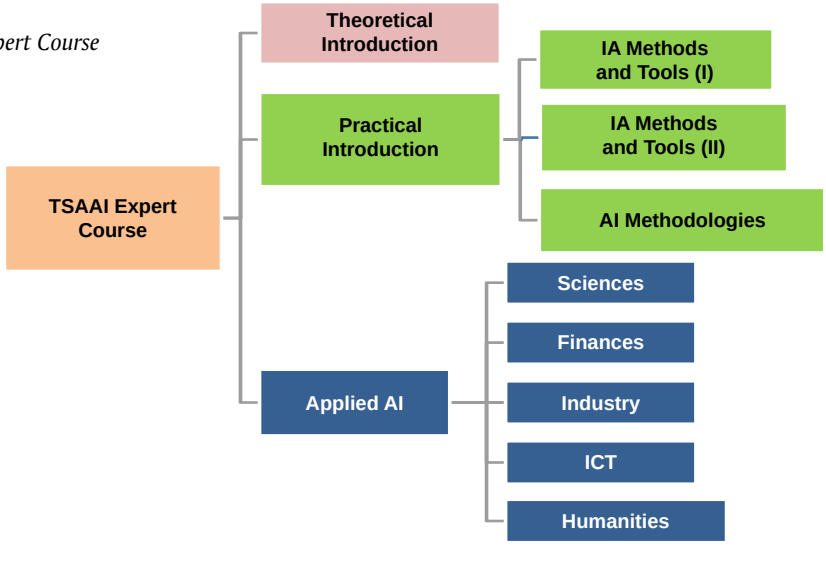
The module related to the Theoretical Introduction to Applied AI is planned to give a solid base for students, allowing them to understand the nature of AI and its potential implications (Gouëdard et al., 2020; Southworth et al., 2023). This module (2 ECTS) should cover the following topics: application of AI to other scientific disciplines, AI as an area of interdisciplinary knowledge, sub-areas of AI, great achievements in AI, and social, ethical and legal implications of AI.

The following modules should focus on practical applications, providing theoretical explanations alongside immediate hands-on exercises that students can follow independently.

The comprehensive scope of concepts and the numerous practical exercises required to train students in general techniques and approaches utilised in AI involves a subdivision of the pillar Practical Introduction into three modules, with 2 ECTS allocated for each. Two modules are concentrated on exploring the inherent elements of AI (e.g. Computational Intelligence, Evolutionary Computing, Machine learning, Deep Learning, Natural Language Processing, etc.). The third module promotes best practices (AI Methodologies) in all AI applications.

Once students have gained proficiency in AI methods, tools and methodologies, shifting the focus toward the specific domains in high demand within the current job market becomes crucial. In the previ-

Figure 1
Hierarchical schema of the TSAAI Expert Course



Source: authors' own work.

ous study we recognised five major fields to prioritise in the third pillar: Sciences, Finances, Industry and Internet of Things, Information and Communication Technology, and Humanities, with 2 ECTS each.

Our focus will be primarily on the module covering the application of AI in finance, the stock market and insurance.

The proposed curriculum for the finance module

In line with the previous discussion in mind during the preparation of training resources, in cooperation with our associated partners from the financial sector (banks and insurance companies), we developed content composed of six main topics. Our suggested curriculum aims to support the current applications of AI-powered technologies and indicates their future trends (OECD, 2021a; Southworth et al., 2023). It covers the following subjects:

1. AI Approaches in Finance
   - 1.1. Fundamental Analysis (Regression and Equity Analysis; Linear Regression; AI-powered Financial Analytics)
   - 1.2. Regression in Finance (Machine and Deep Learning as Model Estimation in Finance; Logistic Regression for Modelling Bank Failures)
2. Predictions in Risk Assessment, Fraud Detection, and Management
   - 2.1. Risk Management (Types of Risk in the Banking and Insurance Sector; Machine Learning and Deep Learning in Risk Assessment; Risk Management Tools; Analytics and Big Data Tools in Risk Management)
   - 2.2. Fraud Detection (Fraud and Benefits of Using Artificial Intelligence for Fraud Detection in Banking; Surveillance of Conduct and Market Abuse in Trading)
   - 2.3. Modelling (Credit Risk and Revenue Modelling)
   - 2.4. Ethics (Ethics and Appliance with the General Data Protection Regulation – GDPR)
3. AI in Customer Behaviour Analysis
   - 3.1. Customer Behaviour (AI Customer Behaviour Analytics and Predictive Analytics; Impact of AI on Consumer Buying Behaviour)
   - 3.2. Interaction (AI in Customer Interaction; AI-powered Virtual Assistants in Banking)
4. Automated Decision-Making (loans, credit cards, insurance policies, …)
   - 4.1. Analysis, Monitoring and Decisions (Credit Decisions, Insurance Decisions; Monitoring and Collections; Deepening Relationships)
5. General Market Forecasts and Correlations
   - 5.1. Analysis and Predictions (Machine Learning and Deep Learning Predictive Approaches; Real-time Financial Time Series Analysis)
   - 5.2. Hidden Information Extraction (Feature Extraction in Potential Market Opportunities)
6. Automation of processes and workflow
   - 6.1. Operations Automation (Automation of trade finance; Automation of banking regulations and compliance; Automation in anti-money laundering (AML) and sanction screening)
   - 6.2. Workflow Automation (Automation of cash management operations; Automation of document workflow and internal processes).

The course implementation introduces innovative formats and content, utilising novel didactic methodologies such as micro-training and interactive computing. The FuturIA platform fosters collaborative learning, recognising that learning is a social, interactive and informal process taking into account students' experiences. The dynamic community enables the acquisition of new knowledge while practising. Each module comprises twenty units, explaining concepts, demonstrating examples and case studies, and addressing the order of content delivery, as well as potential challenges that students may encounter. The general introduction modules do not require prior knowledge. All the courses will be based on problem-solution-practice triads that 1) present a clear, concise problem close to the student, 2) propose an intuitive and reasonable way to solve it, and 3) offer a practical guide to solve the problem. Online practices via interactive computing allow for the participation of a larger audience due to the lack of required investments in equipment.

The proposed curriculum was developed with the help of associated partners, in this case the banking and insurance sector, and is one of a kind, following the current trends in competencies required in the business field that are not taught and covered by formal higher education in the partner countries. The FuturIA teaching platform is expected to promote internationalisation, since teachers and students are among all the partners. In addition, students will have access to AI jobs in all the countries participating in the programme. The remarkable development of "Information and Communication Technology (ICT)" led to the high degree of digitalisation of business processes and standard operating processes in both public and private organisations. The anticipated outcome throughout the progression of this project, and thus this paper, includes the development of professionals within the field of Applied AI, curricular advancements in the field of Applied AI, the creation of educational resources aimed at acquiring transversal skills, and production of audio-visual materials for the course in the format of a Massive Online Open Course (MOOC). At first, this free-of-charge online course will be offered in the partner countries, but it will be accessible to attendees from other countries in Europe and all over the world, i.e. to anyone who finds it beneficial.

Further details about the didactic units' development and profound discussion about their contents will be part of future work.

Conclusions

The framework of the Erasmus+ project "Transversal Skills in Applied Artificial Intelligence" (TSAAI) is in line with the EU strategy on digitalisation and reinforcement in technology and focuses on Applied Artificial Intelligence. The TSAAI project aims to create teaching materials, i.e. the FuturIA teaching platform, providing its' educational content to a wide range of interested groups and keeping it updated on fast-evolving AI technology. The fast digitalisation of industries creates a discrepancy between required profiles on the labour markets and the rate with which the formal educational system provides such experts.

This paper centres around the analysis of the formal tertiary education programmes in consortium countries (Spain, Estonia, North Macedonia, Croatia, Germany and Slovenia), covering Applied Artificial Intelligence, as well as developing the curriculum and educational material, including the areas of application of AI technology in the financial and insurance sectors. To this end, the TSAAI FuturIA teaching portal is expected to diminish this gap. Systematic Review of Literacy (SRL) on the web methodology has been applied to pinpoint the present employability requirements in AI, while the curriculum development relied on Learning-Centred Syllabus methodology. An Expert Course focusing on the required specific and transversal skills related to Applied Artificial Intelligence in the financial sector has been suggested in this paper, and is expected to assist students, educators, and professionals in enhancing their skills to meet the evolving demands of the labour market.

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The appendix is available in the online version of the journal.

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Business Process Management education in Poland: A manifesto for academic teaching

Abstract

This paper critically assesses Business Process Management (BPM) education in Poland and provides evidence-based recommendations for improvement. Through a survey of 44 BPM educators, the study evaluates BPM lifecycle coverage, IT tool utilization, and incorporation of the Six Core Elements of BPM. The findings reveal a focus on process modeling and analysis, identifying gaps in the way the entire BPM lifecycle is addressed. Despite the utilization of various IT tools, there is a notable absence of coverage for emerging topics such as process mining, AI, and Robotic Process Automation. Only 12% of courses cover all Six Core Elements of BPM, and there is a critical gap in student education, which is the underrepresentation of the People and Culture elements. The paper concludes with a manifesto for greater alignment between academic education and industry needs through comprehensive BPM curricula, dedicated software tools, and more robust coverage of the strategic and governance aspects of BPM. This will bridge the gap between academic education and real-world BPM applications, so that graduates can be better prepared for the challenges of the modern business landscape, which can enhance the quality and effectiveness of BPM education, thereby aligning it with the evolving demands of the business environment and contributing to the growth and competitiveness of organizations in Poland.

Keywords: BPM education, Business Process Management, technologies in BPM education, academic teaching, manifesto

Introduction

Higher Education Institutions (HEIs) aim to equip students and graduates with a future-proof skillset, which will enable them to adapt to and fit into the swift digital transformation of Industry 4.0 and effectively develop intellectual capital in line with Industry 5.0. Teaching Business Process Management is crucial for ensuring preparation for the challenges of the modern economy. It prepares for the use in economic practice of constantly developing new technologies that have an increasing impact on

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the efficiency and competitive position of enterprises. In evolving industries, proficiency in comprehending, optimizing, and streamlining business processes is becoming essential for navigating dynamic and interconnected business environments. Perhaps more importantly, BPM education supports an approach to management that uses the knowledge and dynamism of employees on a daily basis, necessary for the effective implementation and continuous improvement of business processes. Investing in people's BPM competences is vital to maintain economic growth and prepare for the jobs of the future, especially in the face of the rapid development of AI, but also due to the potential slowdown due to factors like an aging population, geopolitical tensions, and the need to meet decarbonization commitments.

In Poland, an emerging trend is observed in assessments of organizational maturity, highlighting a focus on the implementation of BPM by organizations. Consequently, BPM is gaining in importance, and this leads to its increasing operationalization and a growing demand in the Polish economy for specialists in this field (Sliż et al., 2023). As a result, competencies associated with BPM have emerged as valuable assets in the job market, compelling universities to offer up-to-date practical knowledge, encompassing areas such as process modeling and process mining (Senkus et al., 2023). This trend has generated a series of questions within the academic community, prompting this paper's primary aim, being to critically assess the state of BPM education in Poland and propose evidence-based recommendations for improvement.

- **Main research question:** Is BPM taught holistically and practically?
- **Detailed research questions** (DRQ) include:
  - **DRQ1**: To what extent does BPM education cover the BPM lifecycle?
  - **DRQ2**: What supporting information systems for each phase of the BPM lifecycle are used in teaching?
  - **DRQ3**: To what extent does BPM education incorporate the Six Core Elements of the BPM framework?
  - **DRQ4**: Is BPM education in Poland of interdisciplinary nature?
  - **DRQ5**: Does the academic community adequately prepare students for BPMN certification?

This article helps to expand the knowledge of BPM by providing a comprehensive overview and diagnosing the current state of BPM education in Poland. It presents a manifesto for enhancing holistic BPM education and proposes recommendations for bridging the gap between academic theory and industry practice. Addressing the main research question involves referencing two prominent BPM frameworks: the BPM lifecycle (Dumas et al., 2018; Szelągowski, 2019), and the Six Core Elements of Business Process Management (Kerpedzhiev et al., 2021; Rosemann & vom Brocke, 2014). The research employs research methods such as a comprehensive literature review and a survey-based opinion research study, the former providing an overview of the current state of BPM education by examining publications in Polish and international contexts, and the latter gauging the practical aspects of BPM education in Poland based on gathered insights and opinions expressed by educators, practitioners, and students.

Context of the study

The history of process management covers a period spanning more than a century, with its formal inclusion in university curricula occurring in the late 1990s. Predominantly integrated into computer science and business management study programs (Koch et al., 2022), BPM has been found to be useful in diverse sectors such as healthcare (Mang et al., 2009). Over the past five years, teaching BPM has gained prominence through the International Conference on BPM, a key annual event for BPM researchers, educators, and practitioners, notably featuring the Educators Forum as a platform to share global teaching know-how. For instance, insights from Australia have focused on university program design in process management (Syed et al., 2023) and the application of active learning methods with efficient assessment of intended learning outcomes (Evans et al., 2023), as well as German good practices such as project-based approaches to holistic BPM teaching based on real-world implementations (Weber & vom Brocke, 2023) and the use of interactive Moodle and H5P plugin-based activities for project-based learning (Groher & Dietschweiler, 2023).

In Poland, while BPM courses have long been taught at HEIs, a comprehensive and interdisciplinary approach to BPM issues aligned with international standards has been present for less than twenty years. The Higher Education Act of July 27, 2005 (Ustawa, 2005), the Regulation issued by the Minister of Science and Higher Education of July 12, 2007, on education standards and the content and effects of education in all fields of study (Rozporządzenie, 2007), were the only two pieces of legislation to define the educational content in this field A holistic approach to managing processes in organizations is included in the educational content of Master's programs in Management. The curricula of Bachelor's and Master's programs in Logistics, Transport, Production Management, and Engineering as well as technical fields, particularly IT system development, include elements of BPM education focused on selected groups of processes. Nowadays, education standards in Poland are aligned with the European Qualifications Framework, granting HEIs the autonomy to create their own study programs, and thus independently configure course syllabi. This direction was pursued in Poland under the Regulation issued by the Minister of Science and Higher Education of November 2, 2011, on the Polish Qualifications Framework for Higher Education (Rozporządzenie, 2011). Over the past decade, it has

become evident that the emphasis of academic communities on ensuring students' appropriate qualifications has had a beneficial effect on development of the courses offered by HEIs. The research to which this paper refers showcases significant differences in BPM teaching programs at universities, across the multitude of fields of study. Management fields naturally develop a holistic approach to BPM, while technical fields more often refer to technological support for business processes. Universities have now embraced a practical approach to education, an idea that has been advocated for many years.

Legal requirements have been established for the development of practical orientation in education through minimum standards, as well as through various possibilities (Ustawa, 2018). According to Article 62 of this 2018 act on higher education, universities may offer dual studies, which are programs with a practical orientation conducted in collaboration with employers. Additionally, Article 64.2 stipulates that programs with a practical focus should allocate more than half of the ECTS points to classes that enhance practical skills, whereas programs with a general academic focus should allocate more than half of the ECTS points to classes related to scientific activities conducted at the university. These legal provisions provide ample opportunity for universities to collaborate with businesses in enhancing students' practical skills. Universities may choose to increase the role played by professionals in their study programs or to forge scientific and research partnerships between academic staff and various enterprises and institutions to varying extents.

Within the BPM community in Poland, the substantial discourse on this subject includes optimal teaching methodology, good practices, and challenges encountered in BPM education. These subjects were prominent items on the agendas of the BPM Symposia and the BPM Day Conference – recurring meetings of researchers, teachers, and business representatives devoted to the process-oriented approach in management. The multitude of BPM education-related topics raised by participants at the BPM Symposia resulted in a dedicated session at which BPM educators share experiences and address challenges. The key challenges of BPM education in Poland include:

1. Designing and implementing courses and study programs centered on BPM, enabling effective teaching of up-to-date and applicable issues in this field.
2. Enhancing certified competencies in process modeling and proficiency in various notational methods, e.g. in BPMN.
3. Utilizing engaging pedagogical methods, e.g., a flipped classroom, to facilitate the learning process on process management issues (second Symposium; third Symposium, BPM Day Conference).

These discussions underscore the commitment of the Polish BPM community to refining BPM education and addressing the associated evolving challenges.

Theoretical background

Addressing the research question regarding holistic BPM education involves referencing two well-known BPM frameworks: the BPM lifecycle (Dumas et al., 2018) and the Six Core Elements of BPM (Rosemann & vom Brocke, 2014).

The BPM lifecycle (Dumas et al. 2018, p. 23), a widely-known framework in BPM education, is a basis for BPM-related courses at more than 300 universities around the world. The stages of the BPM cycle lifecycle include process identification, process discovery, process analysis, process redesign, process implementation, and process monitoring and control. The BPM lifecycle stresses close cooperation between process analysts, system analysts, and domain experts as a key factor for successful improvement initiatives. A more holistic approach to the BPM lifecycle can be further emphasized from the perspective of dynamic BPM (Szelągowski, 2018).

The Six Core Elements of BPM proposal were developed in 2014 by Rosemann and vom Brocke (2012) based on earlier work by de Bruin and Rosemann (2007). A thorough revision of the Six Core Elements to address the requirements of Industry 4.0 was proposed by Kerpedzhiev et al. (2021). The Six Core Elements of the BPM framework serve as a foundation for assessing holistic BPM education for two main reasons. Firstly, this model represents a contemporary understanding of BPM as a holistic management approach, extending beyond process optimization to strategic management. Secondly, the Six Core Elements encapsulate all facets of BPM in an organization: strategic alignment, governance, methods, information technology, people, and culture. This is the comprehensive scope of BPM. The Six Core Elements provide a comprehensive framework for BPM, useful for managing complexity, guiding projects, standardization, and strategy. This model has been applied and proven useful for assessing BPM maturity and guiding process improvement initiatives in numerous case studies (vom Brocke et al., 2021). The direction of further development of this tool and its adaptation to the requirements of Industry 5.0 was proposed by Szelągowski and Berniak-Woźny (2024).

Thus, we advocate for its incorporation into educational programs, as it provides an excellent basis for structuring knowledge about BPM and includes all the facets of BPM.

Study design

This study utilized a three-step process to collect exploratory survey data on teaching BPM at HEIs in Poland. The survey questionnaire consisted of fifteen questions covering various aspects of BPM courses, including topics taught, tools used, teaching methods, and respondents' backgrounds. Both open-ended and closed-ended questions were included. The study was prepared in the following steps a pilot study, a paper-based survey, and an online survey.

In summary, this non-representative, exploratory survey employed multiple distribution methods to maximize participation. However, the sample was limited to those with direct access or referral. The multi-phase approach made it possible to refine the questionnaire and expand the non-probabilistic sample. While not representative, the data provides initial insights into BPM education from the perspectives of educators at major Polish universities.

As the study focuses on evaluating the state of BPM education in Poland, emphasizing a holistic and practical approach, the authors first defined these concepts through a critical literature review and developed the research tool–a survey questionnaire. Detailed Research Questions (DRQs) were used as a guide for analyzing the empirical study results. The DRQs addressed issues such as the courses' content from the perspective of BPM lifecycle phases, IT tools used, adherence to the Six Core Elements of the BPM framework, management and technical issues, and certifications covered in courses. The detailed research questions and the approach used to analyze the collected data are presented in Figure 1.

BPM Education in Poland – empirical results

The study involved teachers associated with the BPM community in Poland, representing 22 Polish scientific institutions. Among the 44 respondents, there were three professors, fifteen associate professors, 23 assistant professors, and three assistants, with quite diverse work experience ranging from 3–10 years among assistants, 3–20 years among assistant professors, and 5–25 years among professors and associate professors. The largest group was research and teaching staff (80%), followed by teaching staff (14%) and persons in research positions (7%).

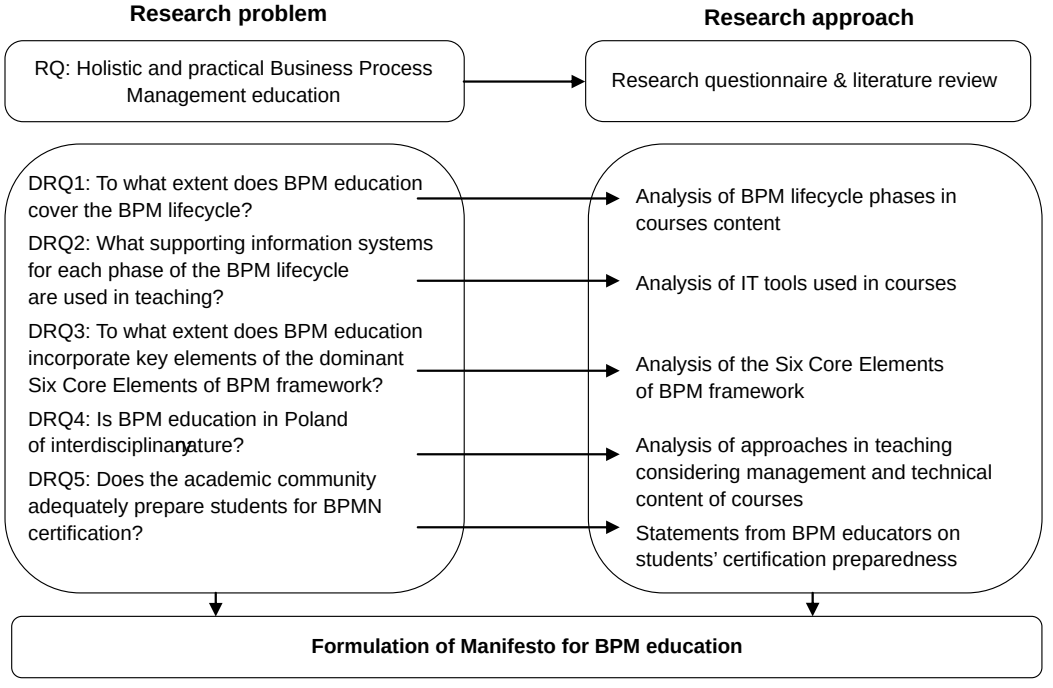
In our sample, we collected responses about 91 BPM-related courses. The number of courses offered by scientific institutions is different. In Figure 2, we present TOP10 universities with the highest number of BPM-related courses.

The highest number of courses is offered by two major technical universities: AGH University of Krakow (17) and Warsaw University of Technology (16). The University of Warsaw is the third institution, with nine courses offered. Teachers of the offered courses represent various scientific disciplines. Most of the courses are elements of management and quality studies, information and communication technology, mechanical engineering, and economics and finance. Courses are offered as first cycle studies (48) and second-cycle studies (with 42 courses).

The classes are predominantly lectures (65 courses) and laboratory classes (45). In the analyzed dataset, 54 courses featured at least two different forms of classes.

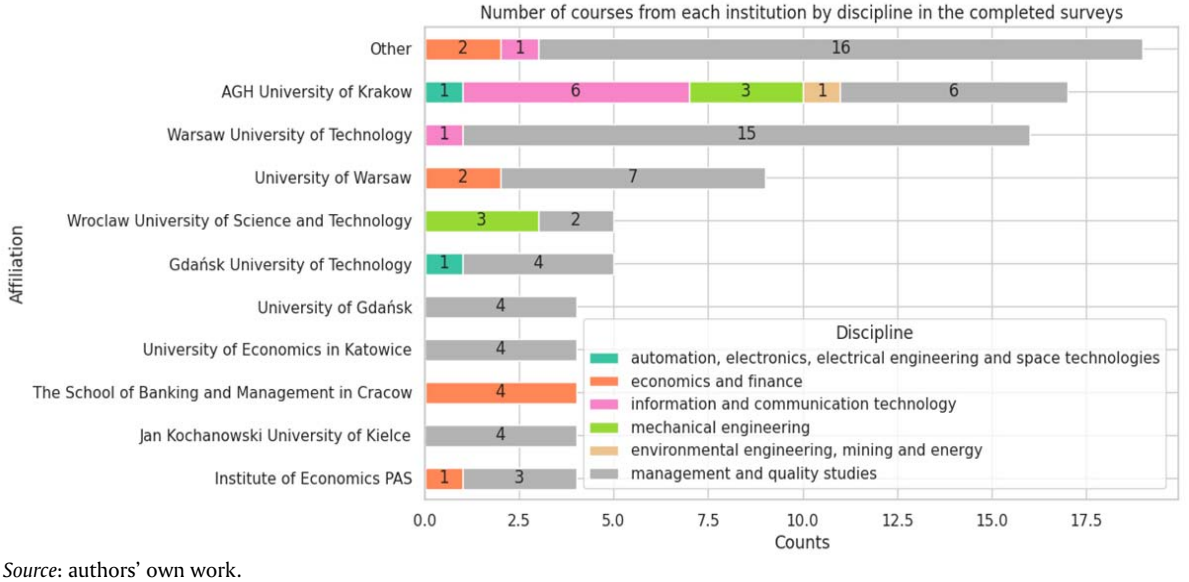
The number of lecture hours in one course ranges between four and thirty, but usually this is from fifteen (51%) to thirty (31%). Conversatory classes often span around fifteen hours (53%), but this number varies between six and sixty hours in different courses. The number of hours allocated to laboratory activities ranges between six and thirty, but most often it is thirty hours (28%), while there are fifteen hours (80%)

Figure 1
Research model



Source: authors' own work.

Figure 2
TOP 10 universities with the highest number of BPM-related courses in the context of scientific disciplines



Source: authors' own work.

of auditorium exercises. The total number of hours for an entire course varies greatly and ranges between four and eighty, but most often it is thirty (30%).

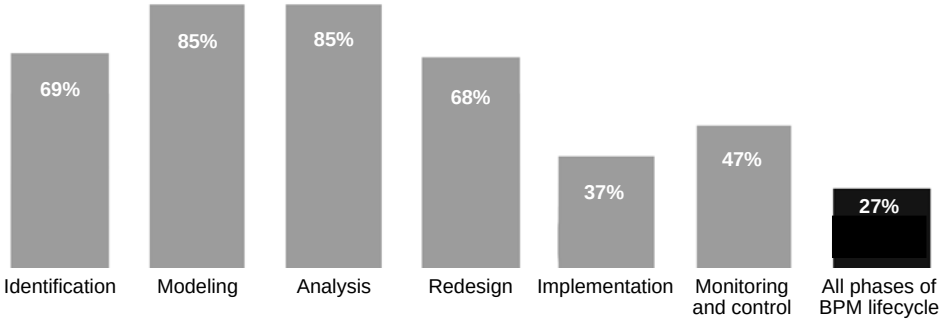
In the context of the formulated DRQ1, we analyzed the content of courses regarding defined stages of the BPM lifecycle. The most frequent course content includes process modeling (85%) and process analysis (85%). These two phases of the BPM lifecycle are most often taught together in offered courses. Other BPM lifecycle phases appear less often in the content covered during classes: process identification is mentioned in 69% of courses, process redesign in 68% of courses, and process monitoring and control in 47% of courses. The process implementation phase is included in 37% of courses, resulting probably from a lack of technical competencies and business experience of teaching staff. Only 27% of courses consider full BPM lifecycle content (Fig. 3). Thus, in the majority of courses, the BPM lifecycle is taught in a fragmentary way without providing a bigger picture of the whole process improvement concept. This fact requires deeper consideration, and the necessary actions need to be taken to expand the existing courses to include the missing content related to the BPM lifecycle (for instance based on the developed core curriculum for BPM-related courses).

In the context of the formulated DRQ2, we analyzed responses related to supporting IT system usage in teaching BPM-related courses. The IT tools used in the offered courses feature various open-source and commercial types of software (Figure 4).

When analyzing the lifecycle, the most popular tools are modeling and analysis tools. Looking at actual development directions in process analytics and innovations in BPM, surprisingly, only eighteen courses offer content related to process mining. Also, in most of the offered courses, content related to process prediction (thirteen responses), AI (twelve), or RPA (eight) is not included.

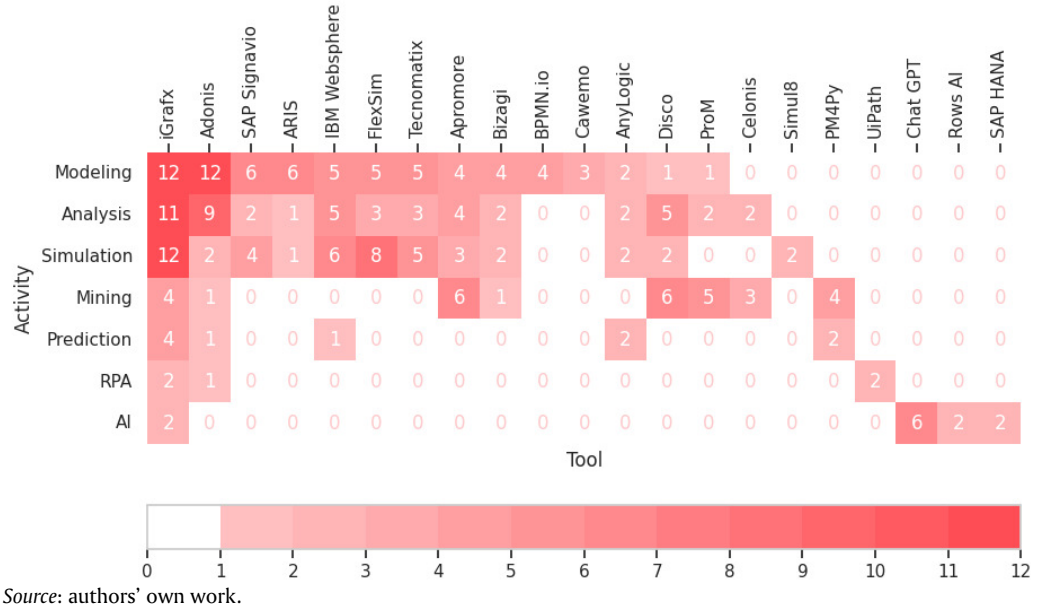
In our study, we planned to address DRQ3 based on the Six Core Elements of the BPM framework (Rosemann & vom Brocke, 2014). This comprehensive

Figure 3
Results of the analysis of the inclusion of BPM Lifecycle's phases in BPM education



Source: authors' own work.

Figure 4
Results of the analysis of IT tools used in BPM education (only software for which three or more responses were given is presented)



Source: authors' own work.

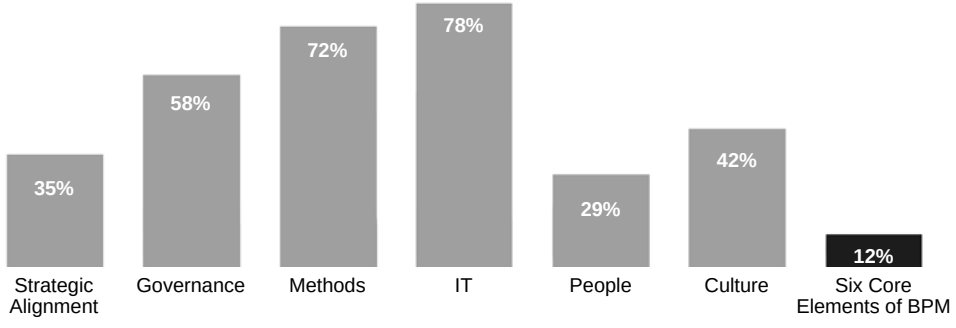
approach is essential for organizations to achieve sustained business process improvement, and ensures that all essential success factors for BPM adoption are included in the education programs. As all elements interact with each other, a deficiency in even one of them can significantly disrupt successful BPM. For this reason, this knowledge needs to be conveyed to students by emphasizing that the six key factors are interconnected. The results of the BPM education analysis from the perspective of the Six Core BPM Elements are presented in Figure 5.

Educating students on the People element of BPM ensures that they will understand how to implement and continually enhance and use process and process management skills, fostering continuous improvement and innovation within the organization.

Understanding the People and Culture elements of BPM helps in creating and facilitating an environment that complements various BPM initiatives, fostering a culture that values and supports process improvement and BPM initiatives. It is also important to provide them with the skills to manage change and build a culture of communication, without which resistance emerges and BPM efforts fail.

In our study, respondents rated the aspect of teaching IT technologies supporting BPM surprisingly highly (78%), even though a large portion of BPM-related subjects do not use practical IT tools. As digitalization continues to transform business processes, new and enhanced BPM capabilities are required to drive corporate success in this context (Kerpedzhiev et al., 2021). Furthermore, the digital transformation and technologies that enable intelligent and comprehensive automation, such as RPA, AI, and ML create new challenges, highlighting the need for continuous evolution and adaptation in BPM practices (Antonucci et al., 2020; Gabryelczyk et al., 2022; Madakam et al., 2022). Awareness among educators, and teaching about key technologies in the BPM lifecycle, is very welcome and beneficial.

Figure 5
Results of the analysis of the inclusion of six key elements of BPM in BPM education



Source: authors' own work.

The Methods element is also largely included in BPM teaching. We assessed this aspect mainly from the perspective of using business process modeling methods. BPMN 2.0 is the leading modeling notation used by 89% of respondents for practical process modeling classes, followed by EPC (Event-driven Process Chain) (17%) and UML (Unified Modeling Language) (11%), with notations like Petri nets and IDEF0 being rare. The dominance in recent years of BPMN 2.0 as a process modeling standard stems from its versatility, industry acceptance, extensive modeling capabilities, integration with tools, and community and industry support (Gabryelczyk & Jurczuk, 2015). The increasing incorporation of the BPMN 2.0 standard into BPM education bodes well for both the certification we propose in this manifesto and the enhanced preparation of future analysts and process architects in organizations (Szelągowski et al., 2021). The low level of incorporation of the Strategic Alignment element into BPM teaching (35%) may indicate that BPM educators do not present BPM as a concept related to the strategy of the entire organization. Strategic alignment provides direction and priorities that shape governance mechanisms, guide method and IT selections, and provide information for people and culture initiatives.

Educators refer to the Governance element (58%) slightly more often than to strategy, but the result is not satisfactory. Unclear allocation of responsibility lead to confusion, duplication of work, and lack of coordination across process initiatives. Without well-defined process roles, responsibilities get overlooked and there is a lack of ownership for processes. Students should understand that strong governance is critical for aligning BPM with corporate objectives.

In addressing the formulated DRQ4, it is evident that the wide array of courses offered by different universities in Poland spans a multitude of scientific disciplines, as depicted in Figure 2. Moreover, the use of a variety of IT tools in BPM education, as shown in Figure 4, underscores the participation of teachers from diverse scientific backgrounds, thereby emphasizing the extensive range of course content. This amalgamation of disciplines and educational tools unequivocally affirms the interdisciplinary nature of BPM education in Poland.

Furthermore, most software companies provide academic licenses for educational use. Also, web-based, widely available solutions like bpmn.io or draw.io are used in several courses for process modeling. In some courses, IT tools are not used in BPM teaching.

Taking into consideration the development of process modeling, process mining, and the RPA software market, implementation in the education process of widely recognized or popular dedicated tools is necessary to equip students with practical competencies needed in process improvement initiatives in organizations.

When addressing DRQ5, the predominance of the BPMN 2.0 standard in BPM education is clear, yet many courses fall short of covering the full BPM lifecycle and in offering a comprehensive approach that encompasses all fundamental aspects of BPM. This partial and segmented educational scope may have a subtle impact on the preparedness of students for BPMN certification.

To summarize, a lack of structured BPM education covering concepts, methods, technologies, and behaviors severely limits an organization's ability to successfully implement and sustain BPM across all core elements. A comprehensive BPM curriculum is thus critical for the preparation and continuous development of specialist staff in line with the needs of the Polish economy.

Manifesto

The manifesto aims to enhance the landscape of Business Process Management (BPM) education in Poland by emphasizing heightened practical orientation. Through advocacy for a curriculum encompassing comprehensive coverage of BPM lifecycle stages, the integration of emerging IT tools into didactic processes, and a nuanced exploration of the Six Core Elements of BPM, the manifesto seeks to reconcile the disparities between theoretical constructs and their pragmatic application within the holistic framework of BPM education. The inclusion of dedicated software tools, aligning education with the demands of the contemporary business environment, is imperative.

Manifesto for Advancing BPM Education in Poland

1. BPM common understanding:

We endorse publishing educational materials and scientific articles in both Polish and English simultaneously. This ensures uniform terminology, fostering a common understanding among students, educators, and practitioners. This shared language facilitates effective communication and collaboration in BPM initiatives, promoting alignment in terms of goals, strategies, and best practices. Standardized terminology prevents confusion, ensuring clarity and precision in discussions and documentation.

2. Holistic learning approach:

BPM education must embrace a holistic approach, recognizing the dynamic evolution of BPM concepts and technological trends. This requires constant enhancement of educators' competencies in new BPM concepts, technologies, and practical skills. Acknowledging the evolving BPM landscape, educators should involve students in analyzing shifting dimensions within the discipline, offering perspectives on established and emerging principles and practices. This ensures adaptive BPM education, preparing students for the evolving demands of the business environment.

3. Knowledge exchange platforms for BPM education:

Recognizing the constantly growing group of Polish representatives at the International Conference on BPM, the launch of the Educators Forum at that conference, and the BPM symposia initiative in Poland, we underscore the importance of knowledge-sharing platforms in BPM education. Building on this

idea, participation in the mentioned events should be encouraged, as it undoubtedly facilitates the sharing of know-how in designing, implementing, and updating educational programs, and encourages fostering a collaborative and supportive academic community.

4. Diverse, but always up-to-date learning programs across disciplines:

The study highlighted the variety of disciplines within which BPM is taught. A concerted effort is required to provide a holistic view of BPM. We therefore call for interdisciplinary cooperation between BPM educators at various faculties and universities. This approach will, for example, enable technical universities to benefit from the knowledge of BPM culture and management faculties, and classic universities to benefit from the skills of advanced analysis and automation/robotization, which are more often available at technical universities. Such collaboration will equip graduates from various institutions with competencies that are useful in the labor market.

5. Progressive skill development throughout studies:

To address the question of BPM skills not being emphasized until the second-cycle degree level (master's degree supplementary studies), we propose the integration of BPM concepts and methods, particularly process management, in first-cycle degree programs (bachelor's or engineering studies). This approach aims to introduce students to BPM early in their academic journey and enhance the number and variety of classes, including laboratory activities and exercises. This adjustment is crucial to meet the practical challenges of the business landscape in the BPM context.

6. IT tools facilitating BPM education:

While recognizing diverse BPM tool usage throughout the BPM lifecycle, especially in non-technical universities, we propose a standardized approach. Addressing gaps, particularly in tools for instance for process mining and automation, and adaptation to Industry 4.0 and 5.0, is crucial. It is essential to integrate dedicated tools to equip students with practical competencies for successful BPM initiatives. Given the role played by technology, educators should incorporate modern BPM tools into their curricula, emphasizing practical, hands-on elements for real-world application understanding. We advocate a platform for sharing knowledge and teaching materials on these tools to enhance BPM education. Regular course updates are necessary, reflecting emerging trends such as machine learning and artificial intelligence in BPM.

7. Wider use of BPMN certification in Poland

The rise of BPM has prompted the introduction of the "Modeling and Analysing Business Processes in accordance with BPMN" certification, which is now incorporated into the Integrated Qualifications System. This certification validates BPMN knowledge as a universal language for clear process communication. To align education with industry needs, a referential syllabus for "Modeling Business Processes in BPMN" was proposed by IBS PAN for university courses, aiming to bridge the gap between academic learning and practical BPMN application. This initiative ensures that professionals have essential skills for effective BPM in today's evolving business landscape. Collaborative efforts are crucial to enhance BPM education in Poland, fostering knowledge-sharing and international insights. Developing an online course on this subject would be valuable for rapid teacher training and wider accessibility, enhancing the educational offer to meet market demands. For businesses, certified employees are essential in the era of rapid IT adoption, ensuring effective and innovative BPM aligned with the organizational context.

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