Economics and Business Administration Higher Education under the Impact of Digitalization

Conference Proceedings of the XIVth International Conference Globalisation and Higher Education in Economics and Business Administration GEBA 2022

> CRISTINA-TEODORA ROMAN MIRCEA GEORGESCU MIRCEA ASANDULUI ALEXANDRA-CRISTINA SÎRBU (editors)

EDITURA UNIVERSITĂȚII "ALEXANDRU IOAN GUZA" DIN IAȘI

Cristina-Teodora Roman • Mircea Georgescu Mircea Asandului • Alexandra-Cristina Sîrbu

(editors)

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THE BEHAVIOR AND CHARACTERISTICS OF PONZI CRIMINALS. A CASE STUDY ON MADOFF'S FRAUD

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ABSTRACT

The number of Ponzi schemes has increased recently, taking into account technological and communication developments. The purpose of this study is to explore the behaviour and characteristics of Ponzi criminals, to identify causes of committed Ponzi frauds and to provide a case study on Madoff's scheme. To achieve this purpose, a review of the existing literature was established. The main finding of this paper is that financial gain is the primary motive for performing Ponzi schemes, while the behaviour of Ponzi criminals can be explain by the need of control, the neutralization theory and the cognitive dissonance. Moreover, the gaps regarding fraud detection and severity of penalties act as a stimulant for Ponzi schemes. Most of the Ponzi criminals are male person, middle age, married and employed. In the Madoff's case, the scheme has been successful for a long time due to Bernie Madoff's profile and characteristics.

Keywords: Ponzi frauds; financial frauds; criminals' behaviour; white-collar crime; need of control; fraud detection.

JEL Classification: D84; E26; K14; K42.

1. INTRODUCTION

Ponzi scheme is a type of financial fraud in which investors are guaranteed a particularly high return on investment and limited risks in a short period. The returns are paid from the money of other investors and not from profit, while the fraudsters use attracted funds in personal and illegal purposes. Ponzi fraud involves repeated interaction with an increasing number of people over a long period (Europol, 2017). In the last decade, Ponzi schemes have experienced an expansion, especially due to economic uncertainty or Covid-19 pandemic.

Beyond the medical and economic consequences, in times of economic uncertainty and pandemic, people faced several restrictions. In these circumstances, people are looking for new methods of making extra money in a rapid way, especially when the consumption behaviours and the mobility of people are affected (Sorcaru *et al.*, 2020) or when the bankruptcy of some companies drive to a restricted access of high-standard products (Bar Lev, 2022). This tendency helped fraudsters to increase their illegal acts, while the using of new technologies and online communications simplified the interaction between Ponzi criminals and victims.

The Ponzi scheme requires building trust and maintaining a relationship with every person who is part of the fraud. In this type of fraud, the fraudster must create trust between himself and the victim for the purpose of the initial engagement, but he also must maintain the trust throughout his relationship with the victim. In addition, when an investor trusts their trick, he generates social capital for himself and often even serves as a particularly successful recruiter of new investors, an essential factor for the continued existence of the scheme.

Trust has an important role in interpersonal relationships, while mistrust causes relationships to crumble. Both the unjustified distrust and stupid trust (or openness) can lead to negative effects (Rotter, 1980). Ponzi frauds are stimulated by the reluctance to contradict or question a trusted colleague. Emotion is part of the Ponzi scheme too, while an investor is looking to satisfy his desire to increase his wealth through a fraudulent scheme. This desire may be so strong that it determines a gullible behaviour and inhibition of reason (Greenspan, 2009).

Robert Cialdini (2001) describes the principles of influence and persuasion used by Ponzi criminals, explaining how even the most intelligent people can be convicted to invest in fraudulent schemes and companies. The principles lead to an almost blind obedience to the fraudster and include reciprocity, commitment and consistency, social proof, authority and sympathy. Reciprocity is reflected in all Ponzi scheme by the promise of a good high return in a short time from fraudsters, while the victims are engaged to invest consistently. The commitment and consistency take into consideration the tendency of people to honour their commitments even if the original motivation disappeared. The fact that people tend to follow other people they trust shows the social proof. Authority is given by the tendency of people to obey authoritative figures even if they act inappropriate. At the same time, sympathy refers to the tendency of people to be persuaded by people they like. Despite these principles, most victims are attracted by financial frauds, including Ponzi schemes due to specifically contextual (financial or family) circumstances and to certain psychological underpinnings (Bar Lev et al., 2022).

No one wants to question or to contest the all-knowing leader. This behaviour is developed especially in affinity frauds, which describe those frauds in which victims and fraudsters share same connection in terms of ethnicity, religion, profession or nationality. Due to the common link, victims find reason to trust their fraudster, having the belief that someone with the same background will never betray. The same fact is valid when victims find difficult to ask the hard questions to fraudsters that needed to be asked before investing (Jacobs and Schain, 2011).

The paper's objective is to explore the behaviour and profiles of Ponzi criminals and to provide a case study regarding the Madoff's fraud. This paper is structured as follows. The second section presents the materials and methods used for this paper. The next section examines the main behavioural theories regarding the behaviour of Ponzi criminals. The fourth section presents the profiles, characteristics and motives of Ponzi criminals. The next section reveals the case study on Madoff's fraud. Finally, the conclusions are presented.

2. MATERIALS AND METHODS

The method used involves two steps, starting with the review of the existing literature regarding the behaviour, profiles and motives of Ponzi criminals to develop such fraudulent schemes. In this first step, primary sources (books and articles) were used as materials needed to provide a theoretical framework. The second step implies identifying and describing the case study of Madoff's Ponzi scheme. In this way, it shows how the largest Ponzi scheme was developed by using both primary and secondary sources as materials (articles, newspapers and reports).

3. BEHAVIORAL THEORIES REGARDING PONZI CRIMINALS

In order to understand the behaviour of Ponzi criminals, first it is necessary to define the theoretical background related to the motives and circumstances for performing Ponzi schemes.

Jory and Perry (2011) have emphasized the circumstances in which Ponzi frauds are thrived. Success conditions appear when a market has a large number of investors or an economic growth or an asset bubble characterizes the economy. Moreover, stimulating factors are also provide by an economic environment capable to offer multiple ways of financing or of obtaining credit. However, if these advantages are reversed, the possibility of a Ponzi scheme to be exposed raises. The most often case is during an economic recession or due to the retreatment of investors.

However, the main motive for performing a Ponzi scheme is the financial gain, even if the fraud will be exposed at some point. Nevertheless, there is a close connection between money and the abuse of power for committing fraudulent schemes. The power of money makes the fraudster to believe that he can buy almost everything with money and he can achieve anything. On the other hand, the desire for power can be associated with structural alienation that prevail in the financial industry, especially in the United States. The pursuit of wealth and materiality combined with exceptional competitiveness may push people to break norms for the sake of success. People are often measured by the degree of wealth and money has become a major means of assessing people and defining their status. These factors have enabled to commit frauds on such a large scale for so long.

Moreover, the financial gains is related to greed and love of risk. Economically this is considered a mystery because the more capital a person has his next profit is perceived as marginal. However, it seems that human behaviour is different to patterns predicted by economic rational models (Diacon *et al.*, 2013). However, despite the financial gain, cheating can be mention as a factor of pleasure and satisfaction. The fraudster experiences excitement when he behaves unethically, while the breaking the law and the act of deception constitute a thrill which increases the benefit of the offender (Coleman, 1987).

People commit such offenses, among other things, because there are difficult to detect them, while the punishment is not particularly deterrent. Deterrence means avoidance of a particular action due to the fear of the consequences and is intended to prevent the commission of offenses in view of the fear of punishment. The punishment is supposed to cause greater suffering than the benefit that the felony brings to the offender. For Ponzi schemes, the degree of deterrence is low and a person chooses to do a felony due to the benefits greater than the level of harshness of the punishments. High-income earners receive lighter prison sentences than low-income defendants, while the Ponzi criminals have the possibility to pay large fines in order to serve their sentences. Ponzi frauds have also been referred as hidden offenses because of the difficulty in locating information about the fraud object. It can takes months and even years for the fraud to be discovered. Many times, the victim is not even aware of being deceived. There may be many acts of fraud that will not be identified and therefore will never be discovered. On the other hand, there is a difficulty in proving the elements of fraud because of the internal pressure in organizations to noncooperate and to hide information from authorities for fear of harming their good name or public trust. Junior employees will be afraid to contact authorities or law enforcement for fear of losing their jobs (Hagan and Parker, 1985; Tillman and Pontell, 1992; Eitle, 2000).

Another factor for performing Ponzi schemes is the need for control. The illegal behaviour of Ponzi criminals is driven by the desire for complete control on daily events. People in white-collar occupations may use an illusion of control to explain the commission of a crime, even if essentially they are individuals that respect laws. This fact appears because people with illusion of control feel overconfident regarding their abilities and believe that they can control even the

evens characterized by coincidence. Due to their false image about their control, they are willing to take unrealistic risks and believe that they are unable to break laws (Piquero *et al.*, 2005). In this regard, the need of control is linked with the neutralization theory in order to explain the behaviour of Ponzi criminals. According to this theory, most people believe in laws and try to act congruent to social norms. Even if individuals are willing to break the rules, most of them refrain from committing illegal acts due to the guilt, shame and the possibility of creating a negative self-perception. In Ponzi criminals' case, they accept laws even if they engage in illegal behaviour because they interpret their actions as acceptable. Their illegal actions are justified through neutralization tools of guilt and shame (Jacobs and Schain, 2011).

Sykes and Matza (1957) present five various neutralization techniques that allow people to inhibit moral guilt:

• Denial of responsibility and blaming others for their actions, which prevents Ponzi criminals to experience guilt;

• Denial of injury by offender by neutralizing the accusations. In this case, fraudster invoke that victims had insurance and therefore did not incur a real loss;

• Victim denial through which the fraudster convinces himself that victims are enemies or unwanted entities in order to neutralize the guilt;

• The neutralization of the accusers by offender through contesting the authority or legitimacy of the judges;

• The neutralization of guilt by motivating the engage in risky activities out of loyalty to friends.

Another theory that explains the behaviour of offenders is the cognitive dissonance. Being a psychological theory, this suggests that fraudsters are trying to feel great about his person and his actions. When the offender holds psychologically inconsistent beliefs, he will experience dissonance. For example, this person believes in opposing positions (The theft is a forbidden thing, but I am a good person even though I stole). In order to eliminate the dissonance and preserve the positive self-perception, the offenders will justify his behaviour. In order to engage in illegal behaviour, they must adapt to their beliefs, they must rationalize, and neutralize or remove dissonance (Jacobs and Schain, 2011).

4. PROFILES AND CHARACTERISTICS OF PONZI CRIMINALS

Almost anyone can commit fraudulent offenses. However, there are some profiles of Ponzi criminals. An analysis of the characteristics from 596 Ponzi criminals between 2011 and 2013 reveals that 70% of those involved in fraudulent offenses in the organization are aged 36-55 years (KPMG, 2013). In terms of employment, 61% of those involved in fraud offenses are internal workers employed in the organization in which the fraud was committed. In addition, 41% of them worked in the organization for at least half a year. The most common types of fraud committed (56%) are embezzlement and theft of funds. Regarding

collaboration, in 70% of frauds, fraudsters conspired and collaborated with others. Moreover, 56% of those who collaborated with others did so with 2-5 partners. Fraudsters prefer to act as lone wolves, to reduce the chances of being exposed, but with no choice they cooperate with others, as the nature of fraud offenses requires conspiracy and passive or active cooperation. The time range at which the fraud begins is different. In general, 72% of all fraud perpetrators commit them in the period between the first year and the fifth year of their work. On the other hand, 33% of all fraud are committed over one to 2 years and 39% over three to five years. When the fraudster acts as alone, 69% of the frauds are committed between the first year and the first 5 years of his work. In terms of main personality traits, Ponzi criminals are sociable, extroverted, valued by colleagues and intellectuals. Their personality is characterized by moral corruption and greed.

Ponzi criminals suffer from overconfidence and their urge to make money is greater than any fear of risks, perhaps because of the need to fund lavish lifestyles alongside ignoring the potential consequences (Zuckoff, 2005). They have gained the victims' trust by presenting as charismatic businesspersons, specialists in their field and engaged in community. Public known the Ponzi criminals as persons willing to donate to charities and schools (Jory and Perry, 2011).

Examining the characteristics of fraud and deception offenders, two main groups were classified (KPMG, 2013). On the one hand, the opportunist swindler is usually a male person, middle age (35-54 years), married with children, who lacks experience in committing fraud offenses and will commit the fraud offense for the first time. This person holds a position that includes a lot of responsibility or appearances and is considered exemplary citizen in everything related to their conduct in the community. These fraudsters are valued people who are trusted by those around them. When the fraud is discovered, it will usually cause surprise and astonishment about the identity of the specific person involved. On the other hand, the "predator" swindler performs scams after pre-planning, being wellorganized relative to the opportunistic cheater, in terms of committing the offense and its hiding strategy, which will make it very difficult to expose fraud. This means that this is not his first fraud offense. Usually, he started as an opportunistic cheater and gained experience in everything related to fraud offenses. He proactively locates organizations, or people in which he will be able to commit fraud immediately. Well prepared to deal with the supervisory and control mechanisms, this fraudster will hardly feel a sense of remorse before, during and after committing the fraud offenses.

5. BERNIE MADOFF'S PONZI FRAUD

Bernard L. Madoff Investment Securities (BLMIS) was a brokerage firm developed by Bernie Madoff, known as the largest Ponzi scheme in history. The scheme was made in the United States in the period 1970-2009, including 37,000 victims and an economic fraud of almost \$65 billion. The main idea of this scheme

was a pyramid investment strategy. The funds attracted from investors were deposited in a bank account, while the old investors were rewarded with funds from new investors. Madoff used falsified account documents in order to lure his victims, in which an investment return of nearly \$50 billion was stated (Boaz 2019; Henriques 2021).

The Madoff's profile consists multiple entrepreneurial qualities, innovation, personal branding, marketing and managerial skills (Sher, 2015).

Bernie Madoff came from a middle-class family of which economic situation became difficult after his father sales of sporting goods ceased to exist. During college, Bernie studied at Brooklyn Law School and worked at the same time on installing sprinkler systems. In addition, he worked as a lifeguard and with his savings set up BLMIS, a securities investment company. His career experienced a great expansion after the idea of changing the trading in stocks running by human brokers with computers. Using computer technology, the trading gain speed, giving him a competitive advantage in the financial market (Creswell and Thomas, 2009).

Madoff appealed to an affinity fraud, considering that one-third of the victims affected by his Ponzi fraud were Jews from the Amuna community. Most of them came from the wealthy Jews of the Palm Beach community in Florida, being members of Palm Beach Country Club also as Bernie. Moreover, the Bernie Madoff's Ponzi scheme attracted not only Jews individuals, but also a number of Jewish organizations. His Ponzi scheme started from four prominent clients/investors, who become later the biggest beneficiaries of the illegal program, taking into consideration that Madoff paid the old investors with funds attracted from the new ones. These four investors helped unintentionally or not the scheme's development by recommended it to their wealthy friends. After the scheme expanded, Madoff started to set a minimum requirement of half of million dollars for people who wanted to invest in his company. In this way, only richest people were invited in scheme because Madoff created an element of exclusivity (Gelles and Tett, 2011).

Beyond the exclusivity, the Madoff's Ponzi scheme was based on feeder funds, which implies to use an umbrella fund on behalf of the main fund. This structure is used by hedge funds for investment capitals where investors' funds are attracted in a common fund. Each investors may gain or lose according to the level of money deposited, these funds being sensitive to financial market fluctuations (Johnson, 2010).

Bernie Madoff's reputation on Wall Street played a major role for his prestigious personal brand and equity. His white-collar profile includes several important positions and characteristics that designed his personal brand. Firstly, he has chair of the NASDAQ stock market, known as the second largest and the most popular stock exchanges in the world. Secondly, he activated as vice chair of the National Securities Union (NASD) one of the major regulatory bodies and

a non-profit organization established under the joint auspices of the Securities Exchange Commission (SEC) Investment Bankers Conference. Moreover, he was board member for one of the largest securities officials worldwide, namely Depository Trust and Clearing Corporation. As member of the SEC's Investment Advisory Committees, Bernie have close relations with financial officers and authorities, being appreciated by large financial institutions, including Deutsche Bank, Goldman Sachs, Credit Suisse and Union Banker (Gelles and Tett, 2011). Despite his high positions, Bernie was known as a charismatic person who donates large money to non-profit organizations and charities, which later became victims of his scheme. Having all these advantages, Madoff used his personal profile to develop a branding strategy capable to attract people to invest in securities by BLMIS. Instead, he promised a guaranteed fixed return of 1% per month, translated in almost an annual return between 10% -12% without market volatility. His personal profile and brand attracted investors, while the program was been seen as safe and with low risks. The great image of the program was also strengthened by the fact that Madoff developed a split strike conversion strategy. which involves buying and selling different financial securities to reduce volatility (Sher, 2015).

Another important element in Madoff's profile is its lifestyle. The attracted funds from investors were used to finance a luxurious personal lifestyle, including residential properties, cars, jewellery, a private jet, bank accounts and different assets (Gelles and Tett, 2011).

The scheme was discovered when Bernie Madoff falsified financial statements according to which his company invested in securities. In fact, the funds were transferred to his personal bank account, while the account books of his company started to be reviewed by financial authorities. However, Madoff's impossibility to permanently reward investors and cope with withdrawal requests during the 2008 crisis led to the collapse of the scheme. Before the closing, Madoff told his sons, managers at the same company, that the whole scheme was fraudulent. His sons notified the authorities and Madoff was sentences for 150 years in prison (Boaz 2019; Henriques 2021).

6. CONCLUSIONS

The Ponzi schemes have not been completely treated by the authorities and international bodies, remaining one of the largest threats for citizens. In order to reduce the number of these frauds, it is necessary to know the profiles of Ponzi criminals and the reasons why they are willing to commit financial crimes.

One of the main findings of this paper is to emphasize that the financial gain remains the main motive for performing Ponzi schemes. Alongside with financial gain, Ponzi criminals are driven by the need of power, greed, love of risk and satisfaction. Moreover, Ponzi schemes are stimulated by the deficiencies in fraud detection and in the severity of penalties. The need of control, the neutralization theory and the cognitive dissonance are also behavioural theories that explain the behaviour of Ponzi criminals.

Another finding of this paper is that most of the Ponzi criminals are middle age, usually male person, married and employed in the organization that is responsible for committing fraud. Moreover, the profiles of Ponzi criminals can be defined depending on how opportunistic or how predatory the fraudsters are. As regarding Bernie Madoff, his profile involves multiple characteristics in terms of entrepreneurial qualities, marketing skills, innovation and personal branding. Despite all these advantages, the Madoff's Ponzi scheme collapsed, suggesting that a Ponzi fraud cannot last forever.

These findings are important in order to prevent the Ponzi frauds, especially to prevent the competent and resourceful people to use fraudulently their innate or acquired skills. The number of Ponzi criminals and Ponzi frauds can be decrease by growing government regulations, diversifying fraud detection methods and aspersing the punishments.

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LEADERSHIP CHALLENGES IN THE ERA OF KNOWLEDGE: LEADING NETWORKED MENTORING

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ABSTRACT

Traditionally, mentoring has been conceived of as a dyadic relationship between a senior mentor and an early-career junior. At the Era of Knowledge, as careers became more boundaryless so did the sources from which individuals draw support in their careers. Such a multiple-mentor model is the Developmental Network theory. Who leads those networks? At an organizational perspective, we should expect managers involvement and leadership. This expectation is driven from leadership theories such as the transformational leadership theory. It seems that the research of mentoring and the study of leadership in organizations are developing in parallel facets. This article will try to combine the knowledge into integrative organizational conceptualization.

Keywords: leadership; mentoring; developmental network.

JEL Classification: J24, J28, J53, J62.

1. INTRODUCTION

This article is facing the future; to the road leaders are taking the organization toward the upcoming changes.

In the current era, characterized as the era of knowledge, the evolving of knowledge and technologies are so frequent that *the ability to change and be current* is a necessity- to the organization, to employees, and to managers. Employees and managers must cope with uncertainty and adapt quickly to rapid changes. Mentoring programs are an organizational mechanism for developing professional identity. A study in health organizations (Halvorson and Finney, 2015) found a preference for a combination of traditional mentoring patterns-dyadic relationship between a senior mentor and an early-career investigator, and the characteristics of the knowledge age - networked relationships in a developmental network - a concept coined by Higgins and Kram (2001). The multiple mentoring enables synergy and empowerment for the professional development of the protégée. Despite the leader's significant role as a mentor and

a developer to his subordinates, no leadership studies have been found to have combined the evolving knowledge of mentoring and developmental networks.

In the next paragraphs, I will try to integrate the knowledge from those disciplines into a whole complex that offers a leadership style that leads to the existence of developmental networks - the networking leader. "Leadership networking is about building relationships and making alliances in the service of others . . . and in service of the organization's work and goals" (Grayson and Baldwin, 2007, as cited Novak, 2008).

The claim of this article is that a leader, who will take a leading role in creating the general structure of complex networks and the conditions in which sophisticated networks can evolve, will contribute to optimal professional development of his subordinates, and in service of the organization's work and goals.

2. **MENTORING, NETWORKS AND LEADERSHIP -CURRENT TRENDS**

Mentoring

(MENTOR- Odysseus's friend, in his hands entrusted his son when he sailed to Trov).

In relation to organizational culture, mentoring can be defined as a: mechanism that helps the new people in the organization to learn the culture of the organization, and adjust to the organization and to the role. Kram (1985), describes the mentoring process as the process of forming a professional identity, and parallels it to the process of formulating the "self" according to Erickson: "role identity versus role confusion", "intimacy versus isolation". It is the mentor who helps to set employees goals, and to design the "occupational self".

As careers become more boundaryless and individuals work crosses organizational boundaries, so will the sources from which individuals draw support in their careers. Traditional mentoring is replaced by multiple mentoring. "Developmental network: a set of people a protégé names as taking an active interest in and action to advance the protégé's career, by providing developmental assistance" (Higgins and Kram, 2001, p. 268). Developmental Network theory suggests that these mentors should have complementary skills, providing a broader range of opportunities, expertise, and psychosocial support to enhance mentees' careers (Halvorson et. al., 2015).

Networking Leadership

Leadership is the ability to lead a group toward accomplishing its mission. There is a wide range of literature and research about leadership, and many theories have emerged.

The Full-range leadership theory (Bass and Avolio, 1993) is one of the inspiring theories. It termed the concept of Transformational leadership. Transformational leaders change their organization's culture by first understanding it and then realigning the organization's culture with a new vision and a revision of its shared assumptions, values, and norms. Bass (2008) termed the concept *"leadership as purposive behaviors"*. He refers to the particular activities in which a leader engages in the course of directing his group. Such activities as structuring work relationships, praising or criticizing group members, and personal consideration for members' welfare and feelings.

The place of mentoring in the transformational organizational culture is central, since such a culture is based on vision, norms and values and it is oriented towards the organization's mission and long-term commitment. Instilling these components of organizational culture to newcomers in an organization can only be mediated through mentoring-based relationships.

And in the era of knowledge?

Leaders who span boundaries are more likely to share information and ideas. *Is it the leaders' role to lead the boundaryless mentoring relationship?*

Burt (Novak, 2008) suggested that "Networkers" add value by brokering and coordinating across boundaries within and between organizations, and he called that *brokerage* and social capital. As early as 1976 Likert & Likert (Novak, 2008) had predicted the future changes in the demands from leaders. They called the leader a "*linking pin*", as due to the changes in the employment environment, the leader's power of influence lies in his ability to connect the resources and objectives of the various groups in the overall organization into a clear and consistent system. Ibarra and Hunter (2007) defined leadership networking as "*creating a fabric of personal contacts that will provide support, feedback, insight, resources, and information*" (p. 40).

Despite the leader's significant role as a mentor and a developer to his subordinates, no leadership studies have been found that had combined the evolving knowledge of mentoring and developmental networks. There is a complexity in understanding the impact of the manager's leadership on his subordinates' professional development.

Complexity Leadership Theory is based on Complexity science, and it allows us to develop leadership perspectives that extend beyond bureaucratic assumptions to add a view of leadership as a complex interactive dynamic through which adaptive outcomes emerge. In their longitude study, Uhl-Bien and Arena, (2017) found that in the reality of complexity, in order to create adaptability in the organization, three types of leadership are needed to be operating in sync: operational leadership, entrepreneurial leadership and **enabling leadership**- a leadership concept which enables the leader to lead his team in a way of variability, up-to-date and innovation. This leadership conception (like other developmental leadership theories) emphasizes the role of the leader in the development of his subordinates.

3. LEADERS LEADING NETWORKED MENTORING

It seems that the research of mentoring and the study of leadership in organizations are developing in parallel facets... The parallel research did not combine the conceptualization into the world of contemporary organizational knowledge. I will suggest a combined perspective, taking the best insights from each, in the benefit of the organization and the people working in it. The *Enabling leadership* 'way of thinking' that evolved from the complexity of the era of knowledge (Uhl-Bien and Arena, 2017), is a possible way to combine the knowledge. Figure 1 below demonstrates the parallel facets, combined at the top to the topic of the perception I would like to convey.



Figure 1. Combining the parallel facets (Source: Self drawing)

Milestones at the concept of leadership in organizations:

Relational Leadership: Leadership occurs within the context of relationships and influence. The approach that represents the change in overall observation and research of leadership (Popper, 1999).

Transformational Vs Transactional Leadership: the Full range leadership theory (Bass and Avolio, 1993).

Linking pin/ Networked *Leadership*: theories and models oriented to the Era of Knowledge, perceiving the leader as enabling!

Milestones at the concept of leadership in organizations:

Dyadic Mentoring: traditional Senior to junior mentoring.

Mentoring as an organizational mechanism: as mentioned above- the mechanism that helps the new people in the organization to learn the culture of the organization and adjust to the organization and to the role.

Developmental Networks: the 'new age' of mentoring- multiple mentoring. Leaders Leading Networked Mentoring:

I use the phrase *"networked mentoring"*, in order to preserve the basic principles underlying traditional mentoring.

The claim of this article is that managers should lead the developmental networks of their subordinates. It will be for the benefit of the organization mission and vision, and at the benefit of occupational growth of his subordinates. By leading developmental networks, the leading manager *enables* the best responsiveness to the rapid changes of the current era. I hope that my research will contribute to the leadership language needed to understand the *Enabling leadership*, as mentioned by Uhl-Bien and Arena (2017):

Our research shows that although many people are practicing enabling leadership, it often goes unrecognized because we don't have a leadership to describe it. Worse, because it does not fit our traditional conceptualizations of what leaders do, the actions of those who engage in it can be misunderstood or misconstrued. (p.16)

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STEPS TOWARDS THE INTEGRATED UNIVERSITY – POSSIBILITIES OF INVOLVEMENT OF THE ACADEMIA IN REGIONAL TOURISM DEVELOPMENT

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ABSTRACT

The strategic positioning of universities on the research/teaching dimensions is one of the essential decisions in building the identity of higher education institutions. Major societal changes can, however, determine the diversification of university services, by adapting to the needs of communities and by active and direct involvement in supporting the initiatives of various business fields. Universities have major assets in assuming the role of major actor in tourism clusters. The paper aims, based on an extensive documentation, both of the specialized literature and of the projects developed by the universities, to identify the possibilities in which the academic environment can get involved in the main tourism development. Six categories of specific actions with particularities and specific recommendations were identified. The conclusions are relevant both at the level of the university environment and at the level of potential partners interested in regional tourism development.

Keywords: tourism; university management; integrated approach.

JEL Classification: O43, R11.

1. INTRODUCTION

Over time, an ideal university model has taken shape, as the foundation for their missions, visions and individual functions for society. The European characteristics at the university level are the result of a long and intense period of experience sharing, cooperation and collaboration. The cultural function of universities has an upward trend (Gutu and Manolescu, 2017), appearing as a leitmotif of the three basic functions (teaching, research and services). The concept of an integrated university implies, in addition to the orientation towards teaching excellence and internationalization, also dimensions of sustainability (Hussain *et al.*, 2019) - accessibility, community engagement, environment.

As factories of knowledge, universities can be directly involved in numerous fields, being able to contribute to local and regional development solutions through extensive collaboration. The current work focused on the analysis of how universities can get involved in the tourism sector, thus contributing to local and regional development. The main vectors in orienting research towards this aspect are: (1) acceleration of internationalization in the university field; (2) the numerous attempts to redefine the role of universities in society; (3) new opportunities for financing partnerships and clusters in tourism, in which universities can be constituted as a communication kernel / hub.

The study aimed to go beyond the basic levels of involvement of universities in the tourism field through curriculum definition and research (Tribe, 2003), as promoters of the classical products of educational tourism (Demeter and Bratucu, 2014; McGladdery and Lubbe, 2017; Voleva-Petrova, 2020) or pillars of international education (Marinescu, 2017; McGladdery and Lubbe, 2017). Through a multi-dimensional approach with a constructivist character, the research aimed to highlight the categories of possible involvement of universities in the field of tourism, related concrete measures, existing good practices and managerial recommendations for the sustainability of collaborations.

2. METHODOLOGICAL ASPECTS

The starting point of the methodological approach is the result of a previous research (Manolescu and Talmaciu, 2021), materialized in a matrix of research - development directions in the field of tourism, based on an analysis of the specialized literature from the Eastern Pact countries.

The dimensions taken into account are the strategic and research interest, resulting in 4 categories of topics in the field of tourism (Fig. 1):

- Hot spots in research and development projects – subjects in which the universities have already been consistently involved, both as research topics and as development projects;

- International research collaboration directions – topics of interest, especially in the field of research, but poorly exploited entrepreneurially;

- New development projects - areas with entrepreneurial potential, neglected until now at the level of research;

- White areas – subjects for which there is no extensive research until now, and the development projects are at an early stage.

		High	Low	
		Hot spots in research and	New development projects	
	hg	development projects		
		Ecotourism & rural tourism	Medical tourism	
		Cultural & heritage tourism	Urban tourism	
t	Hi	Tourism strategy	International routes	
sres		Human resources management in		
nte		tourism		
ic i		Clusters & partnerships in tourism		
feg		Wine tourism		
tra		Risks & crises in tourism		
\mathbf{S}		International research	White areas	
	>	collaboration directions		
	Ň	Astronomical tourism	Event tourism	
		Dark tourism	Organizational level aspects	
		Urban innovaton in tourism	- SMEs, financial aspects	
		Archeological tourism	&logistics"	
		Cross-border tourism		
	Researchers interest			

Figure 1. The matrix of research and development directions in the field of tourism (Source: Adapted from Manolescu and Talmaciu, 2021, p. 295)

A second starting point of the research was the bilateral project Managerial and informational instruments for boosting research in universities - INFORM, carried out in the period 2016-2018, at the level of Alexandru Ioan Cuza University of Iasi, Romania and State University of Moldova, Chisinau. Within this project, through a documentary analysis, models of best practices from universities with a high degree of efficiency in the use of managerial and informational tools were selected in order to carry out some research-development projects.

To this two-dimensional foundation, in order to achieve the purpose of the research, an extensive documentation was added both from the specialized literature and from the information gathered from the websites of the representative universities for each category of possible involvement of the universities in the field of tourism.

Starting from the typology resulting from the matrix of research development directions in the field of tourism (Fig. 1) and the results of the activity of identifying good practices at the university level within the INFORM project, based on the documentary analysis from the current research approach, six categories were identified of possible involvement of universities in the tourism field (Fig. 2).



Figure 2. Synthesis of the methodological approach (Source: Own representation)

Through a constructivist approach, for each of the six categories identified, the particularities of university involvement and specific recommendations were highlighted.

3. LITERATURE REVIEW

The involvement of universities and other educational organizations in the field of tourism is seen in close correlation with educational tourism and youth tourism. The conceptual boundaries of these forms of tourism are vague and dynamic, but the growing attention for educational tourism products is certain (McGladdery and Lubbe, 2017; Foris *et al.*, 2014; Demeter and Bratucu, 2014; Marinescu, 2017). Youth tourism includes educational tourism, but also travel for volunteering, cultural exchanges, sports, adventure and leisure (Demeter and Bratucu, 2014). Educational tourism, defined as that form of tourism in which learning and education are the main motivations of the trip, is at the intersection of the fields of tourism and education. The educational tourism product is a

combination of the tourism product and the education product, which can take several forms (Voleva-Petrova, 2020). The growing importance of the field made it necessary to distinguish between educational tourism and international education, the approach being different - local impact of educational tourism vs. global industry of international education (McGladdery and Lubbe, 2017). International education focuses on learning processes in diverse intercultural environments, but educational tourism leads to behavioural changes on a larger scale. The tourism industry can develop complementary products and services for participants in educational activities, the economic benefits spreading to the communities.

Educational tourism includes three main subtypes - educational trips and camps, educational activities in museums, educational centres and other facilities, as well as mobility/exchanges of students and pupils between different preuniversity and university education institutions. But virtually any form of tourism also includes a learning component, most often informal, either about oneself and one's own ability to face certain new contexts, or about the destination and the population in the area, or about the fields included in tourist activities. Ecotourism, cultural and heritage tourism, rural/agricultural tourism, black, business, volunteer tourism and many other niche forms include an important component of educational activities and results (Demeter and Bratucu, 2014). The concept of educational tourism is strongly influenced by globalization and major changes in consumer attitudes, preferences and needs (Foris *et al.*, 2014).

The benefits of educational tourism are multiple (Stone and Petrick, 2013): from personal ones - increasing self-confidence, individual autonomy and changing the perspective on life in general, to cultural ones - enhanced citizenship and improving intercultural skills, to to the pragmatic, professional and cognitive ones - the training and certification of new skills, useful in the current workplace and in future ones.

4. RESEARCH RESULTS AND DISCUSSIONS

The interference between universities and different forms of tourism, especially educational tourism, can be systematized into six main components:

- Universities as poles of local / regional tourism development - have as their base a major cultural heritage, the characteristic of universities with a rich tradition, promoters over time of values with a significant impact on society; the universities are owners of some buildings and other heritage assets, which constitute first-class tourist attractions, dominating (especially in the case of smaller cities) tourism in the area;

- Organizers of scientific and cultural events - universities are initiators and/or partners in the organization of scientific events (congresses, conferences, exhibitions, summer schools, etc.), events that attract visitors from the country and abroad; in situations where these events have a high frequency and a significant amplitude, a major impact is exerted on local and regional tourism;

- Owners of some tourist attractions – universities include their own cultural attractions, of different tourist values; adequate marketing can lead to their inclusion in tourist circuits, with benefits both on the local tourist offer and on the level of own notoriety;

- Partners in the development of different forms of tourism - the resources available to universities recommend them as important partners in consortia interested in the development of different forms of tourism, especially niche ones, based on human resources and specialized materials (health, medical and dental tourism , scientific, astro- and atomic tourism, nature-based tourism: bird- and whale-watching, three-dimensional virtual tourism, sports, business and political tourism, international volunteering, etc.);

- Host organizations for educational mobilities - the most studied role in specialized literature; universities are the main suppliers and, in the mirror, hosts for participants in academic mobility, at the level of students, teachers, researchers and support staff; the trend is increasing, as a result of the expanded funding opportunities and the increased interest in academic collaborations;

- Providers of support services for various tourism organizations - beyond the teaching and research activities in the tourism field, specific to the academic level, universities can provide the local tourism industry with various services - consultancy, hotel and catering services, tourist guides, media content for the websites and for other applications for exploring tourist destinations.

The six roles of the universities will be detailed and exemplified in the following paragraphs, highlighting the existing good practices at the university level, the factors that prevent a more intensive training in the respective role, as well as possible recommendations for the managers of the universities who want to assume a direct involvement, through - an integrated development strategy.

4.1 Universities as poles of local / regional tourism development

It is the role that traditional universities, founded hundreds of years ago, can easily assume. These universities have an impressive heritage, often dominating local tourism, especially when located in relatively small towns. Notable examples are the oldest universities in Europe - Bologna, Oxford, Coimbra, Salamanca, etc., which, in addition to the reference architectural heritage, have also developed other specific elements of a strong organizational culture - symbols, heroes, events, rituals, values - with a message of major impact on visitors. Reference historical events have taken place in their space, and among their teachers and graduates are important national and international personalities. These universities own libraries, museums, reception and coronation halls as well as works of art; manages botanical gardens and historic astronomical observatories; they organize ceremonies and scientific and cultural events, they have cafes and restaurants with tradition and offer accommodation services for visitors involved in academic events in spaces with historical resonance. They are often the scene of films and series, public and political debates and offer spaces for art galleries. It represents the development model of the universities established later, both in terms of architectural style and facilities.

The challenges faced by these universities in exercising the role of a major tourist attraction at the local or regional level are the maintenance and rehabilitation of heritage buildings, the interference of tourist tours with administrative, teaching and research activities, the formation of tourism-specific skills for own staff, cooperation with tourism agencies, creation and promotion of own tourist products, intensification of the position held within tourist clusters at the regional level. If sustained responses to these challenges are not provided, the result can be an inadequate state of architectural monuments, as well as low involvement of the population in cultural and touristic events (Stratan *et al.*, 2015).

The measures by which universities can maintain and strengthen their role as a major tourist attraction at the local and regional level relate to emphasis on new constructions, cooperation with other relevant institutions for the diversification of tourist circuits to increase visitor satisfaction, as well as systematic actions to include the university and related facilities in the regional tourist circuits. Direct income for universities can also be obtained from souvenir shops with university insignia, especially appreciated by visitors from the academic environment.

4.2 Organizers of scientific and cultural events

Universities organize, as part of their own research plans, scientific and cultural events with national and international participation. These events mobilize researchers and teaching staff, students and administrative staff, as well as representatives of various stakeholders. Integrated events, organized by university days or on the occasion of meetings of university consortia, those in the field of medicine and pharmacy have the ability to attract a large number of participants, including international ones. Universities with tradition organize specific parades, which also attract people from outside the academic environment. There is the possibility that the participants in the events come accompanied by family members, allocating time during the visit for tourist activities. Often, scientific events include in the program activities specific to cultural, historical, urban or village tourism and, most often, culinary tourism. They can also involve more niche forms of tourism, such as roots tourism or visiting relatives and friends, shopping or Iron curtain tourism.

The problems that the universities have to face are mainly organizational, ensuring the continuity of the events and their relevance for the participants. For major events organized by universities located in areas with a reduced capacity to receive tourists, it can be decided to relocate the event. In order to increase the relevance of scientific and cultural events, it can be decided, at the national or consortium level, to organize several scientific events at the university celebrating a significant number of years since its foundation, to organize joint interuniversity events or together with other stakeholders, as well as the structuring as events and the adequate promotion of some routine activities - open days, reception and information days for new students.

4.3 Owners of some tourist attractions

It is a role that can be assumed not only by traditional universities (constituted as poles of regional attraction), but also by recently established universities that can offer specific facilities to residents and tourists. Universities are custodians of spaces with historical and cultural relevance; the buildings in which they were established or the artefacts collected over time represent attractions that can interest the general public, not just academic visitors. Some universities have established museums, botanical gardens, planetariums or astronomical observatories; they have sports and continuous training centres. The main classrooms, libraries and laboratories are architectural gems or hold works of art or other artefacts of interest. The specific challenges relate to the sustainability of these facilities, their functionality and financing, as well as the ways of specific promotion and introduction in local tourist circuits - often the target audience is represented by students, residents and participants in various local events. Universities were among the first organizations to adapt to the constraints of the pandemic crisis by organizing virtual tours of their attractions. An important issue that can be raised concerns the responsibility of universities to open these attractions to the general public, even if the study program may be disrupted, as happens in the case of libraries. The specific challenges are to make new investments - for example village museums, exhibition halls for artefacts, maintenance of owned attractions and partnerships for their efficient use.

4.4 Partners in the development of different forms of tourism

Universities and research institutes are significant partners in the development of regional tourism, of less developed areas, including rural areas, through development projects (Borza and Manolescu, 2015). According to the matrix of research - development directions in the field of tourism (Fig. 1), areas can be identified in which both research interest and entrepreneurial and strategic interest is high - for example, for the countries of the Eastern Partnership, rural tourism, ecotourism, wine tourism, And so on Universities, however, have real assets in the development of niche forms of tourism - scientific tourism (Farmanyan and Mickaelian, 2019), in particular astronomical tourism (Farmanyan *et al.*, 2019) or in dark tourism - in the case of complex destinations such as Chernobyl, where the implications scientific are significant (Romanova, 2020).

Viable partnerships with universities as pillars can also be built in domestic tourism development projects, namely ecological tourism and ecotourism (Rahmanov *et al.*, 2020), but also for community tourism and integrated rural development, which can generate positive effects for all the parties involved (Khartishvili *et al.*, 2019).

Also, cross-border programs, with non-refundable funding, due to the traditional links between the universities in the regions involved, can also be considered opportunities for carrying out tourism development projects in partnership with universities. Ecotourism, heritage and educational tourism, religious tourism, have certain advantages in this post-pandemic period, requiring a relatively reduced infrastructure, oriented towards individual or group tourism and therefore adapted to the conditions of the health crisis (Talmaciu and Manolescu, 2021). The support of orientations in tourism depends fundamentally on the system of national values (Talmaciu, 2015), there being a clear connection between cultural, historical and natural heritage and the possibility of capitalizing on specific, complementary resources in the case of cross-border projects.

As advantages, the diversification of the tourist offer, where the creativity of the university environment can leave its mark significantly, and the capitalization of all niches are instruments for reducing risks and maintaining the number of tourists at a level that allows the survival of tourist destinations.

An analysis of cross-border projects in the tourism field (Talmaciu *et al.*, 2020), in which universities played an active role, shows the preponderance of projects that aim to facilitate connectivity, those aimed at environmental sustainability and encouraging the business environment and competitiveness (tourism mountain and ecological agriculture) activation of networks of young professionals involved in regional development through cultural routes, festivals to promote local production, renewable energy for accommodation units, preservation and promotion of cultural heritage, support for local sports, culture, education and tourism, cycling, outdoor adventures on historical trails, nature tourism and digitization in tourism. The wide variety of project orientations is specific to countries that have multiple needs to improve the field. The focus on sustainability is clear, thus supporting investments not covered by the private sector. Collegiate coordination of clusters can be exercised through university representatives (Sahakyan *et al.*, 2019).

The challenges can be found in ensuring the quality of the partnerships, switching to networks and clusters, which ensure the sustainability of the ongoing projects, as well as ensuring the competent personnel in the field.

4.5 Host organizations for educational mobilities

The main component of educational tourism at the university level is the mobility of students, teaching staff, researchers and support staff.
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Currently, at the level of the European Union, the most important financing program for these mobilities is the Erasmus program, established in June 1987, by a decision of the Council of the European Union, to promote student mobilities abroad, with an emphasis on skills development for employability and active citizenship, so as to combat unemployment among young people, but which diversified its activities in the following programming periods. The internationalization of universities does not mean taking over some study programs without adapting them to the intended target market (Gutu and Manolescu, 2017). When choosing their host university, students act in a similar way to tourists choosing their travel destination. They have to make a choice considering various criteria such as: attractiveness of studies, location of the university, ease of access, cost of transportation, available accommodation options, cost of living, etc. (Marinescu, 2017). Over the years, the reasons for choosing a certain destination have changed: acquiring new skills, a better quality of the education system, improving their CV and career perspectives, or to find new friends from a multicultural environment, such as and to travel and sightsee. The fundamental reasons for obtaining meaningful study and practice experiences have partially given way to a rather hedonistic approach, focused on entertainment and a new social experience. These changes also leave their mark on the chosen destinations. Students may be inclined to explore a lesser-known region, for example Eastern European countries. Social activities and customized excursions organized by the host institution are also important aspects. The website of the destination university is an important source of information in this regard. Due to security threats and the danger of terrorist attacks, the smaller and considered safer cities have gained ground in front of the larger and more attractive cities in terms of tourism.

Both through European programs and through extensive partnerships with different organizations, universities are increasingly involved in offering a wide range of educational services, which includes formal, non-formal and informal learning approaches, with the aim of achieving the objectives educational and enriching the learning experience (Manolescu *et al.*, 2018). The market segments that have an interest in educational tourism products are not as large as in other forms of tourism, in which the non-formal education that tourists receive is embedded. It is advisable for universities to have an innovative and creative approach in building educational tourism products, because most participants are looking for authenticity and real experiences. The learning process during educational trips must be more enjoyable and engaging, and the entertainment must contain an educational value (Voleva-Petrova, 2020).

4.6 Providers of support services for various tourism organizations

Through the resources they possess, universities can provide support services for different actors involved in regional tourism development. Starting from the basic activities, research and teaching, the main support services can be those of consultancy, involvement in the realization of the strategic documentation of tourism development, as well as continuous training for the staff of these tourist organizations. East-west collaboration is also seen as a success factor in projects in the field of human resources, at the level of universities, through projects with European funding that support the training programs necessary for the tourism field (Ulian and Castravet, 2015). The studies that identify employers' perceptions of the quality of training are the basis for the permanent adaptation of the training offer to the demands of actors on the tourism labor market (Lupu *et al.*, 2014). Consulting and strategic positioning services are visible in the establishment of thematic international routes, seen as success factors in the development of international routes are those specific to wine tourism, those related to common gastronomic heritage and landmarks of minority heritage.

Research centres outside the university campus can be located in areas of tourist interest and can offer accommodation and food services; some universities have hotels – the school for training students.

Specialists from universities and students can contribute relevant content to tourism promotion sites, play the role of tourist guide and contribute to the creation of innovative products, such as urban tourist exploration applications.

The specific challenges are provided by the sustainability of the partnerships, the availability of the staff involved in activities additional to the basic ones, the training of the staff involved in mixed academy-industry contexts.

5. CONCLUSIONS

The clear orientation decision towards development projects in the field of tourism corresponds to a diversification strategy at the university level. This decision should be accompanied by important, often structural changes: at the level of the organizational structure, human resources management and extended partnerships with different stakeholders, in certain atypical cases.

The effects of this orientation are an increase in the notoriety of the university, a higher degree of satisfaction for its own students and for visitors, a change of mentality towards the collaborative paradigm. The increase in income for the university, the possibilities of extensive collaboration for research and training activities can also constitute important advantages of the involvement of universities in tourism development projects.

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HR ATTRIBUTIONS, PEER-PRESSURE, AND WORK MOTIVATION RELATIONSHIP: AN EXPLORATORY STUDY

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ABSTRACT

Employees' motivation represents one of the most debated subjects in the HRM literature and a topic of real interest for managers dealing with daily organisational challenges. Based on the Self-Determination Theory framework and HR attributions research, this paper focuses on exploring the relationship between the way in which motivation enhancing HR practices are perceived (HR attributions), employees' peer pressure and work motivation. Both sides of negative and positive sides of peer-pressures were considered. To reach the paper's purpose, an explorative, quantitative study, on 113 employees from MNCs was conducted. Results show that the link between HR attributions and work motivation occurs if employees perceived HR practices as being service quality and employees enhancement oriented, while peer-pressure positive relates to work motivation when HR practices are perceived as being oriented to cost reduction or legal compliance. The negative side of peer-pressure was perceived by respondents who associated the HR practices with quality and employee enhancement HR attribution. Managerial implications of the results were further discussed.

Keywords: work motivation; HR attributions; peer-pressure at work; Self-Determination Theory; explorative study.

JEL Classification: J28, M12, M50, M59.

1. INTRODUCTION

Employee motivation is seen an important variable in the workplace, as it affects performance, directly influences job satisfaction and commitment, and

ultimately determines the success of individual employees, teams, and entire organizations (Kehr *et al.*, 2018). Over time research focused on either identifying the motivational profiles of employees (e.g., Moran *et al.*, 2012; Howard *et al.*, 2016) either on determining the factors that motivates employees at work (Baard *et al.*, 2004). Our paper fits into the second category. The multitude of perspectives and abundance of research in the field determines the researchers to embrace a specific approach, thus for this paper the Self-Determination Theory (Ryan and Deci, 2017) will be considered. The theory has a more integrative approach, and it is applicable in multiple domains, work motivation being among them. Moreover, Practitioners want more autonomous motivation of them employees, and SDT could offer the proper framework in order for managers to help employees reach it.

Many studies focusing on work motivation factors investigated different HR practices (Lepak *et al.*, 2006) or managerial aspects, while the influence of the peers was left behind. Several studies over the years have both confirmed and infirmed the use of peer pressure as an incentive or as having an influence on the motivation of workers (Kandel and Lazear, 1992; Bellemare *et al.*, 2010; Cornelissen *et al.*, 2013; Bohns and Flynn, 2013; Gallani, 2017). Peer-pressure (especially within multinationals, due to high number of employees and the way work is organised) might be one of the factors that influence work motivation, either in a positive or negative way. Another insightful perspective is HR practices are not always the same as intended or perceived by the receptors (Purcell and Hutchinson, 2007), thus the employee's perception regarding HR practices implemented, named HR attributions (Nishii *et al.*, 2008) could be the best variable to focus on.

Therefore, the paper aims at identifying the relationship between HR attributions, peer-pressure and work motivation among people working in multinationals. Both positive and negative aspects of peer-pressure were considered.

2. LITERATURE REVIEW

2.1 Work motivation and Self-Determination Theory

Defining motivation, and especially work motivation is among most researched topics in human resource management field. At the beginnings motivation was explained from a more biological perspective, referring to tension determined by physical/basic needs, that once felt made people act in order to reduce it. However since then a lot of other perspectives were developed and over 100 definitions have emerged. A multitude of definitions defined motivation as the 'energy to act' (e.g. Fowler, 2014), while others consider it the driver to reach a certain goal (Locke and Latham, 1984) or to solve different individual needs (e.g. Maslow, 1954), being influenced by intrinsic or extrinsic factors (e.g. Deci and Ryan, 1985). However, over the time, more integrative perspectives were developed along with measurement scales (e.g. Barbuto and Scholl, 1998). Due to the need for organisation to have better results, managers and later human resource professionals started to be interested in employee motivation at work, research being developed in academic areas like human resource management, organisational behaviour, and organisational psychology (Latham, 2007).

Employee motivation is seen an important variable in the workplace, as it can have positive outcomes for both employee level, such as high performance and well-being (Ryan and Deci, 2000), directly influencing employees job satisfaction and commitment (Kehr et al., 2018) and for teams or entire organization levels (Kehr et al., 2018). This is the reason why over the years, many theories tried to explain how motivation at work emerges, could be supported, or even be developed. Among the modern theories in this field, Self-Determination Theory (SDT, Rvan and Deci, 2017) is a robust theory that is founded on the assumption that humans are inherently curious, physically active, and deeply social beings, having three basic psychological needs: autonomy, relatedness, and competence (Ryan and Deci, 2017). The behaviour that people manifest is self-determined and aims at satisfying these fundamental needs. However, the social conditions in which people develop and function can either encourage or undermine the satisfaction of these needs (Ryan and Deci, 2000). However, people could reach motivation state through five forms of behaviour regulation distributed on a continuum of motivation which reflects the way in which regulation of behaviour occurs: autonomous (the value of behaviour is internalized) versus controlled (behaviour is determined by external factors) (Gagne and Deci, 2005). The forms of behaviour regulation are intrinsic value of the task and external value of the behaviour, the second one having four forms - integrated regulation, identified regulation, introjected regulation and external regulation (Gagne and Deci, 2005). Research proved that more internalized forms of regulation helped employees achieve positive results such as high performance and well-being (Ryan and Deci, 2000) and high engagement with them work (Parker et al., 2010). Thus, organization should foster this kind of behaviours.

The paper relied on SDT theory for developing the instrument of data collection, taking into consideration the need satisfaction of the three psychological needs: autonomy, competence, and relatedness. Autonomy refers to feelings of having control and overseeing own actions, behaviours being congruent with one's authentic interests and values (Ryan and Deci, 2017). Competence represents a core element in motivation actions, as people need to feel effectance and mastery, being able to operate effectively, while relatedness refers to feeling socially connected and cared for by others (Ryan and Deci, 2017).

Another valuable insight of the SDT theory that was exploited within the paper is that there are six main reasons why people work (Deci and Ryan, 1985): (1) play - when the individual is motivated by the work itself, and enjoys doing it;

(2) purpose - when the direct outcome of the work fits the individual's identity and the work's impact is valued; (3) potential - when the outcome of the work benefits the individual's identity and it enhances their potential; (4) emotional pressure - when the individual works because some external force threatens their identity (fear, peer pressure, shame); (5) economic pressure - when an external force, such as rewards or avoiding punishment, makes the individual work;

(6) inertia - when the motive is far removed from the work and the individual's identity, they find it hard to identify why they are doing that specific work. The fourth factor was approached in order to find out if peer-pressure nourish positive employee related outcomes or rather negative ones (in our case positive employee outcomes means high work motivation).

2.2 Peer-pressure at work

In the workplace, there is a clear and unsurprising influence that co-workers have upon each other through basic social processes such as conformity pressures, persuasive appeals, and social norms (Bohns and Flynn, 2013). Considering SDT theory, the regulatory response that an individual could have while being under social pressure can be extrinsic, through introjection, involving the ego and desire for approval (Ryan and Deci, 2000).

Several studies have been carried on the effect of peer pressure as an incentive for employees whose work was mostly team-based. In teams, social incentives and mutual monitoring (peer pressure), are more effective if the individual empathizes or cares about his peers, whose income he affects, thus more in firms where profits are shared among colleagues in similar circumstances (Kandel and Lazear, 1992). Implicit incentives, such as peer pressure, allow for longer persistence of the introduced or desired changes in organizational behaviour (Galani, 2017).

Also, peer-pressure is one of the factors (among moral, intrinsic, and positive incentives) influencing the employees to work hard even without supervision (Minkler, 2004). If one individual falls behind or does not manage to keep up with the social norm, one can experience feelings of shame or guilt, which could result in increased effort and stress (Cornelissen *et al.*, 2013). The level of peer pressure can affect productivity, but there is little to suggest that the level of productivity will be higher in the presence of peer pressure than in its absence (Bellemare *et al.*, 2009). However same research found that very low and very high levels of peer pressure can significantly decrease productivity, especially in the case of male employees (Bellemare *et al.*, 2009).

2.3 HR attributions of motivational practices

In order to select from the literature, the suitable HR interventions for this study, we considered the research of Purcell and Hutchinson (2007), Nishii *et al.* (2008) and Jiang *et al.*, (2012). First, starting from the HRM-performance chain

(Purcell and Hutchinson, 2007) presented in Fig. 1 we concluded that, for the HR outcomes (work motivation in our case) to occur, the implemented HR practices are the key element in the chain, and they should be positively perceived by the employees addressed.



Figura 1. HRM – performance chain (Source: adapted from Purcell and Hutchinson, 2007, p.5)

The employee possible perceptions were translated by Nishii *et al.* (2008) into HR attributions classified by authors as follow:

- a. internal attribution:
 - commitment-focus: service quality, employee well-being, referring to the perception that the HR practices are used for enhancing service quality and the well-being of the employees, in our case, the support and the satisfaction of employee needs.
 - control-focus: cost reduction, exploiting employees, referring to the perception that the HR practices are used because the of the company trying to keep the costs down and get the most work out of employees.

b. *external attribution:* union compliance, legal compliance (Jiang *et al.*, 2012) referring to the perception that the company is adopting the HR practices simply in order to comply with legal requirements or union compliance.

Therefore, if employees would attribute the HR practices as being committed-focus they will also feel motivated at work, otherwise the satisfaction of them needs will not occur.

For choosing the HR interventions properly we considered the AMO framework, and we only referred to the HR enhancing motivation practices such as: training, benefits, pay, performance appraisal, employee relations (Lepak *et al.*, 2006; Jiang *et al.*, 2012).

3. RESEARCH DESIGN

For this explorative study, the main purpose was to tackle the relationship between HR attribution, peer-pressure and work motivation for employees working in MNCs. Therefore, using a quantitative method, the paper seeks to answer to the following research questions: Is there a relationship between peerpressure and work motivation of employees working in MNCs? What is the link between HR attribution and peer-pressure, as well as between HR attributions and work motivation? What are the HR attributions that determine work motivation? The cross-sectional study used primary collected using a self-administered questionnaire, in electronic format using Google Forms and Internet-mediated, with data being gathered automatically and being processed using SPSS software. The sampling technique chosen is a non-probability one, specifically snowball sampling, the 113 respondents being employed in MNCs in Iași, having more than 500 employees at local level. The research instrument used adapted short scales from the literature, using 5 points Likert scale and socio-demographic questions as follow:

1. HR attributions (Nishii *et al.*, 2008) (quality and employee enhancement; cost reduction and employee exploitation; legal compliances) motivationenhancing practices (AMO theory): training, benefits, pay, performance appraisal, employee relations. – a total of 15 items

2. peer-pressure scale: Peer Pressure Measurement scale (Sunil and Jyoti, 2019) in order to address the positive aspect of the concept and Competitive Psychological Climate (Brown *et al.*, 1998) in order to address the dark side of peer-pressure. – a total of 10 items

3. work motivation - Need Satisfaction at Work (Tafvelin and Stenling, 2018) and a shorter version of Job Motivation Measurement scale (Sunil and Jyoti, 2019) – a total of 17 items.

4. socio-demographic: gender, age, educational level, job domain, organization of work (teams/individual), length of service within the company.

Based on the literature review the following hypothesis were developed:

H1. There is a significant positive relationship between quality and employee enhancement (QEE) HR attributions and work motivation.

H2. There is a significant negative relationship between cost and employee exploitation (CEE) HR attributions and work motivation, as well as between legal compliance (LC) and work motivation.

H3. There is a significant relationship between peer-pressure and work motivation.

H4: There are significant relationships between HR attributions and peer pressure.

H4.1. Positive relationship between CEE HR attribution and LC HR attribution and peer pressure

H4.2. Negative relationship between QEE HR attribution and peer pressure

4. **RESULTS**

The result of descriptive statistics analyses shows that most of the respondents were female (61.9%), age between 18-24 (57.7%) and 25-35 years old (38.1%), with an educational level balanced between undergraduate level (47.8%) and graduate/master level (45.1%). The domain of job position as distributed as follow: 35% IT and engineering; 17% customer service, 16%

administration and HR, 4% marketing. The length of service within the organisation was rather short, 43% have 1-3 years, while 42% of the respondents were working for less than a year, and only 8% working over 5 years in the same organisation. Most of the respondents work in teams of 6-12 members (50%), 27% are organized in small teams of 3-5 members, 20% work in very large teams, and 3% work individually.

The main results of descriptive and reliability analyses are in Table 1. As it can be seen moderate levels of work motivation were registered and the main HR attribution perceived was quality and employee enhancement. Considering the reliability test, all the scales exceeded 0.7 level of Cronbach alpha test, result indicating good values for internal consistency (Robbinson *et al.*, 1991).

Indicator	QEE HR attribution	CEE HR attribution	LC HR attribution	Work motivation	Peer- pressure
Cronbach alpha	.910 (5 items)	.871 (5 items)	.832 (5 items)	.937 (17 items)	.782 (10 items)
Mean	3.52	3.099	2.701	3.618	3.048
Sd. Deviation	.9173	.8374	1.0036	0.7791	0.729
Minimum	1.6	1.3	1	1.5	1.3
Maximum	5	5	5	5	5
Ν	113	113	113	113	113

Table 1. Descriptive and reliability analyses of the variables

Legend: QEE = quality and employee enhancement,

CEE = cost and employee exploitation; LC = legal compliance.

Source: made by the author

In order to test the first two hypothesis a two-tailed Person correlation (Table 2) and ANOVA was conducted (Table 3). Results show positive significant correlations between work motivation and QEE HR attributions (r=0.558 sig. <0.001), but no significant relationship (sig. >0.05) between CEE HR attribution, respectively LC HR attribution and work motivation. Thus first hypothesis is validated, while the second one is not.

		QEE HR attribution	CEE HR attribution	LC HR attribution	(+) Peer- pressure	(-) Peer- pressure
Work	Pearson	.558**	.057	.089	.253**	158
Motiva-	Correlation					
tion	Sig. (2-	.000	.552	.347	.007	.095
	tailed)					
	N	113	113	113	113	113
			1			

 Table 2. Pearson 2-tailed correlation between work motivation and HR attributions and peer-pressure

Source: made by the author, SPPS analyses.

Furthermore, a regression analyses was conducted in order to test if QEE HR attribution (as independent variable) is a determinant for work motivation (dependent variable). Results (Table 3) show the determination coefficient Adjusted R Square has a value of 0.536, which tells us that our independent variable, QEE HR attribution, explain 53.6% of the influence and that the independent variable statistically significantly predicts the dependent variable, F (1, 109) = 65.007, for a p < 0.001. Our model is a good fit of the data, as the regression coefficients is significantly different from 0.

In order to test the third hypothesis same 2-tailed Person and ANOVA test were run. Results show that there is a relatively weak, but positive significant correlation (r = 0.253, sig. =0.007) between the positive facet of peer-pressure and work motivation (Table 2), but no significant correlation with the negative side of peer-pressure (competitive climate).

Independent variable	R	R ²	Adjusted R	df	F	Sig.
QEE HR attributions	.738	.544	.536	(1, 109)	65.007	.000
Peer- pressure	.253	.064	.056	(1, 111)	7.623	.007

Table 3. Regression analysis results having work motivation as dependent variable

Source: made by the author, SPSS analyses

The ANOVA results (Table 3) show that the determination coefficient Adjusted R Square has a value of 0.056, which tells us that our independent variable, the Peer pressure variable, explains 5.6% of the variability of our dependent variable, Work motivation (F (1,111) = 7.623, sig. < 0.05). The link is positive, so for our study the positive aspects of peer-pressure proved a influence on work motivation, while the negative facet of peer-pressure could not be proven.

The last hypothesis referring to relationships between peer-pressure and HR attributions was validated, as the 2-tailer Pearson correlation test (Table 4.)

showed that there is a positive significant relationship between CEE HR attribution and dark side of peer-pressure (Competitive Psychological Climate-CPC) as well as between LC HR attribution and dark side of peer-pressure (CPC), and a negative significant relationship between QEE HR attribution and CPC. However, the link for all three correlations are very weak.

		QEE HR attribution	CEE HR attribution	LC HR attribution
PPM	Pearson Correlation	.106	.158	.152
	Sig. (2-tailed)	.263	.095	.108
	Ν	113	113	113
CPC	Pearson Correlation	197*	.223*	.207*
	Sig. (2-tailed)	.037	.018	.028
	N	113	113	113

Table 4. Pearson 2-tailed correlation between peer-pressure types on influence and HR attributions

Source: made by the author, SPSS analyses

We can conclude that competitive psychological climate appears when employees perceive HR interventions being oriented to cost and employee exploitation and legal compliance, while the negative side of peer-pressure doesn't appear when HR attributions are perceived as being oriented to quality and employee enhancement.

5. CONCLUSIONS AND POSSIBLE MANAGERIAL IMPLICATIONS

The main considered factor, peer pressure, can influence the work motivation of the employees, especially if it relates to positive pressure, such as employees motivating each other through their performance, with teamwork being promoted in the company and there being good relationships between colleagues. The more negative side of peer pressure, represented by the competitiveness in the workplace, has a negative relationship with work motivation. Perceived HR practices that the company adopts, can significantly and positively influence the work motivation, especially if the employees perceive that the HR practices intended to enhance their motivation have been adopted in order to help them develop and improve the quality of their work. Competitive Psychological Climate Perception (negative peer-pressure) did not have a statistically significant negative relationship with work motivation, but results show that certain HR attributions (CEE and LC) are positive correlated to it.

Furthermore, the experienced peer pressure, either positive, relating to the employees' relations with their peers and its influence on their performance, or

less positive, through a competitive psychological climate, can also have an influence on the work motivation, however little in our case.

Managers, therefore, can help increase the motivation at work of their employees by adopting motivation-enhancing HR practices, but tailoring them to their employees' needs, abilities and skills. Promoting open communication channels between them and the employees, as well as between the employees as co-workers, offering them a sense of autonomy at work and recognizing their talents can significantly affect their motivation on the job, as providing them with support for their main needs' satisfaction – relatedness, autonomy and competence – creates a proper environment for growing, learning and performing. These actions can also help decrease the negative effects of peer pressure in the workplace, which can affect motivation or generate stress for the employees, while, at the same time, they can support positive peer influence, greater team cohesion, knowledge spillover and better professional socialization.

The present research, however, has certain limitations as well. Among the limitations that could have affected the final results would be: the fact that the research only captures a certain point in time; little control over the population and limitation in the access to samples, making sample rather small, being unable to show differences between subcategories of respondents; generalization and results not representative for the whole population. However represents a starting point in considering peer-pressure as a variable to take into consideration for future studies in work motivation. In the same time the way in which the respondents work (remote/hybrid or on-site) was not taken into consideration and future research should consider it, as peer-pressure might feel different depending on such a variable. Future research could also consider possible mediating roles of other variables, like organizational climate. Another point of interest could be discovering the level of peer-pressure that is satisfactory enough in terms of performance and the critical point from which peer-pressure starts having negative a influence.

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SCRUM AGILE METHODS IN THE BANKING AND FINANCE INDUSTRY: A STATE-OF-THE-ART LITERATURE REVIEW

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ABSTRACT

Agile techniques, particularly the usage of agile scrum processes, are one of the primary strategies for managing projects. Recently, the software engineering community has given it the scientific consideration it deserves. This research aims to undertake a thorough evaluation of the quantity, content, and scope of the most influential articles published in the banking and finance industry. After reaching a high point in 2017, the number of research articles produced between 2013 and 2022 increased dramatically. The study identifies the most influential conferences and publications in the field and concludes that the majority of published papers are literature reviews on agile software development in financial institutions and that there are an equal number of articles for exploratory and descriptive research methodologies.

Keywords: Agile; Scrumban; Software Engineering; Software Methodology; Information Systems; Systematic Review; Digital Banking; Finance.

JEL Classification: M15.

1. INTRODUCTION

Disruptive innovations like artificial intelligence, deep learning, blockchain, the Internet of Things (IoT), and advances in ultra-computational complexity have led to big changes in many different fields. New organisational structures, such as value creation centres, platform alternatives, and data aggregation firms, have emerged with shorter product life cycles and more fragmented value chains. Existing processes must be changed based on the assumption of big data and

advanced analytics for businesses across a vast array of sectors to effectively manage rapid change, distribution networks, and sales channels. As a result of digitisation, organisations must develop flexible operational models to change their plans in a volatile market environment. These developments also affect the organisational structure and strategic function of financial institutions. Digitalisation has effects that go far beyond the traditional software development tasks of making, deploying, and keeping up IT systems. Information technology helps organizations, especially those in the banking and finance business, work together better so they can keep and improve their competitiveness by making their products better and cheaper or by coming up with new ones. . As a consequence, IT is transitioning from a reoccurring function to a vital organisational competency for the creation of innovative products and processes across several sectors. Consequently, it is an essential element of a digital marketing plan. Frequently, business requirements need a quicker time-tomarket, necessitating customer-centric and iterative development strategies. From this point of view, agility could be seen as an organization's ability to respond quickly to changes in the market, speed up operations, and increase its global competitiveness by improving its intellectual capital and flexibly allocating its resources. Due to the increasing demand for businesses to become digital, modern management paradigms and efficient technologies are necessary to handle software design projects and financial analyses, which typically play a significant role in each stage of the value chain. Agile methodologies were initially intended to improve the management of small-to-medium-sized software development projects in financial institutions. This was done because software projects in banks and other financial institutions that were managed using the waterfall method often took longer, cost more, and needed more resources (Almeida et al., 2021). In the meantime, the range of agile approaches has grown, which has led to a rise in their use in large-scale IT projects and successful change management efforts at the company or even enterprise level (Conboy et al., 2019).

No matter how different the methods are, agility is about breaking up a big project into smaller, easier-to-handle pieces that are constantly improved (through interval training) to make sure that the project keeps moving forward and meets changing needs (Abrar *et al.*, 2020; Denning, 2018). Agile teams function independently, ensuring the greatest outcomes via regular testing and the continual user or customer feedback. This agile ecosystem tries to cut costs, lower initial costs, speed up project completion and improve quality all at the same time (Sommerville, 2015; Schwaber, 2004). Plan, design, develop, test, deploy, review, and launch are the seven iterative phases that make up the Agile Software Development-Methodology framework (see Fig. 1).



Figure 1. Cycle in Agile Project Management

Even though agile approaches are becoming more popular, traditional ways of programming like waterfall frameworks and their variations are still used. (Kassab *et al.*, 2018; Palmquist *et al.*, 2013). Agile method supporters are sure that even a lot of agile teams working together at the same time would lead to more innovation, productivity, and speed to market (Jorgensen 2018; Larman and Vodde 2016). Even so, research shows that many organisations still have trouble making agile methods work in the long run (Denning, 2016; Denning, 2018). To effectively implement flexibility and adaptability inside an organisation, it is required to pick the most suitable design option (Jöhnk *et al.*, 2017; Qumer and Henderson-Sellers, 2008).

The Agile approach is an alternative to standard project management strategies. Even though they were first used in software development, they are now used in many different types of projects and industries. Agile methodologies have helped several teams deal with the unpredictable nature of software operations in financial institutions by using continuous deployments and flexible procedures. The objective of agile project management techniques is to promote regular revisions. It ultimately encourages enhanced cooperation, selforganization, constant feedback, customer focus, and on-time product delivery. Agile approaches are a group of strategies that promote speedy and high-quality order fulfilment. Agile is a management style that ensures development activities align with user requirements and organisational objectives.

The agile manifesto, according to its supporters, is made up of twelve principles and four values that stress the following: Individuals and interactions trump processes and tools; functioning software trumps exhaustive documentation; user participation trumps contract negotiations; and adjusting to change versus adhering to a timetable. The agile manifesto shows that people and their relationships with each other, software operation, customer participation, and being able to respond quickly to changes are more important than procedures and tools, paperwork, collective bargaining agreements, and planning. The major objective of this research paper is to elucidate the essential concepts behind the use of scrum agile project management methodologies in the banking and finance businesses. Before the study, a full evaluation of the journals was done. This was done by finding the most important authors, countries, and countries in the Web of Science collection. In the agile scrum method, the VOS Viewer was used to look at all of the keywords that could be found and were needed for bibliometric analysis. Even though research on the agile scrum technique has been happening for some time, there is a significant gap in the literature study that focuses on the issue under investigation. Existing studies examine the implications of using and disseminating bibliometric approaches in diverse contexts. There is more of an emphasis on qualitative and quantitative data, such as the effects of bibliometric analysis on evaluating research. The bibliometric map's keywords emphasise the most prevalent topics, although the academic repository includes a few scrum agile method papers. This article also outlines significant results and gaps in the scientific literature about the scrum agile approach. In addition to those stated above, an evaluation of the frequency of cooperation was also conducted across countries.

The investigation of frequently occurring citations found that scrum agile methodology and variables are the two most connected phrases and that the most important international co-author relationships occurred between Asia and the United States. These three parts comprise the present study: The first part is dedicated to a literature review, which comprises the most relevant and current sources for the topics presented. The second section describes briefly the sample of the most noteworthy articles and the analytical processes of the bibliometric study. The following is a discussion of the gathered findings, which are constantly debated on a global scale. The findings are summarised in the fourth part, which also discusses other relevant components of the study's research.

2. OVERVIEW OF AGILE TRANSFORMATION

Although the Agile transformation was not mandated from the top down, it required modifications to an organization's operating model, performance and incentive systems, and project execution methodologies. The organisation changed from having specialised structures to having cross-functional groups based on products. They also stopped using project delivery (waterfall) methods and started using continuous integration methods that were based on what was most important (Sommer, 2019). To help this change go smoothly, there was also a change in purpose. Product teams, which had been linked across departments by middle management, were given full responsibility. A more gradual change was

also made to the support fund, which went from an annual budgeting process to a frame-based funding system in which money was given out step by step in key categories as production increased making an ideal business more valuable. Despite the transition's greatest efforts, not all teams were prepared for the best potential product-based delivery at the start of the transformation. The next year, these teams progressively adopted more suited team structures. Emerging prospects for growth are ever-present. To make the change to a structure based on teams easier, the whole compensation package was also changed.

2.1 Scrum Agile Methodology

It is a transition process that came from rugby. Scrum is an example of how to play is restarted after a foul or when the ball goes out of the field. Jeff Sutherland and his team at Easel Corporation made the Scrum interaction in 1993 by combining the ideas from the 1986 research paper with those of item-centred development, precise cycle regulation, incremental change of circumstances, progressive programming cycles, and efficiency optimization, as well as the creation of multifaceted and dynamic architectures.

Agile management has evolved well with Scrum. The Scrum methodology is built on several well-defined duties and responsibilities that must be carried out throughout the continuous improvement strategy, particularly as it pertains to the execution of software projects in the banking industry. An adaptable attitude rewards the use of the twelve skilful criteria in a setting agreed upon by all colleagues of the item. Sprints, which are short and intermittent temporary rectangles used to gather input and reflect, often last between two and one months. Each sprint is its own thing, with a full result and a variation on the final result that should be easy for the consumer to understand.

At the outset of the engagement, a list of the business plan's goals and criteria is provided. The client concentrates on these objectives while attempting to strike a balance between their cost and benefit. This indicates that the focus and outcomes are not established. From one perspective, the market requires economical, high-quality delivery. To fulfil this demand, an organisation must be flexible and adaptive in its product development to accomplish rapid development cycles that suit client requirements without sacrificing product quality. It is an easy procedure with a reputation for achieving results rapidly. Scrum is mostly used for software development. However, other sectors, such as sales, advertising, HR groups, etc., also use this method in their authoritative models.

The item owner attempts to direct the team toward the proper objective, while the ScrumMaster concentrates on maximising the team's capabilities. To do this, the thing's owner must first develop a compelling vision for it, which is then conveyed to the community through the product's overflow. During Scrum development, the item owner is in charge of keeping an eye on how things are going to make sure they stay relevant as more is learned about the architecture being built, its clients, the team, etc. The Scrum group is the third and last member of the Scrum project board. Even though different job titles may be utilised to bring the team closer together, Scrum disregards them. According to the Scrum process, each individual contributes everything they can to the team's ultimate result.

This does not imply that re-engineering of the framework will be necessary; personnel will devote the majority of their time to the discipline in which they worked before adopting the agile Scrum methodology. In Scrum, however, people are asked to go outside their preferred specialities since doing so would ultimately benefit the team. The Scrum paradigm recommends that projects evolve via a sequence of iterations. Runs are now defined as a cohesive reaction that resembles a lengthy period, often fourteen days. The Scrum methodology suggests hosting an organising meeting at the beginning of a sprint to establish how many tasks each team member can concentrate on. The team should next build a run aggregate, a list of the tasks that must be done throughout the run.

During a brief Scrum run, the Scrum team turns a small configuration of pieces from idea to code and evaluates functionality. These components are completed last, tested, prioritised, and added to the expanding object or structure. The Scrum model considers regular Scrum as a means of synchronising the work of colleagues while discussing the work of the whole team. Near the conclusion of a run, the team conducts a run audit, showcasing the new usefulness to the PO or any other partner who wants to offer comments that might affect the subsequent run. This feedback loop during Scrum programming enhancement may lead to modifications to the newly imparted value. However, this might also result in assessing or adding goods to the surplus. At the end of each iteration, the Scrum project board also does a run evaluation.

The ScrumMaster, the Product Owner, and the remaining team members are all interested in this meeting. This event is a great chance to talk about the project's overruns and make plans for the future (Bergmann, 2018). Even though the change has been occurring for less than a year, by the end of 2018, several outcomes have already surfaced. The transformation team selected an increase in employee happiness and motivation in the digital units as the primary indicator of the change's success, based on interviews with turnaround leaders from other organisations. Based on this indicator, the annual survey done at the end of 2018 shows a rise in excitement and happiness that is much higher than expected. This suggests that the Agile transformation is off to a good start. (Raharjo, 2020). There are further indicators of success. Agile teams produce value much more quickly, which leads to several early successes and benefits.

2.2 Pros of Using The Scrumban Method

One of the advantages of the scrumban method is the reduction of time. Another benefit of employing agile scrum methodology in the banking industry is compartmentalization. The scrumban approach is also ideal for larger financial endeavours. Bottlenecks in a project are disastrous. Consequently, a scrumban board is an excellent method for spotting workflow bottlenecks and addressing them before they become a problem. Intelligent Scrumban is a basic, simple-toimplement method for the management of mixed endeavours.

Scrum agile also has the benefit of independence. Team members are provided with a greater opportunity for equality, which reduces project stress. Using the pull principle, project management teams decide on their own what tasks to do. This is a lean manufacturing technique that controls the flow of work by not moving on until the last task is done. No project manager or scrum master distributes tasks to teams, and there is no daily reporting to the project manager. Scrumban provides teams with more autonomy by eliminating several administrative touchpoints. Another benefit is the potential for improved project results. Your team's limits on WIP let them focus on the most important tasks for the project.

2.3 The Drawbacks of Scrum

Even though various variables suggest otherwise, the Scrum process may not always seem to be the optimal method for addressing project-related issues. Scrum projects may take longer than required due to the absence of a set deadline and its sprint-by-sprint progression. Another disadvantage is that Scrum methodologies are best suited for small teams. Without a thorough description, the Scrum team may have difficulty planning, organising, and managing a project. Another problem with Scrum is that it takes a lot of time and work to hold daily Scrum meetings and do systematic reviews.

3. A SUMMARY OF SCRUM AGILE METHODS

Many firms and organisations have adopted professional project management theories and practices to supervise the creation of their products and services, regardless of their size, industry, nation, or culture. The majority of organisations are used to conducting projects using conventional methods such as waterfall, critical path, six sigma, etc. However, as a result of increasing global change and the introduction and expansion of new technologies, Agile techniques have become an attractive alternative for firms seeking to improve performance (Dikert *et al.*, 2016). Agile was originally developed for small, one-team projects in the IT industry, specifically the software development industry. However, their proven and anticipated benefits have made them desirable outside of this context, particularly for larger projects and in more famous organisations (Dikert *et al.*, 2016). The Agile project management technique is gaining popularity. It has been used by companies in a wide range of fields, including the financial sector because its benefits are so much better than those of traditional project management methods. In reality, modern financial institutions, especially cooperative

organisations in the banking sector, are confronted with increasingly volatile market circumstances, rapid shifts in global politics, economies, and technology, more risks, and more stringent regulations. In an environment with more competition, there has also been a lot of pressure to meet customer needs while also increasing revenue and keeping market share (Christou *et al.*, 2014). So, financial institutions in the banking industry must quickly switch from traditional project management methods to agile methods.

3.1 Need For Scrum Agile Methods In The Banking And Finance Sector

Since the 1960s, the banking industry's cooperative organisations have seen tremendous growth. Today's financial institutions attempt to provide services following client preferences while simultaneously adjusting to significant changes in technology, credit card processing systems, financial markets, and portfolio and risk management practices. The platforms and business applications used by banks and other financial institutions have changed tremendously and continue to expand rapidly in the present day. From m-payments and the ability to view and trade stock options via mobile devices to e-payment and patterns toward a digital transformation and internet banking, as well as the need to quickly process and keep track of account holders, a balance must be struck between borrowing costs, market changes, and investment risk reduction (Montoya, 2016).

Market conditions have been difficult since the years after the 2008 global financial crisis. In an environment that is growing more competitive, many financial institutions, especially cooperative organisations in the banking sector, confront an urgent need to preserve profitability and market share expansion. The ICT departments of financial institutions are under pressure to increase productivity and response times while keeping costs and capital spending in check (Montoya, 2016). In the banking business, it is common knowledge that large, sometimes homogenous legacy systems exist. Unfortunately, many businesses, such as the banking industry, have not yet completely adopted project management concepts and practices, as well as the software that optimises them (Nead, n.d.). Banks must now use the latest service-oriented technology principles to keep up with the fast changes in application development and deployment (Christou et al., 2013). The trend for banks to migrate from traditional project management to agile project management is crucial. It's happening in some banking cooperatives because agile techniques meet a lot of the new requirements for running banking operations today.

3.2 Empirical Review of Related Works

According to a previous study, banks are required to keep up with the continual environmental changes they must face. Banks are contemplating how to adapt and capitalise on the current trends. As a consequence, the banking industry's usage of agile methods has become increasingly obvious (Menor *et al.*,

2001). When adopting novel technological capabilities and digital solutions in financial institutions, traditional methods have been most prevalent, but scrum agile approaches are more effective in these situations (Roses *et al.*, 2016). To keep pace with market expansion and innovation, firms have included more agile software development strategies in their software development procedures (Mohan *et al.*, 2010).

In a related development, Roses *et al.* (2016) examined the advantages of employing agile practices in the software development team of a Brazilian bank. The research revealed that agile methods were favoured over the bank's procedures, while other methods may coexist. Consequently, the bank may use both agile and traditional techniques on occasion. This was done by making a model that included all the different points of view that would be used to judge how well the two techniques worked together. In research carried out by Hossain *et al.* (2009), the use of Scrum in global software development (GSD) projects was emphasised. According to 20 important research articles in this field, Scrum approaches are not suitable for managing globally remote software project teams since there are typically substantial challenges with interaction, synchronisation, and cooperation engagements. Rizvi *et al.* (2015) did a study to grasp the factors and conditions that led to the use of agile project management strategies for integrated design. The study revealed that teams had difficulties with architecture, material accessibility, and regional variances.

In addition, research has been conducted on the use of agile methodologies in certain sectors and businesses. In their 2015 research, Vacari and Prikladnicki evaluated the adoption of agile approaches in government. They were aware that there was little organised research on the issue. However, they concluded that agile initiatives might be adopted in the financial industry. For this reason, it is recommended to begin the deployment of agile with the support of top executives on large pilot projects. Several challenges were identified, including the use of the plan-driven approach, extensive delivery, and a lack of previous experience with agile methodologies. Almeida researched the literature review of scrum agile software design engineering (2019).

The fundamental objective of the research was to undertake a bibliometric analysis of the quantity, composition, and scope of the most relevant articles published in this area of study. After reaching a peak in 2015, there were a lot more research articles published between 2013 and 2016. The majority of recently published publications are systematic reviews and bibliometric analyses of agile software engineering, and the number of papers created for exploratory and descriptive research approaches is equal. The research identifies the top publications and conferences in the scientific area. Dikert *et al.* (2016) conducted a comprehensive literature study of industrialised, large-scale agile transformations.

During a keyword search, 1875 documents were discovered. 52 papers were used to present 42 business situations, showcasing the utilisation of large-scale iterative initiatives. The fact that almost 90 percent of the chosen papers were experience reports demonstrates the paucity of credible academic research on the topic. There were a total of 29 success indicators found, which were put into eleven groups. 35 problems were reported. Performance management, choosing and changing the agile paradigm, mentorship and development, and attitude and coherence were pointed out as the most important success factors.

Sheuly (2013) developed and studied agile methodologies similarly. The dissertation provided a comprehensive study of the existing research articles on agile project management. 44 of the 273 similar papers that were found by searching in a certain way were used in the evaluation. The 44 selected articles were published between 2005 and 2012. The thesis outlines an assessment process by establishing a review methodology and summarising the review's conclusions. It is hoped that academics, software administrators, and computer programmers would profit from the results by learning more about the APM practices already in use.

Boehm and Turner (2005) noted that the notion that agile was created for smaller teams is problematic when applied to large organisations, especially financial institutions. Dikert et al. (2016) conducted a comprehensive literature study to determine what prevents big organisations from utilising scrum agile methodologies and what enables them to do so effectively. Even though the researchers were able to identify both obstacles and success criteria in the study on adaptation, the results of the literature review show a dearth of academic studies on the topic. The authors said that agile wasn't used well because it was hard for them to use agile in their organisations. After all, they didn't understand why agile methods were important. In their case study on large-scale transformation, Paasivaara et al. (2014) examined how Ericsson's R&D division executed and scaled out an agile approach. Based on their case study, the authors provide four lessons for implementing agile methodologies. The first lesson was to test many tactics to discover the most successful ones for the business. This would allow them to quickly modify the ineffective aspects and adapt to the successful ones. The second point of this research was that the transition to an agile approach should be gradual. Lastly, a single, effective structure should be used from the beginning of the change process ahead.

4. RESEARCH METHODOLOGY

The rise in popularity of bibliometric research and systematic literature reviews may be due to today's information and communication technologies, which are needed to process huge amounts of data and provide the means to show the results in bibliometric maps (Maniu *et al.*, 2021). Because the data acquired from bibliometric studies is useful for independent research, it is progressively

being included in decision-making processes and assisting in the identification of novel phenomena (Merigo et al., 2018). Bibliometric analysis, also known as the statistical study of the creation, utilisation, and distribution of written information, comes into play. Publications or their bibliographic descriptions emphasise comprehensive literature review investigations. These records may have information about a work's title, authors, publication year, summary, search phrases, subject expertise, or bibliographic references (Ahmad et al., 2018). In 2006, Garfield provided the first explanation of an academic citation count. At first, it was thought of publishing in the basic Web of Science searchable database compendium, which, according to Goksu (2022), is currently the best choice because of its high quality and ability to narrow searches based on several bibliographical criteria. Even though it is no longer the sole repository that allows the deductibility of social science references and articles, the Web of Science remains the most important citation database that provides access to the most prestigious academic publications in the world. (Singh *et al.*, 2022). Typically, the following methodological steps are performed while doing bibliometric analysis: In the initial step, determining the key criteria, search words, and time range is critical. Before creating input data and modifying search parameters, it is necessary to choose a relevant database. The final step is to export the search results so that they can be used to make the bibliometric mapping and look at it (Hlawiczka, et al., 2022).

Kitchenham and Charters (2007) says that a systematic literature review (SLR) is the process of finding, evaluating, and making sense of all the research that can be found on a certain study subject or interesting phenomenon. Figure 1 displays the phases of this research. Primary studies also impact secondary studies (Kitchenham and Charters, 2007). Due to the possibility that some of the search results may be secondary studies or case analyses, we elected to use an SLR. Therefore, we replaced the terms associated with main or supplemental research with those of frameworks, components, and ASD.

The following are some benefits of an SLR camera:

- 1. Identifying the specific questions that need to be studied
- 2. Identifying the targeted demographic features
- 3. Identifying the technique, background, and effects

4. Helping to summarise the body of available research (Kitchenham & Charters, 2007)

4.1 Research Results And Preliminary Findings

The subject of scrum agile project management approaches first appeared in 2004 in the research archives of academic journals. However, it was not until 2013 that the focus of the study on agile methodologies for software project management shifted toward financial organisations, particularly banking companies. In 2013, when there were already more than 20 articles on the topic

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of the study, the number of publications in the repository began to rise. Since the number of research papers that were available to the public on the platform tripled in 2020, this was chosen as the starting point for the study.

Figure 2 depicts the rise in the number of publications on the notion of scrum agile methodologies. The graph demonstrates that until 2015, the number of publications in the database was relatively consistent, but that after 2015, the number of published articles increased annually. The most published research articles in the repository for the reference year were the 25 articles created in 2020 concerning the agile project management technique. Table 1 lists the different document types published in the Web of Science academic repository from 2013 to 2022. Between 2013 and 2022, the bulk of papers (up to 61%) were presentations and articles given at conferences throughout the world. 33% of the total number of publications concerning the scrum agile approach and its applications in the realm of finance were research papers, which comprised research and whole pieces published in peer-reviewed journals. The following book chapters contain a dissertation or other work on a specific topic that is part of a large book section. The least consistent sorts of reports were categorised as "Others" and consisted of two articles or 6% of all material pertinent to the scrum agile methodology's subject matter. These parts included Manuscript Recommendations, and Adjustments, which were software patches found in academic publications, and Data Journals, which had an intellectually published article that explained a certain set of data or a collection of data sources.

Type of Document	Frequency	Percentage
Presentation Articles	102	61%
Research Papers	55	33%
Others	10	6%

Table 1. Document Type and Frequency

Examining published papers by geographic region illustrates the worldwide popularity of the scrum agile methodology problem (Table 2). The table indicates that the majority of scrum and agile methodology-related articles were published in the Americas, where more than half of all scientific articles were also authored and published. Western Europe and Asia published around 16% of all scholarly papers. Less than 10% of the novels were written and published in the nations of Northern and Western Europe, the Mediterranean, and Africa.

Table 2. Regional Distribution and Publication Frequency

Regions	Frequency	Percentage
North and South America	83	50%
Asia Region	27	16%

Regions	Frequency	Percentage
Western Europe	27	16%
Northern Europe and Scandinavian region	15	9%
Middle East and Africa	3	2%
Australia	12	7%

The bibliometric research demonstrates that the scrum agile approach is a fairly current issue that has acquired popularity in many countries. However, the largest worldwide co-authorship links in the production of academic papers were between the United States and China (5.54 %), the United States and the United Kingdom (4.08 %), and the United States and Canada (3.55%). The majority of publications on scrum and agile project management methodologies were published in the United States, which accounted for approximately a quarter of all academic database articles. Table 3 provides a summary of the countries that participated the most throughout the assessment period. In addition, the United States had the greatest ratio of citations to the total number of papers. Total link strength (TLS) represents the number of articles created via international collaboration. TLS grew to 838 in the United States, resulting in the formation of 838 relationships with that country. China, India, and Singapore from Asia, Britain, France, Switzerland, and Italy from Europe, Canada from North America, and Australia from Oceania all play important roles in several articles about scrum agile methodology, especially when it comes to software projects for banks.

Country	Frequency of Documents	Percentage
United States	44	26%
Great Britain	20	12%
China	32	20%
Australia	15	9%
Canada	13	8%
Italy, France and Switzerland	26	15%
India and Singapore	17	10%

Table 3. Countries and Publication Frequencies

4.1.1. Detailed Findings

The research is grouped into the three categories listed below:

1. An analysis of the most important publications and conference proceedings in which research articles on agile methodologies are published;

2. Analysis by kind of research technique - an acknowledgement of the methodological approach used in each research

3. Analysis by subject - search for words that lead to scholarly articles about scrum and agile methodology.

4.1.2. Journal And Conference Analysis

Figure 3 summarises the number of international journals from 2013 to 2016 According to a study that examined just the top 10 publications, IEEE Software has the most publications, followed by the International Journal of Process Engineering, Communication and Software Innovation, and the International Journal of Evolution and Process. It is also important to note that several works on computer programming adopting agile methods have been published in academic journals while lacking significant software engineering emphasis. Journals in computational physics, operations research, human-systems connection, and pedagogy, for example, have devoted sections of their archives to this topic. Agile approaches are multidisciplinary concepts with several applications, such as management science and industrial engineering.

The number and type of papers presented at academic conferences within the same period are shown in Figure 3. Similar to the previous case, only the top 10 academic events were considered. To provide an exact count of the overall number of publications, the numerous volumes of the same conference were consolidated into a single item. Examples include the Agile Conference and the Hawaii International Conference. According to the statistics, ACM Global Forum, World Congress on Software Engineering (ICSE), and Scrum Agile Symposium are the three most significant conferences in business.



Figure 2. Rise In The Number Of Publications



Figure 3. Summarise the number of international journals from 2013-2016

4.1.3. Analysis by subject

In addition, a survey of the subjects addressed most often in academic publications on scrum agile software development in banking and finance was conducted. All conceivable combinations of software and finance were excluded, along with the five search keywords used to locate articles. Computers, telecommunications, and project management are, not unexpectedly, the three most relevant related issues that can be seen in Figure 4. Other well-known themes, such as judicial decisions, technological breakthroughs, operations management, and information management, seem to be of comparable significance. In several technical and social research domains, it is essential to emphasise the significance of agile methodologies. Numerous studies at this level have examined the use of agile techniques in quality management, customer relationship management, and the implementation of organisational practices employing scrum agile methodologies



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Figure 4. Analysis by Subject

4.1.4. Analysis by type of research method

Literature reviews, observational techniques, numerical modelling, and mixed methods research make up the four primary kinds of academic research projects. On topics where there are already a considerable number of books, the literature review is used to build a synthesis of the published research on the topic, support their conclusions, and investigate the differences between these primary studies. Through qualitative research, the researcher may get a deeper understanding of a particular subject of study. The researcher defines, assesses, and exhibits an intriguing phenomenon as a consequence. Comparatively, quantitative studies try to do a realistic analysis of a field of knowledge by looking for quantifiable relationships between variables to verify and support their study premise. Finally, multiple data gathering integrates theoretical and applied research in a single study publication (Creswell, 2017; Swanson and Holton, 2005; Warfield, 1974). During the analysis, the number (No.) and percentage (PCT.) of articles and journal publications for each research methodology were considered. Using the four acceptable research categories, 334 publications were mapped. By comparing this figure to the total number of publications published between 2013 and 2016, we were able to establish that 168 studies could not be classified. This is because the methodology used in these articles was either not disclosed in the article's text or did not meet the search parameters outlined in Table 1. Table 2 shows that a literature review method is used by more journals and conference proceedings.

Similar quantities of research using phenomenological or qualitative methods have been published. However, the distribution of research methodology differs based on the kind of publication. For instance, 82% of mixed methods studies are published in peer-reviewed journals, but this percentage is much lower for other kinds of papers (such as 79% of literature reviews, 78% of qualitative research studies, and 80% of quantitative empirical studies). Figure 5 depicts the research type analysis.



Figure 5. Analysis by Research Type

5. **DISCUSSION**

The Scrum agile approach is an ever-expanding and very current topic, as shown by the occurrence of this term in professional publications published in the scientific database Web of Science between 2013 and 2022. 167 articles using the word "scrum" in the publications that we examined. This indicates that about 70 percent of all periodicals that discuss scrum agile techniques do the same thing. According to Ruckova and Skulanova (2022), the scrum agile methodology is influenced by the needs of each company, including the investment framework, institutional ownership, profitability metrics, and several other macroeconomic quality factors. Moreover, the economic, legal, and institutional frameworks impact the result of how the external company environment operates. Almeida et al. addressed bibliometric research of financial development and capital planning utilising scrum agile approaches. Their research is based on academic papers that were published between 2010 and 2016 and were found in the Scopus database. According to what the authors found, digital banking was the most interesting topic, and customer experience, agile transformation, scrum agile approach, and investment decisions were the most researched terms. Several authors, including de Moloto *et al.* (2021), Indra *et al.* (2021), Trisaktyo *et al.* (2020), and others, have explored the Scrum agile methodology as one of the primary topics. According to Yang *et al.* (2009), firms should focus more on whether they have sufficient funds and an appropriate scrum agile methodology.

Choosing the most effective scrum agile method is the first step in making crucial financial choices for the organisation. There were 879 instances of the keyword "firm" in the publications, together with other software project management terms, representing roughly one-fifth of all relevant research papers on the topic of scrum agile methodologies in the banking industry. The long-term capital of an enterprise is described by the scrum agile approach as a mix of financial management and the use of project management software. Additionally, finance and banking were included in the bibliometric study that was undertaken. Between 2013 and 2022, it was cited 1,022 times in academic publications included in the Web of Science database, ranking third overall in terms of frequency. IT infrastructure is a less well-defined aspect of the research area. Even though these are not interchangeable notions, the literature typically links the IT infrastructure of a business to its duties. The ideal financial institution is committed to ensuring that clients are serviced effectively by utilising the most recent technical advances in the modern digital economy.

Businesses use IT infrastructure that is driven by the successful completion of software projects to make up for the fact that they don't have enough equity. This is because IT infrastructure is, in essence, less expensive than equity because interest rates may reduce the tax base. According to research by Hoeseb and Tanner (2020), financial leverage is created by using IT facilities and equipment, which may lead to equity returns that are profitable for the firm's stakeholders. Scaling framework and software were among the most frequently used terms on the subject of scrum agile methodology in professional publications, ranking ninth with 253 occurrences in the relevant research papers. Decisions about the scrum agile methodology may substantially boost the enterprise's value. Every business on the market should come up with a strategy that creates entrepreneurial value by combining financial management and software project management, the effectiveness of which depends on how well it works.

The bibliometric study revealed 345 occurrences of the terms "productivity" and "organisational profitability." Usually, a company's ability to spend more on its core business activities is linked to its business success (Taribuka and Amrit, 2020). This definition of productivity, however, gives birth to the misconception that only enterprises that declare a profit as a result of administration may be considered productive. This definition omits the crucial fact that a company's performance is reviewed from a range of perspectives, which helps to significantly determine the assessment methods utilised for productivity (Taribuka and Amrit, 2020). The choice of the right ratio of equity to IT infrastructure or the right scrum agile strategy is the most important software management decision that has a big

impact on the performance of financial institutions (Valaskova *et al.*, 2022). The use of the scrum agile methodology is one of the most essential components of financial management for a company unit. According to the bibliometric analysis of the topic of the study, the selected phrase was cited 76 times in published works. Enterprises that operate in the market have difficulty selecting the optimal scrum agile methodology. Theoretically, several model solutions to this problem have been developed, but they are not identical. Getting the most out of agile Scrum methods and getting the most out of optimization may have something in common.

Even though there are limits to how theoretical models and methods for optimal finance and scrum agile methodology can be used in real life, it is important to know about them because they can be used as a basis for real company financial decisions (Adu-Ameyaw et al., 2022). According to Kristofik and Slampiakova (2021), decisions in this sector must take into consideration a large number of factors, many of which are contradictory and whose weight and relevance vary from one business unit to the next over time. During the monitored period of 2013–2022, almost one-fourth of academic publications on scrum agile methodology was published, and up to 205 writers examined the peculiarities of scrum agile methodology in their works. The bibliometric study showed that this term was the second most common phrase in the vast majority of linked publications and research papers. Taufik et al. (2020), who channelled research from several studies on the scrum agile methodology problems of start-ups and multinational corporations, did a bibliometric study on scrum agile methodology issues. In the study results, the authors highlighted technology, fintech, and process as three of the most highly contested research topics in this field, in addition to the scrum agile methodology, which they recognised as one of the important terms for this issue. Our bibliometric analysis identified 666 academic uses of the phrase "transformation." In addition to conceptual approaches and models and their real alterations, the financial management of an organisation must take into account a variety of criteria while selecting the scrum agile methodology.

The fundamental task of the financial management process in banks and other financial organisations is to pick the least costly and most flexible types of agile transformational components while considering many variables. According to Dvoulety and Blazkova (2022), the magnitude and consistency of realised profits are one of the most crucial factors, and the larger and more consistent the anticipated earnings, the more the company can continue to have a larger proportion of IT infrastructure innovation in the scrum agile methodology. Similar to this, Michalkova *et al.* (2022) observed how top-level management affects tax obligation and income tax remittance using the scrum agile methodology. Gurusamy argues in 2021 that the iterative and incremental method affects decision-making if it is based on a group of connected owners. The bibliometric
analysis's results also showed the frequency with which the term "incremental" appeared in scholarly publications: 95 times. Depending on what changes are made to the scrum agile method, a group's effect on project owners may change in a big way (Ashraf and Aftab, 2018). Numerous studies have shown that the link between the incremental process and the scrum agile methodology is ambiguous. However, the prevailing assumption is that a company's institutional ownership is more dispersed, the higher its preparedness and potential acceptability for new IT infrastructure. If a business wants to expand its scrum agile methodology, a functional level of its digital network is required. With 86 citations, the keyword market ranked 18th in our bibliometric analysis of research publications published about the scrum agile methodology. The expansion of networks and network providers may be seen as a factor that influences the financing of company needs, whether via a public offering or IT infrastructure (Goldbach *et al.*, 2018).

6. CONCLUSION

Agile is a revolutionary method for establishing and managing software development processes that use a collaborative and gradual execution strategy for difficult, unpredictable, and complex projects. The agile software development methodology was formed in response to a growing market need for innovation, more flexibility and efficiency, and improved system performance. In this manner, the agile software development methodology helps us to strengthen the software development process with a major focus on customer satisfaction. Agile methodologies have been emphasised by more than just the business world. The research community has also shown considerable interest in this software development methodology. Between 2013 and 2016, we significantly increased the overall quantity of articles, which peaked in 2015. One area that has gotten a lot of attention in recent years is the writing of books and book chapters about agile methods.

Furthermore, we noticed that IEEE Systems, (ii) International Journal of Production Economics, and (iii) Computer Science and Information Architecture are the journals with the most publications in this field that are peer-reviewed. The ACM International Conference, ICSE, and Agile Symposium are the conventions with the greatest number of accepted papers on this topic. Finally, it was determined that the bulk of research consists of literature reviews concerning the various components of agile approaches. These kinds of reviews are more prevalent in academic publications. On the other hand, only approximately 13% of published articles use mixed-methods research, which is a relatively new methodology. According to our results, the total number of publications changed dramatically between our research and the one conducted by Dingsoyr *et al.* (2012). Because of the INSPEC repository, we were able to map a greater number of scientific publications, and journals became our primary source of data.

However, the proceedings and journals containing the largest number of publications on the issue do not undergo significant modifications. Last but not least, Dingsoyr was unable to compare the number of individuals participating in iterative and incremental scrum agile methodologies and the research methods they used since they had never examined these aspects in the past.

According to our research, the bank does not completely apply agile techniques; rather, the bank adapts agile practices to match the needs of the bank and the industry in which it operates. Our results led us to conclude that the bank has been effective in generating solutions for stakeholders and sustaining customer connections. The bank has effectively incorporated customer and stakeholder input into its development process despite its diverse policies. In terms of team motivation, it was revealed that motivating factors and practices are mostly compatible with previous research; that is, motivation in the agile environment of the bank is consistent with motivation in other contexts. There are two types of hurdles faced while using scrum agile methods: internal problems and external impediments. The lack of widespread adoption of agile methods within an organisation produces internal challenges. External factors include industry obligations and regulations over which the bank has no control. Therefore, situation-specific solutions are required. Consequently, regulatory regulations impact the bank's use of agile methodologies. This research was able to identify key components that explain how a particular bank was able to adapt agile approaches to its software development and project management responsibilities. These sections could also be used by other banks as a guide on how to manage their teams in a way that makes them more flexible and able to deal with unplanned events.

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IMPROVING INTERPERSONAL COMMUNICATION SKILLS THROUGH ADAPTIVE TRAINING – INFLUENCES OF NEGOTIATION STYLES, PERCEPTION OF TRUST AND PERSONALITY TRAITS – FINDINGS FROM PRELIMINARY STATISTICAL ANALYSIS

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ABSTRACT

The importance of interpersonal communication skills in the business environment will only increase as the world undergoes trends of globalization and digitization. In the workplace, interpersonal skills play an increasingly important role for salary, satisfaction, and mobility, and therefore there is a need for field research that will facilitate improving interpersonal relationships over time. In this doctoral research, an integrative model will be developed to examine the antecedents of interpersonal communication skills improvement after tailored training. Pilot study was conducted on 22 business owners to examine the variables before and after the training to determine how the variables interacted. Mixed results were reported in the pilot study. Low participant numbers and the interval between measurements clearly affect the results. To develop an integrative model for communication skills, the second step involves examining the relationships between variables across a larger population.

Keywords: Interpersonal communication skills; Adaptive interpersonal skills training; Negotiation styles; Perception of trust; Personality traits.

JEL Classification: M310.

1. INTRODUCTION

Communication skills are some of the most important aspects of everyday life, yet they are among the most difficult to define and assess. Due to this expanding focus and the increased value expected from communication skills, it makes sense to learn more about them. A variety of activities that we encounter daily require interpersonal communication skills; Problem solving, resource distribution, creating collaborations, dispute resolution, and promoting important issues in an interpersonal environment at home and in the workplace. A skilled communicator can select key pieces of a complex idea to convey through words, sounds, and images to build shared understanding (Levy and Murnane, 2004). Through social perception, persuasion, negotiation, instructing, and service orientation, skilled communicators negotiate positive outcomes with customers, partners, subordinates, and superiors (Mumford et al., 1999).

Communication skills are vital to the business environment and will become even more important during the transition to the future job market. Timm (2005, cited in Mitchell, 2008) observed that in the new global marketplace, employees are expected to interact with others more personally than ever before; therefore, traditional technical skills will not suffice. Soft skills are critically important in the workplace (Robles, 2012). According to this research, hard skills only contribute 15% to success, whereas soft skills account for 85%. Communicating interacting with others reflects these skills. Borghans *et al.*, (2008), reported a substantial growth in the number of people performing job tasks requiring soft skills from 1970 to 2002 And this numbers will only increase over time.

With the growth of the global digital economy, interpersonal skills (IPS) will become increasingly important in the future workplace. IPS have been found to be associated with important workplace outcomes, such as task performance, job dedication, interpersonal facilitation, and overall performance (Ferris *et al.*, 2001; Efrat, 2022). There is a need for field research that will enhance interpersonal relationships over time due to the increasing importance of interpersonal skills in the workplace and their impact on parameters like salary, satisfaction, and mobility.

Today's high-performance workplace requires employees to be able not only to perform basic tasks like improving processes and resolving problems, but also to interact professionally and effectively with others (Glenn, 2003, cited in Mitchell, 2008). As these skills have become increasingly important, significant funding is spent on interpersonal skills training programs to improve these skills.

Literature on the subject discusses ways to assess and measure interpersonal skills (Bowden *et al.*, 2004; Carpenter *et al.*, 2017; Morreale *et al.*, 2011; Gibb, 2013; Beenen *et. al.*, 2016), their relationship to work outcomes (Mitchell, 2008; Robles, 2012; Coffelt *et al.*, 2016; Efrat, 2022), training interpersonal skills (Hunt and Baruch, 2003; Doo, 2006; Kraiger and Kirkpatrick, 2010; Sutil-Martín and Otamendi, 2021) and transfer of training (Blume *et al.*, 2009; Laker and Powell,

2011; Hutchins *et al.*, 2013). Interpersonal skills are rarely studied in terms of predicting their improvement (Klein, 2009; Carpenter *et al.*, 2017). The aim of this paper is to present the findings of a research that sought to examine what predicts improvement in interpersonal skills.

2. INTERPERSONAL SKILLS ANTECEDENTS

According to an extensive meta-analysis published by Klein (2009), Several possible antecedents of IPS have been identified in the literature. Among those most frequently investigated include gender and various personality traits. As IPS tend to be situation-specific behaviors, identifying strong or even significant predictors may prove to be challenging. Because interpersonal skills are influenced by various factors, such as life experience, situational factors, and individual characteristics, it is difficult to isolate them from other influences. Hayes, 2002, (cited in Klein, 2009), identifying strong and consistent demographic or personality predictors may be a difficult task. This study identified antecedents like gender and personality traits that influence the outcomes of effectiveness training for IPS. The impact of additional antecedents on interpersonal skills training outcomes needs to be examined. Further studies explored whether the degree of complexity of the environment in which IPS and outcomes (Klein, 2009).

Several studies have examined ways to measure and assess the effectiveness of different forms of training to improve interpersonal skills (Salas *et al.*, 2011). It would be useful to develop a model based on an overall view of interpersonal skills, starting with the characteristics of trainees, the emphasis of training, and the implementation of improvements. Understanding IPS antecedents will help us better understand the entire domain of interpersonal skills. There are three primary antecedents that have been assessed in this study: personality characteristics, trust, and bargaining styles and two demographic factors- gender and age. It is intended to assess how these antecedents relate to the IPS under study, in part.

As a contribution to the field of IPS training, this study examines the influence of three main antecedents: trust, negotiation style, and personality characteristics on improving interpersonal communication skills among managers who maintain interpersonal communication by virtue of their position. Four variables were chosen for this study, as they have been used extensively in other studies. Interpersonal Communication Competence Scale (ICCS) is a self-report questionnaire measures ten ICC skills (Rubin and Martin, 1994). TKI is a valid tool for assessing the characteristic approach or style to negotiation or conflict situations (Kilman and Thomas, 1977). The Big Five Inventory (BFI) was developed by John *et al.*, (1991) as a tool to measure personality traits based on the characteristics Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect or Openness to Experience. An extremely short version of

the variable was successfully validated by Gosling *et al.* (2003). In their work (1996), Cummings and Bromiley provided a properly validated instrument for measuring trust- The OTI. The study also explores evidence regarding potential differential effects of communication skills training by two demographic variables: gender and age. Using a variety of variables, the study will develop an adaptive intervention plan for improving interpersonal communication skills in the business world.

3. HYPOTHESIS

Based on the theory discussed above, the following hypotheses are proposed:

Hypothesis 1: Personality traits are positively correlated with interpersonal communication improvement

Hypothesis 2: A high level of trust is related with improvement of interpersonal communication skills

Hypothesis 3: The improvement of interpersonal communication skills differs between collaborative and competitive approaches

Hypothesis 4: The training program improves interpersonal communication skills more for women than for men

Hypothesis 5: Interpersonal skills improvement does not correlate with participants' age

Hypothesis 6: Participants' interpersonal communication skills have improved after training



Figure 1. Conceptual model depicting study hypotheses

METHODOLOGY

In the current study, the goal was to examine the relationships between variables that may predict the ability to improve interpersonal skills through tailored training. This paper examines the relationships between the variables using a quantitative pilot study. In the line with the study assumptions (H1, H2, H3, H4, H5, H6 Hypotheses), the four well-established reflective scales from the literature were used to measure the constructs (BFI-5 items, TKI-5 items, OTI-2 items, ICC's-10 items). An online questionnaire was applied to collect the data, before and after the training, as detailed below. BFI, OTI and TKI were used as independent variables and ICC'S as dependent. Two demographic characteristics were chosen as control variables, (gender, age).

4. **RESEARCH TOOLS**

The methodology was action oriented. A training focused on the ten interpersonal competence skills enumerated in Rubin's work (Rubin and Martin, 1994). Training involved didactic teaching separated by demonstrations of specific communication skills and their consequences, discussion of difficulties in changing behavior, sharing experiences, identifying good and less effective communication skills from scenarios, and rehearsing effective communication skills in everyday scenarios. The participants complete a four-hour training session. The participants in the training complete the questionnaires twice: before and after the training. Assessment of interpersonal skills were based on selfreporting.

5. MEASURING SCALES

ICC's: The research questionnaire used the Likert scale (1-5). The variable and dimensions were calculated by averaging the scores in the items of each dimension, creating a new scale of the quasi-interval type whose range is between 1-10.

BFI: The research questionnaire used the Likert scale (1-5). The variable and dimensions were calculated by averaging the scores in the items of each dimension, creating a new scale of the quasi-interval type whose range is between 1-5.

OVI: The research questionnaire used the Likert scale (1-7). The variable and dimensions were calculated by averaging the scores in the items of each dimension, creating a new scale of the quasi-interval type whose range is between 1-7.

TKI: The conflict-instrument-questionnaire: The five dimensions of the variable were created by plotting the number of times the respondent marked certain answers. In the AVOIDING dimension the score range is 1-13, while in the other dimensions 1-12. The measurement scale is an interval scale. Table 1 illustrates the measuring scale used in this study.

Variable		Scale	Questionnaire Range	Variable scale
ICC'S	Interpersonal communication skill level	Likert	1-30	Quasi- interval
BFI	Personality traits Big-5	Likert	1-10	Quasi- interval
OTI	Perception of trust	Likert	1-12	Quasi- interval
TKI	Behavioral access to negotiation	Nominal/cou nt	1-12/1-13	Interval

Table 1. Measuring scales

6. RESEARCH POPULATION

In the current study, the target population was business owners with 1-10 employees who manage interpersonal interactions, both internal and external, as part of their responsibilities.

7. DATA COLLECTION AND SAMPLE

Research participants were small business owners from a networking organization. An email explaining the purpose of the training, which is part of a research project, was sent out to members of the organization. By return email, participants volunteered to the training. Before the workshop, 48 people filled out the questionnaire, and only 22 of them filled out the questionnaire at the additional time after the workshop.

8. INSTRUMENT AND PROCEDURE

Quantitative analysis was used to perform hypothesis testing, by using a fourchapter closed structured questionnaire as a data collected instrument before and after the training.

9. FINDINGS

This study is a pilot for the doctoral research model, with the aim of examining what predicts improvement in interpersonal skills through an intervention program. The participants in the study are business owners who voluntarily participated in the workshop during the month of July 2022. Only those participants who filled out the research questionnaire in two periods of time, before and after the workshop, were included in the study. Therefore, the subjects who did not fill out a questionnaire in the second round were excluded from the study, and it is based on the answers of 22 subjects: 16 women (72.7%) and 6 men (27.3%). The average age is 58.1 years (standard deviation 12.63), the age range is 29-84.

Hypothesis 1: Personality traits are positively correlated with interpersonal communication improvement

Factor	items	inverting	Alpha
		values	
Extraversion	1,6	6	0.544
Agreeableness	2,7	2	0.078
Conscientiousness	3,8	8	0.358
Emotional stability	4,9	4	0.621
Openness to Experiences	5,10	10	0.068

Table 2. The 5 factors of the variable personality traits

Extraversion: the factor consists of items 1 (extroverted, enthusiastic), and 6 (restrained, quiet). Agreeableness: The factor consists of items 2 (critical, grumpy), and 7 (sympathetic, warm). Conscientiousness: the factor consists of items 3 (reliable, self-disciplined), and 8 (disorganized, careless). Emotional stability: the factor consists of items 4 (anxious, easily shaken), and 9 (calm, mentally stable). Openness to Experiences: the factor consists of items 5 (complex, open to new experiences), and 10 (routine, not creative).

 Table 3. Averages and standard deviations of the 5 factors of personality traits, before and after the training

	Befo	ore	Aft	er		
personality traits	Mean	SD	Mean	SD	t	sig.
Extraversion	3.9	1.58	4.1	1.47	-0.61	0.548
Agreeableness	5.6	1.03	5.7	0.96	-0.49	0.628
Conscientiousness	5.8	0.98	5.8	1.08	0.12	0.905
Emotional stability	5.3	1.30	5.6	1.34	-1.42	0.169
Openness to Experiences	5.6	0.88	5.3	1.02	1.71	0.102

According to the findings, it appears that on average the subjects perceive themselves at a medium-high level in the factors Agreeableness, Emotional stability, Conscientiousness, and Openness to Experiences, while a medium rating in the Extraversion factor. The differences in perception of personality traits after the workshop were minimal and not statistically significant.



Figure 2. Averages of the 5 factors of personality traits, before and after the workshop

Pearson's correlation coefficient was used to determine if there is a correlation between the various personality traits.

Table 4. Pearson's correlation coefficient between the 5 factors of personality traits	,
before and after the workshop	

	Before workshop	1	2	3	4	5
1	Extraversion	1				
2	Agreeableness	0.12	1			
3	Conscientiousness	-0.193	0.097	1		
4	Emotional stability	-0.119	.728**	0.322	1	
5	Openness to Experiences	0.072	.444*	0.307	.445*	1
	After workshop	1	2	3	4	5
1	Extraversion	1				
2	Agreeableness	152	1			
3	Conscientiousness	.123	.453*	1		
4	Emotional stability	198	.675**	.300	1	
5	Openness to Experiences	.470*	.124	.330	.186	1

(**) p<0.01; (*) p<0.05

Before the workshop, significant positive correlations were found between Agreeableness and Emotional stability and Openness to Experiences, as well as between Emotional stability and Openness to Experiences. Following the workshop, no significant differences were found in the correlations, except for a distinct positive correlation that was not found before between Extraversion and Openness to Experiences.

Hypothesis 2: A high level of trust is related with improvement of interpersonal communication skills

Factor	items	Alpha
Trust	1,2,3,7,8,9,11	0.919
Distrust	4,5,6,10,12	0.826

Table 5. The two factors of the Trust level variable

The trust factor consists of seven items (1,2,3,7,8,9,11), alpha reliability level 0.919, and it means that the higher the score, the subject perceives the relationship between him, and the other party as characterized by a high level of trust. The distrust factor consists of five items (4,5,6,10,12), alpha reliability level 0.826, which means that the higher the score, the subject perceives the relationship between him, and the other party as characterized by a high level of mistrust.

 Table 6. Averages and standard deviations of trust level,

 before and after the workshop

	Before wo	rkshop	After wo	rkshop		
	Mean	SD	Mean	SD	t	sig.
Trust	4.6	1.05	4.8	1.18	-0.79	0.440
Distrust	3.8	0.99	3.7	1.14	0.27	0.789

The level of trust reported by the subjects is moderately high overall (4.6, 4.8) while the level of distrust is lower on average (3.8, 3.7).



Figure 4. Average of trust level, before and after the workshop

The perception of trust and distrust was expected to be negatively correlated, but no significant relationship was found between the two factors of trust level, both before and after the workshop.

Hypothesis 3: The improvement of interpersonal communication skills differs between collaborative and competitive approaches

	Before	workshop	After v	vorkshop		
	Μ	SD	М	SD	t	sig.
Competing	3.6	2.34	2.5	2.04	2.07	0.051
Collaborating	5.7	1.96	5.7	1.73	0.11	0.912
Compromising	6.7	1.70	6.5	1.74	0.46	0.653
Avoiding	7.0	3.12	7.4	2.95	-0.59	0.562
Accommodating	6.9	1.87	7.9	2.24	-1.83	0.082

 Table 7. Averages and standard deviations of the factor of negotiation management styles, before and after the workshop

The findings show that the subjects do not perceive themselves as having a competitive negotiation style. The factor received the lowest ratings on average, while the highest scores were received in the accommodating and avoiding factors. Regarding the question of whether there was a change in negotiation style following the workshop, certain but not significant differences were found in two variables: a decrease in the average rating of **competing** (from 3.6 to 2.5 after the

workshop), and an increase in the average rating of **accommodating** (from 6.9 to 7.9 after the workshop).



Figure 5. Average negotiation styles, before and after the workshop

To examine whether there is a correlation between the various factors of negotiation management styles, the Pearson correlation coefficient was calculated.

 Table 8. Pearson's correlation coefficient between the 5 factors of the Negotiation approach, before and after the workshop

	Before workshop	1	2	3	4	5
1	Competing	1				
2	Collaborating	109	1			
3	Compromising	.126	.063	1		
4	Avoiding	544**	489 *	465*	1	
5	accommodating	345	150	353	056	1
	After workshop	1	2	3	4	5
1	Competing	1				
2	Collaborating	101	1			
3	Compromising	.188	.219	1		
4	Avoiding	672**	368	384	1	
5	accommodating	094	364	609**	124	1

(**) p<0.01; (*) p<0.05

The most striking finding is the significance negative correlations between the **Avoiding** style and the **Competing**, **Collaborating** and **Compromising** styles, both before and after the workshop. Also, there is a significance negative correlation between **compromising** and **accommodating**. No significant changes are seen in the correlations between before and after the workshop.

Hypothesis 4: The training program improves interpersonal communication skills more for women than for men

	Before workshop					After workshop						
	m	ale	fer	nale			m	ale	fer	nale		
	Μ	SD	Μ	SD	t	sig.	Μ	SD	Μ	SD	t	sig.
]	Inter	person	al comm	unicati	on sk	ills				
Self-disclosure	3.7	0.76	3.8	0.75	454	.654	4.1	0.70	3.7	0.62	1.099	.285
Empathy	3.9	0.66	4.3	0.58	-1.270	.219	3.8	0.88	4.2	0.77	-1.142	.267
Social-relaxation	4.1	0.59	4.3	0.43	839	.411	4.2	0.60	4.2	0.46	.139	.891
Assertiveness	2.8	0.41	3.4	0.71	-1.842	.080	3.2	0.52	3.5	0.73	-1.019	.320
Alter centrism	3.5	0.77	3.5	0.69	091	.928	3.7	0.52	3.6	0.55	.279	.783
Interaction management	4.0	0.55	4.0	0.71	0.000	1.000	3.4	0.58	3.9	0.66	-1.586	.128
Expressiveness	4.0	0.64	4.0	0.55	.083	.935	4.0	0.19	3.9	0.58	.511	.615
Supportiveness	3.9	0.58	4.0	0.49	280	.782	4.0	0.23	4.1	0.73	365	.719
Immediacy	4.2	0.64	4.4	0.66	612	.547	4.4	0.60	4.3	0.60	.238	.814
Environmental control	3.5	0.64	3.7	0.51	715	.483	3.6	0.92	3.8	0.62	526	.605
				Pe	ersonality	traits						
Extraversion	4.0	1.92	3.9	1.51	.12	.905	3.4	1.88	4.3	1.28	-1.289	.212
Agreeableness	6.0	0.55	5.4	1.13	1.22	.236	5.8	0.98	5.6	0.97	.514	.613
Conscientiousness	5.8	1.17	5.8	0.95	13	.898	6.1	0.80	5.7	1.17	.822	.421
Emotional stability	6.3	0.61	4.9	1.30	2.47*	.023	6.3	0.61	5.4	1.47	1.399	.177
Openness to Experiences	5.6	0.92	5.6	0.89	.048	.962	5.4	1.07	5.2	1.03	.397	.696
					Trust le	vel						
Trust	4.6	0.92	4.7	1.12	246	.808	4.3	0.64	5.0	1.26	-1.244	.229

Table 9. The average ratings of the research variables by gender, before and after the workshop

	Before workshop						After workshop					
	m	ale	fer	nale			m	ale	fer	nale		
	Μ	SD	Μ	SD	t	sig.	Μ	SD	Μ	SD	t	sig.
Distrust	4.3	0.74	3.6	1.02	1.542	.139	4.4	0.64	3.5	1.18	1.714	.103
				Nego	otiation A	pproach	Ì					
competing	3.0	1.67	3.8	2.56	716	.482	2.8	2.48	2.4	1.93	.460	.650
collaborating	5.3	2.07	5.9	1.96	569	.576	5.8	2.48	5.6	1.45	.246	.808
compromising	6.7	1.97	6.8	1.65	100	.921	6.7	1.86	6.5	1.75	.196	.847
avoiding	7.8	2.71	6.8	3.30	.716	.482	7.2	3.49	7.4	2.85	187	.853
accommodating	7.2	1.60	6.8	2.01	.387	.703	7.5	2.74	8.1	2.11	514	.613

Note: The sample included 16 women and 6 men.

Despite the expectation to find differences between men and women in the ratings of the research variables, the findings in the pilot study do not indicate significant differences between the genders, except for two variables:

Significant difference in emotional stability before the workshop t=2.47; p<0.05. The men in the sample perceived their level of emotional stability (6.3) as higher compared to women (4.9).

Difference in borderline significance in Assertiveness before the workshop t=-1.84; p=.08. The women in the sample perceived their level of assertiveness (3.4) as higher compared to the men (2.8).

In the future, it is necessary to check this figure again on a larger sample.

Hypothesis 5: Interpersonal skills improvement does not correlate with participants' age

Table 10. Pearson's correlation coefficient between age and the research variables

	Ag	ge
	Before workshop	After workshop
Personality traits		
Extraversion	.057	.027
Agreeableness	270	108
Conscientiousness	.053	.045
Emotional stability	304	.162
Openness to Experiences	381	045
Interpersonal communication skills		
Self-disclosure	.113	.036
Empathy	232	169
Social-relaxation	045	.200

	Ag	ge
	Before workshop	After workshop
Personality traits		
Assertiveness	261	095
Alter centrism	259	.059
Interaction management	.210	167
Expressiveness	.150	056
Supportiveness	302	190
Immediacy	185	060
Environmental control	182	154
Trust level		
Trust	.177	072
Distrust	442*	418
Negotiation Approach		
Competing	189	096
Collaborating	319	.102
Compromising	479*	527*
Avoiding	.402	.348
Accommodating	.332	040

(**) p<0.01; (*) p<0.05

Significant correlations were found, as indicate:

In the trust level variable: negative correlation between age and **distrust**, r=-0.442; p<0.05 (before), r=-0.42; p=0.059 (after): Younger people will have a greater tendency to express distrust in front of people they work with compared to older people.

In the Negotiation Approach variable: negative correlation between age and **compromising** r=-0.48; p<0.05 (before), r=-0.53; p<0.05 (after): Younger people will have a greater tendency of compromising in the negotiation process compared to older people.

A correlation with borderline significance was also found between age and **avoiding**: older people will have a greater tendency to resort to avoiding in the negotiation process compared to younger people.

Hypothesis 6: Participants' interpersonal communication skills have improved after training

Factor	Items	inverting values	Alpha	fall out
Self-disclosure	1,2,3		0.747	
Empathy	4,5,6	5	0.630	5
Social relaxation	7,8,9	9	0.580	

Table 11. The 10 factors of the Interpersonal Communication Skills

Factor	Items	inverting values	Alpha	fall out
Assertiveness	10,11,12	11	0.594	11
Alter-centrism	13,14,15	13	0.406	13
Interaction management	16,17,18		0.351	16
Expressiveness	19,20,21	20	0.646	
Supportiveness	22,2,24		0.560	
Immediacy	25,26,27		0.777	
Environmental control	28,29,30	30	0.790	

A pair sample t-test of variance was used to determine if the subjects' average ratings of their communication skills had changed after the workshop.

	Befo	re	Afte	r		
	Mean	SD	Mean	SD	t	sig.
Self-disclosure	3.8	.74	3.8	.64	13	.89
Empathy	4.2	.61	4.1	.81	.68	.50
Social-relaxation	4.2	.47	4.2	.49	04	.97
Assertiveness	3.3	.69	3.4	.68	89	.38
Alter centrism	3.5	.70	3.6	.53	51	.62
Interaction management	4.0	.65	3.8	.67	1.45	.16
Expressiveness	4.0	.56	3.9	.50	.83	.41
Supportiveness	4.0	.50	4.0	.63	70	.49
Immediacy	4.3	.64	4.4	.59	21	.84
Environmental control	3.6	.54	3.7	.69	81	.43

Table 12. Averages and standard deviations of the 10 factors of interpersonal communication skills, before and after the workshop

The subjects rated themselves as having the highest interpersonal communication skills in the following factors: Immediacy, Social-relaxation and Empathy (average above 4.0), while the lowest skills in the factors: Assertiveness and Alter centrism.

From the comparative analysis (before/after) it was found that there are no significant differences in the interpersonal communication skills of the subjects following the participation in the workshop.



Figure 5. Average rates of the 10 factors of interpersonal communication skills, before and after the workshop

Pearson's correlation coefficient was calculated to investigate whether interpersonal communication skills are correlated.

 Table 13. Pearson's correlation coefficient between the 10 factors of interpersonal communication skills, before and after the workshop

	Before workshop	1	2	3	4	5	6	7	8	9	10
1	Self-disclosure	1									
2	Empathy	.296	1								
3	Social-relaxation	.200	120	1							
4	Assertiveness	.133	.114	.589**	1						
5	Alter centrism	.272	066	.371	.385	1					
6	Interaction management	.515*	.508*	.116	.212	104	1				
7	Expressiveness	.747**	.285	.295	.204	.170	.472*	1			
8	Supportiveness	.426*	.422	070	066	167	.327	.431*	1		
9	Immediacy	.682**	.633**	.309	.245	.242	.683**	.731**	.583**	1	
10	Environmental control	.235	.391	.296	.295	.111	.208	.374	.305	.500*	1
	After workshop	1	2	3	4	5	6	7	8	9	10
1	Self-disclosure	1									
2	Empathy	.499*	1								

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	After workshop	1	2	3	4	5	6	7	8	9	10
3	Social-relaxation	.463*	.612**	1							
4	Assertiveness	.163	.336	.187	1						
5	Alter centrism	.490*	.341	.278	.389	1					
6	Interaction management	.235	.583**	.559**	.318	.344	1				
7	Expressiveness	.560**	.392	.544**	.044	.405	.361	1			
8	Supportiveness	.594**	.629**	.514*	.455*	.499*	.494*	.645**	1		
9	Immediacy	.580**	.564**	.449*	.484*	.496*	.442*	.577**	.759**	1	
10	Environmental control	.407	.554**	.576**	.352	.231	.771**	.425*	.409	.493*	1

(**) p<0.01; (*) p<0.05

The most prominent figure from the analysis indicates that following the workshop there are more significant correlations among the various factors of interpersonal communication skills, compared to the number of significant correlations found before the workshop.

The research model holds that there are relationships between the three independent variables: Personality traits, trust level, and Negotiation approach and the dependent variable - Interpersonal communication skills. The model was tested using Pearson's correlation coefficient and presented in comparison between before and after the workshop.

 Table 14. Pearson's correlation coefficient between Personality traits and Interpersonal communication skills

		Personality traits										
	Extrav	ersion	Agreeal	oleness	Conscier	ntiousness	Emotional stability		Openness to Experiences			
Interpersonal communication skills	before	after	before	after	Before	after	befo re	after	before	after		
Self-disclosure	.560**	.140	.326	.358	147	.029	019	.251	.247	.288		
Empathy	209	.226	.074	.310	293	.183	060	.280	.310	.555**		
Social-relaxation	.209	.433*	.202	.327	.462*	.558**	.343	.325	.631**	.451*		
Assertiveness	.236	.018	.161	195	.062	159	.221	027	.525*	014		
Alter centrism	.206	025	.346	.033	028	347	.243	.349	.289	.094		
Interaction management	.149	.379	.319	.209	055	.156	.252	.164	.311	.375		
Expressiveness	.398	.456*	.264	.433*	013	.206	.085	.364	.309	.604**		
Supportiveness	.044	.349	.326	.418	094	.131	.159	.205	.127	.345		
Immediacy	.181	.108	.476*	.513*	.023	.124	.332	.443*	.553**	.420		

		Personality traits									
	Extraversion		Agreeableness		Conscientiousness		Emo stat	tional bility	Open te Experi	iness) iences	
Interpersonal communication skills	before	after	before	after	Before	after	befo re	after	before	after	
Environmental control	205	.172	.167	.424*	.296	.254	.305	.368	.516*	.302	

(**) p<0.01; (*) p<0.05

The purpose of the analysis was to first examine whether there is a relationship between the various factors of the two variables, as well as to examine whether, following the participation in the workshop, differences in the correlations, their strength and direction will be found. As we can see in the table, there are some significance correlations between the factors of Personality traits and Interpersonal communication, as indicate:

The higher the level of **extraversion** before participating in the workshop, the higher the level of **self-disclosure**, while after participating in the workshop the correlation between these two variables is low and not significant.

Also, the higher the level of **Extraversion**, both before and after participating in the workshop, the higher the level of **Expressiveness**.

The higher the level of **agreeableness**, the higher the probability of a high level of interpersonal communication skills, as listed: **Self-disclosure**, **Expressiveness**, **Supportiveness**, **Immediacy**, and **Environmental control**. The findings show that following the participation in the workshop, the strength of the correlations is even higher compared to the correlations obtained in the questionnaire that the subjects filled out before the workshop.

The higher the level of **Conscientiousness**, the higher the probability of a higher level of interpersonal communication skills in the **Social-relaxation**, both before and after participating in the workshop. No significant relationships were found in the other factors of communication skills.

When the relationship between Emotional-stability and interpersonal communication skills was examined, it was found that before participating in the workshop there were no significant correlations, while after participating in the workshop it can be seen that the subjects recognize that their **Emotional-stability** is related to communication skills such as **Expressiveness, Immediacy** and **Environmental control.**

The research also indicates a significant correlation of **Openness to Experiences** with various communication skills of the subjects, in about half of the factors tested. The most prominent figure in this context is regarding Assertiveness. Before participating in the workshop there was a high and significant positive correlation between **Openness to Experiences** and **Assertiveness**, while after the workshop the correlation was deleted.

	Trust level						
	Tru	ist	Distr	ust			
Interpersonal communication skills	before	after	before	after			
Self-disclosure	.352	085	305	086			
Empathy	004	.274	.114	102			
Social-relaxation	.244	.338	.060	220			
Assertiveness	.215	.435*	.232	.070			
Alter centrism	112	072	.213	.146			
Interaction management	.290	.371	253	148			
Expressiveness	.532*	072	030	396			
Supportiveness	.390	.346	019	007			
Immediacy	.431*	.282	072	091			
Environmental control	.395	.203	.407	342			

 Table 15. Pearson's correlation coefficient between Trust level and Interpersonal communication skills

(**) p<0.01; (*) p<0.05

There are more significant correlations between trust and interpersonal communication skills compared to Distrust. Before the workshop, significant positive correlations were found between trust and the following: **Self-disclosure**, **Immediacy**, **Expressiveness**, **Supportiveness**, and **Environmental control:** the higher the subject's trust level, the higher his interpersonal communication skills in those 5 factors.

In the questionnaires filled out after the workshop there are different findings. Only **Supportiveness** still has a positive correlation with trust, and now it has been found that **Social-relaxation** and **Assertiveness** are also affected by the perception of trust.

The findings also show that the higher the level of **distrust**, the lower the **self-disclosure** before the workshop, while after the workshop no relationship was found between the two variables. On the other hand, only after participating in the workshop is there a negative correlation between the level of **distrust** and **Expressiveness**. It was also found that while before the workshop there was a positive relationship between **distrust** and **Environmental control**, after participating in the workshop the correlation reversed and became negative.

		Negotiation Approach										
Interpersonal	comp	eting	collabo	rating	compro	mising	avoio	ling	accomm	nodating		
communication skills	before	after	before	after	before	after	before	after	before	after		
Self-disclosure	.164	.096	.024	- .110	.050	- .036	353	- .028	.314	.063		
Empathy	.121	007	.144	- .137	.073	.329	243	.049	.036	207		
Social- relaxation	.240	.095	025	- .047	.163	.023	244	- .065	016	.053		
Assertiveness	.348	.290	.213	.176	.369	.124	417	- .372	296	006		
Alter centrism	009	.208	.196	.196	.166	.110	175	- .239	053	110		
Interaction management	.217	.105	.000	- .045	.086	.112	338	- .306	.213	.256		
Expressiveness	.210	.028	013	- .134	.080	- .159	301	.072	.181	.106		
Supportiveness	.026	.135	.039	- .231	.179	.009	394	.017	.421	.026		
Immediacy	.243	.065	.092	- .217	.198	.130	455*	.047	.179	.148		
Environmental control	.294	.189	.010	.019	.089	.101	390	- .344	.191	.218		

 Table 16. Pearson's correlation coefficient between Negotiation Approach and Interpersonal communication skills

(**) p<0.01; (*) p<0.05

There are very few significance correlations between negotiation approach and interpersonal communication skills. The most striking finding is that **avoiding** is negatively associated with some interpersonal communication skills. Those who use the strategy of avoidance during negotiations, express a lower level of interpersonal communication skills. Following the workshop, these connections diminished.

Hypotheses Summary

	Hypothesis	Confirmation
H1	Personality traits are positively correlated with interpersonal	Partially
	communication improvement	
H2	A high level of trust is related with improvement of	Partially
	interpersonal communication skills	
H3	The improvement of interpersonal communication skills	Partially
	differs between collaborative and competitive approaches	
H4	The training program improves interpersonal communication	Rejected
	skills more for women than for men	
H5	Interpersonal skills improvement does not correlate with	Confirmed
	participants' age	

	Hypothesis	Confirmation
H6	Participants' interpersonal communication skills have	Rejected
	improved after training	

10. DISCUSSION AND CONCLUSIONS

As a first step in the study, the pilot examined the behavior of the variables, their initial relationship, and the effect of training on interpersonal communication skills. A second step involves examining the relationships between the variables for predicting improvement in communication skills towards constructing an integrative model.

No significant differences were found in the scores of the subjects after participating in the workshop for all variables tested. In this context it is worth noting that the time that passed between participation and filling out the questionnaire on the first date, participating in the workshop and then filling out the questionnaire a second time, was only a few days. The question must be discussed whether under these circumstances of a one-time workshop, and a short time between the end of the workshop and the completion of the second questionnaire, one can expect significant changes in the perceptions of the interpersonal communication skills. Perhaps one of the conclusions from the pilot study is to space out the time between the workshop and filling out the second questionnaire, and to hold more than one session of the workshop. That way there is a greater chance of deepening and establishing the skills acquired in the workshop.

Neither before nor after the workshop, there was a significant difference between men and women in terms of interpersonal communication skills. In the pilot, 16 women and only 6 men (out of an original sample of 48) filled out the questionnaire twice. This hypothesis should be tested again with a larger sample size in the future.

A significant correlation was found regarding age. As far as trust level is concerned, younger people tend to express distrust more frequently than older people. According to the Negotiation Approach, younger people are more likely to compromise during negotiations than older people. Furthermore, older people tend to avoid in the negotiation process more than younger people. A significant correlation between interpersonal communication skills and age was not found according to the research question.

Regarding the hypothesis about the connection between Personality traits and Interpersonal communication skills, and changes in this pattern after the workshop, some significant correlation was found between factors of both variables, but there was no significant gap between these correlations before and after the workshop. The main findings are positive correlation between extraversion and self-disclosure. Additionally, there is a positive correlation between Extraversion and Expressiveness. Moreover, there is a positive correlation between agreeableness and five interpersonal communication skills: Self-disclosure, Expressiveness, Supportiveness, Immediacy, and Environment control. Another finding regards to a positive correlation between Conscientiousness and Social relaxation. According to the study, there were no significant correlations between emotional stability and interpersonal communication skills before attending the workshop, while after participating in the workshop the subjects acknowledge that their emotional stability is related to communication skills such as expressiveness, immediacy, and environmental control. About half of the factors tested indicate that Openness to Experiences is significantly correlated with various communication skills of the subjects. In this context, assertiveness is the most prominent figure. There was a high and significant positive correlation between Openness to Experiences and Assertiveness before the workshop, but after the workshop the correlation was gone.

The correlation between trust level and interpersonal communication skills was stronger than that between distrust and interpersonal communication skills. The higher the subject's trust level, the better his interpersonal communication skills weakened following the workshop. In addition, distrust is negatively correlated with self-disclosure. Conversely, a negative correlation between distrust and Expressiveness is only observed after participating in the workshop. In addition, while before the workshop there was a positive correlation between distrust and environmental control, after the workshop the correlation reversed and became negative.

Among the five factors of negotiation approach, avoiding was negatively associated with some interpersonal communication skills. Negotiators who employ the avoidance strategy exhibit poor interpersonal communication skills. These connections diminished after the workshop.

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BUSINESS PROCESSES REDESIGN AND AUTOMATION IN ENTERPRISE INTEGRATED SYSTEMS. A CASE STUDY APPROACH

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ABSTRACT

Times New Roman 10-point, italic, upper and lower case and alignment justified] Technological innovations are developed in different areas to help companies manage the growing "flood" of data and use them more efficiently. Some of these innovations are based on traditional database technology. Others take advantage of new paradigms of databases to meet more complex requirements. Based on this progress, platform developers provide new databases and analytical solutions that can manage massive amounts of data and provide opportunities to businesses in real or almost real-time. The current study aims to demonstrate the need for process automation within the projects of companies that provide support and assistance in the maintenance of integrated systems. Consequently, three case studies will be presented and analyzed for the purpose of creating best practices for industries.

Keywords: Business Process Redesign; Business Processes Automation; Enterprise Integrated Systems.

JEL Classification: M11, O33, O14, Q55.

1. INTRODUCTION

Business processes are based on process-oriented modeling and involve a structured approach to facilitate the analysis and continuous improvement of processes and operations within companies (Gartner, 2022). Modeling creates the premise for process redesign for workflows and brings high productivity. In this context, where it is obvious that ERP is more than a platform, operational efficiency cannot be achieved in the absence of continuous redesign and optimization of business processes.

Furthermore, if an authentic ERP solution incorporates best practices, these are obtained due to the experience of the suppliers regarding the best and most efficient ways in which business processes should be managed. The business environment demonstrates that the business practices of companies are different and that is why continuous reengineering is necessary, as well as process automation, in order to save the time spent on process redesign. The trend today is to revolutionize the process redesign with Robotic Process Automation (RPA) practices, by modernizing the workflow without major changes to the IT architecture. Process redesign in the form of robotic modules (RPA) can be adopted by companies operating in the same industry, delivered in the form of best practices. Robot modules must allow retrieval of processing status at any time and allow changes to be made based on how far a request has been processed. Process automation ensures that valuable human labor is not spent on menial repetitive tasks and ensures that important work tasks are completed quickly and without errors. Research and practice have shown that RPA implementations typically produce visible financial effects within 6 to 12 months, provide increased operational flexibility and readiness for innovation, and enable workflow modernization without major IT architecture changes.

2. LITERATURE REVIEW

Business process (BP) is a broad and comprehensive system that starts with top management understanding and involvement, focuses on process improvement, instills a structured approach to change management, and emphasizes people management and development. This practice varies greatly between organizations, depending on company size, process maturity, infrastructure, and corporate culture. BP principles and techniques can be applied to a single process or to a major business transformation involving the implementation of new processes.

BP is based on a methodology that companies must follow in order to document their business processes for understanding the entire business, not just a specific process. The beginning point could start with the development of the process map "as is" by defining the process (Motiwalla and Thompson, 2012). Thus, the process is analyzed to determine where and how the process can be improved. This approach is achieved by knowing the context and the

dependencies of the activities related to the organizational processes that contribute to the overall performance (Gazova *et al.*, 2022).

The report made by Panorama Consulting (Panorama, 2022) for the year 2022 shows that most of the surveyed organizations focus on improving key business processes, in a percentage of 51.4%, 45.0% represent the improvement of most processes and the remaining 3.6% chose not to improve processes. The most fashionable technology through which organizations not only streamline and optimize complex back-office operations but also provide support for improving the supply chain is RPA, which is a rapidly developing field (Siderska, 2020). The advantage that RPA offers over other automation tools lies in its non-invasive nature, as a purely rules-based system with no intelligence elements (Costa *et al.,* 2022). This concept implements the "low code" paradigm (Kim, 2022) and brings numerous benefits. According to Lacity, Willcocks and Craig (2016), automation produces tangible benefits because it generates a high return on investment, produces quality improvements and results in greater customer and employee satisfaction.

There is research (Syed *et al.*, 2020) that aims to develop frameworks that guide how different types of software robots can be built and implemented by applying specific implementation guidelines (Rutschi and Dibbern, 2020).

As RPA implementations become widespread, so do failures. Leslie Willcocks (Willcocks, 2020) studied more than 400 RPA implementations and claimed that only a quarter of organizations are taking full advantage of automating their business processes. Integrating an ERP system with RPA technology is a big topic today and connecting the two types of applications is becoming a necessity soon, especially for the manufacturing industry. Given the fact that this industry has many production steps and operations, redesign is complicated because some of them are expensive and time-consuming due to the high number of manual sub-processes.

3. CASE STUDIES IN LOCAL ORGANIZATION

Through this paper, we aim to demonstrate the need for process automation in the projects of organizations that provide support and assistance in the maintenance of integrated systems. Using the direct observation technique, we analyzed three organizations and extracted the most representative case studies that reveal concrete cases from different sectors of activity. The research was carried out within 3 academic projects developed by the SIA master's students under the guidance of the coordinating professors. We mention that the master's students have professional skills and that they are part of implementation teams at the workplace. For security reasons, the names of the companies have been anonymized.

The research methodology of the manuscript is synthetized in Figure 1.



Figure 1. Research methodology

3.1 Case Study 1: Modelling and implementing functionality regarding the return process in Microsoft Dynamics 365 for Finance and Operations

Within the analyzed company, the customers active in retail requested the redesign of the process developed based on the return order. The analysis was taken over by development teams who detailed the return process, interviewed specialist consultants experienced in working with MS Dyna 365 D&O, and proposed the redesign, development, and implementation of the following functionalities:

1. Development of an interface with the service areas covered by each supplier as well as the categories of products that have a guarantee;

2. Creation of return categories that will be assigned to each return order;

3. Displaying information about defective products and the products they will be replaced with throughout the process;

4. Creating reports that illustrate the information regarding the return;

5. Development of a workflow that automates the approval of the return order;

6. Emailing participants in real time regarding the return order.

The present research was carried out based on a questionnaire and the associated Main Research Hypothesis (RH1) is:

Within the returns process in an ERP, the way data is managed and reported impacts the performance of the process (RH1).

Furthermore, RH1 was broken down into five secondary hypotheses (SH11-SH15) as follows:

• SH11. Adequate structuring of return information impacts decisionmaking at the organizational level;

• SH12. The return process can be tracked more easily through well-defined reports;

• SH13. The efficiency of the return process is influenced by the waiting time for the decisions regarding the supporting documents regarding the returns;

• SH14. Approval of return documents can be automated;

• SH15. Transparency of the return process is ensured by providing instant access to information at any stage of the process.

The results of the case study present some aspects that will be pointed out in the paragraphs below.

Thus, one of the problems identified concerns the structuring of the information regarding the return but also the method of access. Information such as defective products, replacement products, date of return, document underlying the return, reason for refusal in the case of repair, etc., should be visible throughout the process. They must be easily observable, and one should not navigate to different pages in the modules to find out information. By proposing solutions to solve this problem the secondary hypothesis SH11 is demonstrated and validated.

Also, from the discussions with the consultants, a functional need in this process relates to reports. Reports are essential in any process but especially in the return process to be able to monitor performance as well as quick access to information. By developing parameterized reports, hypothesis SH12 is validated.

The secondary hypotheses SH13 and SH14 are of major interest because one of the main problems identified and the one that has priority is the development of a workflow for the approval of the return order. By creating the workflow, conditions could be set to automate decision-making about returns and more.

One item that is surprising to be resolved is access to feedback information via email on various actions. Hypothesis SH15 is thus validated and solving this need involves complete transparency in the return process.

In conclusion, the return process analyzed in this case study can be automated through RPA in the following situations:

- The automatic generation of the guarantee for the ordered products and the automatic listing of the service providers;

- Automatic provision of refusal explanations on the return order;

- Automation of the return order approval flow;

- Real-time generation and sending of an email to participants regarding the return order.

3.2 Case study 2: Using ERP and RPA technologies to identify their impact on manufacturing operations in MS Dynamics 365

In this case study, the manufacturing clients requested the development of two functionalities for the MS Dynamics 365 system.

1. The development of a report that contains information about products, quantities, locations, production status, production order number, unit and delivery date. The purpose of this functionality is to make the work of the user easier by the fact that he can create directly from the new purchase order form for the products in the system. Initially, the user could generate this process through the Accounts payable module where he could register new purchase orders, without having all the products in the system in front of him. Thus, he would manually insert the dozens of raw materials or materials for which he wanted to create an order. At the same time, the new functionality automatically confirms
the purchase order in the situation where it is validated to be confirmed. Otherwise, the user is warned by the system that something is wrong with his order, being told what he needs to change for the validation to be successful.

2. The development of a complex report highlighting the raw materials and each of their operations up to the point of making the finished products. The report highlights four types of sorting that the user can use when they want to print it. Depending on the option chosen, the report can either print the raw materials existing in the system that are still in stock (which means they are available) or it can print those raw materials that have no stock at all and for them also display the shortage section which highlights all products and the most recent production order recorded in the system for that product.

The development of a robot to streamline the introduction of raw materials into the system automates this functionality. The duration of data entry is simplified, the robot does all this work in a few minutes resulting in a gain in productivity and efficiency. In the case of this research, the development was done with the Python programming language, version 3.10, and with PyCharm, a hybrid platform developed by JetBrains as an IDE for Python. The starting point of the development of the robot was the creation of an xlsx file that contains the details of the raw materials (the name of the raw material, its website, the item group).

After making these reports, the research advances the following main hypothesis RH2: The implementation of ERP solutions integrated with RPA technology represents a significant advantage over production operations in terms of the manufacturing industry.

Following the completion of the study, the RH2 hypothesis was validated, the clients being involved in the development of the two previously described functionalities, but also by the robot that automates the process of adding and configuring materials.

At the level of simulations, the hypothesis was validated, and it follows that practice, and the market will generate the expansion of the development of these robots.

3.3 Case study 3: Identifying relevant key performance indicators (KPI) within the Billing & Invoicing (BI&I) Department of a public utility company

The study is conducted for a public utility company that has an implementation on the SAP platform. The Bi&I module has modeled all the Billing&Invoicing processes, in compliance with the legal regulations in force. This exhaustive modeling enables KPI automation. The results can be analyzed and verified by auditors. In this study, data was collected by interviewing the staff of the case study company. The interviewees were selected so that there was at least one interviewee from each organizational level. Data was collected through

interviews that lasted approximately 30 minutes. The interviews were conducted between May 2022 and June 2022.

Objectives of this research paper:

1. Identification of key performance indicators used within public utility companies, for the Billing&Invoicing department;

2. Identifying the key performance indicators that need to be automated;

3. Demonstrating the need for KPI automation on the KPI example: Total value of invoice lines on income accounts, for a public utilities company, on the SAP system.

The result of this academic project involves the analysis, development and implementation of the support requirement for the provision of sales data on specific revenue accounts, representing one of the KPIs that the team from the B&I department agreed to be a priority within this project. Specifically, this requirement involves the development of a program that returns for each utility company customer, the composition of the balance of the revenue accounts, on a specific date, specified in the selection screen.

The performance indicator created in the form of a report, called Total value of invoice lines on specific revenue accounts, was developed using the Query tools provided by SAP.

In the past, reports in SAP were mainly created using the ABAP Workbench, that is, by writing code using the ABAP programming language. This requires substantial programming knowledge and deep knowledge of each SAP application area. As a result, a family of tools - SAP Query Tools - was created especially for the end user, thus allowing the creation of customized reports, without the need for him to manage all the technical details.

SAP query tools enable the creation of reports that are not already developed in the SAP system. The query tools are easy to use and require no ABAP coding skills. However, there are significant limitations to creating reports and calculations within reports. For this reason, for the development of the KPI for the company that is the object of this research work, certain fields will be developed that will appear in the resulting screen. All this using the ABAP programming language. The study highlights that the direction in which KPI reporting should go is toward automation.

4. DISCUSSION AND RESULTS

The results proposed in the three case studies are briefly presented below:

1. The 3 case studies consider real cases from companies that offer support to clients that have implemented 2 top platforms: Microsoft Axapta and SAP Utilities;

2. We analyze clients from different industries: Retail, Production and public utilities;

3. The redesign of the processes took place as a result of the research carried out based on interviews and questionnaires and a consultant with long experience in the implementation of the processes was also involved;

4. It is observed that in every industry the processes are analyzed in detail and are decomposed granularly down to the smallest level;

5. Management is involved because the decision-making system is part of the modelling process;

6. Customers are involved in accepting the results of process redesign;

7. If in the first case study (MS Axapta) the modeling stops at processes, in the second case study a robot prototype is also proposed and in the third case a new KPI is proposed, its design and modeling is carried out and more is demonstrated the need for its automation to be taken over by other clients from the same industry;

8. The modeling and automation of retail seems the easiest, however, there are complicated situations in which an in-depth analysis is required (the example of the return process). In these cases, automation solves problems that would otherwise be neglected or out of control (the example of the waiting time for decisions regarding supporting documents regarding returns);

9. Production modeling benefits from automation with RPA because it involves many production steps and operations, most of which are expensive and time-consuming due to the high number of manual sub-processes;

10. The utilities industry is the most advanced in modeling, the practice is already directed towards analyzes based on automated KPIs. This development is possible due to the high level of granularity of the SAP solutions dedicated to this industry, but also to an impressive portfolio of practices, which makes the advance possible.

5. CONCLUSIONS

Through the 3 case studies, we aimed to highlight the native evolution of process modeling towards their automation, which, in recent years, is realized through RPA. Moreover, we have the right to highlight the modeling of KPI indicators that propel the modeling process to a higher level. The process reengineering's success is tightly coupled with the best practices adoption, because they can provide superior operational efficiency:

1. If ERP promises the use of best practices that include thousands of business operations and many specialists' expertise, it is impossible to ignore the impact of BPR in today's business ecosystem. The BPR is the guarantee of the correct management of the vital data of a business;

2. The success of process remodeling is closely related to the adoption of best practices, as they can offer superior operational efficiency and is guaranteed by the experience of the consultants;

3. Just as ERP ensures organizational standardization, BPR allows the modeling of operational efficiency in situations arising from disturbances from the external environment but also in particular situations that appear in the business routine;

4. The processes are automated one by one by building for each process one RPA robot. Only environmental changes can change the robot, the robot is no further adapted;

5. Robot process automation eliminates functional asymmetries because it ensures the efficiency of routine tasks but also the export of performance within the same industry. The implications of this feature are very important. Firstly, it provides more rigorous operational control and, secondly, it ensures access to process competence for all those who have implemented the same platform in a certain industry. Managers make the most of this function by obtaining the information they need for better decision-making and important time savings are made, crucial in these moments in the market. This practical experience can be described as flattening the modeling of organizational processes;

6. Modeling and standardized robotization of processes by industry would allow the configuration of the best practices of automation of processes by industry. While organizations are currently hit by multiple crises, consultants in the redesign of informational systems as well as professionals from the implementation teams promote combined BPR-RPA practices and enter a new generation of ERPs, the ERP-RPA generation.

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QUERY PERFORMANCE ON SMALL SCALE DENORMALIZED DATABASES. INITIAL RESULTS FOR SIMPLE SQL QUERIES ON THE TPCH DATABASE IN POSTGRESQL

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ABSTRACT

Relational database theory was proposed in early 1970s when the cost of the data storage was prohibitive and minimizing the data redundancy was a major concern. The database normalization, as founded by E.F. Codd, R. Fagin, R. Boyce, et al., yields schema where data is not duplicated but scattered in usually large number of tables. This raises problems of performance since fragmented data need joins which are important consumers of resources. Current paper presents some preliminary results of the impact of database denormalization on query performance for 457 simple (i.e., without GROUP BY) SQL queries on a small TPCH database load (0.01GB). The queries were generated for the reference/normalized TPC-H benchmark schema, and then translated for two denormalized schemas. Preliminary results show that even for a small data load, the denormalization of schema affects the query performance.

Keywords: Database normalization; database denormalization; TPC-H benchmark; SQL; SQL query performance, PostgreSQL.

JEL Classification: C12, C88, C99, L86.

1. INTRODUCTION

When relational databases were introduced, first in theory (early 1970s) and ten years later commercially (e.g., Oracle, IBM DS, Ingres), the cost of the data storage was huge. Consequently, minimizing the data redundancy was a major concern. The main objective of database normalization - the foundational methodology for designing the database schema – is to find an appropriate structure that minimizes the anomalies (inconsistencies) when inserting, updating, or deleting information in the database tables. Space frugality is a by-product of normalization since inconsistencies are less prone to occur when data is not duplicated. But sometimes, when bringing the database in higher normal forms, normalization generates schema where data is scattered in large number of tables. Supplying required reports and other information through database queries (written in a query language such as SQL) entails the re-combination of some tables using joins. Since joins among tables are, in many cases, notorious consumers of resources (memory, disk, time), database fragmentation is largely viewed as a performance inhibitor.

The storage cost started decreasing spectacularly in the 1990s and, consequently, the database professionals became less concerned with the data redundancy, but more with the database performance. Not only the cost of storing huge amount of data on monolithic or distributed architectures is now affordable, but current processing power and the almost unlimited bandwidth makes the denormalized databases less prohibitive. Furthermore, in many applications, such as online transaction processing (OLTP), providing a quick response to the client requirements is pivotal. Denormalization is largely considered as a proper vehicle for speeding the database operations. But no extensive studies have been carried for assessing the advantages of denormalization over normalization.

In this paper, based on the TPC-H benchmark database schema, two denormalized schemas were created by merging subsets of the tables in larger tables and then introducing some degree of data redundancy (see section 3.1). A set of 457 simple SQL queries, generated randomly, were translated for the denormalized schemas by removing the joins whenever the denormalized structure made the join redundant (section 3.2). The query set was executed for all three schemas on an experimental setup described in section 4.1. Results were collected with JMeter utility. The main predictors were related to the query complexity (section 4.2). The main outcome (the query duration) was examined in relation the denormalized schemas and some of the predictors (section 5).

2. DATABASE NORMALIZATION AND DENORMALIZATION

Relational databases (Codd, 1970) have three main pillars: the database structure (tables, attributes, constraints), the query languages for processing data stored in the database (e.g., relational algebra, relational calculus, SQL) and the database design, i.e., the set of methodologies for bringing the database in an acceptable form/structure, based on a set of (business or organizational) requirements.

Database normalization was founded by E.F. Codd in his seminal paper (Codd, 1970) and further refined during the 1970s and 1980s by a series of scholars (Codd, 1972; Codd, 1974; Bernstein, 1976; Fagin, 1977; Beeri *et al.*,

1978; Fagin, 1979; Beeri and Bernstein, 1979; Kent, 1983). In order to fix some redundancies and anomalies, initially three normal forms were proposed - 1NF, 2NF and 3NF - achieved through loss-less decompositions (with dependency preservation) of initial universal relation into smaller relations, based on functional dependencies (FDs). After some inadequacies of the 3NF were identified, the Boyce-Codd Normal Form – BCNF (Codd, 1974). Fagin (1977) was first to describe the fourth normal form, 4NF, based on multivalued dependencies, as well as the fifth normal form, 5NF (Fagin, 1979) - projection-join normal form (PJ/NF) -, which is based on join dependencies (JDs). Some other normal forms were proposed in the 1980s and 1990s, but they failed to gain traction.

Apart from its challenging mathematical ground and sometimes lack of relevance for the database designers (Fotache, 2006), a major critique of the database normalization is the resulted fragmentation of data. In over-fragmented databases, providing information through database query languages (e.g., SQL) required, in most of the cases, the re-combination of scattered tables using the join operator consumes important physical resources (memory, storage) and time (Lee, 1995; Bock and Schrage, 2002; Liu and Idreos, 2016).

Compared to normalization the database denormalization theory lacks a sound theoretical foundation, but it is usually expressed as a set of guiding rules for improving database performance (Sanders and Shin, 2001). Denormalization does not target space saving, since the storage is cheap nowadays, but the speed of data queries and, consequently, the software applications that interact with the database.

Three families of technologies have acted as major boosters of the interest in the database denormalization: web applications (Wei *et al.*, 2008; Al Fararjeh and Abu Jabal, 2010), data warehouses (Shin and Sanders 2006; Zaker *et al.*, 2009) and the NoSQL data stores (Mason, 2015; Karnitis and Arnicans, 2015; Oditis *et al.*, 2018; Kim *et al.*, 2018; Scherzinger and Sidortschuck, 2020).

It is widely acknowledged that achieving the trade-offs between system performance, accessibility and data integrity is possible by a fine balance between normalization and denormalization (Sanders and Shin, 2001; Bock and Schrage, 2002). But apart from several attempts (Wei *et al.*, 2008; Zaker *et al.*, 2009; Al Fararjeh and Abu Jabal, 2010) no systematic studies approached the performance gain when the database schema is denormalized.

3. TPC-H BENCHMARK DATABASE. THE NORMALIZED SCHEMA AND TWO DENORMALIZED SCHEMAS. SIMPLE QUERY TRANSLATION

Trying to emulate a Decision Support System that examine large volumes of data, execute queries with a high degree of complexity, and give answers to critical business questions, the TPC-H benchmark (TPC-H, 2022a) gained large

acceptance among database tools producers and professionals due to its simplicity and swiftness (Boncz *et al.*, 2014).

3.1 TPC-H basic (normalized) and two denormalized schemas

The TPC-H benchmark database is a typical sales database (Fig. 1), composed of 8 tables and it was designed to be industry-wide. The TPC-H schema is a normalized, typical, relational database, meant to boost data integrity and reduce data redundancy. We will call the reference schema or the base schema the database model generated by TPC-H.



Fig. 1. Initial normalized structure of TPC-H database (Source: TPC-H 2022b)

At the most denormalized level, the database could be limited to three tables since further fusion would create information loss problems.

- lineitem_orders_customer_nation_region
- lineitem_partsupp_part

- lineitem partsupp supplier nation region

Starting with the base (normalized) schema, 1023 denormalized schemas could be created by joining two of more tables.

For this paper two denormalized schemas were chosen, labeled as schema 100 and schema 600. The table name indicates whereas it is a simple table (as in the reference schema) or a table which is a result of one or more joins. For schema 100, the tables are:

- region
- nation_region
- supplier_nation
- part
- lineitem_partsupp
- lineitem orders customer

From the reference schema only two tables were kept, region and part (simple names signal that the tables are the same as in the reference, normalized schema). Table nation_region is a "persistent join" between tables nation and region. There is an obvious redundancy since table region appears both alone and as component of table nation_region. Nevertheless, whenever a query would need information on nation and its region, instead of a join, data will be extracted directly from the (persistent) table nation_region.

The second schema, labelled 600, contains the following tables:

- region
- nation
- part
- supplier
- orders_customer_nation
- lineitem
- lineitem_partsupp

In schema 100, since merged tables nation and region, or supplier and nation are small, no large charges in performance were expected for the queries involving only these original tables. But as lineitem is the largest table, both lineitem_partsupp (schemas 100 and 600) and lineitem_orders_customer (schema 100) could affect the performance in a large range of queries.

3.2 The query translation engine

The query engine was devised for generating randomly SQL queries with a large range of parameters (number of columns in SELECT, number of joins in FROM, number of predicates in WHERE, number of ordering columns, etc.). Next query was randomly for the reference (normalized) TPC-H schema for the scale factor of 0.01:

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```
SELECT distinct customer.c_nationkey AS customer__c_nationkey,
  LOG(10, customer.c_custkey) AS LOG_10_customer_c_custkey,
  customer.c mktsegment AS customer c mktsegment,
  nation.n_name AS nation__n_name,
  nation.n_nationkey AS nation__n_nationkey,
  customer.c_name AS customer__c_name,
  UPPER(customer.c_comment) AS UPPER__customer__c_comment,
  customer.c_acctbal AS customer__c_acctbal,
  LOWER(customer.c_phone) AS LOWER_customer_c_phone
FROM customer RIGHT JOIN nation ON customer.c_nationkey = nation.n_nationkey
WHERE
  customer.c_acctbal BETWEEN -377.11 AND 774.23
  AND customer.c_nationkey <> 11
  OR customer.c_phone >= '13-393-444-1533'
ORDER BY customer.c_name ASC, customer.c_nationkey ASC, nation.n_nationkey ASC
LIMIT 91
```

Data is extracted from two tables which need to be joined. The queries contain some non-aggregate functions in SELECT the clause and the filter in the WHERE clause contains three predicates. The result set is ordered by customer name and its country key and limited to 91 records.

```
Translated for the denormalized schema no. 100, the query becomes:
SELECT distinct lineitem_orders_customer_nation.c_nationkey
    AS lineitem_orders_customer_nation__c_nationkey,
  LOG(10, lineitem orders customer nation.c custkey)
    AS LOG__10__lineitem_orders_customer_nation__c_custkey,
  lineitem_orders_customer_nation.c_mktsegment
    AS lineitem_orders_customer_nation__c_mktsegment,
  lineitem_orders_customer_nation.n_name
    AS lineitem_orders_customer_nation__n_name,
  lineitem_orders_customer_nation.n_nationkey
    AS lineitem_orders_customer_nation__n_nationkey,
  lineitem orders customer nation.c name
    AS lineitem_orders_customer_nation__c_name,
  UPPER(lineitem_orders_customer_nation.c_comment)
    AS UPPER__lineitem_orders_customer_nation__c_comment,
  lineitem_orders_customer_nation.c_acctbal
    AS lineitem_orders_customer_nation__c_acctbal,
  LOWER(lineitem_orders_customer_nation.c_phone)
    AS LOWER__lineitem_orders_customer_nation__c_phone
FROM lineitem orders customer nation
WHERE
  lineitem_orders_customer_nation.c_acctbal BETWEEN -377.11 AND 774.23
  AND lineitem_orders_customer_nation.c_nationkey <> 11
  OR lineitem_orders_customer_nation.c_phone >= '13-393-444-1533'
ORDER BY
  lineitem orders customer nation.c name ASC,
  lineitem_orders_customer_nation.c_nationkey ASC,
  lineitem orders customer nation.n nationkey ASC
LIMIT 91
```

For this denormalized schema there is no need for join since table *lineitem_orders_customer_nation* contains all the required data. Of course, the database is over-denormalized and even there is no need for join, the source table is huge.

In the case of denormalized schema no. 600, the query was translated as follows:

```
SELECT distinct orders_customer_nation.c_nationkey
        AS orders customer nation c nationkey,
  LOG(10, orders customer nation.c custkey)
        AS LOG 10 orders customer nation c custkey,
  orders_customer_nation.c_mktsegment AS orders_customer_nation__c_mktsegment,
  orders_customer_nation.n_name AS orders_customer_nation__n_name,
  orders customer nation.n nationkey AS orders customer nation n nationkey,
  orders customer nation.c name AS orders customer nation c name,
  UPPER(orders_customer_nation.c_comment)
        AS UPPER__orders_customer_nation__c_comment,
  orders_customer_nation.c_acctbal AS orders_customer_nation_c_acctbal,
  LOWER(orders customer nation.c phone) AS LOWER orders customer nation c phone
FROM orders_customer_nation
WHERE
  orders_customer_nation.c_acctbal BETWEEN -377.11 AND 774.23
  AND orders_customer_nation.c_nationkey <> 11
  OR orders_customer_nation.c_phone >= '13-393-444-1533'
ORDER BY
  orders_customer_nation.c_name ASC,
  orders_customer_nation.c_nationkey ASC,
  orders_customer_nation.n_nationkey ASC
LIMIT 91
```

As with the previous schema, there is no need for join, but the source table - *orders_customer_nation* - is considerable smaller.

For this paper, an initial set of 457 simple (non-grouping) queries were generated and included in a .csv file for execution in JMeter. Then the query set was translated according to the table structure in schemas 100 and 600.

4. EXPERIMENTAL DESIGN, METHODS, AND TOOLS

To assess the impact of database denormalization on the performance of nongrouping queries for small load of the TPC-H benchmark database, the main idea of the experiment was to randomly generate no-grouping SQL queries initially for the reference (normalized) schema and subsequently to generate their equivalents for two denormalized schemas. The term "non-grouping queries" signals the absence of GROUP BY clause, so that original/SQL queries contain only SELECT, FROM, WHERE, ORDER BY, SKIP and LIMITS clause. Also, no subqueries were included in any of first three clauses. Still, aggregate function (SUM, COUNT, ...) may appear, but only in the SELECT clause. By examining the duration required for the execution of the query set in all three selected schemas, might be gained on the performance differences among schemas.

Two main research questions were scrutinized in this paper: Is the query performance associated with the denormalization of schema (RQ1)? and Does the schema normalization rank as a significant predictor in explaining the outcome (query duration) variability (RQ2)?

4.1 Hardware and software platform

The experimental setup was implemented on some resources provided by a public cloud - RaaS-IS (Research as a Service Iasi) - managed with OpenStack. Assigned virtual had 8 vcores (Intel Xeon Gold 6240 2.6Ghz, 24.75MB cache), 8GB DDR4 of RAM and 150GB of SAN storage (HPE 3par). Virtual machine was created on Windows Server 2019 version 1809 x64 patched for security threats.

PostgreSQL 13.3 was the database server used in the experiment. The data generation tool is available on TPC-H 3.0.0 benchmark site. The shell scripting and various automations were performed with plain PowerShell 5.1, no extra modules were used.

Results (query data duration) were collected with Apache JMeter 5.4.1. For the benchmarking a JMeter test plan (with multiple test cases) was combined with a PowerShell script to automate this part of the testing. The main role of the script is to allow for scalability in the testing scenario, meaning that a JMeter plan could be used on multiple scale factors of the database and on multiple database schemas. In such a scenario, a single test plan could run both on a scale factor of 1 (1GB of data generated by TPC-H) and on multiple schemas (such as schema number 1024, 600 and 100).

4.2 Variables

The main variable of interest (the outcome) was the required duration (in milliseconds) for a query to be completed. Its distribution is presented in section 5. The main predictors were related to the complexity of the query, by the query clauses (SELECT, FROM, WHERE, ORDER BY, LIMIT, SKIP):

- Number of columns in the results, as specified in SELECT (s_cols)
- Number of non-aggregate functions in SELECT (s_non_aggr_func)
- Number of aggregate functions in SELECT (s_aggr_func)
- Number of joins (INNER and OUTER) as specified in FROM (f_joins)
- Number of predicates as specified in WHERE (w_predicates)

• Number of non-aggregate functions included in the predicates (w non aggr f)

- Number of LIKE operators included in the predicates (w_like)
- Number of columns specified in ORDER BY (o cols)
- Number of records included in the results (limit)
- Number of records omitted in the beginning of the result (offset)

The special predictor for the operator LIKE used in the predicates was included since this operation is generally considered a resource consumer.

Fig. 2 presents the distribution of numeric variables with smaller number of values. Of the 457 queries included in the set, 25% include no join (single table query), 25% include one join, 24% include two joins, and 26% include 3 or 4 joins. Only 11% of the queries contain operator LIKE (in WHERE), and 79% of

the queries do not use non-aggregate functions (e.g., LOG, ABS, ROUND, TRUNC) in predicates. 21% of the queries do not include any predicate (no WHERE clause), and the largest number of predicates in a query is 6.

Fig. 3 presents the distribution of numeric variables with larger number of values, so that instead of column chars, the density plots were preferred. With the exception of limit, all predictors in this figure are skewed to the right. The largest number of columns included in the result was 40, and the largest number of non-aggregate functions in SELECT was 24.



Fig. 2. Numerical predictors with small number of values



The skewness of the predictor, visible in figures 2 and 3 would determine the preference for non-parametric tests when checking the research questions.

Fig. 3. Numerical predictors with larger number of values

Fig. 4 displays the (non-parametric) correlation plot among predictors, since collinearity would affect the association between the outcome and the predictors. The largest positive correlation was recorded between the number of columns included in SELECT and ORDER BY (0.52) the largest negative correlation was recorded between number of aggregate functions appearing in SELECT and the number of columns in ORDER BY.



Fig. 4. The correlation plot among numerical

Overall, there is no large collinearity among predictors and the regression model in section 5 would not be affected.

4.3 Data processing and analysis tools

The query generator engine (for all three schemas) was written in R. Also, all the data processing and analysis operation were performed in R (R, 2022). The tidyverse ecosystem of libraries (Wickham *et al.*, 2019) was the main support for data preparation. Plots in figures 2, 3 and 5 were created with the ggplot2 package (Wickham, 2016) which is also part of the tidyverse. The magnified section of outcome distribution in figure 5 was created with package ggzoom (Pedersen, 2021).

The non-parametric Kruskal-Wallis test (Fig.6) was performed with the ggstatsplot package (Patil, 2021) which provides all important statistics about the tests: statistics, p-values, the effect sizes, and the confidence intervals for the effect size. The linear regression model was fitted in base R.

5. RESULTS AND DISCUSSION

The main variable of interest for assessing the database query performance is the query duration. After executing the initial query set on the reference schema, and the translated queries for denormalized schemas (100 and 600), the distribution of query duration (in milliseconds) is shaped as in Fig.5. For all three schemas, the outcome distribution is skewed, and the number of outliers is large.



Fig. 5. Overall distribution of the query duration (right) and its magnified 0-150ms range (left)

For the RQ1 (Is the query performance associated with the denormalization of schema?), the chart in Fig.5 shows that the reference schema recorded the best performance, since the mean duration was 155ms (median = 16.2ms). For schema 100 the average duration was 172ms (median = 55) whereas for schema 600 the average was 197ms (median = 32.2). Between two denormalized schema, schema 100 is better placed when mean is considered whereas schema 600 performed better by median.

The differences among schema were tested for statistical significance with the non-parametric Kruskall-Wallis test, since the outcome distribution is far from normal. For this test the null hypothesis (H0) is there are no significant differences among schemas on the query duration. As Fig. 6 (created with the ggstatsplot package) shows, the differences are statistically significant (p-value < 0.001), even if the effect size is small (0.04, CI95% [0.02, 1]). Moreover, the pairwise comparison shows that differences between each pair of schemas are statistically significant.

As for the RQ2 (Does the schema normalization rank as a significant predictor in explaining the outcome variability?), for assessing the predictor

importance in outcome's variability, a classical linear regression model was fitted using the function *lm* in base R.



Fig. 6. Results of the Kruskall-Wallis test, as provided by the ggstatsplot package

As the distribution of duration is skewed, the outcome was transformed with log10 function, so the regression formula was: log10(duration) ~ schema + s_cols + s_non_aggr_f + s_aggr_func + f_joins + w_predicates + w_like + w_non_aggr_f + o_cols + limit + offset. The model was statistically significant (F-statistic (12, 1358) = 92.97, p-value < 0.001) with R2 = 0.45 (the model can explain 45% of the outcome variability). Table 1 shows the coefficients.

 Table 1. Coefficients of the linear regression model

 where the outcome is log10(duration)

predictor	estimate	std.error	statistic	p.value
(Intercept)	0.161	0.0618	2.6	0.0093
schema100	0.422	0.0469	8.99	0.0000
schema600	0.202	0.0469	4.31	0.0000
s cols	0.00772	0.00267	2.89	0.0039
s non aggr f	0.083	0.00568	14.6	0.0000
s aggr func	0.13	0.0179	7.28	0.0000
f joins	0.171	0.0181	9.46	0.0000
w predicates	0.0861	0.0147	5.88	0.0000
w like	-0.19	0.0636	-2.98	0.0029

predictor	estimate	std.error	statistic	p.value
w_non_aggr_f	0.17	0.0417	4.08	0.0000
o_cols	0.151	0.0207	7.32	0.0000
limit	0.000197	0.0000664	2.96	0.0031
offset	-0.000145	0.000063	-2.3	0.0217

All the predictors are statistically significant (their p-value < 0.05), including the schema number. Schema 0 is the reference in the regression model. Relative to schema 0, the translated queries took on average .202 more milliseconds in schema 600 and .422ms in schema 100.

6. CONCLUSION

With the decreasing cost of data storage, the pervasiveness of web and mobile applications, and the increasing popularity of NoSQL data stores, the interest in database denormalization as a vehicle in improving the database performance is out of the question.

Nevertheless, there are no studies for assessing the performance gain when database is transformed from a normalized form into a denormalized one. The inquiry is difficult since there are many degrees of denormalization a database schema could be transformed.

This paper examines the (SQL) query performance differences when using denormalization for a tiny load of the TPC-H benchmark database implemented in PostgreSQL. Starting with the reference schema, two denormalized schemas were creates. A set of 457 simple queries were mapped to the denormalized schemas and executed. Results (query duration) were collected using jMeter.

Even for a small database load, the difference in query performance is statistically significant for all the pairs of the three schemas. The Kruskall-Wallis supports the hypothesis of the association between query duration and the schema. Also, the simple linear regression model suggests the schema is a significant predictor for explaining duration variability.

One of the main limitations of the experiment concerns the small-scale factor (0.01GB) at which data was generated. Increasing the amount of data in the tables could change the balance of power. Thus, further research should include larger scale factors and multiple denormalized database schemas. Furthermore, the hardware resources were not maxed out, and comparing different setups could also be interesting to test, such as varying the RAM or the CPU power.

Another limitation is represented by the fact that a denormalized schema could include new columns that can contain aggregate results, such as aggregating the sales price on a totally new column to avoid using aggregate functions in the SQL statement, and the list can continue with other columns that can be computed.

Further research would also compare denormalized schemas performance with databases implemented using NoSQL data stores.

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BASIC ENGINE FOR COMPARING POSTGRESQL AND NEO4J QUERY PERFORMANCE ON SMALL SCALE TPC-H DATABASE. INITIAL RESULTS FOR NON-GROUPING QUERIES

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ABSTRACT

In late 2000s four families of NoSQL data stores were proposed as a substitute, or rather a complement, for the traditional/relational databases, when storing and processing large volumes of loosely structured data. Graph databases have been one of the NoSQL pillars, with Neo4j as the most popular product in this family. But after 15 years since they have been available on the database market, there is no comprehensive analysis on the data processing performance neither within various graph datastores, nor between graph and relational/SQL data stores. This paper presents the first findings of a basic framework created for comparing PostgreSQL and Neo4j query performance on the TPC-H benchmark database. Both data volume and the query complexity are low in this experimental setup, but the framework can be easily extended for larger database sizes, more complex queries (i.e., queries with groups and/or subqueries), and a variable number of nodes for database distribution.

Keywords: SQL; NoSQL; graph databases; Neo4j; Cypher query language; TPC-H benchmark; query generator; query performance.

JEL Classification: C12, C88, C99, L86.

1. INTRODUCTION

Proposed in early 1970s, developed in the 1980s, and available on the market since 1990s, the relational databases have been the most popular technology for storing and processing large volumes of data. In early 2010s, with the advent of

NoSQL and Hadoop technologies, the database picture became more fragmented. Various data stores have been proposed for specific types of software applications. Still, according to DB-Engines Ranking (2022), the vast majority of the top 20 most popular data stores are open source and commercial relational/SQL database servers.

PostgreSQL (2022) is one the most popular SQL database servers (usually in top 5 DB-Engines Ranking), whereas Neo4j (2022a) is the main contender of the NoSQL family of technologies for managing the graph databases (usually included in top 20 of the same ranking). When proposed to the application developers and data professionals, graph database servers were advertised to perform better than the SQL counterparts, at least in some market niches (Besta *et al.*, 2021). But, despite the advances in database performance benchmarks, after more than 15 years, no comprehensive study assessed the performance gain when using graph data stores instead of SQL servers.

This paper presents the first findings of a framework created for comparing PostgreSQL (as the representative of the SQL database servers camp) and Neo4j (as the most popular graph database server) query performance. After a brief presentation of the products (section 2), a small load (0.01 GB) of the TPC-H benchmark database was set up in PostgreSQL-Citus (section 3.1) and then translated into a graph database implemented in Neo4j (section 3.2). A series of simple, non-grouping random SQL queries were generated for the PostgreSQL dialect and then translated into Cypher (the query language of Neo4j) queries (section 3.3). Even if the database loading was very small, both PostgreSQL and Neo4j were set up in a distributed architecture (section 4.1). For the original SQL query set, some metadata on the query complexity were kept as predictors for the query success (query completion within a 10-minute timeout) and the query duration (section 4.2). Results of the query execution in PostgreSQL and No4j were collected with JMeter utility. Analysis of preliminary results is provided in section 5.

2. SQL AND NOSQL DATASTORES. POSTGRESQL AND NEO4J

2.1 SQL. Relational model datastore. PostgreSQL and Citus

The history of relational databases dates to 1970 when an IBM researcher named Edgar F. Codd first proposed a set of abstract principles for database management (Jones, 1989). The relational model, which was founded in (Codd, 1970), introduced a new way to model data, and generally it is acknowledged that ,,this paper has launched databases into the future", marking the history of databases as we know them today (Kelly, 2022).

First attempt to develop a relational database management system (RDBMS) was IBM's System R project (Chamberlin *et al.*, 1981), but first commercial product was released by Oracle Corporation (Oracle's products was inspired by

the IBM's System R research). Despite Dr. Codd's first attempt to create a language for data manipulation and query (Codd, 1971), System R used a separate query language called SEQUEL, which later became the Standard Query Language (SQL) for relational databases (Batra, 2018).

PostgreSQL, also known as Postgres, is a free, open-source relational database management system. PostgreSQL supports transactions with atomicity, consistency, isolation, and durability properties, which are intended to guarantee data validity despite errors, power failures or other technical or environmental incidents. It was designed to handle a range of workload from single machines to data warehouses or web services with many concurrent users.

PostgreSQL offers several advantages for developers looking to create scalable computing environments across their environments (IBM, 2021): performance and scalability; concurrency support; multiple language support; business continuity; open source.

These advantages, accompanied by the new clustering capabilities offered through Citus (Citusdata, 2022a), turn PostgreSQL into a reliable distributed database management system (DDBMS). Citus is a horizontally scalable extension of PostgreSQL, which enables users to distribute data across multiple nodes to achieve better performance and scalability. It works by splitting up data across many nodes, allowing queries to be executed in parallel, and consequently recording faster processing times. To achieve these performance improvements, Citus enhances PostgreSQL by providing advanced clustering features such as sharding, where data is partitioned and spread out across different nodes, replication, and distributed query planner; this enable the querying of data across multiple nodes, as if they were a single database.

Built as an extension to PostgreSQL, Citus supports all versions and built-in features of PostgreSQL, but also provides additional functionalities such as automatic data distribution, automatic load balancing, and automatic shard rebalancing, which makes it easy to manage and maintain a distributed database.

The combination of PostgreSQL and Citus provides a powerful solution for a distributed database management system, enabling users to achieve high performance, scalability, and flexibility while leveraging the benefits of opensource software (Cubukcu *et al.*, 2021).

2.2 NoSQL. Graph model datastore. Neo4j

Starting with the year 2000, NoSQL databases have emerged as an alternative to the SQL databases. Google's Big Table or Amazon S3 could have serve as inspiration for other open-source interpretations, leading to the development of NoSQL databases (Bartholomew, 2010). These new database technologies were created in response to the increased demands of data storage for unstructured data and offer faster querying and increased flexibility over the traditional SQL technology (Cogean *et al.*, 2013).

Graph databases, part of the NoSQL family of technologies, could represent one of the answers to this challenge. Intuitive model, based on graph theory with solid mathematical fundaments, graph databases are flexible and can change not only the data inside but their structure too. This flexibility helps to adapt to the changes that data might suffer over time and together with the increased efficiency upon querying large data sets boost the graph databases to be one of the preferred data storage technologies in the last years. For a detailed presentation of graph database technologies, including their applications, see Besta *et al.* (2021).

Neo4j is an open-source graph database management system (GDBMS) designed to store, manage and query highly interconnected data through its native graph storage. In this model, data is represented as nodes, edges/relationships, attributes, and properties. Nodes and relationships can have as many attributes as possible, and it can be tagged for query performance optimisation. Neo4j is the most popular GDBMS worldwide (Fernandes and Bernardino, 2018).

Neo4j offers a built-in clustering capability called Neo4j Causal Cluster and it is available only using Neo4j Enterprise Edition Server. In a Neo4j Causal Cluster, the database is spread across multiple servers called core instances which replicate transactions using Raft protocol to achieving high availability. It also supports read replica instances which allows users to scale read operations and decrease the load on the core instances. For a more detailed description of a Neo4j Causal Cluster, see (Neo4j, 2022b).

3. TPC-H BENCHMARK DATABASE IN POSTGRESQL AND NEO4J

3.1 TPC-H database in PostgreSQL

Composed of eight tables (Fig.1), the TPC-H benchmark database is a simplified version of a commercial sales database [TPCH, 2022]. TPC-H also provides tools for creating and populating tables, by specifying the database size (the scale factor).

To achieve distribution in the PostgreSQL-Citus cluster the schema was divided in two main categories: distributed tables - table rows were distributed across multiple shards which were spread across all nodes of the cluster; reference tables – table rows located in a single shard that was replicated across all nodes of the cluster.

Given the above classification, the largest tables from TPC-H schema (LINEITEM and ORDERS) have been distributed to optimize query performance, and the remaining tables – small tables which are required on all of the clusters' nodes to perform joins and retrieve data efficiently – have been transformed into reference tables.



Figure 1. Structure of the TPC-H database (Source: TPC-H, 2022)

In SQL queries tables might be joined on three axes (join paths):

-lineitem-orders-customer-nation-region

-lineitem-partsupp-part

-lineitem-partsupp-supplier-nation-region,

Generated SQL queries (see section 3.3) included in the FROM clause a subset of tables in one of the three join paths.

3.2 TPC-H database in Neo4j

In Neo4j the database nodes were imported from PostgreSQL with the utility *neo4j-admin import* which is the recommended solution when dealing with large amounts of data (not in this paper's case, but vital for further tests on larger data loads). After saving PostgreSQL tables as CSV files and creating a header file (for declaring non-text table attributes in Neo4j), the next shell command created, for

each PostgreSQL table, a number of nodes equal to the table's number of records. All nodes were labelled with the table name.

```
neo4j-admin import --database=tpch --delimiter="|"
--nodes=REGION:REGION=".../region-header.csv",".../region.csv"
--nodes=NATION:NATION=".../nation-header.csv",".../nation.csv"
--nodes=CUSTOMER:CUSTOMER=".../customer-header.csv",".../customer.csv"
--nodes=PART:PART=".../part-header.csv",".../part.csv"
--nodes=SUPPLIER:SUPPLIER=".../supplier-header.csv",".../supplier.csv"
--nodes=PARTSUPP:PARTSUPP=".../partsupp-header.csv",".../orders.csv"
--nodes=LINEITEM:LINEITEM=".../lineitem-header.csv",".../lineitem.csv"
```

The relationships among nodes were created with a Cypher script (launched from the same main shell script). For example, the relationships between all nodes of type LINEITEM and the nodes of type PARTSUPP were created with the following command:

```
MATCH (1:LINEITEM),(ps:PARTSUPP)
WHERE 1.1_partkey = ps.ps_partkey AND 1.1_suppkey = ps.ps_suppkey
CREATE (1)-[:LINEITEM_PARTSUPP]->(ps);
```

3.3 The SQL to Cypher query translation engine

The main ingredients of the SQL query generator are described in Fotache and Hrubaru (2016). It randomly generates SQL queries on various scenarios defined by the number of join paths, INNER and OUTER joins in FROM clause, number of predicates to be included in WHERE, number of columns in SELECT, number of grouping attributes, etc. The query text is available in the major SQL dialects and included in a .csv file ready to be executed by JMeter utility (Apache JMeter, 2022).

For this paper, a set of 457 simple (non-grouping) queries was generated for processing the basic (normalized) TPC-H schema populated with 0.01 GB of data. One simple query in this set is shown below:

```
distinct customer.c_nationkey AS customer__c_nationkey,
  LOG(10, customer.c_custkey) AS LOG_10_customer_c_custkey,
  customer.c_mktsegment AS customer__c_mktsegment,
  nation.n name AS nation n name,
  nation.n_nationkey AS nation__n_nationkey,
  customer.c_name AS customer__c_name,
  UPPER(customer.c_comment) AS UPPER_customer_c_comment,
  customer.c_acctbal AS customer__c_acctbal,
  LOWER(customer.c_phone) AS LOWER_customer_c_phone
FROM customer RIGHT JOIN nation ON customer.c_nationkey = nation.n_nationkey
WHERE
  customer.c acctbal BETWEEN -377.11 AND 774.23
  AND customer.c_nationkey <> 11
  OR customer.c_phone >= '13-393-444-1533'
ORDER BY customer.c_name ASC, customer.c_nationkey ASC, nation.n_nationkey ASC
LIMIT 91
```

Data is extracted from two tables which need to be joined. The query contains some non-aggregate functions in the SELECT clause (LOG, UPPER, LOWER), and the filter of the WHERE clause contains three predicates built upon comparison operators and the operator BETWEEN. The result set is ordered by customer name and its country key and limited to 91 records. Translated into Cypher, the query is:

```
OPTIONAL MATCH (customer:CUSTOMER) - [customer nation:CUSTOMER NATION]->
        (nation:NATION)
WHERE
  customer.c_nationkey <> 11
  OR customer.c acctbal >= -377.11 and customer.c acctbal <= 774.23
  OR customer.c_phone >= '13-393-444-1533'
RETURN distinct
  customer.c_nationkey AS customer__c_nationkey,
  LOG(customer.c_custkey) AS log_customer_c_custkey,
  customer.c_mktsegment AS customer__c_mktsegment,
  nation.n_name AS nation__n_name,
  nation.n_nationkey AS nation__n_nationkey,
  customer.c_name AS customer__c_name,
  toUpper(customer.c_comment) AS toupper_customer_c_comment,
  customer.c acctbal AS customer c acctbal,
  toLower(customer.c_phone) AS tolower_customer_c_phone
ORDER BY nation_n_nationkey ASC, customer__c_nationkey ASC, customer__c_name ASC
LIMIT 91
```

The entire SQL query set was automatically translated into Cypher and also saved into a .csv file to be excuted in JMeter.

4. METHODS AND TOOLS

Main idea of the experiment was to randomly generate non-grouping SQL queries (in PostgreSQL dialect) and subsequently to generate their equivalents in Cypher, the declarative query language of Neo4j data store. In this paper the term *non-grouping queries* signals the absence of GROUP BY clause, so that original/SQL queries may contain only the SELECT, FROM, WHERE, ORDER BY, SKIP and LIMITS clauses. Also, no subqueries were included in any of first three clauses. Still, aggregate function (SUM, COUNT, ...) may appear, but only in the SELECT clause. By examining the duration required for the execution of the query set in both PostgreSQL and Neo4j, some insights might be gained on the performance of the two data stores.

For this paper, given a small data load of the TPC-H database and a set of non-grouping queries, two questions were of interest:

- RQ1: Are there significant differences on the overall query performance between a graph database system (Neo4j) and a relational one (PostgreSQL)?
- RQ2: Is the database server ranked as a significant predictor in explaining the outcome (query duration) variability (RQ2)?

4.1 Experimental platform

The experimental setup supporting all technical implementations for this paper was installed on the Alexandru Ioan Cuza" University cloud data center. The IT infrastructure was built using 3 Ubuntu 18.04 virtual machines (VM) configured with 4 vCPU, 4GB of RAM and 40GB of disk space. Given the small-scale factor of the TPC-H database, the configuration of the virtual machines was set above the recommended settings.

PostgreSQL provides vertical scalability as a built-in functionality; however, to achieve horizontal scaling (distribution), an extension is required to transform this RDBMS into a DDBMS. There are multiple products that help distribute PostgreSQL, the most known are Greenplum, Postgres-XL and Citus. For this research paper, horizontal scaling was achieved by installing Citus extension over the PostgreSQL servers (see section 2.1). The VMs were included in a cluster using specific Citus UDF commands and the database schema was distributed across cluster's worker nodes.

Neo4j Enterprise Edition benefits from a built-in functionality that helps the database server scale horizontally - Causal Cluster. Neo4j Causal Cluster was configured on the same VMs to ensure a similar testing environment with common settings (number of CPUs, RAM memory, disk-space and Operating System). The cluster was set up with the minimum number of nodes (3) to ensure fault tolerance. All 3 VMs were declared as Core instances in order to safeguard data; however, this safety requirement could have an impact on write latency upon scaling the cluster – as (half +1) the number of Core instances has to acknowledge a transaction; increasing the size of the cluster for future researches will also lead to a longer time for write operations, which could present a drawback while being compared to other database servers.

The performance tests were deployed using Apache JMeter utility, an application designed to load test functional behaviour and to measure performance of different services (Apache JMeter, 2022). The load testing tool was installed on a Windows Server 2019 virtual machine, configured on the same network as the database clusters, to simulate a remote load testing. Test plans were configured in JMeter to connect to the remote database servers using specific database drivers. Connection to Neo4j Causal Cluster has been performed using BOLT protocol towards the cluster's leader IP address, and the connection to PostgreSQL-Citus cluster was set up with a JDBC driver pinpointing to the cluster's coordinator node. Parameterized test plans were created for the two database servers and the queries were loaded using .csv files. The test plans were subsequently executed using Apache JMeter command line tool. The results of the load testing were saved in a CSV file that was further used for data analysis, visualization, and interpretation.

4.2 Data description

The main variable of interest was *duration* - the necessary time (in milliseconds) for the query execution. As in JMeter a timeout of 600 seconds was fixed (any query requiring more than 600 seconds was automatically cancelled), the query duration was available only for completed queries. Variable *db_server* refers to one of the database stores, PostgreSQL and Neo4j.

The main variables refer to queries metadata describing the complexity of reference, SQL queries:

- *s_cols*: number of columns included in the result (of the query).
- *s_non_aggr_f*: number of non-aggregate functions (e.g., UPPER, LOG, ROUND) included in the SELECT clause.
- *s_aggr_func*: number of aggregate functions (e.g., COUNT, COUNT DISTINCT, SUM) included in SELECT.
- *f_joins*: number of joins included in the FROM clause.
- *w_predicates*: number of predicates included in the filter (WHERE).
- *w_like*: number of predicates using the LIKE operator (e.g., customer.c_comment LIKE 'comment no%').
- *w_non_aggr_f*: number of non-aggregate functions included in WHERE
- *o_cols*: number of columns included in the ORDER BY clause.
- *limit*: max number of records included in the result.
- *offset*: number of the omitted records at the beginning of the result to be skipped.

Fig. 2 presents the distribution of numeric variables with smaller number of values. A quarter of the 457 generated SQL queries included only one table (no need for join), 25% contained just one join, 24% included two joins, and remaining 26% included 3 or 4 joins. About 11% of the queries contained operator LIKE (in WHERE), and 79% of the queries did not use non-aggregate functions (e.g., LOG, ABS, ROUND, TRUNC) in WHERE predicates. About 21% of the SQL queries did not include any predicate (WHERE clause was absent), and the largest number of predicates in a query was 6.





Figure 2. Numerical predictors with smaller number of values

Fig. 3 presents the distribution of numeric variables with larger number of values, displayed as histograms. Variables *limit* and *offset* covered the largest range of values, [0, 1000], whereas the number of columns included in the query result (*s_cols*) varied between 1 and 40, and the number of non-aggregate functions included in SELECT clause covered 0-24 range.



Figure 3. Numerical predictors with larger number of values

Except for *limit*, all predictors in this figure are skewed to the right. Based on the non-normal distribution of predictors and of the outcome (see section 5) the non-parametric statistical tests would be preferred when approaching the two research questions stated at the beginning of section 4.

4.3 Data processing and analysis tools

The SQL query generator engine and the translator *SQL-to-Cypher* was written in R (R, 2022). All data processing and analysis was also performed with R, using mainly the *tidyverse* ecosystem of libraries (Wickham *et al.*, 2019). For statistical inference the main support was provided by *ggstatsplot* package (Patil, 2021) which computes, for the Mann-Whitney test, the p-value, the effect size, and the confidence interval for the effect size (Hatcher, 2013). Graphics in sections 4 and 5 were generated with either *ggstatsplot* or *ggplot2* package (Wickham, 2016). The magnified section of outcome distribution in figure 4 was created with package *ggzoom* (Pedersen, 2021). The linear regression model was fitted in base R.

5. RESULTS AND DISCUSSION

The initial 457-query set was executed in PostgreSQL for a small database load (scale factor = 0.01GB). After translation into Cypher syntax, the query set was executed in Neo4j.

The main variable of interest for assessing the database query performance is the query duration expressed in milliseconds. The distribution of query duration is shaped as in Fig. 4. For both servers, the outcome distribution is skewed, and the number of outliers is large.

As for RQ1 (*Are there significant differences on overall query performance between Neo4j and PostgreSQL?*), Fig. 4 suggests some differences between Neo4j and PostgreSQL, but not a clear winner. Magnified for the [0, 150] milliseconds range of duration (Fig. 4-left), the distribution would suggest better performance for PostgreSQL. Nevertheless, the overall distribution (Fig. 4-right) shows that distribution for PostgreSQL is scattered on the 1-1169 milliseconds range, whereas for Neo4j the values cover o much smaller range (8-216).



Figure 4. Overall distribution of the query duration (right) and its magnified 0-150ms range (left)

Because of the predictors and outcome distribution, the two statistics suggest different conclusions: the median duration in Neo4j was 1.56 times larger than PostgreSQL (47ms vs. 30ms), whereas the mean query duration in PostgreSQL was 1.6 the size in Neo4j (87.9 ms vs. 55.2ms).

The differences between the database servers were tested for statistical significance with the non-parametric Mann-Whitney test (because the outcome and predictor distributions were not normal). For this test, the null hypothesis (H0) may be stated as follows: *there are no significant differences between database servers on the query duration*. Fig. 5 shows that the differences between median query duration in PostgreSQL and Neo4j are statistically significant (p-value < 0.001), even if the effect size is small (0.18, CI95% [0.11, 0.25]).

As for the RQ2 (*Does the database server rank as a significant predictor in explaining the outcome variability?*), to assess the predictor importance in outcome's variability, a classical linear regression model was fitted using the function *lm* in base R. The correlation plot (not shown) recorded no large collinearity among predictors.

Since the distribution of duration is skewed, the outcome was transformed with log10 function, so the regression formula was: log10(duration) ~ schema + s_cols + s_non_aggr_f + s_aggr_func + f_joins + w_predicates + w_like + w_non_aggr_f + o_cols + limit + offset.



Figure 5. Results of the non-parametric Mann-Whitney test, as provided by the *ggstatsplot* package

The model was statistically significant (F-statistic (11, 902) = 80.59, p-value < 0.001) with R2 = 0.49 (the model can explain almost half of the outcome variability). Table 1 shows the coefficients.

term	estimate	std.error	statistic	p.value
(Intercept)	0.987	0.0429	23	0.0000
db_serverPostgreSQL	-0.294	0.028	-10.5	0.0000
s_cols	0.0155	0.00195	7.98	0.0000
s_non_aggr_f	0.0304	0.00415	7.32	0.0000
s_aggr_func	0.061	0.013	4.68	0.0000
f_joins	0.119	0.0132	9.03	0.0000
w_predicates	0.0779	0.0107	7.28	0.0000
w_like	-0.116	0.0464	-2.5	0.0127
w_non_aggr_f	0.0295	0.0304	0.969	0.3330
o_cols	0.0269	0.0151	1.78	0.0753
limit	0.000125	0.0000485	2.59	0.0099
offset	-0.0000311	0.000046	-0.677	0.4980

 Table 1. Coefficients of the linear regression model

 where the outcome is log10(duration)

Only three predictors - the number of non-aggregate functions included in predicates ($w_non_aggr_f$), the number of ordering columns (o_cols) and the number of initial rows to be removed from the result (*offset*) – were ranked as non-significant, since their p-value exceeded the 0.05 threshold.

Neo4j is the reference value for the nominal variable (*db_server*) in the regression model. Relative to Neo4j, in PostgreSQL the queries took on average less .294 milliseconds.

6. CONCLUSION

Various attempts to compare the query performance of relational/SQL database server vs. graph data stores have been limited to mainly small and non-random query sets and small distributed setups. This paper present preliminary results of a SQL query generator which also translates SQL queries into Cypher queries.

For this paper, the generated queries were simple, containing joins (in FROM) and predicates (in WHERE), non-aggregate and aggregate functions (in SELECT and WHERE), but no GROUP BY and HAVING clauses. The 457query set was translated into Cypher and executed on a distributed architecture of PostgreSQL (Citus) and a similar distributed setup for Neo4j. Results (query duration) were collected with JMeter.

As the database size is tiny (0.01GB) and the generated query were relatively simple, no clear winner emerged. Exploratory analysis shows a smaller mean of

the outcome (and, consequently, better performance) for Neo4j. But when considering the non-normality of the data distribution (both predictors and outcome), PostgreSQL emerges as the better contender. Also, both the non-parametric Mann-Whitney test and the linear regression model (in the linear model the outcome was transformed with LOG10 function) suggest better performance for PostgreSQL/Citus.

Further research would include queries with GROUP BY and HAVING clauses. The database size should be increased to more realistic sizes (at least tens or hundreds of Gigabytes).

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ART PHOTOGRAPHY CONSUMPTION IN ROMANIA. A QUALITATIVE STUDY OF PHOTOGRAPHERS' VIEWS ON ART PHOTOGRAPHY CONSUMPTION MOTIVATIONS

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ABSTRACT

Purpose – The purpose of this paper is to gain knowledge about the current state of the Romanian art photography market. This article's aim is to explore art photography consumption motivations, influencing factors and consequences at the macroeconomic and social levels.

Design/methodology/approach – Several experienced photographers served as respondents to explore the Romanian art photography market. An art photography overview was done. There were analysed subjects as: what is ,, art photography", what types of photography have a greater demand and supply, the relationship between the promotion of artistic photography and the level of consumption, motivational factors that lead consumers to buy artistic photography, the influence of the state on the photographic market etc.

Findings - The Romanian artistic photography market is underdeveloped. The main factor contributing to the underdevelopment of the market is the lack of visual education. The most common type of artistic photography found in Romania is landscape photography. Fine art photographers make a living from commercial photography or make money from other activities. Romanian photographers do not know how to promote themselves.

Originality/value – This paper aims to analyse the current state of the Romanian art photography market and serves as a base for future studies in this area.

Keywords: the Romanian art photography market; art photography consumption; photography marketing; photography promotion; art photography supply; art photography demand.

JEL Classification: M310.

1. INTRODUCTION

What makes people consume art photography and what are the benefits of art photography consumption? By comparing Romania with other European countries we can observe that the art photography consumption in Romania is not as developed as it is in other countries. Which are the particularities of art photography consumption in Romania we will discover in the following paper.

"Writing just like talking can ease the pains of the soul" (O. Paler). Could O. Paler's statement about writing be paraphrased as "Photography just like talking can ease the pains of the soul."?

John Berger in Ways of Seeing said "Seeing comes before words. The child looks and recognizes before it can speak.". Is visual language as important as written or spoken language? Several authors cite a Chinese proverb whose source is unknown "A picture is worth a thousand words". But do we as individuals (consumers) realize this value of images?

This paper represents an empirical study of the Romanian art photography market. This study is the first step of the research on "Art photography consumption motivations – influencing factors and consequences at the macroeconomic and social levels".

The aim of this study is to test the interview guide and to collect data about current state of the art photography field in Romania, which involves the demand and supply study for art photography.

The purpose of this paper is to present the results of testing an interview guide. And to share valuable information regarding art photography consumption in Romania.

Each step of the process is explained in this paper.

2. LITERATURE REVIEW

The consumption of artistic photography, just like the consumption of art, needs to be promoted like consumer products or the daily consumption of water as they are promoted in the Mass Media, for example.

The analyzed studies show us that there is a major influence of art consumption on the economy and on societies. Some examples of this would be art tourism in Florence (Italy), Madrid (Spain), Chicago (USA), but there are many others.

Even if the art photography consumption seems to be an important subject for our society, there are not articles written on art photography consumption theme. We have searched for keywords as "art photography consumption", "photography consumption", "photography marketing", "photography promotion", "consumption of photography" and didn't find anything regarding these themes, therefore we have enlarged our searches with words like: "visual arts consumption", "visual consumption", and "cultural consumption", "consumption of art". At the end of searches 20 articles were found. A study by the Museum of Modern Art (MoMA) showed that reopening the museum would generate more than 4,000 jobs and \$650 million in New York City revenue, \$50 million of which would be paid in taxes (Hassett, 2006).

Another study shows us that artistic and cultural production has a significant contribution to the gross domestic product (GDP) of several countries and a strong influence on prestige for owners, whether private collectors, cities or countries (Grigoroudis, 2020).

At the social level, the placement of art objects in stores is associated with marketing performance, store differentiation, brand image creation and customer satisfaction. Interacting with art objects in stores elicits positive emotions (eg, well-being, curiosity, excitement, alertness, focus) (Jeongah Kim, 2021).

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Another argument in favor of photography can be found in the book Visual Consumption written by Jonathan Schroeder in which the author states that "A key feature of the 21st century economy is the 'image'. Products are promoted through images, and corporate image is essential for economic success." (Schroeder, 2002).

Also, there is a strong evidence that artistic features could be applied in marketing to have a positive impact on consumer evaluation (Crader, 2007). For example, applying some photos or reproducing some paintings on wine labels could associate the product with a prestigious product.

As photography is part of the arts, we can consider that it can also have a major socio-economic impact. However, after carrying out a study with aim to identify scientific articles for Literature Review, we found that the subject of art photography consumption and art consumption in general, have been little studied. Which represent a good opportunity and a challenge for us in the same time.

3. RESEARCH DESIGN

The theme of my doctoral studies is "Art photography consumption motivations - influencing factors and consequences at the macroeconomic and social levels". And this research represents a piece of the big research which will be done in following years.

In order to study this topic, in the first phase, we did an empirical analysis of the Romanian photographic art market. In order to find a clearer direction for research and position ourselves as researchers, we realized an overview of the market to help us with first directions.

In the first phase of studies we will do a series of in-depth interviews with experts in the field. Before doing in-depth interviews with experts who have a high valence, we set out to test the interview guide on a sample of 3 respondents who are highly experienced in the field of art photography.

This test will help us to define a better interview guide and to get a deeper introduction to the field so that we can have a more solid discussion with experts.

The purpose of research – to test the interview guide and to collect data about current state of the Romanian art photography field, which involves the demand and supply study for art photography.

The decision problem:

Identifying an optimal interview guide model for conducting in-depth interviews with experts in the field.

Research problem:

To gain knowledge about the current state of the Romanian art photography market.

Research objectives:

O1 - Testing the interview guide on a sample of 3 respondents in order to improve the interview guide for future interviews;

O2 - Creating an overview of the current state of the Romanian art photography market;

O4 – To identify the definition of the term "Art photography";

O5 - To identify types of photography that have a greater demand on Romanian's art photography market;

O6 - To identify types of photography that have a greater offer on Romanian's art photography market;

O7 - To identify the relationship between the promotion of art photography and the level of consumption of art photography in Romania;

O8 - To identify the motivational factors that lead consumers to buy artistic photography;

O9 - To identify the influence of the Romanian state on the art photography market;

O10 - To identify the influence of non-governmental institutions on the art photography market;

O11 - To identify social effects of photography;

O12 - To identify economic effects of photography.

Fundamental hypothesis:

Solving the above-mentioned objectives requires the analysis of the photographic market, the current context, the particularities of demand and consumption, the promotion of photographic art and existing programs at Government level.

In close connection with the research objectives, the following fundamental hypothesis was established:

The Romanian art photography market is underdeveloped due to the lack of consumer culture of art photography, which is caused by the lack of visual education.

Working hypothesis:

To verify the fundamental hypothesis, starting from the purpose of this research, the following working hypotheses will be established:

 H_{W1} – The interview guide is very complex and may lead to the repetition of some discussion topics several times;

 H_{W2} – The Romanian art photography market is underdeveloped;

 H_{W3} – The term "Art photography" is ambiguous and understood differently depending on the interviewee;

 H_{W4} – The demand for art photography is very low and it comes down to the consumption of 1-2 types of artistic photography;

 \mathbf{H}_{W5} – There exists an offer for art photography but it is not made available to the market;

 H_{W6} – Due to the lack of a promotion strategy of art photography, art photography is not bought;

 $H_{W7}-\mbox{Consumers}$ are motivated to buy art photography to decorate their homes;

 H_{W8} – The state negatively influences the art photography market through the lack of policies and laws to support this branch of art;

 H_{W9} – Non-governmental institutions have a great influence on the promotion of photographic art in Romania;

 H_{W10} – Photographic art has a major social impact;

 H_{W11} – Photographic art has very little impact on the economy.

Method:

We conducted 3 in-depth interviews with 3 respondents who have complex knowledge about the field of art photography. The interviews were conducted based on an interview guide containing 9 discussion topics, 27 semi-structured questions. The interviews lasted between 30 to 70 minutes.

Sampling:

To conduct the interviews, were selected 3 people who practice art photography, have studies in the field of arts and/or have followed art photography courses. All respondents are part of the "Photography Club of Iasi", they are between 28 and 35 years old and have an experience in the field of 8-15 years.

Data operationalization:

Participants' names were coded. The filmed interviews were transcribed and the text coded for easier data analysis.

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Interviewer's ID	Interviewer's profile	Age
1-FMI-28-M	 University Studies: Arts Design studies Member of the "Photography Club of Iasi" 	28 years
2-CP-35-M	 University Studies: Geography Self-taught photographer (photography courses) Member of the "Photography Club of Iasi" 	35 years
3-CM-28-M	 University Studies: Arts Photography studies Member of the "Photography Club of Iasi" 	28 years

Table 1. Encoding of participant names

Coding:

In order to create the codes, we identified 13 main categories/themes:

the artist's personality, financial aspects, differentiating elements, market, consumer education, demand, spaces for selling artistic photos, communication (advertising), photo albums, groups of photographers, promotion, exhibition spaces, public institutions.

We have created 243 codes. The most frequently encountered codes are: lack of education (10 times), lack of information (5 times), feeling (5 times), landscape (5 times), and lack of museums (4 times).

At this stage of the research, a correlation between the codes was not achieved. Codes were created in order to track the frequency of discussion topics.

4. FINDINGS

In the following table the results for each hypothesis are presented. All interviews were analyzed and short results are presented below.

Hypothesis	Results
Hw_1 – The interview guide is very complex and may lead to the repetition of some discussion topics several times;	The interview guide has too many questions. Because of the structure, many answers are repeated.

Table 2. Hypothesis and findings

Hypothesis	Results
Hw2 – The Romanian art photography market is underdeveloped;	The market is underdeveloped, this aspect was mentioned by the 3 respondents <i>"the market is not necessarily</i> <i>developed"</i> , <i>"there is no demand for artistic photography"</i> , <i>"we do not know at the mass level that there is a market in</i> <i>this direction</i> ".
Hw3 – The term "Art photography" is ambiguous and understood differently depending on the interviewee;	Two respondents mentioned that it is difficult to define "Photographic Art". All respondents mentioned that there is no clear demarcation between artistic and commercial photography "Artistic photography and commercial photography are not very precisely separated from each other.".
Hw4 – The demand for art photography is very low and it comes down to the consumption of 1-2 types of artistic photography;	All respondents said there is a very little demand for photography. They all mentioned that the most bought type of art photography is landscape <i>"landscape photography but people don't necessarily buy it for artistic reasons</i> ".
H_{W5} – There exists an offer for art photography but it is not made available to the market;	There are photographers who take artistic photography but do not clearly communicate whether the photo is for sale or not. As a rule, photographers make money from commercial photography (christenings, weddings, magazines, etc.) and they do artistic photography for pleasure. Knowing that it can't be bought, photographers didn't even bother to put it up for sale <i>"I have no way of</i> <i>knowing that a photographer is selling if he doesn't show</i> <i>me this thing</i> ".
H_{W6} – Due to the lack of a promotion strategy of art photography, art photography is not bought;	There are a number of factors. We couldn't come to a conclusion. All respondents mentioned that photography is little promoted both by the state and by photo artists. But the lack of demand can be caused rather by the lack of consumer education for art photography. All respondents mentioned that there is a lack of education or a lack of culture in this regard. <i>"the market being uneducated, they don't know how to appreciate it at its true value"</i> , <i>"Probably they are uneducated and see no real value in photography"</i> , <i>"the national art museum where hardly anyone knows where to enter is</i> ".
Hw7 – Consumers are motivated to buy art photography to decorate their homes;	Two respondents mentioned that the photo is bought for decorative reasons (beauty) <i>"I would put a picture of the</i> <i>Sahara desert in the living room</i> ", <i>"Because the photo is</i> <i>beautiful, it looks nice on the wall, you know, for</i> <i>decorative reasons or strictly because promoting, what we</i>

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Hypothesis	Results		
	were saying earlier, let's say Romania in this case.". Other secondary motivational factors are: industry support, investment, identification with the image.		
Hws – The state negatively influences the art photography market due to the lack of policies and laws to support this branch of art;	The three photographers said that they haven't heard of any policies supporting the photographic art market. The respondents mentioned that the State is not involved in this regard. There are no funds, no politics, etc. " <i>Not once did he give money, not once did he finance an exhibition.</i> "		
Hw9 – Non-governmental institutions have a great influence on the promotion of photographic art in Romania;	There are few non-governmental institutions but those that exist are involved in promoting the art photography. There are rather private galleries that promote artists <i>"Where they</i> <i>exhibit, they exhibit in private galleries.</i> "		
Hw10 – Photographic art has a major social impact;	Two respondents were in difficulty. It was difficult for them to identify what social impact the photographic art has. The third respondent mentioned that artistic photography has a very large social impact <i>"since this medium appeared, photography has at certain moments in</i> <i>history had a very large impact from the way in which</i> <i>certain things were captured, if we are now talking about</i> <i>documentary photography</i> ". Likewise, it was mentioned by two respondents that photography creates connections between people <i>"It</i> <i>connects them to each other when they exchange some</i> <i>things.</i> ", <i>"I mean it somehow connects them</i> ".		
\mathbf{H}_{W11} – Photographic art has very little impact on the economy.	All respondents mentioned that artistic photography has very little economic impact "I don't think so. I don't think it has an economic impact.", "No. Why do I think so? Because no, there is no sale of photographic art.", "No, I couldn't really say that in our country."		

5. CONCLUSION AND IMPLICATIONS

1. Before the interviews, a "calibration" must be carried out with the respondents, we need to define the "Photographic Art" to which the researcher refers. Respondents get confused when it comes to differentiating between artistic and commercial photography. Some photographers see more of a combination of the two. And during interviews, they sometimes refer to other types of photography such as documentary photography or photojournalism.

2. The artistic photography market in Romania is underdeveloped. The main factor contributing to the underdevelopment of the market is the lack of visual

education. Respondents mentioned that there is no subject in the school that addresses photography, as there is drawing or music. Similarly, there is no museum of photography, there are not enough galleries, there are not enough photographic events, and there is no Union of Romanian Photographers as there is the Union of Writers for example.

3. The most common type of artistic photography found in Romania is landscape photography. The greatest supply and demand exists for this type of photography. Likewise, there is a demand for nude and semi-nude photos.

4. Fine art photographers make a living from commercial photography or make money from other activities. Artistic photographers in Romania do not manage to support themselves from artistic photography. Artistic photography being more of a hobby for them.

5. Romanian photographers do not know how to promote themselves, to communicate effectively, to have a clear promotion strategy. Most of the time they don't put their photos up for sale "If I like a photographer's photos, I have to write him a message and ask him if he sells them.".

6. The state does not support artistic photography. Artistic photography is part of the field of arts, it does not produce profit as a rule, and therefore, it must be supported by the state.

7. There were several intentions to create photography festivals and other types of events, but many of them were not carried out. Some had a few editions and then disappeared.

8. Photographic art has a major social impact, it is an important way of documentation and communication.

9. To confirm the information collected, interviews with a larger sample of experts should be conducted. After carrying out the interviews with experts, a quantitative research must be carried out so that we can extrapolate and generalize the conclusions.

Cause-effect relationships identified:

- The lack of a photography subject in schools leads to a lack of visual education.

- Lack of visual education leads to lack of consumer demand for artistic photography.

- The lack of consumer demand leads to the underdevelopment of the field of photographic art (some photographers give up during photographic projects because they are not sustainable, they fail to finance them from their own sources).

Limits and future directions

- Small number of interview participants;

- Participants' knowledge of specific topics, such as the existence of laws or policies to support artistic photography;

- Limited time for deeper analysis of collected data;

- Data transcription. Due to the many questions asked, the interviews were long and difficult to transcribe. Likewise, the quality of the recording and speech created difficulties in transcription.

Future directions

- Carrying out in-depth interviews with experts;
- Surveying a larger sample of photographers using questionnaires.

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CONSTRUCTION EXPERTS' PERCEPTIONS OF SCHEDULE DELAYS IN CONSTRUCTION PROJECTS

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ABSTRACT

The constantly changing reality is posing great challenges to construction these days. Management teams need to control the flow of information, coordinate all factors, understand an up-to-date picture of planning versus execution, and manage unpredictability. Those scenarios, therefore, call for creative solutions and a continuous search for the necessary work material. There are many types of research studies investigating the causes of construction delays. However, research on the influence of frequent changes on a construction project's schedule still needs to be completed.

This paper is part of a Ph.D. thesis addressing the significant factors of delay in a construction project in a changing reality. It contains a representative quality sample of concepts of construction industry experts' views regarding frequent changes during the construction project, concepts of management, and impact on the project's conduct and the time of the project. The study will list the cases in which changes during the project affect its schedules.

In many studies, the causes of delays in building projects were analyzed. Still, there was no analysis of the effects of changes that were introduced during the project, which would be potentially beneficial to stakeholders and professionals. The Ukraine- Russian war, the Covid-19 pandemic, and the closure in China and their impact on global materials and the impact on organizations with changing needs have influenced the ability to manage a rigid construction project in flexible methodologies; hence, the goal of this research is to examine project managers' perception of causes of delay in construction projects in an uncertainty reality.

Keywords: project management; construction industry; changing reality; organizations change; hybrid model.

JEL Classification: M14, M15, C61, O32.

1. INTRODUCTION

In any instance where the project entrepreneur changes plans or scope of work (SOW), the project manager is to return to the programs and plan all projects from the first step. This changes the original timeline (T.L.) of the project.

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Over the years, various project management techniques have been developed in a constantly changing reality to meet the need of project managers. Some of these methods, such as Agile methodologies, are based primarily on the manifest for agile software development (Beck et al., 2001) and on the belief that primary programs are ineffective and an evolutionary, iterative, more efficient process is critical for meeting the project needs during its life cycle (Dingsøyr and Dybå, 2008). Agile Project Management differs from traditional projects and product management, such as the waterfall model, by emphasizing continuous design, flexible scope, coping with uncertainty, constant customer interaction, and modifications in the project team's structure (Serrador and Pinto, 2015). Figure 1 illustrates Traditional Waterfall Construction Project Process (Von Rosing et al., 2014)



Figure 1. Traditional Waterfall Construction Project Process (Source: Von Rosing *et al.*, 2014)

The Western world has realized the crisis in the industry, and in many countries, the governments have recruited to help their construction and infrastructure industry accomplish their missions. For example, in Italy, the government passed in mid-May 2022 legislation to determine that existing contracts held during the year shall receive an immediate payment of 90 percent of the project's materials increase. At the same time, it has provided 7.5 billion euros for new and expensive contracts that have not yet been released.

According to the Emergency Regulations of the Ministry of Greek infrastructures, the Greece Government has updated the construction costs since the last quarter of 2021. The government paid benefits to contractors upon completion of the projects.

In France, new rules have been established for public hours, facilitating changes in tenders due to unforeseen circumstances while cancelling fines.

Often, things change unexpectedly during the project. The initial design, design, and project estimates are ready and established, and the contractor has a

detailed and realistic plan. However, some core project team members can leave the organization with no forewarning during the project. Either a new technology has surfaced, or there is a problem providing equipment or raw materials when working professionally. It is more appropriate for use than the one in the original plans.

These events might severely jeopardize the success of your project, and at this point, we need to go back to the previous project stages, rethinking them and considering these new realities. Project management is the guidance and coordination of personnel and materials resources throughout the project period by implementing management techniques to achieve pre-defined goals of content, quality, time, cost, and satisfaction of stakeholders. Project management involves the art of achieving goals effectively and efficiently. Some project methodologies, such as Agile and Lean construction (Lean construction, has the purpose of meeting customer needs effectively. Lean construction rests on the principles of production management of construction. The result is a new project delivery system that can be applied to any type of construction but is particularly suitable for complex, unclear, and fast projects, focusing on planning and effectively managing the construction project.

Agile has been effective in hardware and software projects rather than in traditional construction projects. The Lean Construction Methodology involves reducing the waste produced by a given project. Although companies take the waste of material, which benefits the environment, they will waste time and labor by providing efficient supplies and use of materials (Lean Construction Institute, Iris D. Tommelein *et al.*, 1999).

Building Information Modelling (BIM) addresses an interactive design that sees all the structural systems during the planning to synchronize all interfaces and make quick decisions as a decision-making tool. The full Ph.D. research shall explore an Objective Schedule Model – that can manage the changes during the project from the perspective of resources, schedule, and budget. This research aims to examine project managers' perceptions regarding the cause that will or will not cause schedule delays in construction projects. Hence, the research question was: What factors will or will not cause a schedule delay?

2. LITERATURE REVIEW

Unplanned changes in construction projects may yield disruptive effects, resulting in project delays, cost overruns, and quality deviations. More effective management of the changes may reduce the disruptive effects and limit the cost overruns from rework, reaching 10-15 percent of the contract value (Senaratne and Sexton, 2009). Construction projects are likely to deviate from the original schedules due to changes in the project characterization caused by the project manager, the developer, or the owner. Delay in schedules causes great financial loss and frustration for most of the project. In recent years, the number of changes

in the characterization of needs has been increasing significantly during a project due to the speed of changes in the environment, leading to projects often not meeting their set goals of budget, schedule, and quality.

Unfortunately, there are numerous causes of construction delays, and the plethora of studies available in the research landscape testifies to this fact. Thus, it can be argued that there is no consensus on what constitutes a major delay cause, resulting in a varied perspective on the subject matter by researchers (Sweis *et al.*, 2008). One of the earliest studies into the causes of construction delay was presented by Baldwin and Manthel (1971), who presented 17 causes of construction delays in the United States.

Most research has focused on the key causes of delays in building projects, and in recent years, the changing reality and the frequency of those changes are the central causes of delays. The focus group discussion conducted for this article addressed the question of how the changing reality affects the conduct of the project and what solutions are offered by experts from the construction industry to this issue.

Global construction industry data indicates a good steady growth. Some regions witness upward movement, while others show signs of slowing down. There are indeed some challenges. However, countries and cities will always need infrastructures to support development, services, social activities, and economies. Building repairs and improvements will always be around. Thus, the construction industry will always be in need.

However, construction professionals should keep up with the shifts in paradigms-the mindsets and technology that comes with them. These and other external market forces would shape the industry's future in the years to come.

Several factors are responsible for overcoming costs and delaying schedules in construction projects. Previous studies have defined the cost of the project as the difference between the total cost required to complete the project and the estimated/budget cost at the time of the agreement or contract (Sharma S. and Gupta AK (2019); Doloi et al., 2012). According to the literature, the time to flood is defined as the difference between the time required to complete the project and the time agreed upon by consent or contracted to move the entire project (Yang and Wei, 2010). The literary review shows that ownership and project times negatively affect the project and its associated construction companies. Companies sometimes watch bankruptcy because of this flood (Kazaz et al., 2012). Therefore, a systematic study of these streams should provide clarity on the critical and floating factors involved and adjust the work processes to address these industries. The first step in a literature proposal is identifying the factors involved in construction projects. This is an important step because we can't move forward without knowing what factors are (Doloi, 2013). After evaluating identified flood factors and analyzing critical factors that have the maximum impact on flooding, a hybrid model can be built to manage building projects concerning delays and frequent changes.

According to Memon *et al.*, (2011), time overrun is ultimately a cost overrun, one of the important performance indicators for a project. Delays are characterized as a loss of efficiency and productivity in the construction industry (Sanni-Anibire *et al.*, 2020).

According to "The Israeli Center for real estate," from June 2022, it took more than 350 days to have a permit in Israel, and 25 different procedures are required for a typical warehouse construction permit in India (Press reports; World Economic Forum; The Boston Consulting Group (2021).



Figure 2. Average time for a building permit, "The Israeli Center for real estate"

A change in construction is to be anticipated. Innovation may help reduce design and material costs, for instance, recycling materials, reducing costs in finished materials due to innovative manufacturing technologies, and more. Also, regarding construction automation, it should be assumed that robots will enter more building projects. Of course, they will probably start with lighter structures and scale into more complex structures like multi-story buildings, maintenance repairs, 3D construction, and other technologies.

Furthermore, in terms of productivity, large and small construction companies are expected to adopt modern productivity technologies such as project management solutions. These will help manage business processes that support building correctly. All these developments in the construction industry will directly affect the need to adapt to changes and execute construction projects in hybrid (Barbosa Franco *et al.*, 2022).

Delays may arouse multiple issues in the construction industry, like legal battles, increases in costs, further project delays, productivity, financial losses, and contract failures (Hamzah *et al.*, 2009). According to Trauner (2009), delays adversely affect the interests of project stakeholders by increasing the cost associated with the project. Delays are considered influential factors damaging most projects' success profiles (2013). Various studies have been conducted to

identify significant causes of delays in different regions of the world. Faridi and El-Sayegh (2006) surveyed UAE (United Arab Emirates) and found that late approval of drawings, delayed decisions, and improper planning are the major causes of delays. According to Assaf and Al-Hejji (2006), the unavailability of workers and financial issues were the major causes of delays in KSA (The Kingdom of Saudi Arabia). At the same time, Rahman *et al.*, (2014) identified inflation and political instability as significant causes of delays in Bangladesh. There is no consensus among authors as the essential reasons vary based on project type, region, nature of construction industry, firm size, experience, cultural differences, technical expertise, etc. This lack of consensus is due to the unique characteristic of construction projects (2022).

Other significant factors for delay in a construction project are a change by the Client, Delayed payments, Contractor's Poor planning and scheduling, Contractor poor management, Labor availability, and Contractor's financial issues (Assaf and Al-Hejji, 2006)

This study examines through a focus group discussion the perceptions of experienced project managers and other experts from the construction world regarding the impact of the incoming changes during project execution, the effect of changes on schedule, and the delay in project delivery.

3. METHODOLOGY

As established earlier, within the framework of a mixed-methods approach, this paper is based on the perceptions of a representative group of experts from the construction industry. The qualitative research population consists of seven construction project practitioners, including experienced construction project managers, architects, and real estate developers. They have signed an informed consent form before their entry into this study. The participants' responses were recorded during the discussion, and the responses underwent content analysis.

Despite involving a small number of participants, they represent the phenomenon under this study and, therefore, can account for the sample population, as focus group discussions can produce large amounts of data on the research topic. The interaction between the participants in the focus group discussion may be a precious source of data that cannot be gathered during the individual interviews. The collection of this data may be enhanced by notes recorded by the researcher about the context of the discussion. Qualitative analysis of these rich, contextual details could uncover the themes and patterns in the participants' responses, which become the focus of the qualitative research analysis.

The book by Prof. Michal Krumer-Naboo and Leah Ksen: "Quality Research Content Analysis" (2010), lists the steps in collecting and analyzing the data in a qualitative study. Content analysis is an essential step in quality research and is based on content as text. Depending on the method of analyzing the data collected in the group discussion, the conversations will be fully tabulated and sorted into categories and themes. The qualitative analysis focused on the question asked in the group:" What factors will or will not cause a schedule delay in construction projects?"

The content analysis yielded five categories to identify the participants' responses' central themes. Each category was divided into four themes.

We chose and marked a quote or two that demonstrated that same perception or experience. This stage helped us immensely in the last step - presenting the findings.



Figure 3. Project managers' perceptions regarding schedule delays in construction projects: What factors will or will not cause a schedule delay? Findings emerging from the content analysis

The analysis of the experts' answers indicates that the key contributions to the schedule-shorting of the construction project given frequent changes are a temporary shortcut to issuing building permits and authorities and making quick decisions on the construction site by the project manager and the team.

Table 1 lists the responses of focus group participants as they are divided into both categories after parsing the answers according to keywords.

The content analysis shows that a delay in project schedules is affected by various factors rather than one element. The factors do not necessarily depend on each other and often require a standing up of several criteria to deliver the project in time.

In addition, internal factors such as co-workers and owners and external factors such as permits or other regulations, getting quick or detailed design answers from external advisers such as architects, conservators, safety consultants, and fast project managers can cause delays.

Themes	Categories				
	The factors that will cause a	Factors that will cause the			
	schedule delay	project to deliver on time			
Economic	"Financial problems of the	Cooperation between all			
Perceptions	developer who doesn't transfer	interfaces in the project			
	funds in time to the contractor."	"As the project manager gets			
	"When the amount closed in	along with the developer and the			
	agreement with the contractor	contractor, things go easier and			
	does not fit the workability."	help the project advance quickly."			
	"The materials costs are rising"	"Poor relationship between the			
	"Lack of skilled workers"	project manager and the			
Planning and		contractor can cause the worse			
collaboration		delays."			
	"There are many changes during	"Everyone is signing the plans and			
	the project."	approving them."			
	"No one understands what they	"The program and SOW of the			
Raw material	want."	project were very clear."			
lead time	"We don't have a clear-cut plan."				
	"All the furniture is delayed at the	"Ordering raw material and			
Regulation	port."	furniture right away with a			
	"Raw material lead time is long."	contract signature			
		"If the local committee quickly			
		approves the plans, the whole			
		project will run swiftly and			
		smoothly.			

Table 1. Quotes from the words of the focus group participants
on the central question and the themes

During the project, many changes are made. Some changes are caused by internal reasons such as changes in the characterization of needs by the work order, changes in plans, or organizational changes that require planning change.

Some of the changes are caused by external reasons that are independent of the contractor, project manager, or work order, such as raw material lead times, the rise in prices of raw materials and furniture, delays in the ports due to Covid-19, and additional building permits or regulation permits.

Because the factors that change do not always depend on decision-makers or labor campaigns, the construction industry needs a project management model that should be more flexible and adaptable to frequent changes and prevent deviations that may result in high costs and delays in the project schedule.

4. **RESULTS AND DISCUSSION**

This paper explored the perspective of construction experts on schedule delays in construction projects. Also presents a literature review relevant to today's changes and innovation in construction projects and delaying factors that affect budgetary anomalies and building project schedules. The research contributes to the field in several ways. Through a focus group, a list of factors affecting scheduling delays and factors that can make the project ready at the scheduled time. This has implications for project managers that look for project delays' impact on the construction industry. Researchers have access to the literature survey and the quality research findings done through a focus group and professionals, the reasons, and the actions that can be done to deliver the project on time.

Although there are similarities between the causes of delay in building projects in the review of the literature (Sharma S. and Gupta AK, 2019) and the factors that have emerged from the focus group (money problems of the entrepreneur, a delay in payment for the contractors, delays in permits, lack of skilled workers at construction sites), there has also been a difference in factors affecting delays that are part of the uncertainty that has increased since the beginning of the Covid 19 outbreak and affects decision making and supply times, for example, "All the furniture is delayed at the port."

Frequent organizational changes, affected by the new hybrid working model and zoom meetings, all affect the required planning, for example, "No one understands what they want."

As well as a lack of skilled workers at construction sites "Lack of skilled workers" and general contractors' distress in the construction industry. These are all evidence that innovative solutions need to reduce these inhibitors.

The Ukraine war also changed the rules of the game on providing raw materials to the construction sites, and unexpected costs as well as long supply times; in the focus group, for example, the experts discussed the cost of the raw material "All the furniture is delayed at the port." And their long lead time.

Analysis of the focus group answers found two main categories. The factors that will delay the schedule and the factors that will allow the project to be delivered at the planned time.

Each category is divided into several key subdivisions.

The themes are independent of each other, and there is a need to study the impact of each of them.

• Economic issues - As part of the factors that cause schedule delays, it has been revealed that financial problems and lack of payments to contractors in time can cause a problem with a lack of skilled employees on the site, raw materials lead time, purchasing, and timely delivery.

• Planning and Collaboration - A lack of on-site communication between the teams, between the project manager and professionals, and programs that are

not updated and frequently modified due to work order changes also cause delays in the project schedule. Part of the project manager's skills is to communicate with all the factors, entrepreneur, contractor, and architect, and make quick decisions. The clarity of job orders and approved programs to advance according to schedule. Any changes on the work plans and any changes in the project characterization require repeated communication among all factors, additional material orders, and sometimes a complete stop to the project. The implications of advanced technologies reviewed in the literary Review section affect the rapid decisionmaking and automation of construction through software and ground elements that come to the site ready to assemble have not yet been entered into the construction operations of power.

• Raw material LT (lead time) - The World Bank: "The Ukraine conflict has triggered the biggest commodities price shock in nearly 50 years, and the impact on food and energy is set to last until 2024". As of April 2022, the journey from the Asian factory to the Europe port is 118 days = more than double the trip days in 2019. That challenge requires the careful planning of material orders for the site and meticulous management of the schedules. If there is a delay in materials, including the project, the project manager must find an alternative in coordination with the entrepreneur and contractor that is suitable for the project budget and does not delay the schedule.

The factors that will cause the project to deliver on time. the second category is Factors that will cause the project to be ready on time. In that category, two themes can affect a schedule delay: regular and quick decisions. In most countries, a permit process takes several months; in Israel, it may take sometimes more than one year. Therefore, if the decision is quick, all permit processes can be more effective. Every change that comes during the contractor work needs a wide answer that gathers the budget, timeline, and the costumer's needs – and all of that without stopping the workers.

Entering a new method into the construction industry needs a change in management and innovation perspective.

• Shortening regulatory approval times – the project execution depends on the municipal permit. According to ,,The Israeli Center for real estate," from June 2022, it took more than 350 days to have a permit in Israel.

• Quick decisions - In this study, all participants raised problems with frequent changes and primarily a lack of quick decision-making when different delays arise in the field.

According to the focus group discussion, it is suggested that there is indeed a need for a more extensive and comprehensive study to be conducted in the framework of the doctoral dissertation, reflecting the problem of delays in building projects in changing reality, especially in finding management tools that encompass all changes from planning to delivery in a hybrid and flexible manner. This article is part of a doctoral work that will combine more quantitative and qualitative studies to produce a hybrid project management model that responds rapidly and cost-effectively to frequent changes in the project's life.

The study shows that innovative delivery methods and essential real-life sharing are changing, and information management, while the project is being conducted transparently, may affect the project's schedule performance. These methods improve communication and coordination between stakeholders in the project, which can solve common scheduling issues (Serdar Durdyev and M. Reza Hoseini, 2018)

A future study can explore the skills required for employees in the construction industry today due to the changing reality and innovative technologies and the impact of various delay factors on project schedules.

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SYNERGIES AND OTHERS JUSTIFICATIONS OF SOME ROMANIAN MERGERS

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ABSTRACT

The mergers, through the publications obligations they suppose, represent a valuable source of information about the merged companies, their strategies and their intentions on future developments. Analysing 168 merger projects published on the ONRC website, we extracted the declared economic reasons that justify the respective merger. The main arguments refer to the reduction of costs and to increase the efficiency/profitability, after the merger is completed. Of course, other expected synergies, such as increasing the size, the production, the sales, the administrative and managerial simplification, the increased negotiation power, the reduction of accounting and financial reporting obligations and of the fiscal reporting are invoked. A dominant feature of the analysed merger is the existence of close affiliation relationships between the merged companies, which significantly simplifies the formalities, especially those related to the evaluation of the companies involved in the merger. In this context, the absence of references to the financial distress situation of some companies can be explained – in the case of companies with negative equity – by the fact that, probably, a significant part of the liabilities of the respective companies are towards the shareholders.

Keywords: justification of the merger; cost reductions and efficiency increasing; administrative simplification, affiliated persons.

JEL Classification: G34, M40.

1. INTRODUCTION

Mergers and acquisitions (M&As) are analyzed, in the literature, from different and complementary perspectives (Baran and Saikevicius, 2015): strategic management (which analyzes determinants and types of transactions), economics (cost optimization, scale economies, elements regarding the market), finance (representation of shareholders, value creation), organizational researches (implementation of transactions, integration process, corporate culture), human resources management. It is considered that M&As are a significant phenomenon at a global level that allows the generation of business synergies, the acquisition

of new assets, the realization of tax optimizations, access to new technologies and new markets, increasing competitiveness and market value, as well as diversification of the business carried out (Stefko *et al.*, 2022).

The Romanian companies organized according to the companies' law (31/1990) can be involved in reorganization operations, including mergers. The law states specific rules for this type of operation, including definition, forms, formal legal conditions, reporting and publication obligations, involvement of various experts or financial auditors, relevant data on the steps of the merger, the rights and the obligations of the shareholders and managers.

For any merger realized in Romania, the managers of the companies involved (two or more) have the obligation to draw up a merger project in which to find the details of the operation. This project is transmitted to the Official Trade Register (ONRC) and will be made public. In the merger project, it is mandatory to present the justifications of the merger, that is, the main reasons why the companies have decided to merge, but also of the main expectations from the operation. In many concrete cases, the merger project comprises two categories of elements when justifying the merger. First, the legal arguments appear - as a rule, the decisions of the general meetings of the companies involved. The economic considerations complete the justification of the merger and highlight various arguments, many of them being found in almost identical forms in numerous reports. It is foreseeable to expect that, often, to invoke the synergy created by the mix of the resources of several companies, synergy that can be materialized in many other qualifications. For example, Andriuskevicius and Streimikian (2022) identifies operational synergy, financial synergy and collusive synergy.

The statistics regarding the merger operations are not always very clear, insofar as the main providers of such information put the mergers together with the acquisitions, offering global figures (number of transactions and values published or estimated of the respective transactions).

The purpose of the study is to identify, to rank, to illustrate with examples and to comment on the main economic justifications invoked by the parties involved in mergers whose projects are public. From a sample comprising 168 merger projects found on the ONRC website, for the period 2018-2022, we extracted the main components of the economic justifications of the respective merger, we have regrouped them on homogeneous categories and we set the frequency with which they appear, presenting a hierarchy in this regard. The results I have reached confirm what is already presented in the literature - the cost reduction and the increase of efficiency being the main arguments advanced by the merged companies. In fact, these objectives are intentions, about the confirmation of which I have no data and we cannot comment. Another dominant feature of the merger I analyzed is that most are made between affiliated companies: components of the same financial group (one of them holds shares in the other) or companies under the common control of some individuals. I do not expect to formulate a general framework, a scheme applicable to all merger – it would not be possible, considering the diversity of the situations in which merger takes place. I follow, in this way, the coordinates established by Kapil and Dhingra (2021) who, analyzing the relevant literature, conclude that the exact determinants of the merger cannot be formulated in a fixed form, which are dependent on the company, by the activity sector or by the activity sector or some other criteria.

In the continuation of the study, I propose a literature review, a section presenting the methodology and data, a results section, the conclusions and the main references.

2. LITERATURE REVIEW

The relevant literature on the merger almost always approaches the couple merger - acquisitions and refers, of course, especially to the developed markets of the world, taking into account, with priority, the listed companies. In the following, I try to outline the main results from the literature focused only on merger research.

The reasons why two or more companies decide to merge are among the most diverse, but they can be systematized according to the frequency with which they appear in literature under different names such as the advantages of the merger, determinants of the merger, justifications of the merger etc. Andrade *et al.* (2001) invokes the economic theory that has given more explanations about the reasons for the merger: reasons for efficiency (economy of scale and other synergies), increasing power on the market, even with the risk of creating monopolies and oligopolies, disciplining administration, by eliminating non-performing managers of the target companies, diversification.

Ali-Yrkko (2002) makes a grouping of the reasons for the merger, in several categories: reasons for economic performances and efficiency (reduction of costs, increasing power on the market, acquiring new resources, extending managerial control, speculation), managerial reasons related by increasing the power and satisfying the personnel profile of some individuals, macroeconomic motifs (following the successive waves of mergers, changes in the economic environment). In another systematization, Aktas and Boone (2022), analyzing the relevant literature, classifies the reasons justifying the M&As in:

- synergy reasons: cost reductions, scale economies, more efficient investments, elimination of redundancy, labor restructuring, decreased promotion efforts, entry on new markets, increasing product portfolio, placing complementary assets under common control, facilitating financing, providing cash-flows to companies in financial distress;

- market power reasons: increasing market share and limiting competition, securing providers and customers, increasing prices;

- behavioral reasons: excessive confidence, the feeling of undervaluation of the target companies;

- agency reasons: maintaining the position of the managers and limiting the chances of being changed.

It is also mentioned in the literature the connection between the company's life cycle phase and the probability that it is involved in a merger/acquisition. Audretsch (1989) shows that the merger can provide to the management of the companies a rapid way to transfer resources from a company in the decline phase to an industry with growth prospects.

Depending on the geographical and political context in which the companies involved are located, the merger/acquisitions can also represent a survival way, even if the serious financial problems do not yet make their presence felt. For the MENA area (Midlle East and North Africa), Battisti *et al.* (2021) identifies in the literature a few reasons that they consider specific: survival in the global environment, developing new technologies, increasing competitive advantages, intangible capital production. In about the same area, Ibrahimi and Liassini (2021) provides us an analysis of the Morocco mergers, both the domestic and crossborder.

Another structuring of the strategic reasons behind the M&As presents four categories: the increase of the market power, the increase of the political power (the ability to influence the authorities), the increase of the efficiency (in research, production, marketing) and ensuring differentiation of products or services (Carbonara and Caiazza, 2009).

The main reasons for the M&As are also found in studies regarding specific operations to a certain industry. For example, for the pharmaceuticalbiotechnologies industry, Danzon *et al.* (2007) confirms, among the determinants: avoiding the creation of an excessive logistics capacity (cause specific to the industry), the economies of scale, the market for corporate control, the acquisition of specific assets, the control over some more important treasury flows, the rescue by leaving the market of some small companies, already reached in the area of difficult financial problems (all the latter being common reasons).

In the case of Romanian companies, the reasons justifying the merger are called by Hromei (2013) advantages: without presenting any particular hierarchy, she takes from the literature: increase of market power, synergy, decreased costs, fiscal advantages, obtaining control over assets without effective payments, diversification of production, better access to financing, improving the image or access to new markets, saving some businesses, by ensuring their continuity, diversification of risks. Of course, all these are intentions of the management of the companies involved in mergers and remains to be seen to what extent they will be confirmed later, given that the success of a merger is not guaranteed before: Ali-Yrkko (2002) analyzes M&As literature and finds that most studies document a decrease in performances after merger, the acquirer being the one who does not

have to win, as opposed to the target companies' shareholders. Epstein (2005) cites studies that give 7 M&As out of 10 fail. Also, Gugler et al. (2003) analyzes a series of mergers from all over the world and finds that, for almost half of them, the subsequent result, in terms of sales, are inferior to the estimated ones, even if the profits have increased, on average.

Aevoae (2018), establishes, for the 245 Romanian mergers of 2016 whose merger projects have been published in the Official Gazette, a hierarchy of merger determinants, finding that the first explanation is the cost reduction, as part of the operational synergy; increases in efficiency, improvement of the decision-making process, increase of the negotiation power, simplification of the accounting and reporting, increase of the market share and, possibly, entering new markets, increase the dimensions to reach a critical mass.

The arguments I found in the studies quoted above represent, in general, confirmations and particularizations of the determinants present in the literature before these studies. Agyeman *et al.* (2022) identifies the cost reduction, increasing the market share and the power of the company, reducing the volatility of results and achieving the economies of scale as reasons underlying most M&S.

The reasons for the merger should not be sought only in the future evolution of the companies involved, but also in the behavior of the managers; Ahn *et al.* (2020) identifies in the literature some such reasons: the extension of the resources to which the managers have access, the increase of the prestige and the visibility, the diversification of the risks, the improvement of the chances of remaining, possibly in the declining businesses.

The justifications of the mergers refer mainly to elements related to the microeconomic level. However, it should be noted that the evolution of M&As at worldwide and regional level, for certain periods, can be explained from several perspectives, with macroeconomic, microeconomic and institutional arguments (Carbonara and Caiazza, 2009). The effect of various crises (financial, sanitary, energy, armed conflicts) on the situation of companies; the difficulties generated by the crises can sometimes be overcome by entering into a merger/acquisitions (Agyeman et al., 2022). Other macroeconomic determinants with influence on the number of M&As are provided by Cortes et al. (2017): interest rate, unemployment, country risk, business freedom, fiscal pressure, change of laws, crises; Dhingra and Kapil (2022), in their turn, lits: freedom of trade, economic growth, exports of a country, legal and governance system, quality of information, the fiscal rules, the stability of the exchange rate, the stock of knowledge and skills to use them, the language used in business, cultural similarities, geographical distances, investor protection, the size of the country, the development of the financial market.

3. METHODOLOGY AND DATA

The data analyzed come from the merger projects made public on the ONRC website. This site does not provide information about all the mergers made in Romania during that period, but we consider that the selection made by the ONRC is acceptable to achieve the objective of this study. A more complete research should have considered all the merger projects published in the Official Gazette. However, we cannot find an exhaustive list here, because the companies' law allows, if the companies involved in the merger have their own site, the publication in the Official Gazette to be replaced by posting on the site, continuously, uninterruptedly and with free access, on the period provided by law. This publication of the merger project is accompanied by the ONRC taking over on the own site of the respective projects, so that I can appreciate that the projects I found are those not published in the Official Gazette, but only on the sites of the companies. There are studies that have analyzed the projects published in the Official Gazette and reporting the number of observations analyzed; for example, Aevoae (2018) finds 245 mergers in Romania, in 2016, with reports published in the Official Gazette. As far as we are concerned, the projects found on the ONRC website come from the period 2018-2022, with few observations for the years end (Table 1).

Year of the publication of the	Nun the pro	umber of Number of the merger Type of the merger in the merger in the merger in the merger		Type of the merger		of the involved erger
merger project	N	%	Absorption	Integration	Absorbent	Target
2018	33	16,64	33	-	33	38
2019	53	31,55	53	-	53	84
2020	45	26,78	45	-	45	112
2021	34	20,24	34	-	34	39
2022	3	1,79	3	-	3	4
Total	168	100,00	168	_	168	277
*If I did not find the precise date in the marger preciset I considered it the date of						

Table 1. Observations analyzed, by years of origin

*If I did not find the precise date in the merger project, I considered it the date of its publication on the ONRC website

(Source: own processing, according to the data obtained from https://www.onrc.ro/index.php/ro/project-fusion-divizare)

Of the 168 merger projects or abstracts of the merger projects accessible on the ONRC, we have found explicit economic reasons that justify the merger in 156 cases (92.86%).

The fact that all the merger analyzed are by absorption is that it confirms the orientation of the Romanian companies towards this form of merger, orientation found also by Aevoae and Georgescu (2018).

I did not intend to analyze different justifications of the merger according to the industry of the companies involved, although literature finds particular elements on types of activities: Andriuskevicius and Streimikian (2022), for the energy sector, Leon-Gonzales and Tole (2015), for the industries based on natural resources or Danzon *et al.* (2007), for the pharmaceutical industry.

4. **RESULTS**

The companies involved in the merger analyzed in this study are all Romanian legal persons. The shareholders of these companies are also, for the most part, Romanians (legal persons but, also natural persons). For absorbent societies, in 12 cases we could find a mix of Romanian and foreign shareholders (from Cyprus, Holland, Hungary, Bulgaria, France, Germany, Israel and the British Virgin Islands), 31 companies have exclusively foreign shareholders (Cyprus, Luxembourg, France, Portugal, Czech Republic, Germany, UK, Malta, Slovakia, Austria, Italy, Holland, Hungary, Denmark), in the other cases being exclusively Romanian shareholders. Referring to the target firms of the merger, their owners are mostly Romanians, with only 22 companies that have exclusively foreign shareholders and with only 15 cases in which, together with Romanians, they are also foreign shareholders. The analyzed mergers are, therefore, all domestic mergers, without involving any company based in another state. In fact, it seems that the cross-border mergers are not very common: Carril-Caccia et al. (2022) found that the domestic mergers are much more frequent than the crossborder ones.

Considering the small dimensions of the Romanian financial market (by the limited number of companies listed), we could expect that very few of the companies involved in the analyzed merger being listed. Indeed, we found only a company listed on the regulated market of the BVB, 2 companies listed on the AERO alternative market and one whose actions are not listed, but their bonds are traded to BVB. We can also identify companies in the situation of representing subsidiaries of other listed companies, on the Romanian market or on other markets. The situation is similar to that of another emerging country – Morocco (Ibrahimi and Liassini, 2021).

4.1 The hierarchy of the merger' justifications

In Table 2, we presented the reasons extracted from the merger projects analyzed and ranked them in the decreasing order of the number of appearances, putting the frequency of the appearance, i.e. the percentage of the number of appearances of a reason in the total cumulative number of appearances. I put on a same line the reasons with the same number of appearances, but less than 10.

From the merger projects, we have taken over the reasons listed as such, although some of them can be regrouped in quite homogeneous categories.

Rank	Reason	Number of apparitions	Frequency (%)
1	cost reduction	120	11.14
2	more efficient allocation and use of resources	93	8.64
3	increased profitability /efficiency	67	6.22
4	improvement in the marketing function	65	6.04
5	increasing financial power, better access to funding, easier negotiation with funders	61	5.66
6	simplification of the reporting	54	5.01
7	more efficient management	53	4.92
8	administrative simplification/optimization	53	4.92
9	simpler and more efficient decision making	43	3.99
10	increased production / business	41	3.81
11	increased negotiation power in general	40	3.71
12	market consolidation	38	3.53
13	same shareholders/elimination of intra-group transactions and transfer pricing return	37	3.44
14	common/compatible/complementary activities	32	2.97
15	eliminating of the redundancies	32	2.97
16	reducing the financial-accounting activity	31	2.88
17	organizational integration	31	2.88
18	improve/optimize the use of workforce	22	2.04
19	unitary approach of the activity	21	1.95
20	other synergies	17	1.58
21	improving the sales capacity	16	1.49
22	consolidation of operations/activities	16	1.49
23	simpler and more efficient control	15	1.39
24	saving one or more companies in financial distress	10	0.93
25	unitary leadership, positive effect on investments	9 each	0.84 each
26	risks reduction	7 each	0.65 each
27	image improvement, elimination of operational difficulties, logistic development/optimization	5 each	0.46 each
28	acquiring new assets, strategic consolidation	4 each	0.37 each
29	compliance with (new) legal restrictions, improvement of the reaction to change	3 each	0.28 each

Table 2. A list of the arguments that justify the Romanian mergers

Rank	Reason	Number of apparitions	Frequency (%)
30	sustainability, better cash-flows, better stability, uniform rules	2 each	0.19 each
31	maintaining the position of market leader, capitalizing on experiences from previous merger, reviewing the business model, improving online activity, accessing European funds, increasing capital, increasing the quality of products/services	1 each	0.09 each
	Total	1,077	100.00

(Source: own processing, according to the data obtained from https://www.onrc.ro/index.php/ro/project-fusion-divizare)

4.2 Cost reduction and increased efficiency

The first reason invoked by the companies involved in the analysed merger refers to the reduction of costs (position 1), which confirms the results of other studies, from various contexts (and especially from Romania, according to Aevoae, 2018). Along with the increase of profitability (position 3) and the more efficient use of resources (position 2), we find elements placed by the literature in what is called the synergy created by the joint use of resources. Organizational integration (position 17) can also be invoked as a reason for increasing efficiency and improving the management of the company resulting from mergers.

The merger is an occasion for the managers - as far as they have contributed significantly to the drafting of the merger projects approved by the general assembly - to hope for an improvement in the efficiency of management (position 7), but also of the marketing function (position 4). A way by which these objectives can be achieved is also the simplification of the decision-making process (position 8) within a single entity, compared to the previous situation, considering that the merged companies have common, compatible and/or complementary activities (position 14) and that a single top management can ensure the unitary approach of the business (position 19); Also, the administrative simplification/optimization (position 8), in general, can contribute to better efficiency.

The merger is considered a path to the external growth of the company, towards strengthening and improving the market share (position 12), increasing production and sales (position 10), improving the sale capacity (position 21) and strengthening operations/activities (position 22); The acquisition of new assets and the strategic consolidation are so many ways in which the company is being located in a safer position in relation to the competitors and the market in general.

It is normal to expect that, the increase of the size of the company lead to the increase of the negotiation power in relation to third parties (position 11). Even more expected is the increase of the financing capacity of negotiation (position 5):

the larger dimensions of the companies and the improvement of the post-financial indicators can be significant arguments in this regard, considering the possible negotiations with various financiers (banks, leasing companies, access on bond market).

In just 11 cases (6.5%) the merger project refers to the intervention of an auditor; these are probably the companies that, before the merger, qualified to audit their financial statements, either as a result of their dimensions, or by their situation of public interest entities, or simply by option. The small percentage of the audited companies can be explained, therefore, by the small dimensions of the majority of the entities involved in mergers and, to a certain extent through the general template identified by Aevoae et al. (2021) according to which, in the M&As, unaudited companies are preferred. However, the post-merger growth in assets can create the premises for some companies not having, before the merger, the obligation to audit their financial statements, by exceeding the thresholds set by the standards, to change the category and to have to audit the financial statements after the merger. This can lead to additional costs, but we can see the good part of things, in the sense that the intervention of a financial auditor has the potential to lead to an even better management of the financial-accounting activity, as well as to an improvement of the company's position in relation to third parties.

Improving the use of workforce is a merger reason (position 18); in some of the analysed projects appearing details regarding the fact that it is difficult to find people with certain profiles, especially in the management area. Even if it refers mainly to the acquisitions, Dicu *et al.* (2020) confirms that indicators related to the workforce (the ratio between personnel expenses and operational income) can be determining in the option for establishing the targets of M&As operations. A merger can generate uncertainties and stress for the employees of the target companies, that is, they can decrease the satisfaction and motivation at work and can lead to non-productive behaviours (Ali-Yrkko, 2002), which is why some mergers may even have no success.

Among the reasons that justify the analysed mergers, sustainability appears in two situations - immaterial frequency - in relation to total. The invocation of sustainable development may come from the belief that the action will even have this effect, but it is not excluded from a fashion effect, being known that sustainability appears very frequently in public speeches and, especially, in the literature from various fields, including from the management, financial and accounting literature.

4.3 Mergers between affiliates

Ahn et al. (2020) distinguish between the mergers of affiliated companies and mergers of independent companies, finding some differences between them,

in terms of overvaluation of the goodwill generated by the transaction. In our case, such a distinction would not be significant for two reasons:

- in most merger (162 out of 168, i.e. over 96%), the evaluation of the companies involved is done by applying the method of the net accounting asset and, as a rule, this method does not lead, according to OMFP 987/2016, to differences in evaluation to qualify them as a goodwill;

- from the merger projects, it appears that only in 9 observations (slightly over 5%) we could not immediately and directly identify an affiliation relationship between companies; in the other cases, the absorbent already holds the majority package at the target (most situations), companies are part of the same group or have the same shareholders.

The regrouping of companies in financial, personal or other groups, more or less formally recognized can result in better business management. The 5% of the observations without an explicit affiliation relationship presented in the merger projects could say a lot about the profile of the Romanian merged companies. Thus, there is not much difficulty convincing the parties involved in the merger, either because the absorbent was careful to become majority in the target, to simplify the procedure, or because the merged companies were under common control, directly or indirectly. I think this feature - the merger between affiliated companies - is significant in the analysis of the Romanian market for the merger between companies.

Here we could find certain simplification of the records and reports specific to the relations between the affiliated persons: in many cases, reference is made to eliminate the need to draw up the transfer price file – an expensive fiscal obligation in terms of financial, logistical, and human resources. Also, the simplification of the transactions between the components of a unique entity is also invoked in relation to the same transactions that would be carried out between distinct legal entities. The existence of some companies between which there are affiliation relationships also raises the problem of effective control on the management and activity of some of them. The merger can simplify the control/monitoring process (position 23), but rather, it changes its form: it remains to be seen if this simplification really happens.

In this context, we can return to one of the above justifications of the merger – the reduction in the reporting efforts and in the accounting activity – observing that, indeed, the transition, through a merger, from a group structure (in the case of the parent-subsidiary relationship) to a single entity can completely eliminate the obligation to draw up the consolidated financial statements, for which the parent company made additional efforts.

4.4 Merged companies in financial distress

Saving a company appears 10 times among the reasons written in the merger projects analysed, given that, among the companies whose equity explicitly appear

in the merger projects (159 absorbents and 226 target), I find a much larger number of companies reporting negative equity - insofar as we only retain this indicator to qualify the company as being in financial distress, which involves its salvation. Thus, 13 absorbents (9.35%) and 83 targets (36.73%) report negative equity, which allows us to consider that saving a company is a much more serious reason than the frequency with which it appears among the economic justifications from the merger projects. In fact, avoiding the closing of the company by merger represents, for Dewey (1961), "a merely civilized alternative to bankruptcy or the voluntary liquidation that transfers assets from falling to rising firms". The difference between the number of observations with negative equity, the absorbent, either at the target, and the number of merger projects in which one of the companies is invoked as being in financial distress can be explained by the fact that many Romanian companies operate in the long term with negative equity, especially due to the fact that a good part of the total liabilities are in their relationships with the shareholders (Istrate, 2021); these latter liabilities fulfil, formally, the criteria for a debt recognition, but the obligation of their reimbursement is not necessarily equivalent to the obligations to third parties: the shareholders finance their companies in this way because it is simpler, faster and with smaller administrative costs.

5. CONCLUSIONS

The purpose of the study is to identify the main reasons invoked by the Romanian firms, in justifying the merger proposal, as it appears in the merger projects. To this end, we have taken over all 168 merger projects available on the ONRC website in March 2022 - these representing only a part of the merger made in Romania during 2018-2022. According to the law, in these projects it is necessary to declare the economic justifications of the operation and we have found a list of over 45 reasons that can be grouped into various categories.

As we could expect and according to the findings reported in the relevant literature, the main arguments made by companies in favour of the merger are those related to reducing costs and increasing efficiency/profitability. This justification can be included in the broader category of synergy generated by the pooling of the resources of two or more companies. Improving management and marketing are also frequent reasons in justifying the merger, especially since it is possible to make the decision processes simplier, given that the activities of the merged companies are often common or complementary. The improvement of the management also comes from the administrative simplification that the merger brings.

Another group of reasons can be identified in the declared intentions of external growth, by strengthening the market position, increasing production and sales, but also of the negotiation power in the relationship with third parties, especially with the funders.

The administrative simplification to which I referred above is, often, explicitly completed with the desire to simplify the accounting activity and the accounting, financial and fiscal reporting.

The evaluation of the companies involved in the analysed merger is done almost exclusively according to the method of the net asset, without using a global evaluation method. This option may seem, at first glance, slightly risky, if we consider the differences that can occur between the market values and the net accounting values of the assets and liabilities of the merged companies. The explanation of the use of the method of the net asset comes from the fact that, in almost all situations, the merged companies are affiliated: the absorbent owns the target (most observations) - or vice versa - or the companies are mostly owned by the same shareholder or group of shareholders. This feature makes the difficult evaluation problems, inherent in a merger between independent companies, not to be relevant.

Even if the financial situation of some companies involved in the merger is difficult, in the sense that the respective companies are at the limit of insolvency/bankruptcy, this reason - saving one or more companies - appears explicitly only 10 times. If we consider the negative equity as an indicator of financial distress, then we find a much larger number of such situations. However, in the merger projects, the respective companies are not considered to have difficulties and it is possible that this characterization will be supported, taking into account another specific of the functioning of companies in Romania: the negative equity are very common, and a large part of the liabilities which lead to these negative capital are to shareholders.

Of course, the study has limits that consist, in particular, in the small number of observations analysed, in the exclusively descriptive approach, but also in the fact that I did not consider the specific of different industries, I did not carry out an econometric model through which to connect various variables. Related to the mergers analysed, I used only the merger projects present on the ONRC website, which could have effects on a possible attempt to generalize the results; however, the fact that the findings of the study are convergent with the findings reported in the literature allows us to be optimistic about the generalization of the results.

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FACILITATING AND INHIBITING FACTORS IN THE CHOICE OF X-RAYS TECHNICIAN PROFESSION

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ABSTRACT

In recent years, the world of medical imaging has made a breakthrough due to the global development in the field of technology. It facilitates the performance of numerous and varied imaging tests that diagnose and treat in general the wide public. X-Rays technicians are, in fact, the linking chain between the patients and the diagnosis of the illness or treatment they require. The X-Rays technicians constitute the roadmap for the diagnosing doctors. As part of their work, X-Rays technicians perform diversified imaging tests, such as: magnetic resonance (MRI), ultrasound, heart catheterization, computerized tomography (CT), X-Rays tests, radiation treatments, and so on. Following the technological development, the growing number of chronic diseases among the population, and the aging of the population, have increased the demand for competent and professional X-Rays technicians in the labor market. Nevertheless, the supply of X-Rays technicians in the labor market is low in most countries around the world. This paper engages in the identification of the facilitating and inhibiting factors in the choice of X-Rays technician profession. This paper reports the results of a small-scale qualitative study, consisting of a focus group of six X-Rays technicians. The main findings obtained from the discussion in the focus group indicate that there are factors that facilitate the choice of the profession, while there are factors that inhibit the choice of the profession. It is important to map these factors in order to nurture the facilitators and improve the inhibitors. Thus, we can obtain insights and develop a marketing strategy designed to improve the supply of X-Rays technicians in the labor market.

Keywords: career choice; X-Rays technician; supply; professional prestige; facilitators and inhibitors in a profession choice.

JEL Classification: J24, I18.

1. INTRODUCTION

In the healthcare system, the human resource is the most important component. Healthcare services worldwide are coping with many challenges, the most difficult among them being insufficient professionals in this field. It is noteworthy that when the economy is booming and the population is growing, it is impossible to cope with insufficient manpower in the field of healthcare, as well as achieve desirable health without enough workers. This lack leads to decrease in the quantity and quality of healthcare services provided to the public (Sinha and Sigamani, 2016). The X-Rays technicians are an important resource in the healthcare system, being responsible for operating imaging machines. However, the prestige of this important resource is low and almost non-existent.

In spite of the quantum leap in the technological development of this field, the X-Rays technicians' skills, knowledge and competence, needed for operating the machines, is disregarded entirely. Moreover, the public perceives and discusses the X-Rays technicians' work as simple. However, in practice, it is quite complicated. It is highly important to reinstate the lost prestige of X-Rays technicians. This might induce individuals to choose and study this profession and, thus, enhance the low supply of these technicians in the healthcare system (Mussmann *et al.*, 2021).

In light of the low supply of X-Rays technicians, great importance is attributed to a study that aims to map the facilitators and inhibitors involved in the choice of this profession. This mapping can assist in building a marketing strategy for the promotion of the supply for this profession.

2. LITERATURE REVIEW

The right choice of career is a major factor in the decision individuals make about their future. The decision is difficult and encompasses a component of uncertainty that relates to many questions. For example: Am I really interested in this specific field? Will I be accepted to the studies? Will I enjoy the studies? Will I succeed in my studies? Will I find a place of work? Will I be successful in my work? Will the work be satisfactory? and others.

Individuals have a huge body of knowledge and have to consider many details when choosing the profession: emotional and personality factors, uncertainty about the future, real or perceived social barriers (Gati, 1996). According to various studies (e.g., Nager, 2012), the main motives that influence the decision to choose any profession are the relationship between the individuals' inclinations and the profession they choose, as well as the relationships between the individuals' characteristics and the features of the chosen profession.

People who are close and important to the individuals, are involved in the latter's development process, influence their choice of profession, and have access to information sources, can consult and assist the individuals in making a decision. In order to determine what motivates students to choose a career in the field of medicine, we need to understand what does motivation imply. It is, in fact, a psychological process that defines people's wish to use all their capabilities in order to accomplish a certain goal. Motivation is the major motive of human behavior for the accomplishment of a goal at work and for demonstrating a strong dedication (Narayanasamy *et al.*, 2019).

Students' attraction to choose learning a medical field depends on many factors, such as: necessity of the profession, social and financial status, altruism, career opportunities, wages, and place of work (Al Subait *et al.*, 2016; Gyorffy *et al.*, 2018; Rani *et al.*, 2016). Studies show that the main factors for choosing a career in the field of medicine are prestige and altruism (Narayanasamy *et al.*, 2019). Another study, conducted in Egypt (Kabil *et al.*, 2018), also found that prestige was the primary factor for the choice of a profession, followed by economic security.

Furthermore, research findings show that the main factors for choosing the X-Rays technician profession are the individuals' personal wish, namely a choice made by the students themselves, as well as the considerable influence of the family members. The circle of friends influences by a smaller percent, and website sources have the lowest rate of influence. Moreover, the option of professional actualization in Israel and abroad, good wages, and acquisition of higher education, are factors that have an influence on the choice (Gagova *et al.*, 2017).

X-Rays technicians constitute an important para-medical profession, and almost no diagnosis can be done without it. Despite its importance and growing demand, the supply of this profession in most countries is low, particularly in countries with low and medium income (Frija *et al.*, 2021). During the COVID-19 pandemic, this lack of X-Rays technicians was especially exacerbated, and the insufficient number of workers caused a considerable rise of workload in the hospitals. Hence, it is very important and urgent to improve the supply of this profession (Rahman Razu *et al.*, 2021).

One of the complexities of X-Rays technician profession is the image of a profession that engages in a working environment with ionizing radiation. This results in a misconception among the public that has little knowledge about ionizing radiation and the risks thereof. However, in fact, the actual risks of this profession are low (Malul-Markovich, 2022). A high number of students of the X-Rays technician profession claimed they were aware of its occupational risks but, actually, only few respondents specified it properly (Gagova *et al.*, 2017).

The curriculum of X-Rays technician studies varies from one country to another. Moreover, there is a difference in the legal regulation of this profession. There are countries that have no legal regulation at all, e.g., Israel, Romania, and 11 American States (Best Accredited Colleges, 2021; Couto *et al.*, 2017; State Comptroller, 2015).

The occupational prestige of X-Rays technicians is low, and they are perceived as workers that only "press the button". It is easy to understand how words can easily become fact. Hence, X-Rays technicians are perceived as workers that just press a button, namely perform a simple operation that does not require making complex decisions. Nevertheless, reality is different and X-Rays technicians are required to make several essential decisions. For example, reading the referral, justification of the test before exposing the patient to radiation, matching parameters of the radiation based on technological knowledge, initial diagnosis, and so on. By changing the way by which the public perceives the profession, role, and status of X-Rays technicians, we can start re-building the profession's lost prestige and improve its supply (Mussmann *et al.*, 2021).

The various study pathways, lack of legal regulation, and a profession with a low image and prestige, undoubtedly compromise the supply. For the purpose of enhancing the supply, it is also important to improve the students' wish to choose this profession, address the inhibiting components and nurture the facilitating ones. One of the ways is by providing more accessible information in schools, cyberspace, and various forums. These will represent the X-Rays technician profession and encourage developing adolescents to choose it. Herein resides the importance of this study (Gagova *et al.*, 2017).

3. METHODOLOGY

3.1 Research method

The objective of this study was to identify the facilitating and inhibiting factors in choosing the X-ray technician profession. In order to do so, qualitative research was chosen. Thus, a focus group discussion with six X-Rays technicians was conducted in Israel. The participants signed an informed consent form, expressing their wish to participate in this study. The writer of this work is herself an X-ray technician. She has worked at Assuta hospital in Haifa, Israel, for approximately 17 years and is the manager of all the imaging institutes of the hospital chain. In addition, the researcher is the manager of the interviewed X-ray technicians and, therefore, relationships of authority exist between them. The researcher is in a position of power vis-à-vis the group interviewees. This situation contradicts one of the main principles of informed consent, that is given voluntarily, without any pressure or coercion.

The question arises to what extent can X-ray technicians decide whether to participate in the focus group, when their manager who is the researcher is asking them to participate. Part of solving this dilemma is signing an informed consent that is perceived in research as a pre-requisite. The reason is not only because of the difficulty to assess risks and chances in advance, but also due to the sensitivity to gaps in the researcher-participant power relationships and in the investigated field.

Hence, each participant was given detailed and clear information about the research aims and importance, as well as the discomfort that might be caused as a result of participation in the study. It should be indicated that the participants were given the full right to refuse participating in the research and they were entitled to exercise this right also during the study (Friedman, 2006). Moreover, the researcher ensured the participants that their personal details would be disguised,

their names would be changed, and participation in the study would not affect their working terms or their wages.

3.2 Data collection and analysis method

The focus group topic was "facilitating and inhibiting factors in choosing the X-Rays technician profession" and it was conducted by the researcher.

The discussion in the focus group was recorded and transcribed. All the transcribed material was read and content analyzed. All the text units were divided into categories, leading to the consolidation and arrangement of the themes. Each theme includes a quotation that clearly and meaningfully expresses the participants' position. This stage helped in the registration and analysis of the findings as part of the data analysis. By writing the results, the findings were described in relation to the chosen themes (Shkedi, 2003).

4. **RESULTS**

Theme	Factors facilitating or inhibiting choosing the X-Rays technician profession			
	Factors facilitating the choice of this	Factors inhibiting the choice of this		
	profession	profession		
	1.Exposure to the profession	4.Lack of knowledge about the		
	"My mother heard from a friend;	profession		
	she found this profession for me"	"Many people do not believe that you		
		need three years of studies for this		
		profession:		
		"So, are you a nurse or a doctor? No one		
		thinks that I am an X-Rays technician"		
	2.Occupational security	5.Radiation-intensive work environment		
~	"Security that will always be there,	"People will not choose it because of the		
ory	there is nothing to be said, this is	radiation"		
teg	field of medicine and in every kind	"He tried convincing me not to study		
Cai	of medicine there will always be	this radiation I need to have		
•	work"	children"		
	3.Ideology - Altruism	6.Low Professional image		
	"A profession with a meaning. You	"Lack of appreciation for the profession"		
	can't say this is work on a computer	"You have studied three years for this,		
	with numbers at home. This means	only for pressing a button"		
	saving life"			
	"You are saving life; without you it			
	will not happen. You decide at that			
	moment about a woman's life"			

 Table 1. Facilitating or habiting factors in choosing the X-Rays technician profession

Factors that might facilitate the choice of this profession

Category 1 – Exposure to the profession

The content analysis illustrated that people chose to learn the X-Ray technician profession because someone had exposed them to this profession, directed them to learn it. Evidence for this category can be found in the participants' statements, in which they explained what made them decide to learn this profession: "My aunt managed an X-Rays institute"; "My mother heard from a friend"; "one member of my family works in this profession. You are exposed to it and then you know it exists, otherwise how would you know there is such a profession?"

To sum up, one of the factors that makes people choose the X-Rays technician profession is that someone, mostly a relative, is acquainted with this profession and recommended learning it.

Category 2 – Occupational security

The findings show that occupational security is a meaningful factor in choosing this profession. Knowing that at the end of the studies, it will be possible to find work in the field of studies. In medicine, there will always be a demand for this para-medical profession. This is attested by the participants' words: "There is nothing to be said, the field of medicine, in any kind of medicine there will always be work"; "There will always be work, there are always sick people". Furthermore, the content analysis of this category showed that feeling that there is occupational security as far as wages are concerned, will make people choose to learn this profession. The participants' statements attested to this: "When you go to work as an X-Rays technician, you have regular wages every month"; "It does not matter what you do. At the end of the day, you can earn respectable wages".

To sum up, occupational security at the end of the studies and a permanent economic security will make people decide to learn this profession.

Category 3 – Ideology Altruism

Another approach that came up in the data analysis indicated that the factor for choosing this profession was connected to ideology. Evidence for this category can be found in the participants' words. They believed this profession was a kind of vocation. That is, people want to work in this profession based on a valued perception of life, namely helping people. The participants' statements attest to this category: "You are saving life, without you this will not happen, you decide at that moment about the life of a women"; "A profession with a meaning. You cannot say this is a work on a computer, working with numbers at home. This is saving life".

To sum up, the choice of profession is perceived as people's ideology. When people want to work in a life-saving profession, helping others, it will make them choose this profession.

Factors that might inhibit the choice of this profession

Category 4 – Lack of knowledge about the profession

The data analysis illustrated that the factor for not choosing to learn this profession was associated with the fact that people were not acquainted with it at all. They were not familiar with the pathway that awarded both a bachelor degree and a professional certificate, and the studies in Israel last three years. People are unaware of the areas in which you work, such as CT, Ultrasound, MRI, catheterizations, and so on. This is evidenced by the participants' statement: "We are not familiar with it"; "Many people do not believe this requires three years of learning"; "Someone has to expose it"; "Even the young generation does not know what an X-Rays technician is. They do not know it, so how will they want to learn it?".

To sum up, one of the factors for not choosing to learn this profession is the fact that people are not familiar with it. The discussion in the group enhanced the importance of making the public aware of this profession.

Category 5 – Radiation-intensive work environment

People will avoid choosing this profession out of fear of working in an environment with ionizing radiation that is dangerous and has implications for the future. This is attested by the participants' words: "It will not be chosen because of the radiation"; "He tried convincing me not to learn this profession… radiation… I want to have children"; "The radiation will harm you as an X-Rays technician".

To sum up, one of the factors for not choosing this profession is the fear of working in an environment that involves ionizing radiation.

Category 6 – *Low professional image*

The wide public has a low image of this profession. People are not familiar with the importance and complexity of this profession and there is no professional appreciation. The participants' words attest to it: "Three years you have learned only for pressing a button"; "You do not need an SAT exam... they have brought it down so much. This is a score of nothing and everybody who wants to, can knock on the door and comes in today to become an X-ray technician"; "People are looking for a prestigious profession, we are on the fifth place from the bottom".

To sum up, one of the factors for not choosing this profession is the low image of this profession among the public.

5. DISCUSSION AND CONCLUSIONS

The findings of this small-range qualitative research show that the factors facilitating the choice of X-Ray technician profession are mainly associated with the individuals' personal reasons, their direct or indirect acquaintance with the profession, the importance they attribute to economic and occupational security, and their personal ideology. On the other hand, the factors that inhibit the choice of X-Rays technician profession are associated with the public's lack of

knowledge about this profession, the pathway, professional nature, fear of radiation, and low professional image. The focus group findings illustrate that it is necessary to make this profession accessible to the public, provide information about the profession, and reduce the apprehension of radiation. Moreover, efforts should be exerted in order to promote the prestige of the profession, and generate a social change in its perception as a medical profession rather than just a 'technical' field.

The empirical literature shows that people choice of a profession in the field of medicine is mainly motivated by prestige and altruism (Madeeha *et al.*, 2020). The professional prestige of the X-Rays technicians has been low for many years. Already in 2002, Collins and Nolen have proven it in their study, and after 20 years, the prestige of the profession remains non-existent.

The public does not have the required knowledge about ionizing radiation (Nasr *et al.*, 2019). Moreover, it has misconceptions about a profession that involves ionizing radiation (Malul-Markovich, 2022). The public constitutes part of the immediate family of the choosing students and it affects their decision to choose their future profession. Hence, acquaintance with the profession and all its areas is highly important (Gagova *et al.*, 2017). Thus, it can be concluded that the public's lack of awareness of and acquaintance with the profession, as well as the low professional prestige, lead to the worldwide insufficient supply of this profession, it is extremely essential to improve the information in schools, Internet websites, and on-line forums (Gagova *et al.*, 2017).

The findings obtained from the content analysis are in line with the empirical literature on this topic.

6. **RESEARCH LIMITATIONS**

The data are based on a sample of six interviewees who work as X-ray technicians in Israel. The sample does not necessarily reflect the attitudes of the entire global population. This study is a pilot of a wider focus group designed to obtain further insights from a larger sample of participants - men and women who work in the field in public and private hospitals.

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AI IMPACT ON THE LABOUR FORCE-SEARCHING FOR THE ANALYTICAL SKILLS OF THE FUTURE SOFTWARE ENGINEERS

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ABSTRACT

This systematic literature review aims to investigate the impact of artificial intelligence (AI) on the labour force in software engineering, with a particular focus on the skills needed for future software engineers, the impact of AI on the demand for software engineering skills, and the future of work for software engineers. The review identified 42 relevant publications through a comprehensive search strategy and analysed their findings. The results indicate that future software engineers will need to be competent in programming and have soft skills such as problem-solving and interpersonal communication. AI will have a significant impact on the software engineers. The role of a software engineer is changing and will continue to change in the future, with AI-assisted software development posing challenges for the software engineering profession. The review suggests that the software engineering profession must adapt to the changing landscape to remain relevant and effective in the future

Keywords: AI; artificial intelligence; labour force; software engineering; skills; demand; future; work; automation; programming; soft skills; communication; problem-solving.

JEL Classification: D90, E24, F23, F66.

1. INTRODUCTION

The growing use of artificial intelligence (AI) and machine learning is transforming many industries and job roles, including that of software engineers. As AI becomes more prevalent, there is a growing concern about the impact of this technology on the demand for analytical skills among software engineers. This is not a new concern, every time technology evolves researchers study the respective impact. In 1989, Gibbs (Gibbs, 1989) posited that with the emergence of technical foundations in software production, software engineers were at risk

of becoming obsolete. However, as the software industry evolved, the demand for software engineers continued to increase.

The purpose of this systematic literature review is to explore the impact of AI on the demand for analytical skills among software engineers in the labour force. Specifically, we seek to identify trends in the use of AI in the workforce and its impact on the demand for specific analytical skills among software engineers. We also aim to examine the skills required for future software engineers, particularly in the context of the growing use of AI and machine learning.

This review is important because it will provide insights into the potential impact of AI on the labour force, particularly in the field of software engineering. By identifying the specific skills that will be most in-demand in the future, this review can help inform education and training programs for software engineers, as well as guide workforce planning and development initiatives.

The review will be conducted using a systematic approach, with a comprehensive search of relevant literature and detailed analysis and synthesis of the findings. The review will include both academic and industry publications, ensuring that a broad range of perspectives are included.

Overall, this systematic literature review aims to provide a comprehensive understanding of the impact of AI on the demand for analytical skills among software engineers, and to identify the key skills that will be most valuable for future software engineers in the age of AI.

2. RESEARCH METHODOLOGY

2.1 Research Design

The research design for this systematic literature review is a comprehensive search of relevant literature, followed by screening and analysis of publications that meet our inclusion criteria. The review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure the reliability and validity of the review process.

The search strategy for this review included searches of academic databases such as Scopus, Web of Science, and Google Scholar, as well as searches of relevant industry publications and reports. We used a combination of relevant search terms and keywords, such as "AI", "machine learning", "labour force", "employment", "future skills", and "software engineers". We also used Boolean operators such as "AND" and "OR" to refine our search and ensure that we are capturing relevant publications.

Inclusion Criteria:

• Publications that address the impact of AI on the demand for analytical skills among software engineers

• Publications that were published in the last 10 years

• Publications that are available in English

• Peer-reviewed academic publications, as well as relevant industry reports and publications

Exclusion Criteria:

- Publications that do not address the research question.
- Publications that are not available in English.
- Publications that were published before 2011.

The screening process was conducted with celerity to review the titles and abstracts of the identified publications to determine whether they meet the inclusion and exclusion criteria.

Once the publications that meet the inclusion criteria have been identified, we conducted a detailed analysis of each publication to extract relevant data, such as the use of AI in the workforce, the skills required for future software engineers, and the potential impact of AI on the demand for analytical skills. We synthesized the findings from the included publications and identified common themes and trends across the literature.

The data extracted from the publications was analyzed using a thematic analysis approach. The data was coded and categorized into themes based on the research objectives, and the findings was synthesized to draw conclusions and identify gaps in the existing literature.

The initial search yielded a total of 2,357 publications. After removing duplicates and screening the titles and abstracts, 236 publications were identified for further analysis.

Following a detailed analysis of the full text of these 236 publications, we coded and categorized the data into themes based on our research objectives. Specifically, we identified themes related to the use of AI in the workforce, the impact of AI on the demand for analytical skills among software engineers, and the specific skills required for future software engineers in the context of AI and machine learning.

After synthesizing the findings from the 236 publications, we identified 42 publications that were most relevant to our research question and objectives. These 42 publications were included in the final synthesis of the review.

The data extracted from these 42 publications were further analyzed and coded into specific themes and sub-themes. For instance, we identified themes related to the specific analytical skills required for software engineers working with AI, the impact of AI on the demand for certain types of jobs and job roles, and the implications of the growing use of AI for education and training programs.

Through the process of coding and categorizing the data, we were able to identify common themes and trends across the literature and draw conclusions about the impact of AI on the demand for analytical skills among software engineers. We were also able to identify gaps in the existing literature and make recommendations for future research in this area.

3. **RESULTS**

The Results section presents the findings of the study in response to three research questions.

- RQ1 What skills will future software engineers need?
- RQ2 How will AI impact the demand for software engineering skills?
- RQ3 What is the future of work for software engineers?

3.1 RQ1 What skills will future software engineers need?

Future software engineers will need to be competent in programming and have soft skills such as problem solving and interpersonal communication. The findings are summarized next in (Table 1).

Skill	Details	Authors
Competence in	Training increases programming	(Kruglyk and Osadchyi,
programming	competences	2019)
	The industry evolves rapidly and	(Almi et al., 2011)
	demands programming competences	
	that usually are not taught in school	
	software requirements, design, and	(Garousi et al., 2019)
	testing	
	configuration management, software	(Moreno et al., 2012)
	engineering models and methods,	
	software engineering process, design	
	(and architecture), as well as in	
	testing	
professional soft	problem-based learning could be a	(Richardson et al., 2011)
competencies	useful method for teaching future	
-	software engineers the skills they will	
	need	
	the most in-demand skills among	(Ahmed, 2012)
	software engineers are self-reflection,	(Daneva et al., 2019)
	conflict resolution, communication,	(Burbekova, 2021)
	teamwork communication skills,	
	leadership	

Table 1. Skills that software engineers will need to have in the future

Kruglyk and Osadchyi (2019) found that more than a third of the students had low levels of competence in programming, but after the experimental group went through the proposed system of training, the level of competence in programming increased significantly. Almi *et al.* (2011) found that there is a gap between industry's requirements and graduates' readiness in software engineering, suggesting that future software engineers may not be adequately prepared for the demands of the software engineering industry. Vakaliuk, Kontsedailo and Mintii (2020) define professional soft competencies as a set of non-specialized competencies that in one way or another relate to problem solving, interaction between people, and are responsible for successful participation in the work process, high productivity. Richardson *et al.* (2011) found that problem-based learning can help lecturers bring their research into the classroom and accomplish multiple goals in a single course module. This could be a useful method for teaching future software engineers the skills they will need.

The most popular programming languages among software engineers are Java, C, and Python (Lu *et al.*, 2020), and Java and Python (Siegfried *et al.*, 2021). The most in-demand skills among software engineers are self-reflection, conflict resolution, communication, teamwork communication skills (Ahmed, 2012), and software requirements, design, and testing (Garousi *et al.*, 2019). Moreno *et al.* (2012) found that the skills demanded by industry that the software engineering curricula do or do not cater for are configuration management, software engineering models and methods, software engineering process, design (and architecture), as well as in testing. This suggests that there is a knowledge gap in the industry for these skills.

The most common tasks that software engineers perform are searching for explanations for unknown terminologies, explanations for exceptions/error messages, reusable code snippets, solutions to common programming bugs, and suitable third-party libraries/services (Xia *et al.*, 2017); finding documentation, debugging, installation, and finding code snippets (Rao *et al.*, 2020). Additionally, ranking tasks could increase students' conceptual knowledge in specific areas (Tao *et al.*, 2016), and software engineers engage in a finite number of work related tasks and they also develop a finite number of "work practices"/"archetypes of behaviour" (Grzywaczewski and Iqbal, 2012).

The most common challenges that software engineers face are lack of clarity and simplicity in the field (McMillin, 2018), challenges in blockchain-oriented software development (Porru *et al.*, 2017), and challenges on the human side of software engineering (Ouhbi and Pombo, 2020).

There is no one "most common" tool that software engineers use. McMillin (2018) found that there is no shortage of sources of information providing various types of requirements and standards for software engineering. This suggests that there is a variety of tools that software engineers can use. Marshall, Brereton and Kitchenham (2015) found that the most commonly mentioned tools were reference managers. This suggests that reference managers are the most common tools used by software engineers. However, Seppälä *et al.* (2016) found that students use a variety of communication and collaboration tools in software projects.

The most in-demand skills among software engineers are communication skills, software requirements, design, and testing. Daneva *et al.* (2019) found that communication skills are the most important soft skills for requirements

engineers, followed by English proficiency. Garousi *et al.* (2019) found that software requirements, design, and testing are the most important skills for software engineers. Burbekova (2021) found that communication skills, teambuilding, and leadership are the most important soft skills for IT specialists.

3.2 RQ2 How will AI impact the demand for software engineering skills?

Marijan, Shang and Shukla (2019) found that one particular topic dominated the discussion at the International Conference on Software Engineering 2019: the resurgence of artificial intelligence and its implications for the collaboration between industry and academia.

There is a demand for AI skills in the labour market. This is directly relevant to our research question (Alekseeva *et al.*, 2019, 2021; Xie *et al.*, 2021). AI can be used to improve software engineering solutions, and vice versa. Xie (2018) found that the emerging field of intelligent software engineering is to focus on two aspects: (1) instilling intelligence in solutions for software engineering problems; (2) providing software engineering solutions for intelligent software. Kalles (2016) found that AI systems can be used to educate IT students in software engineering practices. Barenkamp, Rebstadt and Thomas (2020) found that the major achievements and future potentials of AI in software engineering are the automation of lengthy routine jobs in software development and testing using algorithms, the structured analysis of big data pools to discover patterns and novel information clusters, and the systematic evaluation of these data in neural networks. Shehab *et al.* (2020) found that previous studies have benefited from incorporating the advantages of both AI and software engineering, and that there are areas for potential future research.

Artificial intelligence will have a significant impact on the software engineering workforce. Dam (2019) found that artificial intelligence is predicted to impact many industries, including the software industry, changing how we produce, manufacture, and deliver. Artificial intelligence will automate many jobs currently done by software engineers, which may lead to a reduction in the need for software engineers in the workforce.

AI will impact the demand for other engineering skills also. Alekseeva *et al.* (2019) and Alekseeva *et al.* (2021) found that the demand for AI skills is highest in IT occupations, followed by architecture/engineering, life/physical/social sciences, and management. Squicciarini and Nachtigall (2021) found that skills related to communication, problem solving, creativity and teamwork gained relative importance over time, as did complementary software-related and AI-specific competencies. Xie *et al.* (2021) found that AI reduces the relative demand for low-skilled labour across all regions in China, while increasing the relative demand for high-skilled labour only in the eastern region. These findings suggest that AI will impact the demand for other engineering skills.

3.3 RQ3 What is the future of work for software engineers?

Laato *et al.* (2022) suggests that the work of software engineers is changing and will continue to change, while Beecham *et al.* (2017) and McMillin (2018) discuss challenges and requirements for the work of software engineers. Lämmel, Kerber and Praza (2020) explain the 'work-item prediction challenge' and how it affects the ability to understand what software engineers are working on. The work of software engineers is changing and will continue to change, and there are challenges to understanding and implementing the work of software engineers.

Meade *et al.* (2019) discuss the changing role of a software engineer from four major standpoints: the software development lifecycle, the influence of opensource software, testing and deployment, and the emergence of new technologies. Khan *et al.* (2021) discuss the past and current trends in software engineering and the future of software engineering with respect to Industry 4.0 and emerging technological platforms like the Internet of Things. Shull *et al.* (2016) discuss the future of software engineering and how it is widely varied and very broad. The role of a software engineer is changing and will continue to change in the future.

There are implications of AI for the software engineering profession. Batarseh *et al.* (2020) found that AI has been applied to software engineering in multiple ways, and has been shown to be helpful in improving the process and eliminating many challenges. Nascimento *et al.* (2020) found that there are several engineering problems that are different from those that arise in non-AI/ML software development. Kästner and Kang (2020) found that software engineers have significant expertise to offer when building intelligent systems, and that a new course has been designed to teach software-engineering skills to students with a background in ML. Marijan, Shang and Shukla (2019) found that the resurgence of artificial intelligence and machine learning algorithms in software engineering research and industry practice has implications for the collaboration between these two communities. AI can be helpful in the software engineering profession, but also that there are challenges in the software engineering profession that are specific to AI/ML systems.

AI-assisted software development will change the role of the software engineer. Meade *et al.* (2019) found that the role of a software engineer is nowadays widely varied and very broad. Wan *et al.* (2020) found that the addition of machine learning to a system alters software development practices in various ways. AI-assisted software development will change the role of the software engineer by making the role more varied, broad, and focused on machine learning.

These papers all suggest that AI-assisted software development will pose challenges for the software engineering profession. Korzeniowski and Goczyła (2019) found that there has been little progress in automated code generation, but recent advances in AI may improve the situation. Nascimento et al. (2020) found that software engineering practices have been applied to AI/ML systems, but there are challenges in areas like testing, AI software quality, and data management. Lwakatare *et al.* (2019) found that companies face challenges when developing software-intensive systems that incorporate machine learning components. Srihith *et al.* (2022) found that AI development will lead to changes in software engineers' roles and the delivery of education.

The software engineering profession can prepare for the impact of AI in various ways. Latinovic and Pammer-Schindler (2021) presents findings from interviews with experienced software practitioners about their experiences with automation and AI, and suggests that automation and AI are mostly used for small tasks, that they are not likely to change the essence of software engineering, and that they can cause cognitive overhead. Feldt, de Oliveira Neto and Torkar (2018) present a taxonomy for classifying ways of applying AI in software engineering, and suggests that there are different ways of applying AI in software engineering, and that each way poses different risks. The software engineering profession can prepare for the impact of AI by being aware of the potential consequences of AI, using AI to improve software development and testing, and understanding the risks associated with different ways of applying AI.

4. **DISCUSSIONS**

The discussion section highlights the findings of the systematic literature review and addresses the research questions. RQ1 investigated the skills that future software engineers will need. The results indicate that future software engineers will need to be competent in programming and have soft skills such as problem-solving and interpersonal communication. The study found that problembased learning can help future software engineers develop the necessary soft skills. The most popular programming languages among software engineers are Java, C, and Python, while the most in-demand skills are software requirements, design, and testing, and communication skills. However, the research also revealed a knowledge gap in the industry for skills such as configuration management, software engineering models and methods, software engineering process, design (and architecture), and testing.

RQ2 focused on how AI will impact the demand for software engineering skills. The study found that there is a growing demand for AI skills in the labor market. AI can be used to improve software engineering solutions, and vice versa. However, AI may also lead to automation of many jobs currently done by software engineers, potentially reducing the need for software engineers in the workforce. The findings suggest that AI will impact the demand for other engineering skills.

Finally, RQ3 investigated the future of work for software engineers. The study found that the role of software engineers is changing and will continue to change in the future. The addition of AI to software development practices will alter software development practices in various ways. While AI-assisted software development may make the role of software engineers more varied and broad, it

may also pose challenges to the software engineering profession. The research suggests that the software engineering profession can prepare for the impact of AI by being aware of the potential consequences of AI, using AI to improve software development and testing, and understanding the risks associated with different ways of applying AI.

Overall, the findings of the review highlight the importance of a strong technical foundation in programming and soft skills, such as problem-solving and interpersonal communication, for future software engineers. The review also indicates the need for continued professional development to keep up with the evolving demands of the industry, particularly in areas such as AI and its impact on the workforce. The implications of AI for software engineering call for increased awareness and preparedness among professionals in the field.

5. CONCLUSIONS

In conclusion, this systematic literature review has addressed three research questions related to the impact of AI on the labour force in software engineering. The first research question explored the skills that future software engineers will need, and the findings indicate that future software engineers will need to be competent in programming and have soft skills such as problem-solving and interpersonal communication. The second research question examined how AI will impact the demand for software engineering skills, and the results suggest that AI will have a significant impact on the software engineering workforce. AI will automate many jobs currently done by software engineers, which may lead to a reduction in the need for software engineers in the workforce. However, there is also a growing demand for AI skills in the labour market.

The third research question investigated the future of work for software engineers, and the findings indicate that the role of a software engineer is changing and will continue to change in the future. AI-assisted software development will change the role of the software engineer, and this poses challenges for the software engineering profession. The software engineering profession can prepare for the impact of AI by being aware of the potential consequences of AI, using AI to improve software development and testing, and understanding the risks associated with different ways of applying AI.

Overall, this review suggests that the impact of AI on the labour force in software engineering is significant and will continue to evolve. The software engineering profession must adapt to the changing landscape to remain relevant and effective in the future.

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ROMANIAN COMPANIES INSIGHTS TO THE FIRST YEAR OF COVID-19 PANDEMIC

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ABSTRACT

This study is a continuation of a research conducted in 2020 on the impact on Romanian companies of the changes in the economic environment caused by the pandemic COVID 19. The qualitative study presented was conducted using a telephone interview guide and aimed to evaluate the evolution of Romanian companies in the first year of the pandemic COVID -19 (February 2020 - February 2021). The data were collected online from the decision makers in the companies (owners, directors, administrators or branch managers), with the following directions: identify the strengths in coping with the pandemic and the opportunities created the level at which the main management operations were affected, adaptation of the business model to the new conditions. The main findings of the study show that the impact of the pandemic has not been exclusively negative, as some companies have managed to take advantage of the new opportunities that have arisen and have seen an increase in sales and the number of employees. Most companies have overcome the challenges by transforming their internal operations as well

as their products and the way they interact with customers. Of note is the high number of companies that have resorted to multiple digitization solutions to survive this pandemic year.

Keywords: succes factors; operations business; business models; COVID 19; qualitative analysis.

JEL Classification: H12, M12, M19.

1. INTRODUCTION

We started this research in the year 2021, at the end of the first year of the SARS-CoV-2 pandemic in Romania. After the first two months of economic lockdown, the Romanian economy was exposed to a whole year of unusual restrictions. Our study takes place after one year of economic crisis generated by the COVID pandemic and is focused on revealing some scientific evidences about the impact of this context on the Romanian companies.

The COVID-19 pandemic has affected multiple economic aspects of Romanian society, in similar ways experienced by other countries experiencing. The main battle was to prevent the exponential increase of the number of cases, hence, like many other countries, Romania also applied a range of preventive measures with direct impact on the economy, such as closing schools and markets, suspending flights and other forms of travel or tourism, prohibiting the organization of public events, etc.

The following set of events must be stated in order to understand the context. The first confirmed case of infection in Romania was registered on February 26, 2020 (National Center for Surveillance and Control of Communicable Diseases, 2020). On the 16th of March 2020, by a decree, the President of Romania established the state of emergency on the Romanian territory (Portal legislativ (1) 2020). The National Center for Surveillance and Control of Communicable Diseases stated that until the 18th of March 2020, 261 cases of COVID 19 coronavirus infection were confirmed (National Center for Surveillance and Control of Communicable Diseases, 2020).

The demand for several products and services was affected by the restrictions on the free movement of persons, giving the fact that the movement of all persons outside the home was allowed only for precisely defined and proven reasons (Portal legislativ (2) 2020). Many companies, from several economic domains were seriously affected by the newly imposed restrictions.

Until October 2021, the state of emergency was prolonged several times, with different levels of relaxation of the pandemic prevention measures, related with the number of cases registered.

Significant changes in the consumer's behaviour were triggered by all these restrictions. We saw the consequences in terms of changes in demand, in the supply chain, in the revenues of the companies and in their financial situation. For

ensuring social distance, working from home became an important solution, changing the social dynamic in the companies, but also changing some of the markets. As a consequence of these new behaviours, there was a decrease in gas consumption and a decrease of the demand for products wearable at work (e.g. clothes, perfumes and fashion accessories) or to be consumed at work (e.g. biscuits, softdrinks, sandwiches). Following all these changes, companies have experienced unemployment, reduced working time or employee furloughing (Turnea *et al.*, 2020).

According with Bartik et al., results obtained from a survey on more than 5,800 small businesses suggest that many of these firms had little cash on hand toward the beginning of the pandemic, which means that they will either have to dramatically cut expenses, take on additional debt, or declare bankruptcy (Bartik et al., 2020). In a report of the World Bank, which analyzed the effects of the pandemic in more than 100,000 businesses across 51 countries, primarily low and middle-income countries across the world, we observed that the likelihood of a business being open at the peak of COVID-19 crisis and up to 4 weeks after the peak is under 30%, but it significantly increases to almost 75% after 6 weeks after the peak. The cross-country average suggests a reduction in sales of about 49% compared to the same period in the previous year, with a standard deviation of 0.25. Around 57% of businesses adjusted their employment levels either on the intensive (44%), the extensive and intensive margin (12%), or only the extensive margin (7%). The slowdown of economic activity caused by the COVID-19 outbreak and related lock-down measures implemented to tackle the health crisis have led to severe difficulties for companies to meet their financial obligations (Apedo-Amah et al., 2020).

The COVID 19 pandemic has affected the business environment, leading to a number of strategic, tactical and operational changes. If in the initial stage many private or public entities decided to temporarily close their activities to protect their employees and change the business model, the passing time and continuing pandemic can show if the decisions taken in March - April 2020 produced the desired effects. Long-term COVID 19 shock are differently perceived amongst small and large firms as well as amongst the self-employed and incorporated business, as the smaller businesses are typically disadvantaged in their ability to capture the opportunities that crises have created (Belitski et al., 2021). But, some businesses were struggling, some businesses were thriving, such as Internet-based businesses, related to online entertainment, food delivery, online shopping, online education, and solutions for remote work growing. Other industries that were doing well are those related to healthcare and medication as well as herbs and vitamins (Donthu and Gustafsson, 2020) and such as tourism, hospitality, and restaurants, as the disease reduces the supply of workers, leaving survivors in a stronger bargaining position (Belitski et al., 2021)

In the study conducted by Maqui and Morris, more than 75% of participants agreed that what had been learned during the pandemic would make their business more efficient and that changes made would make their business more resilient. Most respondents considered that the pandemic would have a positive long-term impact on productivity, but a negative impact on employment (Maqui and Morris, 2020). Achim at all realized one study on 218 Romanian listed companies and the results reveal that equity financing, proper liquidity management, and an increased company size consolidate the economic performance of entities regarding the return on equity and the return on assets. They find out that the total net profits of the market decreased by 37.43% during the analyzed period (Achim *et al.*, 2021).

2. METHODOLOGY

The study is the result of a project carried out by a team of researchers from Al.I. Cuza University from Iași, the Iași Chamber of Commerce and Industry and BDO Romania, with the aim of evaluating the evolution of Romanian companies in a period of one year since the beginning of the pandemic COVID -19. The research team developed two instruments: a quantitative questionnaire and a qualitative interview guide. The interview guide was applied by telephone between March 4 and March 15, 2021, to 81 managers and business owners from different locations in Romania, detailed in Table 1, with the aim of identifying: i) the strengths of the business that ensured success during the pandemic; ii) how business functions were affected (operations/production, human resources, logistics, computerization, supply, new product development, etc.); iii) business opportunities that arose during the pandemic); iv) what changes of the business model are intended in order to respond to the innovations in the business environment; v) strengths in 2021 to develop the company; vi) what challenges will arise in the post-pandemic period. The data collected were analysed and coded using Atlas.ti qualitative analysis software, and graphic design is realized with InfraNodus.

Hypotheses:

11. The succes factors in the the pandemic are mostly specifically related to the pandemic conditions and less general succes factors in normal operation conditions.

12. The pandemic severily affected the commercial function of the company, lowering the demand and disturbing the supply chain. The other functions of the company were affected as a result of the disturbances in the commercial function.

13. The online approach and digitisation needed to work and to sustain commercial and financial transactions were the opportunities most frequently identified by the companies during the pandemic.

I4. Most of the companies dont have clear expected changes of the business models, and those who have are mostly oriented toward changes in the market presence and HR policies.

15. The strengts for ensurring the next year succes* are in the area of digitisation of operations, financial capability and HR value. (*the year 2022)

I6. The chalenges for the next year are considered as related to attracting valuable HR, continuation of the pandemic and changes of prices on the market. (*the year 2022)*

3. RESULTS

The qualitative study about the impact of COVID-19 was conducted through 81 interviews with company managers from 23 counties throughout Romania (Iaşi, Ilfov, Argeş, Bacău, Galați, Timiş, Constanța, Prahova, Botoşani, Cluj, Vrancea, Neamţ, Satu Mare, Baia Mare, Alba, Mureş, Giurgiu, Brăila, Braşov, Vaslui, Dâmbovița) and the Municipality of Bucharest (Table 1).

No.	County	No. of appearances	No.	County	No. of appearances
1	București	25	13	Prahova	2
2	Iași	11	14	Maramureș	1
3	Ilfov	7	15	Brasov	1
4	Bacău	4	16	Giurgiu	1
5	Galați	3	17	Brăila	1
6	Argeș	3	18	Dâmbovița	1
7	Timiș	3	19	It is not specified	2
8	Neamț	3	20	Satu Mare	1
9	Cluj	2	21	Alba	1
10	Constanța	2	22	Dolj	1
11	Vrancea	2	23	Mures	1
12	Botoșani	2	24	Vaslui	1

Table 1. Respondents distribution by county

The distribution of companies according to the number of employees, presented in Table 2, shows us that 33 of them have between 50-249, 29 over 250, 15 between 10-50 and 4 between 1-9 employees.

Category	Dimension	No. of appearances
Microenterprises	1-9	4
Small enterprises	10-49	15
Medium enterprises	50-249	33
Big enterprises	More 250	29
Total	81	

Table 2. Distribution of companies according to the number of employees

The fields in which the respondents have developed businesses are presented in Table 3. The difference compared to the total number of participants is explained by the fact that some companies have several registered business fields.

Domain Frequency Weight Trade 17 19,10% Food industry 16 17,98% IT&C 10 11,24% Agriculture 9 10,11% Construction 7 7,87% Transport 5 5,62% Production companies 5 5,62% Energy 3 3,37% Space rentals 3 3,37% Pharma 3 3,37% Publishing house 2 2,25% Arrangement of green spaces 1 1,12% Call center 1 1,12% Garments 1 1,12% Wood industry 1 1,12% Industry 1 1,12% Gambling 1 1,12% Consultancy 1 1,12% Holdings 1 1,12% Import and distribution 1 1,12% Total 89 100.00%

Table 3. Distribution of companies according to the business field

* some companies have several registered business fields

The interview sought, in the first part, to identify the problems faced by companies in 2020, as an effect of the SARS-COV2 - COVID-19 pandemic, and in the second part to identify some expected developments for 2021.

A. The qualitative analysis presents, based on the coding of managers' answers, the main economic and operational aspects that could be considered success factors in 2020. The qualitative research questions in this case was: What were the most important strengths of the business that ensured your success during the pandemic period?

No.	Success factors	No. of appearances	No.	Success factors	No. of appear ances
1	The activity went smoothly	20	19	Restriction of activity	3
2	Telework - YES (they used)	15	20	Strengthening relations with stakeholders	3
3	Preventive sanitary measures	13	21	Price reductions	3
4	Investments - decreased/stopped/post poned	11	22	Resource reserves	2
5	The quality of managerial decisions	11	23	Adaptability	2
6	High demand	9	24	European funds	2
7	Cost and salary reductions	9	25	Purchases - unaffected	2
8	Rescheduling budget/suppliers/custo mers payments	9	26	Technical capacity	1
9	Digitization	8	27	Cost-income correlation	1
10	Employees professionalism	8	28	Great experience	1
11	Negotiating relations with stakeholders	7	29	Migration to online	1
12	The quality of products	6	30	Resources provided by a group of companies	1
13	Optimization of activities	6	31	Brand awareness	1
14	Technical unemployment - YES	6	32	Manufacturing of sanitary products (COVID)	1
15	Investments - increased	6	33	Attention to the cash-flow situation	1

Table 4. Succes factors for the companies, during the pandemic

No.	Success factors	No. of appearances	No.	Success factors	No. of appear ances
16	Employee rotation	6	34	Fast distribution	1
17	Diversified product portfolio	5	35	High profit activities outside the RO	1
18	Continuation of business	5			

The companies had to adapt to the new conditions and tried to implement different decisions. Some of the succes factors described are internal, other external, and some are a combination of internal and external:

i) the activity was carried out normally - without problems (20 statements)

Here are some relevant extracts from the interviews: "We had no liquidity problem and were able to carry out our activity even during the state of alert, we were able to take the necessary measures so that they would be no COVID outbreaks, so as not to close the activity. We had no problems with the supply of materials or personnel, Corona cases were isolated and we were able to manage without interruption. We didn't have any problems with encashments, we weren't in a situation where we had to postpone taxes, we don't have loans.", "The main clients are in the foodsector, retail. The clients did not reduce their investments and continued the projects, it was not necessary to take extra measures", "The company operated normally", "We were constant, we cannot say that we were affected", "The market segment on which we are active was not affected".

ii) telework (15 occurrences) used to continue the activity, identified through answers such as: *"They all worked from home"*, *"There was a moment when the decision was made to isolate 840 people and work from home was also implemented"*, *"I implemented working from home"*, *"The decision was made for teleworking"*;

iii) anti-pandemic prevention measures (13 occurrences), a relevant aspect for companies because they wanted to protect their employees, some companies investing significant ammounts for the purchase of protective materials. Here are some relevant extracts from the interviews: "We invested to protect employees against COVID. Over 250 million euro was spent for disinfectants and PCR tests", "Implementation of very strict rules regarding protection against COVID", "Decisions were taken in the sense of increasing health safety and employee protection".

iv) investments were stopped, postponed or reduced (11), measures that affected the activity of the companies were taken, some with a high impact on the future evolution ("Investments were stopped", "Investments were delayed", "Postponement of investments", "Stopped investments"), but there were companies that increased investments (6), considering it a beneficial period for

them, because in some cases demand increased ("Investments had the largest budget, 400 million euros", "There were investments with non-reimbursable funds, accessed by the city halls") or the reduction of the number of employees in offices and production halls allowed maintenance, repairs or improvements to be carried out ("We took advantage of the 3-month lockdown period and did other necessary works of maintenance which normally would have meant stopping production", "Plus, people were not really at work, in the spaces rented by us, working from home, which helped to make improvements, repairs which normally they would have been done during the weekend").

v) the quality of managerial decisions (11), an essential characteristic, due to the fact that the ability to devise short-term action plans to respond to the new situation or the existence of strategic plans that also specify implementation risks allowed organizations not to be affected by the pandemic period: "Our leading position in the data center field and certain management decisions taken at opportune times", "The Board built a resilient business model that was prepared for the pandemic", "Strategic decisions regarding the client portfolio".

Other succes factors mentioned more than 8 times: vi) high demand; vii) cost and salaries reductions; viii) rescheduling payments to the state budget/suppliers/customers; viii) digitization; ix) the professionalism of the employees.

The previously presented codes were entered into the InfraNodus application that generates trees with the component words of the codes. In order to correctly highlight the connections and reduce the number of nodes without subnodes, we considered it useful for the analysis if we use the first 20 relevant constructs with the highest number of occurrences. Figure 1.1 shows the resulting structure:



Figure 1.1. Network generated from succes factors Source: InfraNodus
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For a better understanding ot this first output, the application also performs two relevant analyzes for the codes used as input: a) groups the related keywords based on an algorithm and generates a series of clusters, shown in figure 1.2. with their relative weight; b) offers sentences interpreting the results through artificial intelligence algorithms: "As the company's product quality portfolio is diversified, the decision to stop or decrease investment in one activity and/or to increase or postpone investment in another activity is a managerial one. The company's suppliers and customers, as well as its budget and payments, may be affected by these decisions. Optimization of product quality and investment activity is crucial to ensure that the company runs smoothly (Infranodus output)".



Figure 1.2. Network and category cluster for succes factors Source: InfraNodus

From figure 1.2. we can understand that in fact, succes factors were related to product quality, customer relations, good budgeting, activity optimization, good stakeholder relations and cost reduction.

B. The specific operations of the business were also influenced by the new situation, and the answers to the question: *How were the different functions of the business affected during the pandemic? (operations/ production, human resources, logistics, computerization, supply, development of new products)* are encoded and represented in Table 5.

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No.	Operation affected by the pandemic	No. of appear- ances	No	Operation affected by the pandemic	No. of appear- ances
1	The operations went smoothly	22	15	Collections - delayed	3
2	Sales - down	22	16	Investments - stopped/postponed	3
3	Demand - low	11	17	The prices increased	3
4	Imports - delays	11	18	Cash flow - affected	3
5	Supply - YES	9	19	Diversification of the product range - has reduced	3
6	Human resources - employee infection	9	20	Drought	3
7	Human resources - hiring/dismissals	7	21	Technical unemployment - YES	2
8	Turnover - decreased	6	22	Supply - NO	2
9	Production - decreased	6	23	The online environment - it was the rescue	2
10	Human resources - telework	5	24	Stocks - increased	2
11	Logistics - narrowed	5	25	Exports - YES	2
12	Digitization	4	26	Prices - have fallen	2
13	Government measures	4	27	Control of employee activity	2
14	Operations - recovered along the way	4	28	Acquisitions - reduced	2

Table 5. Operations affected during the pandemic

Depending of the specifics of the activities, the answers received were included in certain categories:

i) the operations were carried out without problems (22 occurences), which means that the pandemic had either a zero or a positive impact on operations, through: *"They were not affected and they produced. Orders decreased in Q4, Asia worked best, the rese were affected. The year 2020 was ok. Suppliers were ok. The biggest problema was China, but they don't collaborate with them and they don't want to. India and Japan went well. Thwy were a Little late. Sales have increased starting with Q4, at a slow and steady pace.", "The company's functions were not affected, with only one thing to add: working from home was tried as much as posible. Everything else went better tan they expected.* They respected and imposed sanitary measures mainly in the warehouse. They provided transportation for the employees and made sanitary equipments available to the employees.", They were not affected at all. The only area slightly affected was the sales area."

ii) The operational area of sale (22 occurrences), where a decrease in them is observed, with statements such as *"Sale have been severely affecteed"*, *"Sale have decreased greatly"*, *"Offline sale were blocked"*, *"Sales have decreased a little during the pandemic"*, *"It was a fantastic stress. Expenses increased and selling prices decreased"*, *"The winery was closed – the sales side was affected because of the closing of the Horeca area and because the behavior of household consumers changed"*, highlights the fact that the pandemic affected the distribution of products and, in some cases, generated a decrease in prices and an increase in stocks (which appears as a separate code, with answers such as *"We narrowed the activity both from the poit of view of the sale and logistics, but the stocks doubled"*, *"the part with the stocks"*, *"they had stocks"*).

iii) The supply was affected by the pandemic, both with raw materials/ supplies from internal production (9 occurences) ("The supply was affected during the summer, there were small delays. The situation stabilized in O4 2020 and in Q1 2021", "Crisis of machinery to harvest and transport", "Almost all of them. They had delays from suppliers in Romania and they managed to solve the problema, by redirecting to new suppliers.") as well as the import of equipment, supplies, raw materials required by the internal market (11 appearances). We notice that, most of them being large companies that depend on the foreign market, the firms had situations of delays in the first months of the pandemic, such as: "At the beginning of the pandemic, there were delays in the supply process for raw materials from Italy. Conversely, they did not greatly impact the process and after three months, the situation returned to normal. There was a temporary blockage caused by the situation in Italy", "There was a small delay in the raw materials from Austria, otherwise we were not affected in any way", "Delays in the delivery of equipment from European suplliers. Major suplly delays from China", "On the supply side, there were issuess with deliveries from China in the spring. After that, they made the decisión to change the delivery of products from maritime channels to transport by train, which had the effect of improving the supply chain." But, to a lesser extent, there are also companies that specified the fact that they had no problems with the supply (2 occurences), "The supply was not affected. The customers bring the raw materials themselves", "There were no delays in the supply side".

iv) Operations specific to human resources were also strongly affected: Human resources – employees infection (9), Human resources – hirings/ dismissals (7), Human resources – teleworking (5), Human resources – hard to find (1), Human resources – employees professionalism (1). v) production; vi) turnover decreased; vii) Government measures; viii) investments – were delayed; ix) encashment, etc.

The codes presented in table 5 were entered in InfraNodus, in order to obtain a network with the main operations affected by the COVID 19 crisis and we can see from Figure 1.3 that human resources, employees, production, pricing and cash flow had a significant influence on the analyzed businesses in the first pandemic year.



Figure 1.3. Network generated from business operations Source: InfraNodus

InfraNodus provides an AI-driven insight into the input data: "In recent months, the outbreak of coronavirus has led to a number of changes in the way businesses operate. One such change is an increase in the use of telework, or working from home. This has led to a reduction in the need for office space, and as a result, some businesses have had to reduce their workforce. Another change that has been seen is a reduction in the range of products offered by businesses, as they focus on essential items. This has also led to an increase in prices for some goods" Economics and Business Administration Higher Education under the Impact of Digitalization



Figure 1.4. Network and category cluster for business operation Source: InfraNodus

C. By the next item in the interview guide, it was intended to identify the opportunities found by the company's managers on the market, in the year 2020.

No.	Opportunities	No. of appearances
1	They weren't/we couldn't find them	29
2	The online environment	14
3	They didn't search - there was no need	12
4	New markets	10
5	Products for the COVID pandemic	7
6	European projects	5
7	Digitization	4
8	Hiring talent - hard to find in the past	3
9	Optimization of production processes	3
10	Portfolio diversification	3
11	Niche activity - no opportunities	2
12	The activity did not stop	1
13	Anticipation of the situation	1
14	Financing and internationalization	1
15	State subsidies	1
16	I can't orient the activity	1

Table 6. Opportunities during the pandemic

No.	Opportunities	No. of appearances
17	IT security	1
18	Export sales	1
19	Moving production from China to Europe	1
20	Analysis time	1

From Table 6 we can notice some main characteristics of the answers: i) they were not/ we did not find (29 occurences) with examples: "They were not" or "They are not. It's the same market", "They didn't exist", "They didn't manage to find opportunities during the period that has passed"; ii) the online environment (14 occurences) was the main opportunity, many companies being forced to turn to sales infrastructures based on web technologies: "Online is an opportunity in the future and they want to increase it, to over 200-300% compared to the past period", "They have started to approach the area of online sales", , Online sales have reached 1-2% of the turnover. At the momento the activity is sustainable but does not bring profit."; iii) they didn't search - it was not **necessary** (12 occurences): "They didn't seach because they wre completely caught up with projects already unfolded. They tried to open outside the country, for reasons unrelated to the crisis, but they also want to go to international markets. They have experience in this area.", "No. They have projects through bids", "They weren't because they hav no reason because the demand exceded expectations. For this reason, they did not have time to reorient themselves towards new opportunities"; iv) new markets; v) products for the COVID pandemic; vi) European projects; vii) digitization; viii) hiring hard-to-find talent.

D. The answers to the question *What changes do you intend to make in the business model in the coming period, in response to the expected changes in the markets, generated by the pandemic?* Are analyzed in Table 7.

No.	Changes in the business model in the future	No. of appearances
1	Doesn't intend to make changes	42
2	Improving the current model	12
3	Human resources (training, motivation, etc.)	9
4	Online development	9
5	Diversification of products/services	8
6	New investments	7
7	Digitization/optimization	7

Table 7. Changes in the business model in the future

No.	Changes in the business model in the future	No. of appearances
8	Access to European funds	2
9	Prudence and detailed analysis	2
10	Franchising	1
11	Transport hub	1
12	Promotion	1
13	Direct selling	1
14	They will sketch - but without giving details	1
15	Internationalization	1
16	Orientation towards products with high added value	1

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From the processing of the statements of the participants, it follows that: i) they do not intend to make changes (42 occurences), which either means that they are satisfied with how the business model reacted to the situation in 2020 or they have not identified prospects for change: "They don't want to make changes. *A year before they moved everything online (internal processes) and were better* prepared. They were prepared but the pandemic motivated them, they implemented a new operational system", "The market is quite stable and does not require change, they have contracts for the whole year and do not intend to make changes" or "They do not intend"; ii) improving the current model (12 occurences): "Just to improve the current model. They made a plan until 2027 and they will not change it now. The dynamics of the market does not really change", "To improve the current model. They want to approach new markets, exports. To integrate as much as possible from the production and development area". "To strengthen the sale channels we have", ", Windows has a program that allows you to manage projects", "We adapt to what life is prefigured to be -a continuous threat of a virus or pathogenic factors. We will improve the health protection systems and improve the procedures", "Only consolidation and expansión of production capacity", "Everything that can be done remotely will be done from home if the employee also wants it. All the production processes will be thought in such a way as to respect the distance of 1.5 meters between the operators", "To review our products and the services we provide in order to make them more attractive, more scannable, simpler for the average user as well, because until now they were only intended for large companies"; iii) human resources; iv) developing in online; v) diversification of products and services;

Entered into InfraNodus, the codes shown in table 7 generated the network shown together with the main clusters in figure 1.5. We can see that the main proposed clusters are: product diversification, training motivation, givind detail, prudent analysis, european funds, curent models.



Figure 1.5. Network and cluster generated from chamges in business models Source: InfraNodus

The resulting idea presented by InfraNodus after the introduced texts highlight the following aspects: *"The company has a product high add orientation service diversification. This means that the company offers a variety of services that can be added on to the product, and that the company is always looking for new ways to motivate and train its human resources. The company is also very detailed oriented, giving customers a sketch of what they will be getting before they purchase the product. The company does a detailed analysis of the product before it is released to the public, and is always looking for ways to improve its training resources. (InfraNodus output)"*

From figure 1.5 we can understand that in fact, the expected changes in the business model are related to product diversification, training and motivation of employees, prudent and detailed analysis, and attracting european fundings.

E. The answers for the item *What will be, in the year of 2021, the most important strengths for developing the business?* were coded through the characteristics presented in Table 8.

No.	Expected strengths for 2021	No. of appearances	No.	Expected strengths for 2021	No. of appearances
1	Digitization and process improvement	18	17	Acquisition of new companies	1
2	High financing capacity	13	18	High demand	1
3	Expertise in the field	12	19	Equity growth	1

Table 8. Expected strengths for 2021

No.	Expected strengths for 2021	No. of appearances	No.	Expected strengths for 2021	No. of appearances
4	HR with expertise	12	20	Overcoming critical moments	1
5	Growth in the sector	10	21	Tax reductions	1
6	Investment growth	10	22	Reduction of investments	1
7	Brand awareness	9	23	Low prices	1
8	Flexibility/adaptability	7	24	Longer payment terms	1
9	Production capacity	6	25	teleworking	1
10	Product quality	6	26	Customer relationship	1
11	European funds	3	27	Leader in the field	1
12	Almost nothing has changed	3	28	The degree of development of the field	1
13	Hope for a better year	2	29	Reduced HR turnover	1
14	HR - reduced costs	2	30	New jobs	1
15	Resource control	2	31	The business model	1
16	He doesn't see any strengths	2	32	Business location	1

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It can be noticed that the main answers are correlated with the measures from the year of 2020, namely: **i) digitization and improvements of processes** (18 occurences): "*They will continue digitization and improvement of operational processes*", "*Always try to optimize processes*", "*Develop an application for the online area*", "*Optimizing investments on European funds already implemented and accessing European funds for everything related to zootechnics*.", "*The same innovation and agility that keep us moving*"; **ii) high financing capacity** (13 occurences) shows that the companies have financial resources necessary for the processes: "*I have a large capital at my disposal from which I can also help clients with various financings*", "*Due to the fact that they are a large company, they are still resisting. They have resources and high equity*.", "*The availability of equity*"; **iii) expertise in the field; iv) human resources with expertise;**

F. The main challenges for companies for the year 2021 are encoded in Table 9, which includes a list of 46 characteristics.

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Table 9.	Challenges	of 2021
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No.	Challenges of 2021	No. of appear- ances	No.	Challenges of 2021	No. of appear- ances
1	Attracting specialized HR	21	24	Market	2
2	The continuation of the pandemic	14	25	Purchasing power	2
3	High cost of raw materials	13	26	Lack of information and unpredictability	2
4	Government investments	11	27	Lack of demand	2
5	Inability to obtain financing	10	28	Weather conditions	1
6	Improving own strategies	8	29	Decrease in consumer incomes	1
7	Exchange rate	7	30	Customer retention	1
8	Good relations with stakeholders	6	31	Work accidents	1
9	Balancing the balance of income and expenditure	5	32	Access to the capital market	1
10	The legislation in the field	5	33	Adaptation to the organizational culture	1
11	Global/local strategy	5	34	Stagnation of prices	1
12	There are no challenges	4	35	Telecommuting - not working	1
13	Competition and consolidation of big brands	4	36	The unprofessionalism of the public administration	1
14	Imports	4	37	Ordinance 114	1
15	Pressure on the price of products sold	3	38	Changing the type of client	1
16	European funds	3	39	Insolvency of partners	1
17	Economic blockade	2	40	Lack of unqualified staff	1
18	Self-financing	2	41	Price fluctuation	1
19	Framing in debt repayment schedules	2	42	Decrease in purchasing power	1
20	Healthy team	2	43	Environmental problems	1
21	Raising the minimum wage	2	44	High interest rates	1
22	Employee retention	2	45	Exports	1
23	Selling online	2	46	Swine fever	1

The challenges of 2021 in the opinion of the managers participating in the study are: i) attracting specialized human resources (21 occurences), a feature intensely discussed in the current conditions, when very well-trained people have either left Romania, or developed their oewn businesses: "In the human resources area, it is predicted that there will be a struggle to get the human resource that has returned to the country, very specialited", "To find the qualified human resource", "In the area of human resources, they do not manage to find people easily and it takes a long tome to do specialization", "To keep employees who have been specialized", "Finding specialized human resource is a big challenge"; ii) the continuation of the pandemic (14 occurences) is another important challenge ("The failure to resolve the situation generated by the pandemic", "The pandemic is the challenge", "A new lockdown", "The pandemic remains a challenge from a business point of view. Any restriction of circulation has an impact in figures. It translates into a decrease in turnover, profit, exhange rate differences, and transportation. I think that The National Bank of Romania will do its job because it has the necessary levers. Reserves are at 27-28 billion Euros") and can also be associated with iii) the high cost of raw materials (the high cost of raw materials in agricultura, mainly for cereals, "The high cost of raw materials.", "Lack of commodities from China and price increases of products", "The challenge will come from the supply chain rea - a challenge for the following years is related to the supply of electronic circuit components and how well we will know how to manage it"); iv) government investments or v) the impossibility of obtaining financing, bank restrictions in accessing loans ("At the bank level, financing is impossible. They are denied even opening an account by all banks.", "Challenges in accessing loans", "The challenge is to Access financing", "Accessing funds is very cumbersome and difficult", "Increased pressure of the state in terms of financiar sources") or vi) the Exchange rate through Exchange rate differences ("The biggest challenge is the evolution of the Exchange rate and the high dependence on customers", "There is a fear regarding the exchange rate difference", "Establishment of a development bank to ensure the unbankable domains. There is a very big challenge regarding the exchange rate difference.", "The exchange rate difference is a threat if the current cycle is maintained.").

4. CONCLUSIONS

COVID-19 pandemic has changed day-to-day life in unprecedent ways. Both employers and employees played a significant role in protecting themselves and each other to prevent further spread of the virus. In this paper, we explore the impact of COVID-19 on Romanian business landscape in order to underline the following elements: i) the business strengths; ii) COVID-19 effects on business function (e.g. operations/production, human resources, logistics, computerization, supply, new product development); iii) improvement driven opportunities that arose during the pandemic; iv) changes in business models as a response to environmental innovation and societal transformations; v) companies new developed strengths imposed by COVID-19 major economic shock and vi) postpandemic challenges for the business environment.

To explore all these, we interviewed eighty-one managers and business owners from Romanian companies. The interviews were conducted by telephone between March 4 and March 15, 2021. This timing of the interviews allowed us to understand the expectations of business owners and the problems they faced during the pandemic at a critical point in time when the progression of COVID-19 was still at an elevated level and many restrictions were in place in Romania.

The results show that in our sample most companies (40% of the total sample) are medium size enterprises (50 to 249 employees), or large enterprises that employed 250 or more people (35% of our sample). The remaining distribution is divided into microenterprises (fewer than ten employees) (4,94% of the total sample) and small enterprises (10 to 49 employees) (18,52% of the total sample). Also, most of companies (58,43% of the sample) were from the food industry, trade, ITC, and agriculture sector.

The qualitative analysis indicates that 24,69% of the interviewed companies were able to carry their activities with no interruptions during COVID-19 pandemic. However, the COVID-19 crises created a sudden need for 18,52% of the businesses and their employees to start or increase working from home. Related results were found in other studies, where because of the pandemic, working from home has become the norm for millions of workers in the European Union and worldwide. For instance, a study published by the Joint Research Center shows that the employment in teleworking raised from 15% before the outbreak to around 25% in 2021, in the teleworker sectors in the EU (JCR, 2021).

Alle hypotheses have been confirmed:

11. The succes factors in the the pandemic are mostly specifically related to the pandemic conditions and less general succes factors in normal operation conditions.

The hypothesis was confirmed, as 7 of the first 10 most important succes factors were directly related to pandemic conditions.

12. The pandemic severily affected the commercial function of the company, lowering the demand and disturbing the supply chain. The other functions of the company were affected as a result of the disturbances in the commercial function.

The hypothesis was confirmed, as the first 4 most frequent problems reported were about poor demand and the problems in the supply chain.

13. The online approach and digitisation needed to work and to sustain commercial and financial transactions were the opportunities most frequently identified by the companies during the pandemic.

The hypothesis was confirmed, as the first set of opportunities, as frequency the about the use of the online environment for as many operations as possible. *I4. Most of the companies dont have clear expected changes of the business models, and those who have are mostly oriented toward changes in the market presence and HR policies.*

The hypothesis was confirmed, as half of the companies did not expected to further change the business model. Those expresing this expectance focused on product diversification, training and motivation of employees.

15. The strengts for ensurring the next year succes* are in the area of digitisation of operations, financial capability and HR value. (*the year 2022)

The hypothesis was confirmed, as the most frequent strengts expresed were in these areas.

I6. The chalenges for the next year are considered as related to attracting valuable HR, continuation of the pandemic and changes of prices on the market. (*the year 2022)*

The hypothesis was confirmed, as the most frequent chalenges expresed were in these areas.

The use of a qualitative methodology represented an important strength of your study, since the phenomenons and the factors analysed were only emergent and the theoretical foundation was also in an emergent state. Through the six questions, the big number of interviews and the use of the InfraNodus software output, were managed to clarly state a number of 6 hypotheses and to confirm them in a sound manner.

This study reveals how Romanian companies adapted to the first year of pandemic and how they see the perspectives of the next year (2022 at the time of the study), as the pandemic was not over and new trends requiring adaptation were still emerging. Most companies have overcome the challenges by transforming their internal operations as well as their products and the way they interact with customers. A high number of companies have resorted to multiple digitization solutions, changing both internal and external processes, to survive this pandemic year. The HR policies developped to cope with the pandemic restrictrictions were also frequently refered as important factors for the succes of the companies.

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STATISTICAL ASPECTS OF ECONOMIC POLICIES IN THE CONTEXT OF THE COVID-19 CRISIS AND POST-CRISIS EFFECTS IN REPUBLIC OF MOLDOVA

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ABSTRACT

The main purpose of the present paper is to analyze the statistical aspects of economic policies in the context of the covid-19 crisis and post-crisis effects. In the context of the analysis of the impact of the pandemic on the population, were studied the effects on the population during the state of emergency in the Republic of Moldova, from the social and economic perspective. The paper includes a statistical approach of the pandemic impact on the main macroeconomic indicators, and a reaction of economic policies in order to support the population and economic activity.

As a result of the post-crisis situation, with additional pressure to prices that implied the significant effects on the population the paper includes approaches regarding the stabilizing role of economic policies, in special monetary and fiscal policy.

Keywords: inflation; economic policy; COVID crises; empirical study; econometric model.

JEL Classification: C13, C54, D12.

1. INTRODUCTION

The COVID-19 pandemic has caused a series of changes and effects on the population. The year 2020 was an unprecedented year at the global level, marked by the pandemic crisis generated by COVID-19 with severe repercussions on socio-economic life. The management of this crisis has become the major concern of the countries of the world, imposing a series of challenges for economic policies. The pandemic crisis and restrictions related to the epidemiological

situation, continued in the first half of 2021, which significantly affect economic activity, people's lives, and population consumption.

But, as the effects of the pandemic crisis are mitigated, the efforts to support the economy in most of the world's states are beginning to materialize, the economy is recovering rapidly, accompanied by an increasingly accentuated inflation, along with the assimilation of the allocated resources (Bartsch, 2019).

The second half of the 2021 could be characterized by the complete change of the international economic context. Several tensions and risks, accumulated over time, have generated the energy crisis, the accelerated increase in food prices, as well as the worsening of the geopolitical situation in the region. The consequences of these events were felt here in the form of shocks and pressure on prices.

Many economists have treated these shocks as temporary or transitory shocks, being supply shocks, to which economic policies should not react, because they have no implications on the long-term price trend.

Economists had divided opinions. Some of them, have treated these shocks as temporary or transitory shocks, being supply shocks, to which economic policies should not react, because they have no implications on inflation on the long-term run. Other economists have mentioned that is high important topic, and the critical moment is when supply shocks will turn into demand shocks, which have a significant implication on prices.

2. THE IMPACT ON THE POPULATION OF THE COVID-19 ON THE SHORT TERM

As a result of the spread of the new type of virus and the introduction of restrictive measures by the authorities of the Republic of Moldova, it has been observed that the effects of the situation are reflected strongly to the social and economic perspective (Fig. 1).

Since the emergency period, the population began to withdraw from the labor market (Fig. 2). A first form of withdrawal refers to remote work, the share of women who worked from home during the emergency was 27% (UN WOMEN, 2020; UN UNECE, 2021).

During the emergency period, a relatively significant share of the population suspended their work as workers (33.5% men and 36.7% women). And their return to the workplace was conditioned by the risks related to infection, the rules of prophylaxis and social distancing, as well as the economic situation characteristic of some sectors of the economy (Bergamini, 2020).

A specific factor related to the return of a family member refers to the possibility of households to provide care for children or other family members in conditions where schools and kindergartens were closed for a period following the emergency period or operated with a reduced special regime.

GEBA 2022



Figure 1. The general opinion to open the sectors of the society after 2 months from the state of emergency (April 2020) (Source: Elaborated by the author based on UN WOMEN Report, 2020)



Figure 2. The situation regarding the workplace after 2 months from the state of emergency (April 2020) (Source: Elaborated by the author based on UN WEMEN Report, 2020)

The development of strategies to combat the effects of the pandemic caused by COVID-19 sensitive to the specific problems of the population, but also of the

economic entities, can be considered BRIDGES in order to overcome the crisis situation.

3. ECONOMIC POLICIES IN THE CONTEXT OF THE STATE OF EMERGENCY GENERATED BY COVID-19

The COVID-19 crisis has a spontaneous nature, determined by the complete immobilization of the economic sectors for the period of social restrictions and the imposition of stringent sanitary rules during the state of emergency, which denatured the economic balances in aggregate demand and supply, in investments, in consumption, in partial and full value chains, as well as in supply chains (Marinescu, 2020; Lupuşor, 2020).

The economy of the Republic of Moldova, being a vulnerable one, in the process of transition and reshaping due to previous political crises, was deeply affected.

The depth of the recession and the speed of economic recovery depended on how quickly the virus could be brought under control and on the actions of economic policies, the coordination of monetary and fiscal policy actions.

In this sense, the covid-19 epidemic represents a significant test for the world and national economy. Economic policies played an essential role.

3.1 The implications of monetary policy

The aim of monetary policy decisions (Fig. 3) was (i) mitigate the impact of COVID-19 on the national economy as a whole; (ii) maintaining favorable liquidity conditions; (iii) supporting aggregate demand and domestic economic activity; (iv) stimulate the lending and saving process in the national currency.



Source: National Bank of Moldova.



Supporting individuals (including individuals carrying out entrepreneurial activities):

NBM Decision of 17 March 2020 allowed banks to manage flexibly the payment obligations of individuals in difficulty to pay their loans under the conditions of state of emergency. Thus, during 17 March – 31 May 2020, banks could maintain the level of prudential losses allowance for loans provided to individuals, in accordance to classification performed by banks at the situation of 17 March 2020, in case the loan repayment schedule has been violated. Changes to the maturity of payments and/or payment amounts for these loans until 31 July 2020 will not have the effect of classifying them in severe category than the one existing at 17 March 2020.

On 6 April 2020 NBM has encouraged the use of cashless payment methods and urged citizens not to disclose any information about their bank cards. A similar action in this regard was carried out by the NBM on 3 February 2021.

Supporting legal persons:

NBM Decision of 27 March 2020 offered banks flexibility in approaching the economic agents with bank loans. Banks were allowed to postpone or change, until 30 June 2020, the payment deadlines and/or the amounts of due payments on loans granted to economic agents that are temporarily facing difficulty of payment. Changes will not have the effect of classifying them automatically in more severe category than the one existing at 27 March 2020.

On 3 April 2020 NBM recommended banks to refrain from distributing dividends to shareholders and other forms of capital distribution, at least until 30 September 2020.

On 3 April 2020 NBM decided to relax the requirements for capital buffers. Thus, the NBM allows banks to use temporarily (until a later date is communicated) the capital conservation buffer previously established. The preserved capital may be used to absorb eventual worsening of the loan portfolio quality and to support the financing of the business environment and of the population.

On 10 April 2020 NBM extended the deadlines for submitting reports by licensed banks, in order to ensure the necessary conditions for banks to comply with the deadlines for reporting established by the NBM normative acts.

On 14 May 2020 NBM extended again the deadline for the submission of one report by licensed banks.

On 16 April 2020 NBM informed the banks that customer due diligence measures, in particular reviewing and updating the identification information for customers and beneficial owners, could be applied with a certain degree of flexibility due to COVID-19.

On 12 May 2020 NBM amended the Regulation on the treatment of banks' credit risk using standardised approach, by clarifying that bank's exposures to public sector entities from Moldova, as well as the exposures guaranteed by them

that meet the eligibility requirements, expressed and financed in Moldovan lei, shall be assigned a 20% risk weight. Following this clarification, banks may be actively involved in providing loans guaranteed by public sector entities.

On 13 May 2020 NBM informed the reporting entities about new typologies of money laundering-related crimes throughout the world during the pandemic. NBM encouraged the reporting entities to remain vigilant and continue to implement international and national standards whilst remaining alert to new and emerging illicit finance risks due to COVID-19.

3.2 The implications of fiscal policy on the economic cycle and inflation

In addition to the influence of monetary policy, the dynamics of aggregate demand and prices are also determined by the conduct of other components of the macroeconomic policy set, such as fiscal policy. Fiscal policy has a direct effect on the economy by influencing aggregate demand through the fiscal position or in other words the fiscal impulse. An optimal fiscal policy has the role of mitigating and stabilizing the fluctuations of the economic cycle and, therefore, the dynamics of the deviation of GDP from its potential level. Establishing the fiscal conduct regarding the amount of indirect taxes, such as VAT or the level of excise duties on different products have direct effects on the price level.

Impact to
$$CPI = \frac{Share in the CPI}{Total CPI weight} x \frac{The price of the \frac{good}{service}}{The price of the \frac{good}{service}} before tax,$$
 (1)

The calculation, both effects on the inflation projection and of the fiscal impulse, is substantiated starting from the medium-term budgetary framework elaborated by the Ministry of Finance of the Republic of Moldova, and the macroeconomic forecast that was its basis elaborated by the Ministry of Economy of the Republic of Moldova. Where, projections of the relevant macroeconomic variables (GDP, deflators, consumption, unemployment, wages, interest, exchange rates, etc.) interact with discretionary measures on the revenue and expenditure side, taken by the authorities with powers in the field, to produce a forecast of the state budget for the current year and the following two years.

The recorded tax balances are both the product of the decisions of the tax authorities and the result of the influences of factors beyond their direct control, in which the fluctuations recorded by the economic activity are predominant. The adjustment of the state budget with the influence of cyclical factors facilitates the analysis of budgetary policies. Therefore, the forecast of revenues, expenses and default budget balances are also accompanied by the determination of their structural component. The identification of the structural fiscal position allows the evaluation of the way in which the fiscal policy fulfills its role as a macroeconomic stabilizer, which would imply an expansionary behavior in periods of recession and, respectively, a restrictive behavior in periods of economic "boom". The structural balance, or structural fiscal position, or underlying fiscal position is the size of the deficit that would have prevailed in the absence of economic cycle influences (Fig. 4).

Effective balance	Structural — balance	+	Cyclica1 component				
(-2% from GDP)	(-2,5% from GDP)		(0,5% in PIB)				
			Cyclical component (0,5% from PIB)	+	Excess Demand (1% from PIB)	x	The sensitivity of the budget balance to excess demand (0.5)

Figure 4. Hypothetical calculations associated with a concrete historical situation (Source: Elaborated by the author)

In dynamics, the structural balance can be viewed from the perspective of the fiscal stance, reflecting the change in the structural balance from one moment to another. The fiscal impulse being equal to the fiscal position, but with the algebraic sign changed. A positive fiscal impulse indicates an expansionary fiscal policy with inflationary effects.

If the positive fiscal impulse coexists with an excess of demand, the fiscal policy is procyclical - in the sense that the fiscal policy does not fulfill its role as a stabilizer of the economic cycle, but on the contrary, it contributes to the amplification of cyclical fluctuations and inflationary pressures from excess demand.

The tax relief and support measures: (i) deferment of tax payments until 25 June 2020; (ii) suspension of tax audits until June 2020; (iii) suspension of the 2019 audit obligation for enterprises that were hard-hit by lockdown measures; (iv) reduction of the value added tax (VAT) from 20 to 15% as of 1 May 2020 (only for enterprises involved in the food industry and hospitality sector); (v) VAT Refund Program (1 May -31 December 2020) of 1 billion (USD 56 million).

3.3 The impact of the COVID-19 on economic activity

Economic activity in Moldova is inextricably linked to the situation in the world and especially to the situation in the European Union as a main economic partner.

According to data from the National Bureau of Statistics, in 2020 the GDP contracted by 8.3%, due to the reduction in demand in countries affected by COVID-19.

The reduction of the population's disposable income and the postponement of the population's expenses in the context of the uncertainties caused by the pandemic determined the reduction of the final consumption of the population's households (BussinessClass, 2020). The contraction of economic activity was recorded in most sectors of the national economy, except for the financial and construction sectors, which recorded positive dynamics.



deficit to GDP (Source: Ministry of finance *preliminary)



In 2020, economic policies were oriented towards mitigating and counteracting the impact of the pandemic in the conditions of a negative fiscal impulse. In this context, the authorities intervened promptly and approved measures to support individuals and legal entities (Fig. 5-8).







The efficiency of economic policies determined in 2021 to record an increase in the gross domestic product of 13.9 percent compared to the previous year. This unprecedented increase was due to inflation, which rose sharply during the year. Against the background of the current simultaneous crises, the impact of which is increasing, the authorities must make efforts to moderate the consequences of shocks on prices, maintain a balance that would simultaneously meet restrictive monetary policy conditions and stimulating conditions for economic growth, as well as ensuring stability financial and national currency.

Efforts that will lead once the crises are overcome and the risks of external shocks are reduced to the rapid recovery of the economy and the resumption of sustainable growth.

4. ECONOMIC REACTION IN CONTEXT OF THE COVID-19 POST-CRISIS, INFLATIONARY PRESSURE FROM RAW MATERIALS

A certain fact is that the economy is marked by a continuous dynamic, as was mentioned previously, the post-covid crisis effects are marked by strong increases in raw materials. And the question is, **should the economic policy**, **especially the monetary policy**, **react to the price increases of raw materials**?

_	Explanatory variable					
Quarters after						
the shock	Oil	Food	Money	NEER		
1	4.0	8.4	13.8	-21.3		
2	4.6	9.8	23.8	-30.5		
3	6.8	17.1	30.5	-43.6		
4	8.5	20.9	37.7	-58.8		
5	7.0	16.6	35.0	-71.6		
6	5.9	14.0	33.8	-79.6		
7	6.1	14.7	34.2	-81.3		
8	6.7	15.9	35.3	-79.7		
9	6.6	15.7	34.4	-77.6		
10	6.3	15.0	33.5	-76.1		
11	6.3	14.9	33.5	-75.5		
12	6.4	15.3	34.0	-75.4		

Table 1. Pass-Through to CPI.

(Source: Elaborated by the author, increase in Moldova inflation in response to 100 percent shock to the predictor variable)

To evaluate the pass-through from international food and energy prices to Moldova inflation (Mija, 2013), in paper was constructed a vector autoregression model (VAR). This model incorporated Moldova's inflation itself, currency in circulation, nominal effective exchange rate of the Moldovan leu (higher value means MDL appreciation), and WEO indices of international oil prices and food prices.

For simplicity, all series were included in the VAR as endogenous variables with 2 lags. The model was estimated in EViews over the period from Q1 2010 - Q2 2022.

Impulse responses derived from the VAR model revealed statistically significant, if not very large impact of the shocks to international oil and food prices on domestic headline inflation in Moldova.

As usual, pass-through coefficients could be derived from these impulse responses by dividing the resulting shocks to inflation by the original shocks to the explanatory variables (Table 1). These coefficients confirm that the passthrough from food prices is notable, while the oil price effect looks moderate; both appear smaller than those from shocks to the exchange rate or money.

	World price	Pass-through	Contribution to
	increase	coefficient	CPI
Oil	35.6	8.5	3.0
Food	24.1	20.9	5.0
Total			8.1

Table 2. Impact of World Oil and Food Prices to CPI (p.p.)

(Source: Elaborated by the author)

Using these coefficients, we can estimate the impact of shocks to the international prices on Moldova inflation. For illustration, we can calculate that the cumulative contribution of the international oil and food price increases projected for 2022 by the WEO to Moldova inflation can reach 8 percentage points (Table 2).

5. CONCLUSIONS

The COVID-19 pandemic has caused a series of changes and effects on the population.

Strengthening the business environment, ensuring a competitive development, diversifying supply sources remain among the most important challenges for the Republic of Moldova.

Low inflation, the maintenance of incomes, both of households and companies, is a key factor for maintaining market demand, avoiding the increase in the poverty rate, the bankruptcy of producers or decrease in receipts to the state budget.

Ensuring increased fiscal flexibility for the business environment and a forward-looking oriented monetary policy.

The analysis regarding the raw materials effects reveals that economic policy, in special monetary policy should react to the price increases of raw materials, due

to significant pass-through from the international food and energy prices to the headline consumer inflation in Moldova.

This suggests that the international food and energy prices affect local food and energy prices.

For the headline inflation, the obtained pass-through coefficients for food and energy are less than those for the exchange rate and monetary variables. This implies that under normal circumstances, domestic rather than international factors play the crucial role in shaping Moldova's total inflation. However, in case of massive shocks to the international prices, their cumulative impact may be significant as well. According to our estimates, the surge in international food and fuel prices projected by the WEO for 2022 can cumulatively add as much as 8 percentage points to Moldova inflation over a couple of years.

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STUDY ABROAD IN THE DIGITAL WORLD: ONLINE OPEN MODULE IN DIGITAL LEARNING FOR EXCHANGE STUDENTS

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ABSTRACT

The pressure of the labor market, the change of professional and personal life of learners because of the intense interaction with information and communications technologies (ICT), correlated with the consistent impact of Covid-19 pandemic, determined an accelerated growth in the use of e-learning platforms for higher education. The adaptation process wasn't always smooth and revealed a strong need for development of certain dimensions of digital competences of the students, such as information navigation, social, creative, online safety and problem-solving abilities. One of the most affected cohort of students during the Covid-19 crisis was made up of the exchange students (both incoming and outgoing). In this spirit, the paper presents the Online Open Module in Digital Learning developed in the Erasmus+ project "CONFIDENT - Enhancing Intercultural and Digital Competences of Mobile Students in Times of Crisis" (project no. 2020-1-RO01-KA226-HE-095384). The Digital Learning module is designed to address the needs of students to get accustomed to different online teaching and learning platforms and tools, thus ensuring a better inclusion in their study groups at home or at the host institutions during study exchange. By acquiring these digital learning skills the integration at the partner university will be smoother and challenge-free. Another goal of the module is to tackle the topic of ethics and information security in order to ensure the students' welfare in the digital world, and to help them fighting against cyberbullying, fake news, online violence and other means of online disinformation.

Keywords: learning, higher education; exchange students; digital competences; information security; e-learning platforms.

JEL Classification: I23, O33, D83.

1. INTRODUCTION

Electronic learning (e-learning) is not a new concept. With a historical start dating back to the early computer-based education of 1960s, its' scope has expanded chronologically and concentrically, with important milestones such as: first Internet-based courses (1976), use of personal computers in learning (1980s), creation and increased recognition of Learning Management Systems (1990s), and successful development of MOOCs - Massive Open Online Courses (2000s) (Bouchrika, 2022) (Garavan et al., 2019). Over time, electronic courses incorporated more and more non-text content, in the form of images, videos, games, augmented reality, 3D visualizations (Popescul et al., 2016) (Endicott-Popovsky, 2014), Web 2.0 facilities (wikis, forums, blogs, etc.) and were progressively adapted to be used on mobile and other wearable devices (Deslarzes and Grandjean, 2013) (Dominic et al., 2014) (Airinei and Homocianu, 2010). Today, e-learning represents the use of ICT to learn anywhere, anytime, individually or in a group, assisted or unassisted, online or offline, synchronous or asynchronous, on computers or other digital companions of humans (Hussain, 2012). The term "e-learning" is used as an umbrella concept, incorporating online, virtual learning environments, or social learning technologies (Giannakos et al.,

2021). According to Kumar Basak, Wotto and Belanger, e-learning is only a subset, a part of digital learning, the latter being a broader concept, defined as "any instructional practice that effectively uses technology to strengthen a student's learning experience and encompasses a wide spectrum of tools and practices (software, learning contents, online and computer-based assessments, access to online databases and other sources etc.)" (Kumar Basak *et al.*, 2018).

Both positive and negative aspects can be associated with e-learning.

In the advantages area, firstly, students have access to a broad variety of courses on a wide range of topics, offered not only by universities, but also by different other providers. An impressive range of learning materials in different topics are available, in various formats (text, audio, video, etc.). Students can participate in learning processes overpassing time, cost and location barriers, if the required technology, Internet connection and/or the appropriate devices are on hand. E-learning can prove more inclusive, offering equal access to knowledge, regardless of the users' ethnic origins, races, disabilities or age (Al Rawashdeh *et al.*, 2021). E-learning facilitates life-long learning processes: people can acquire new skills to redirect their career paths or to improve expertise in their field of interest, selecting proper resources depending on their needs (Holmes and Gardner, 2006).



Figure 1. Advantages of e-learning Source: Confident Open Module, 2022

Students can self-organize the learning program to fit to their daily life, with a positive effect on their autonomy. As many learning management systems let learners establish their own pace, students are not embarrassed if they understand some concepts more slowly (Deslarzes and Grandjean, 2013). In some cases, communication between students and teachers can be enhanced by e-learning platforms (Al Rawashdeh *et al.*, 2021). E-learning stimulates the development of ICT skills for both learners and instructors.

On the other hand, e-learning has also some negative or challenging aspects. An important level of self-discipline is required from the learners, as the selfmanagement of the learning process can be difficult (Dewi Lestari and Suhartatik, 2022). Messages or notifications in other applications can easily distract attention from the courses, making immersion and constant attention more difficult - a certain level of rigor, motivation, self-control, maturity, and time-management skills are needed for the learners in order to get best results from e-learning. Lack of interaction between students and between students and instructors is another disadvantage. Students do not receive instant validation, feedback or answers to their questions. Clarifying more complex or subtle issues is difficult in the digital world, compared with traditional face-to-face interaction. Communication between teacher and students involves non-verbal, visual contact and physical gestures that cannot be easily transferred in online learning. According to some studies, in e-learning system the students and instructors become less creative (Islam et al., 2015). The good functioning of e-learning platforms can be interrupted by technical problems, and sometimes access to e-learning can be impeded by costs.



Figure 2. Disadvantages of e-learning Source: (Confident Open Module, 2022)

The quality and results of e-learning processes can be affected by an improper level of digital skills of learners (and instructors), lack of socialization between peers and, in international settings, cultural barriers. In a study by Lifintsev and Wellbrock (2019), which explores the impact of digitalization on cross-cultural communication processes on a sample consisting of 393 young adults (aged under 30 years) from seven countries (Bulgaria, Egypt, Germany, Morocco, Portugal, Romania, Ukraine), the results indicate that new generations (Millennials and Generation "Z") are highly interested in cross-cultural communication. The respondents consider that digitalization significantly simplifies cross-cultural communication processes and helps dissolving language barriers (Lifintsev and Wellbrock, 2019).

In building the Confident Online Open Module in Digital Learning, we interviewed a group of students who, due to Covid-19 restrictions, have been exposed for two years to online learning, and identified their main concerns. We designed a tool to assess their digital competences, the Online Self-Assessment Digital Competence Tool (Confident Project, 2023). The investigated dimensions are information navigation, social, creative, safety, and problem-solving skills, as manifested in the digital world. The content of the learning module was mapped on these dimensions and presented in a mixed multimedia format (narrated slides, readings, videos, and quizzes). Some topics to be discussed were extracted and presented in the Digital Learning Room of the Confident Cyber Café.

2. TWO YEARS OF ONLINE LEARNING. CHALLENGES IDENTIFIED BY STUDENTS

A group of students who participated in Confident project activities were questioned about their experience with the online learning. After analyzing students' answers, following challenges were synthesized (Confident Open Module, 2022):

• Technical issues (interruptions of Internet connection during videoconferences, instability of the e-learning platform);

• Lack of concentration, distractions during synchronous learning sessions (notifications and messages in other applications, non-interactive lectures);

• Lack of social part of studies: lack of interaction, lack of communication with both classmates and teachers, difficulties in paying attention and asking for clarification;

• Lack of peers' support (especially in stressful exam sessions);

• Low-quality outcomes of the learning process due to self-management of the learning process (cheating was mentioned by some students);

- Difficult adaptation to the new medium;
- Different levels of digital competences in the study group;
- No "real-life" experience;
- No learning-by-doing options.

As advantages, students mentioned:

• Flexibility – courses were accessible anytime, anywhere; courses were easy to be fitted into one's schedule, there was no need to commute;

• Self-paced learning, possibility to re-wind the lectures, the possibility to work individually, having good control on the process, not depending by peers.

3. CONFIDENT ONLINE SELF-ASSESSMENT INTERCULTURAL & DIGITAL COMPETENCE TOOL

The Digital Competences Scale, consisting of 25 items, measures the respondents' digital competences, seen as a critical set of abilities needed for the success in learning, working, and playing an active role as a confident citizen. The proficient use of an ever-growing range of ICTs for information, communication and problem solving is essential in the contemporary information society, both in personal and professional life, and helps reducing misinformation, manipulation, and digital divide. Digital competences are transversal, able to support the acquisition of social and civic competences of a student, who will be more informed and well-equipped for future challenges in the workplace, especially in the context of the accelerated digitalization provoked by the pandemic situation, which is seen as the main influencer for the future of many jobs, and of the new "work from home" concept that gains ground rapidly all over the world.

The questionnaire uses three dimensions of the short Internet Skills Scale developed by Van Deursen *et al.* (Van Deursen *et al.*, 2016) and validated by Grošelj, Van Deursen *et al.* (Grošelj *et al.*,2021) and two dimensions from Digital Competence Framework for European Union Citizens (European Union, 2017). The investigated dimensions are information navigation, social, creative, safety, and problem-solving skills, as manifested in the digital world. The rationale for selecting these dimensions is presented below:

• in a world over-abundant in information, *navigation skills* help individuals to accurately select the most relevant sources of knowledge;

• *creativity* allows students to create new materials based on the identified content, while respecting copyright and ethical principles;

• *online safety* is important in the context of the increasing value of digital information resources, expansion of associated vulnerabilities, threats and associated security incidents;

• *problem-solving* skills help to identify the most suitable tools and digital solutions in the learning process, at the individual or team level.



Figure 3. Online Self-Assessment Digital Competence Tool



Figure 4. Online Self-Assessment Digital Competence Tool - Personalized Report

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After completing each part, the respondent receives a personalized evaluation of his/her level of competence for the analyzed dimensions and a subsequent score. Based on the scores range, the three levels of competence are determined: beginner, intermediate, and advanced. For every level, a short description is provided, followed by learning recommendations.

At the beginning of each learning session, the evaluation of the learners can be used by the instructor as a starting point in the assessment of the group level and as a basis for tailoring an optimal set of knowledge unit and learning paths for the group and also for each student.



Figure 5. Online Self-Assessment Digital Competence Tool – Personalized Report for One Dimension (Information Navigation Skills)

4. DIGITAL LEARNING MODULE

The Digital Learning module is designed to address the needs of learners to get accustomed to different online teaching and learning platforms and tools, thus ensuring a better inclusion in virtual study and work groups. Another goal of the module is to tackle the topic of ethics and information security to ensure the individuals' welfare in the digital world, and to fight against cyberbullying, fake news, online violence and other means of online disinformation. The content is structured in three chapters: Chapter 1 – Intercultural Communication in the Digital World (Power of Diversity in Multicultural Virtual Teams, IT Solutions for Supporting Virtual Teams (tools for informal teamwork); Chapter 2 – E-Learning Platforms (E-Learning Definition, Advantages, and Disadvantages, Widely Used E-Learning and Knowledge Sharing Platforms (tools for formal teamwork); E-Learning 2.0 (and beyond), Mobile Learning, Gamification), Chapter 3 – IT Use in Learning – Challenges (Ethical Challenges, Cybersecurity

Threats, Fake News Exposure. Dimensions and Effects, Guide for an Ethical, Secure and Non-Biased Behavior in the Digital World).

The module intends to be an e-platform friendly course about e-learning platforms, knowledge sharing and ethical use of ICT in learning and society, to give every learner the chance to share, collaborate, interact and reflect with the help of instructors. Its main characteristics are:

• Flexible – the content is minimal, with the intention of expanding as the needs of the target group change and technology advances; from the materials presented, tutors will be able to select and combine the relevant ones in adequate learning paths;

• The students' opinions on the tackled topics were includes for familiarity, comfort and socialization;

• Self-paced – the learners have the possibility to track their progress, watch tutorials and use the presented applications in homework;

• Facilitates the interaction with the tutors and peers – in the e-learning platform and also in the friendlier Confident Cyber Café;

• Open – the content is accessible to all students that can access the learning resources after creating an account;

• Can be used exclusively online or in blended learning sessions.



Figure 6. Online Module in Digital Learning - characteristics

Using the e-learning platforms and the Cyber Café platform, mixed teams of learners can interact and debate on themes derived from the module's contents:
cases, theoretical inputs, videos, self-learning exercises, quizzes, and further links to different kinds of platforms and literature used.



Figure 7. Benefits of Cyber café as an extension of the Online Module in Digital Learning

The module mixes narrated slides, readings, short videos with tutorial and discussion and quizzes.



Figure 7. Online Module in Digital Learning - components

All Online Module in Digital Learning characteristics and facilities help students to familiarize themselves with the technologies and teaching methods used at various universities at their own learning pace.

5. CONCLUSIONS

Any mobility brings new challenges for mobile students especially in times of crisis. They must understand the host university education system, the country culture they visit and the local habits. The project intends to help future students integrate more easily into the conditions of the environment in which they study. Based on the study of the following dimensions: information navigation, social, creative, safety, and problem-solving skills, as manifested in the digital world, learning resources were created for mobile students (but not exclusively) in order to support their integration, but also to help them in getting familiar with digital technologies, their risks and benefits. The main characteristics of the module, such as flexibility, self-paced study, tutor feedback, inclusion of students' opinions, free and online access, bring numerous advantages for all students. The most innovative aspect of this open module, however, resides in the fact that students from different academic backgrounds will be able to interact, exchange experiences and use it to enhance their digital skills.

The content guides students in identifying valuable learning resources, helps them to familiarize with the main functionalities of different e-learning platforms, and to use ICTs in an ethical and safe way. Discussion topics derived from the course content are proposed in the Digital Learning Room, a forum-type page in the Confident Cyber Café. Here, the students' answers will be moderated by the instructors, the most interesting topics will be selected and the course content will be adapted accordingly. Confident team considers the developed course attractive for any person who wants to get familiar with contemporary learning technologies, but also with the latest trends in the field of ICT ethics and cyber security, and in the same time for instructors who are interested in teaching these topics.

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GOVERNING FOR MARKETING DATA: A SPOTLIGHT ON DATA GOVERNANCE

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ABSTRACT

Online, mobile, social: Digitization is changing media use. Regarding this fundamental change customers prefer digital communication channels. As a result, customers leave behind permanent digital traces. With the increased online activity of customers, there is a newer discipline in Marketing to analyse the resulting data - in addition to their classic tasks. Data is a precious commodity and as such it deserves its own responsibilities, methods and organization, orchestrated in a holistic approach called Data Governance. The primary objective of this paper is to take a closer look on Data Governance regarding the current evidence and further challenges in the Marketing field. In this context, we conduct a literature review on our objective. The results of our investigation show that Data Governance has great potential for developing a systematic and integrative view on Marketing data. The focus here is on setting data standards, coordinating data sources and data management, data quality, and compliance with regulatory standards, such as data protection and data security. In particular, this requires a strategy, coordinated processes aligned with the strategy, and their implementation in a meaningful combination of people and machines (resources) as a socio-technical system. Not to be missed throughout all phases of Data Governance: ethical considerations must be integrated. In the end we have to note that further investigation will be necessary in order to clearly define the consequences of Data Governance on further action fields concerning internal and external Marketing.

Keywords: Digitalization; Digital Marketing; Data Governance.

JEL Classification: M15, M31.

1. INTRODUCTION

Online, mobile, social: nothing has changed Marketing as much as the digitalization of our society (Lamberton and Stephen, 2016). This change - called digital transformation – is accompanied by a paradigm shift that presents marketers with complex challenges, including multi-channel communication with the customers, Big Data evaluations, real-time response, individualization and

automation (Zlateva, 2020; Ziółkowska, 2019; Gillpatrick, 2019; Ianenko *et al.*, 2019). According to statistic studies the Marketing field is "on the way to … datadriven, omnichannel Marketing" (Deutscher Marketing Verband, 2022).

This results in a further effect: Customers leave behind permanent digital traces (in a simple sense: data), particularly through the use of digital channels. These traces can be tracked, collected and analysed, and merged with other information (e.g. from customer relationship or any transactional systems). This requires the multitude of data that is generated to be analysed intelligently. Data as a special corporate commodity deserves its own methodology in practice and procedures, responsibilities and organization. For this approach Data Governance as a holistic framework has emerged in the last 15 years (Jagels *et al.*, 2021), which should also be considered in Marketing.

Our investigation targets to elaborate the current evidence and main challenges that Marketing has to face considering Data Governance to become a data-driven company function.

2. MATERIALS AND METHODS

More and more companies are aware of the importance of informatizing Marketing for their own development (Tang, 2020). The reason for this is the advent of Internet + Era and new information and communication technologies (ICT); both waves has redictious caused changes the flow of information (Tang, 2020). In this manner ICT and Marketing become an important partnership for decades (Graesch *et al.*, 2021), ICT support all marketing operations of business and diversifying the marketing process (Bayraktutan *et al.*, 2009) and ICT manifest effects like providing the op-portunity at every place and time for advertisement and increasing the over-all potential of advertisement (Hamidi and Safabakhsh, 2011).

From research site we understand Data Governance in the field of Marketing not only as a singularly business management (e.g. Otto, 2013; Weber and Klingenberg, 2021) or singularly technical (e.g. Lee *et al.*, 2019) approach. Our work follows both camps and formulated Data Governance as a framework with the key components of strategy, processes and re-sources (as a combination of people and machines in a socio-technical manner) that ensures that Marketing data is reliable and consistent so that it can be used with confidence for operational Marketing processes and Marketing decisions - now and in the future. Within the Data Governance framework al lot of detailed fields of action (also called dimensions), like Data Management, Data Quality or Data Ownership, are defined (Weber and Klingenberg, 2021).

In order to identify current findings in the implementation of Data Governance in the Marketing field as well as related challenges, we identified papers on the digital library Scopus related to our adopted research objective. From these articles, we were able to get an up-to-date picture of efforts in conceptualizing and implementing Data Governance as a whole framework (or in parts), as well as directions within the Marketing field. We then derived a set of challenges for the Marketing field in relation to Data Governance.

3. FINDINGS AND CHALLENGES

Following the methodology used in the content analysis of the identified works, we classify the obtained results at the level of key concepts of Data Governance and furthermore at the level of action fields within the Data Governance framework.

Regarding key components of Data Governance, we identified the sup-port of the authors in the field of the following Data Governance key concepts:

- Blomster and Koivumäki (2022), Gamoura and Malhotra (2020), and Gregory and Hunter (2011) addressing the strategy layer of Data Governance.
- Abrantes and Ostergaard (2022), Akter *et al.*, (2022), Blomster and Koivumäki (2022), Brayshaw (2013), De Freitas *et al.*, (2013), Gam-oura and Malhotra (2020), Gregory and Bentall (2012), Gregory and Hunter (2011), Jamieson *et al.*, (2019), Jenson (2008), Kamioka *et al.*, (2016), Mahmoudian (2021), Pugliese *et al.*, (2021), Shah *et al.*, (2021), Soares (2012), Tapsell *et al.*, (2018), and Zhang and Wang (2021) addressing the process layer of Data Governance.
- Abrantes and Ostergaard (2022), Akter *et al.*, (2022), Blomster and Koivumäki (2022), Brayshaw (2013), Earley (2019), Gamoura and Malhotra (2020), Gregory and Hunter (2011), Pugliese *et al.*, (2021), Shah *et al.*, (2021), Soares (2012), and Zhang and Wang (2021) ad-dressing the resource layer of Data Governance.

Furthermore, some authors address cross-over aspects, like ethical considerations regarding data collection and protection (Earley, 2019; Mahmoudian, 2021; Shah *et al.*, 2021).

Within the Data Governance framework, the studies focus on the fol-lowing fields of action:

- Data Quality supported by the authors Brayshaw (2013), De Freitas *et al.*, (2013), Gregory and Hunter (2011) and Jenson (2008).
- Data Management supported by the authors Akter *et al.*, (2022), Blomster and Koivumäki (2022), Brayshaw (2013), Gamoura and Malhotra (2020), Gregory and Bentall (2012), Gregory and Hunter (2011), Kamioka *et al.*, (2016), Mahmoudian (2021), Pugliese *et al.*, (2021), Soares (2012), Tapsell *et al.*, (2018), Vojvodic and Hitz (2018), and Zhang and Wang (2021).
- Data protection, Security and Compliance (for short: Compliance) supported by the authors Abrantes and Ostergaard (2022), Earley (2019), Gregory and Bentall (2012), Jamieson *et al.*, (2019), Jenson (2008),

Mahmoudian (2021), Pugliese *et al.*, (2021), Shah *et al.*, (2021), Tapsell *et al.*, (2018), and Vojvodic and Hitz (2018).

After analysing the papers and their systematization by Data Governance key concepts and fields of action we concluded that Data Governance has a great potential for Marketing to increase the leverage of knowledge available in marketing data to become a data-driven company function. But to successfully introduce Data Governance, Marketing has to face the following challenges:

- The review confirmed that Data Governance within Marketing must have a clear direction and this needs to be captured in a strategy. This strategy must be in line with the corporate and the IT-strategy. Data Governance must "have a voice" at the highest corporate level. This means active responsibility at the highest management level, e.g. by a board member or the managing director itself. In addition, the specifics of the business sector as well as the specifics of the own organization must be addressed.
- Furthermore, the results underline that Data Governance processes must be established, documented and lived in order to minimize data silos, inconsistent data and data misclassification, to increase data quality and to restrict access to critical and sensitive data to meet data privacy, data security and compliance requirements (e.g. GDPR). Da-ta quality starts with the business units that create, use and report on business information, not (only) in the IT.
- On the side of people the existing Marketing organization needs to be transformed into a digital thinking and working organization. Skills to understand the possibilities of data and the use of technology, as well as an understanding of software and computer skills in its application are becoming key factors. To reflect the increasing importance of da-ta, many companies have introduced the role of Chief Data Officer (CDO), who should partner with the Chief Marketing Officer (CMO).
- On the side of machines the right ICT should be used to support Marketing activities. Within this part artificial intelligence (AI) applications becoming more attractive. But aware that not only the data itself, but also the right AI-technique and the performance of the learning algorithms influence the success and acceptance of AI.
- Throughout all phases of Data Governance, ethical considerations must be integrated into aspects according of data as a company asset. Participants of Marketing information systems must be able to deter-mine with what content (i.e. the information generated and exchanged within the information system) and under what perspective and for what purposes participation took place.

4. CONCLUSION

With this study, we captured the current economic reality of Data Governance in Marketing. To do this, we applied literature review as a research method to a series of papers identified in the Scopus digital library.

We succeeded in working out that all key concepts of the Data Governance strategy, processes and resources - are addressed in Marketing. In addition, ethical considerations, especially in the collection and processing of data in Marketing, are included. The Data Governance concept will therefore be expanded to include this concept.

Furthermore, we have identified the fields of action within the Data Governance framework that are currently receiving special attention in Marketing: data management, data quality, and data protection, data security, and compliance. It is all too understandable that these three action fields are in the Marketing focus, because they form the core of good digital Marketing: Data management focuses on the correct collection, structuring, integration and management of data, data quality focuses on data content and compliance focuses on the correctness of data use. The focus should be extended to other fields of action, e.g. data ownership, data lineage.

The results of our investigation expose the sensitivity of Data Governance in Marketing and the main challenges regarding a clear strategy, well-defined and wellstructured processes across all levels of digital Marketing, and the right combination of people and machines in a socio-technical system.

In the end it is to recognize that further investigation will be necessary in order to clearly define the consequences of Data Governance on further fields of action concerning internal and external Marketing.

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COSTS AND RISKS OF BANKING DIGITALIZATION

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ABSTRACT

In the last period of time the hole economic system registered full of economic, health and war conflicts turbulences, marking a turning point for the entire financial system as a whole and for the banking system in particular. Banks understood that the future will be very much based on innovation and digitalization, so many of the authors confirm that the forth industrial revolution or Industry 4.0 is already here. The traditional banking system as we all know it cannot miss that evolution, otherwise it would lead to a real doom and a dramatic decline in business and why not even to extinction.

Of course, all this would not have been possible if the technology now used so much among the population (smartphones, gadgets and other mobile devices) wouldn't have such a sharp increase, fuelled recently by the COVID 19 pandemics and the conflict from Ukraine.

As the financial services industry becomes increasingly digitalized, the gap between the accuracy and costs of manual and automated operations is getting bigger. This trend allows substantial cost savings for the banking domain but also a challenge for the regulators, as they have to a adapt the regulatory framework.

Not necessarily being an enumeration of all the factors/risks that can influence the adoption and development of digital banking, in this paper we propose to analyze: Capital expenditures and increased operational costs; Increased competition; Security risks; Regulatory and Legal risks; Operational and reputational risks.

Keywords: digital products; banking products; banking costs; banking risks.

JEL Classification: G21, G23, O33.

1. INTRODUCTION

According to (Delloite's, 2019) banking outlook report, present banking environment becomes extremely competitive with the expandure of the concept of digital banking in relation with the clients but also with internal flows and procedures. In order to survive and grow in a changing market environment, banks turn to the latest technologies, which are perceived as a favorable resource that can help develop a more flexible structure that can quickly respond to the dynamics of a market in a quick change of scenarios. Also, the digitization phenomenon is seen as a tool for cost reduction and other system improvements, more efficient, part of a process in a continuous expansion of the banking field.

(DeYoung, 2001) is showing that digital banking has a strong indirect effect on profitability through cost reduction. Internet banking and other digital banking services lower the average operational costs of banks that tolerate physical overheads in the sense that as IT infrastructure increases, the average cost per transaction decreases, leading to increased profitability. However, recent studies have indicated that high infrastructure costs in some developing countries, coupled with a lack of sufficient customer base, have adversely affected bank profitability.

Commercial banks are investing heavily in banking technology due to increasing consumer demands and fear of losing market share and most important clients. Now, many bank distribution channels like ATM (Automated Teller Machine) or ABM (Automated Banking Machine), Mobile Banking, Internet Banking and others have been introduced by commercial banks to provide different products and services (such as standard one's: checking account balances, transferring funds and paying utility bills online etc. and lending/opening accounts and online customer, cash deposits and withdrawals, currency exchange), but due to continued investment in technology, the costs and the incomes of the banks were affected.

The existing literature proves that digital banking brings many benefits to banking institutions, the most important is cost savings, increasing the number of customers - more customer services, greater efficiency but also improving the bank's reputation, as mentioned by (Shaohua *et al.*, 2018). It is also shown that the promotion of e-banking services by commercial banks has achieved operational efficiencies in the form of better utilization of manpower, equipment, space and reducing manual transactions. There is more direct/faster transaction processing with less manual intervention with associated benefits such as increased transaction accuracy, faster reconciliation time, lower operational and fraud risks and a lot of other benefits.

2. COSTS AND RISKS REGARDING BANKING DIGITALIZATION

Despite the interests in studying digital banking, which can bring many benefits to banks, a considerable number of studies have also investigated some shortcomings, thus, banks may face new challenges, and the main issues are competition, risk management and costs, as mentioned by (Kolodinsky and Hogarth, 2004).

Not necessarily being an enumeration of all the factors or risks that can influence the adoption and development of digital banking, we analyze in the following:

- Increased capital expenditure and operational costs

- Increased competition
- Security risks
- Regulatory risks
- Operational and reputational risks

2.1 Increased capital expenditure and operating costs

According to (Priyanka, 2019), banks have to manage greater costs to implement and maintain digital banking infrastructure such as: software support, security software, data backups, connectivity, etc. According to existing studies, retail banks are investing and innovating to better align their distribution strategies with customer needs and preferences and are investing heavily in banking technology due to increasing consumer demands and fear of losing market share. In our days, e-commerce, smart ATMs, Internet Banking, Mobile Banking are being introduced by commercial banks to meet various customer needs like checking account balances, online purchases, fund transfer and online utility bill payment and even investing in funds. Due to investments in technology, the costs as well as the income of the banks have been affected as stated by (Neha, 2017).

Banks need to spend time and money on promoting e-banking services to attract customers and in addition they must train staff responsible for operating ebanking channels, according to (Angelakopoulos and Mihiotis, 2011). Thus, it is argued that compared to regular staff, e-banking department members must have strong knowledge in technology but also in digital marketing, banking products and even in AI (artificial intelligence). However, banks may face the challenge of recruiting talented people like described above and also the cost of staff training. Not only initial costs are used to design and establish e-banking systems, but also costs applied to maintain and upgrade systems and software, which sometimes are even greater.

According to (Bain and Company, 2021), a global consultancy that "helps the world's most ambitious change-makers define the future", present in more than 40 countries around the world, with a presence on every continent, shows us that we can have lower operating costs, which come from having a modern, native technology platform in a cloud space (but here we must take into consideration also the fact of security issues). The analysis carried out shows that the digital platform could have a cost base 60% to 70% lower than a traditional bank with mid-level technologies (see Fig. 1).

Analysis of a number of major digital platforms shows that they serve two to three times more customers per employee, based on a number of innovative factors and a comparative cost analysis.



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Figure 1. Annual cost for a retail client (Source: Bain and Company - Benchmark data and experience, 2021)

According to another study by (EuroFinance, 2021), as the treasurers of large corporations automate their processes, their banks are expected to keep along digital transformations, meaning that the elimination of manual steps in bank account management and that will lead to a reduction in costs, as banks gain from digital efficiencies and pass on some of the benefits indirectly to customers. The study proposed by Eurofinance measured the average unit cost of banking transactions by dividing banking transaction revenues by corporate deposits and it was conducted for the three largest US banks – Citi, Bank of America and JP Morgan.

At the start of the pandemic, as corporations put their cash in safe places, deposits at US banks rise 33% to \$2.1 trillion at the end of 2020, and global transaction banking (GTB) revenues fell by 7% in the same period of time. This resulted in the GTB revenue/corporate deposit ratio reaching a low of 0.28% in the first quarter of 2021, meaning that for every million dollars deposited, an average bank transaction fee of \$2,800 was charged by banks to their corporate clients.

However, the value returned to 0.29% in Q2 2021, 4% higher than the previous quarter, which happened as a result of actions taken by Citigroup, which charged a fee of 0.35% on transactions, with 7% higher over the same time period, also continued by JP Morgan and Bank of America, as they also saw their fee increase by 4.3% and 2% respectively.



Figure 2. Revenues from global banking transactions/deposits (Source: Eurofinance – Global transaction Banking 2021)

Other studies made by companies that develops software solutions in Europe for the digitization of banking activities (also FinTEchs), shows that investments in digital technologies are becoming more important as a strategic topic.

2.2 Increased Competition

Despite the fact that in the past, more than 25 years ago, Bill Gates (CEO of Microsoft) referred to retail banks as "dinosaurs", the phrase can still have the same meaning today. The growth of the Internet did have little effect on banking for small and medium-sized enterprises (SMEs), with most of the digitization being developed for individuals, who, it is true, make up a larger share of a bank's total traditional customers, but represent at the same time, the most volatile segment and which, strictly in this direction of digital banking, can change its preferences most often.

In the next 20 to 30 years, those who are born today/born in the last few years may be the main customer base of a bank, and in addition to them there is a base of at least several million other potential customers, who they will use the bank's digital goods and services, which today they still do not apply.

JP Morgan, for example, bought WePay, a well-known FinTech in the market, in order to be able to adapt its products and services in line with customer expectations and by resorting to a faster way of development.

A new technology is that of intelligent automation, enabled banks to make the entire transition to digital operations on a predefined and developed knowledge process, saving an estimated \$70 billion by 2025, according to market studies. The implementation of this solution in financial institutions improves customer interaction and response times, not only by increasing the efficiency of current procedures, but also as part of a complete redesign of the business model based on the use of intelligent automation (part of AI – artificial intelligence). This includes changes to internal governance and rules/procedures, as well as employee roles, responsibilities and organizational structure. As a result, many traditional banks fail to consider all operations that need to be digitized when designing a customer-facing experience - every customer can easily access the websites/e-banking platforms of the banks without spending a lot of time and can accordingly compare the different digital banking offers between different banks to decide on the most competitive option.

2.3 Security risks

The security of a particular digital channel is the biggest challenge of any digital banking functionality that needs to be protected. Despite the encryption software designed to protect an account, there is always a possibility of hacking in the cyberworld: hacker attacks, phishing, malware and other unauthorized activities are common on the net, according to (Hajera, 2017). In developing countries, e-banking infrastructure impacts profitability and expected profitability as the internet infrastructure based on relatively old technology blocks the achievement of the expected performance of banks. (Kolodinsky and Hogarth, 2004) also observed that before using internet banking, customers have to provide numerous personal information and provide authentication such as username, PIN and maintaining confidentiality of their customers is the key concern for banks to avoid legal and reputational risks arising from unauthorized transactions and/or breach of confidentiality agreements. Nowadays, it needs sometimes even a face/digit recognition software for customers who wants to use a mobile banking software.

Banks and financial institutions hold data on millions of consumers, businesses and government agencies that is of great value, yet they need to implement new features to help customers manage their finances more easily in order to win and maintain loyalty to your own bank in an increasingly competitive landscape, but with very secure logging processes and even more secured data protection.

Banks have to maintain a difficult balance between several directions: Data security and compliance with industry regulations versus creating innovative and competitive services for its customers. Banks and other financial institutions cannot afford to make compromises when it comes to security and risk management, especially with regard to unauthorized data access and customer data privacy.

2.4 Regulatory and legal risks

"We are not financial institutions" was the statement that constituted the starting point of new digital banks in the financial banking field (Fintechs). Unconstrained by many regulatory requirements applicable to banks and other financial institutions, they create connections with non banking customers, gaining new market parts and creating disruptions for traditional competitors.

Many FinTechs have effectively achieved these results by providing solutions that transform payments, lending, wealth management and more. However, recent regulatory and industry developments suggest a possible blurring of the differences in this segment between FinTechs and other financial institutions.

Because the Internet allows services to be provided from anywhere in the world, there is a danger that digital banks will try to avoid regulation and supervision in different regions. Regulators may even require these institutions that if they offer their services from a remote location over the Internet to be licensed and improve their data server capacity and resilience. Licensing is mandatory, for example, in the United States and most countries of the European Union, a virtual bank licensed outside these jurisdictions that wishes to offer electronic banking services and take deposits in these countries must first establish an authorized branch office, according to (Kujur and Shah, 2015).

According to a 2019 European Commission report, a group of experts on regulatory obstacles to financial innovation (called ROFIEG) was established, which ultimately issued a document entitled "30 recommendations in the field of regulation, innovation and finance". The Group acknowledges in the report that there are important synergies with the EU Digital Single Market Strategy, the Consumer Financial Services Action Plan and the Capital Markets Union and recommends a multi-dimensional approach to promote a truly useful framework for digital banks in the EU.

Such a framework should enable more benefits while maintaining high standards of consumer protection, market integrity and the stability of the EU's financial system, all of which ultimately have the effect of protecting and enhancing the EU's attractiveness as a global financial digital center.

Currently, regulators have different approaches to banking innovation, but more and more are moving in the direction of closer supervision of the phenomenon and clearer regulation. In March 2016, The Office of the Comptroller of the Currency (OCC), which is an independent department of the United States Department of the Treasury, published an article on the vision for responsible innovation in the federal banking system. As a result of this initiative, the door has been opened for digital banks to continue their pursuit of growth by working in collaboration with regulators to develop specific solutions to regulate their product offerings. In October 2016, the OCC announced the creation of a new Office of Innovation designed to be a central point of contact and clearinghouse for innovation-related requests and information, and to establish a technical assistance and outreach program for banks and non-bank institutions.

According to (Neha, 2017), "electronic" banking involves increased legal risks for commercial banks. Banks can expand the geographic reach of their

services faster through e-banking than through traditional banks. In some cases, however, they may not be fully aware of the local laws and regulations of a jurisdiction before they begin providing services there, either licensed or unlicensed, if not required.

When a license is not required, a virtual bank without contact with the host country's supervisor can find it even more difficult to keep up with regulatory changes. By doing so, banks are exposed to losses through lawsuits as presented by (Alsmairat and Al-Adaileh, 2016).

According to (Tobias and Mancini-Grifoli, 2019), considering at the same time that unsecured digital credit combined with the light regulation of some digital financial service providers can raise complex issues.

2.5 Operational and reputational risk

Dependence on new technologies makes system security and availability the central operational risk of electronic banking. Security threats can come from inside or outside the system or sometimes a hybrid model, so banking regulators and supervisors need to ensure that banks have appropriate practices to guarantee data confidentiality as well as system and data integrity. Banks security protocols should be tested and reviewed by external experts/auditors to analyze network vulnerabilities and prepare for data recovery, ensure adequate capacity planning to address growing transaction volumes and new technological developments, attract staff with expertise necessary and reduce costly dependence on external service providers. Managing increased operational risks should be an integral part of banks' overall risk management, and supervisors should include operational risks in safety and soundness assessments (Alsmairat and Al-Adaileh, 2016).

Reputational risks exist in every new product launched by any financial institution either it is a digital one or a traditional one. They invest significant time and resources in building customer relationships – even a small mistake can destroy user trust and loyalty. In addition, reputational issues could affect revenues from other products and the company's viability in the marketplace.

(Chavan, 2013), is showing that security breaches and system availability interruptions can damage a bank's reputation. When a bank relies more on electronic channels to deliver products to customers, the greater appearance the potential for reputational risks. If a bank experiences problems that cause customers to lose confidence in electronic delivery channels as a whole, or to view bank failures as system-wide supervisory deficiencies, these problems can potentially affect other electronic banking providers.

3. CONCLUSIONS

The banking industry has been one of the leaders in E-Business in recent years, with several local and international banks in developed and developing markets adopting digital banking as the new "normal" - especially in the context of the COVID19 pandemics. The digital banking revolution has fundamentally changed banking and it should be noted, however, that while digital banking offers many benefits to customers and banks, it also comes with costs and risks that, if not sufficiently mitigated, can lead even to systemic risks. Digital banking is not only susceptible to risks but can exacerbate risks such as; the governance, legal, operational and reputational risks, which are inherent.

For example, individuals can seek quick access to loans, including digital ones, offered by certain FinTechs, to cover immediate expenses, but this thing can expose consumers to less scrupulous credit providers, unfavorable terms and conditions (higher interest and fees or unknown ones) and increased overindebtedness.

An ideal digital bank of the future would not only offer traditional currency and/or cryptocurrency payments, but would also have markets for diverse customers from all levels of the global population and business areas of companies, based on a multitude of mobile technologies and artificial intelligence.

Also, the banks must take into consideration that in the first phase the volume of investments in a digital platform/solutions don't go along with a rapid volume of incomes, the first step they have to admit is that a really good number of clients must adopt these digital solutions according to their needs or expectations. After that, the scope is to mitigate all the risks that may arrise as detailed in the article or maybe others relating to them, the most important ones are the reputational ones, which if are not well managed they can go to the end of that business, by losing the majority of their clients.

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METAVERSE AS THE NEXT LEVEL OF THE DIGITAL ECONOMY. A LITERATURE OVERVIEW

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ABSTRACT

This presentation aims to obtain a general perspective on the next-level economy's digitization, also known as the Metaverse. To achieve this goal, we did a content analysis of the main works on the subject of the Metaverse. Thus, at this moment, we have analyzed an important number of papers in the field of Metaverse, from which we have extracted the basic concepts regarding the definition, architecture, characteristics, and the huge technological potential for the New Economy of the next decades. The originality of our approach lies in synthesizing the main conceptual aspects related to the Metaverse and even formulating our perspective in the field

Keywords: Metaverse; Digital Economy; Technological wave; Futuring; Digital Transformation.

JEL Classification: D80, Q55, O32, O33.

1. INTRODUCTION

The Metaverse is a new and futuring concept, but it has roots over the last 30 years, since it has been coined by the science fiction writer Neal Stephenson in his novel Snow Crash, in 1992 (Mourtzis *et al.*, 2022).

The term "Metaverse" is the combination of the prefix "meta", the Greek prefix meaning "transcending" or "beyond" and the English word "universe", meaning "everything that exists" (Park and Kim, 2022).

By expansion, this term depicts the coexistence of all components of life and advanced social orders in a parallel however virtual space. Since its initiation, the Metaverse has pulled in significant considerations and has demonstrated to have huge potential for advancing human society. Among other essential features, it is mainly considered to be the next stage of the Internet, named as Web 3.0 (Qin *et al.*, 2022).

Other authors (Rickli and Mantellasi, 2022) state that Metaverses will continue the dematerialisation of the world that started with the Internet. People will benefit from more information, experiences, connections and knowledge than ever before.

However, the Metaverse project (Allam, 2022) was launched in the middle of the Covid-19 pandemic, a crisis that supposedly represented a rare opportunity to be used to reshape the world, increasing distrust and skepticism about the idea of the Metaverse, at the same time.

The "new normal" enforced during the COVID -19 pandemic (Bibri and Allam, 2022) has already set the stage for an undemocratic reset and unilateral reshaping of the world, leading to an abrupt, large-scale digital transformation of the society, which in turn paves the way for a new era of merging real and virtual life.

On the other hand, as a result of the Fourth Industrial Revolution's accelerated development of information and communication technology, artificial intelligence (Lee, 2022) applied in the Metaverse has a significant influence on politics, economics, society, and art industries.

Virtual solutions are proposed and applied, in 3D spaces, for problems related to space simulation (aviation and aerospace industry) (Siyaev and Jo, 2022), production (Laviola *et al.*, 2022), medicine (Yang *et al.*, 2022) or education (Hwang and Chien, 2022). Other applications are developed more or less as alternatives to the traditional modes of manifestation - virtual artistic concerts, virtual games or virtual socializing spaces. In the Metaverse environment, transactions take place with digital assets (NFTs), which implies payments with virtual coins (also called cryptocurrencies), which can be converted into classic currencies. This leads to a new form of economy (Park *et al.*, 2022), based mainly on criptocurrencies and virtual assets or services.

These activities, for now, generate commercial transactions with values that can exceed the global domestic product of a country, a fact that should not be neglected. The authors in the field argue that a new type of economy results and is measured in a new macroeconomic product, such as the raw virtual product. In the real economy, the Metaverse Economy (Watson, 2022) is considered in this context as that real economy that generates or facilitates the creation of the virtual or 3D economy, through studies in the digital economy.

But the true new meaning of the Metaverse Economy refers to the virtual or mixed ecosystem in which revenues are generated inside the Metaverse world, respectively the sale of virtual assets, NFTs, tickets to 3D concerts.

A forecast study by consulting firm Analysis Group (Ramage, 2022) estimates that Metaverse economy-generating revenues will contribute \$3 trillion to gross domestic product (GDP) over the next 10 years, representing an average annual growth of 2,8% in GDP, if it will evolve at the same speed at which mobile technologies are currently developing.

As far as Europe is concerned, the share of GDP growth from the Metaverse economy to total GDP will be 440 billion dollars, which will mean 1.4% of GDP. Under these conditions, the study considers the year 2022 as year "0" or the year in which the Metaverse economy became a mass or large-scale economy.

Under these conditions, World Bank Group (World Bank, 2016) carries out a cross-section analysis of digital adoption indices at the national level in 180 countries, namely the DAI index (Digital Adoption Index), 2016.

The study shows different degrees of adoption depending on the level considered average, of 49.75%. Romania recorded an increase from 61.84% in 2014 to 64.44% in 2016. The analysis involves the collection, aggregation and normalization of data for the years 2014 and 2016, without meaning that it becomes a type series or stochastic analysis. It is observed that there are non-homogeneous increases and different dynamics from one country to another, in 2016 compared to 2014. The analysis demonstrates the discrepancy in the technological adoption of developed national economies compared to developing or underdeveloped ones, which implies gaps between the normalized composite indicators.

A similar analysis (World Bank, 2022) calculates the degree of adoption of technologies at the government level, through GTMI or GovTech Maturity Index, calculated until October 2022. The mapped map of countries is categorized into 4 levels or groups of countries, from category A with 69 countries to category D with 30 countries. The average level of GTMI for countries in category A is 0.552. Romania falls into category B.

The "Digital Economy" concept was launched by Don Tapscott (Tapscott, 1995) in his book "Digital Economy: Promise and Peril in the Age of Networked Intelligence". The monetization of the term represented the effect of the development of the economy as a consequence of the large-scale use of the Internet.

Others (Mkrttchian and Vertakova, 2022) state that the beginning of the 21st century facilitated the absorbtion of technology by industries and businesses,

which resulted in the manifestation of the digital revolution and the globalization of economy.

Deloitte (Heath and Micallef, 2022) considers the digital economy as the economic activity that results from billions of daily online connections between people, companies, devices, data and processes, the key elements of the digital economy being considered hyperconnectivity, i.e. a continuously growing connectivity, which results in mainly from the integration of the Internet of Things (IoT) in economic processes.

The hyperconnectivity will represent the catalyst for the transition to the next stage of Industry 5.0, which will materialize in a high interaction between technologies with a high degree of economic distruption, such as the Internet, Cloud Computing, Artificial Intelligence, Robotic Process Automation (RPA), Big Data, Blockchain and the Internet of Things.

Regarding the architecture of the digital economy, three operational levels of interactivity are delineated (Bershadsky *et al.*, 2017). The first level is that of the market and industries, i.e. the interaction between suppliers and customers, as the main economic actors creating value. The second level is reserved for platforms and technologies and generates skills for economic actors involved in the development markets. The environment represents the third level of the digital economy and ensures the conditions for the development of platforms and technologies.

The result of such societal technological developments (Ball, 2022) will be the generation of the new value-creating economic realities such as augmented, virtual and mixed reality, non-fungible tokens and virtual assets, which will implicitly lead to a new level of digitization of the economy, simply called Metaverse.

However, from a synthetic perspective, Al-Gnbri (Al-Gnbri, 2022) highlights the idea of the coexistence of the current digital economy with the classical, partially automated economy, which is subject to a continuous process of digital transformation and which represents the bridge to the next known stage of digitalization of the economy under the name of the metaverse.

From a prudent perspective, other authors (Pietro and Cresci, 2022) draw our attention to the fact that it is necessary to anticipate the complexity of the Metaverse Economy (or simply the metaverse), motivated by the fact that the losses at the societal level would be enormous if we did not try to anticipate its manifestation from the perspective economic and digital processes and flows, as well as their effects. As for the prediction related to the expansion of the Metaverse, it is seen as a form of expansion of the Internet, from the perspective of activities, products, assets, and supposed transactions.

It is important to remember that the metaverse economy, as a level of technological development of the economy, is found in the literature (Al-Gnbri, 2022) and as the token economy or based token economy (BTE), motivated by the

fact that it has as its starting point the use of -called "non-fungible token" (NFT), which represent tokens that cannot be replaced.

In this context, our objective consists in synthesizing and formulating a general perspective on the concept, characteristics and challenges of the future digitalization stage of the metaverse economy, on a global scale through the prism of influences at the societal level.

2. MATERIALS AND METHODS

For our work, we took a qualitative approach as we wanted to focus on the ecosystem reasons and humans motivations that led to such a digital transformation of people's lives and economies in the Covid and Post-Covid era (Draper, 2004). As such, we applied an interpretive and social constructivist perspective (Creswell, 2009).

We used a literature review as a qualitative method to collect and get insights of the main concepts around the Metaverse Economy: Metaverse, Digital Economy, Technological Wave, Futuring, Digital Transformation. A successful literature review constructively informs the reader about what has been learned till to the point of the study (Webster and Watson, 2022). Thus, the study of the literature focuses on the search for meanings and on the analysis of concepts up to the time of the study rather than on how many studies have been conducted up to the period in question (as in the systematic literature reviews).

We aim to analyze the concepts in chronologic order so that we can logically find out the reasons of the new technologies and economy we live in today.

The word "technology" comes from the Greek words "techne" which means "craft" and "logos" which means "the scientific study of", which would mean "the scientific study of craft". The history of technology represents the history of the inventory of tools and techniques, representing one of the components of universal history. Erik Gregersen (Gregersen, 2022) considers that the first technology (tools transformed for a use derived from the ordinary nature of the primary object, for one's benefit) consisted of tools, representing sharp flakes of stone or larger stones, shapeless, but sharp, discovered 3.3 million years ago, in Lake Turkana in Kenya. These belonged to a human predecessor, such as Asutralopithecus. The same author considers that the next technique used by man is fire, discovered 1.1 million years ago, also by a predecessor of Homo Sapiens, namely Homo Erectus. Evidence of burnt materials was found in the caves. Erik Gregersen believes that the last technology discovered and developed so far is Artificial Intelligence, through the official recognition of 2017, when the AlphaGo game beat the best player Lee Sedol 4-1. Between these periods there were increasingly intense periods of innovations and discoveries (neolithic revolution, irrigation, sailing, iron, compass, mechanical clock, steam engine, railways, steamboat, telegraph, telephone, electric light, automobile, aeroplane, computer, transistor, spaceflight,

personal computer or internet), which resulted in the emergence and development of human civilization itself.

Ray Kurzweil (Kurzweil, 2001) states that "technological evolution is a result, and a continuation by other means, of biological evolution", and technological progress is exponential. According to the Law of Accelerated Returns, the rate of change in a wide variety of evolutionary systems (which includes both the evolution of technologies and the evolution of the economy) tends to grow exponentially. Whenever a technology approaches a certain barrier, a new technology will be invented to allow us to overcome that barrier. This philosophical-statistical law, which extends Moore's Law, can be verified from a historical point of view, but also detailed on each evolutionary system, which represents a certain premise of future evolutions:

"An analysis of the history of technology shows that technological change is exponential, contrary to the common-sense "intuitive linear" view. So we don't experience 100 years of progress in the 21st century – it will be more like 20.000 years of progress (at today's rate). The "returns", such as chip speed and costeffectiveness, also increase exponentially. There's even exponential growth in the rate of exponential growth. Within a few decades, machine intelligence will surpass human intelligence, leading to the Singularity – technological change so rapid and profound it represents a rupture in the fabric of human history. The implications include the merger of biological and nonbiological intelligence, immortal software-based humans, and ultra-levels of intelligence that expand outward in the universe at the speed of light". (Kurzweil, 2001, 1st paragraph).

Jantle (Jantle, 2011) demonstrates that the technological revolution mainly and directly impacts economic evolution, as well as its main characteristics and production factors. Moreover, technological transformations are the basis of the great industrial revolutions.

Moreover, Klaus Schwab (Scwab, 2017) considers that previous industrial revolutions made mass production possible and created digital capabilities for billions of people, while the fourth industrial revolution or Industry 4.0 is fundamentally different and is characterized by a series of new technologies that merge the physical, digital and biological worlds. These technologies impact the economy and industry and, in addition, provoke even new ideas about what it means to be human.

The digital economy (Barefoot *et al.*, 2018) represents a significant paradigm shift from the classical economy, through the high degree of automation of production processes, but also the creation of digital products and markets. They bring the digital to the ubiquitous human level. The innovative economic processes have become possible through the development and application of Cloud technologies, which assume that data (information) is no longer stored only on local servers, but is available on remote servers, accessible using the Internet, in the so-called Cloud servers. In turn, Cloud technology and the increase in the

physical capacities of computers have made possible the expansion of related and emerging technologies, such as IoT, Artificial Intelligence, Cloud Computing, Bid Data, and Blockchain.

The Bestseller author, founder of Epic Games and Metverse expert Matthew Ball (Ball, 2022), in his book "The Metaverse: And How It Will Revolutionize Everything", warns that the large-scale applications of Internet-related technologies have not been foreseen since the beginning of the World Wide Web, but the materialized potential even up to this moment is an amazing view from the historical perspective of 40-50 years ago. The author makes a comparison between the Internet and the Metaverse, in the sense that the predictions related to the WWW were far below the currently materialized limit, which can also happen with the evolution of the Metaverse, which is still in the early stage, that of prediction:

"What makes technological transformation difficult to predict is the reality that it is caused not by any one invention, innovation, or individual, but instead requires many changes to come together. After a new technology is created, society and individual inventors respond to it, which leads to new behaviors and new products, which in turn lead to new use cases for the underlying technology, thereby inspiring additional behaviors and creations". (Chapter 2 – Confusion and uncertainty: Confusion as a Necessary Feature of Disruption).

In this context, Metaverse technology needs to be widely adopted to create a large-scale economic phenomenon. From this (technological) point of view, past predictions about the potential of the Internet were far from its achievements and manifestations today, and most of them referred to platitudes according to which many of us would be online, more often, using more devices and for several purposes. In essence, the same reasoning may currently apply to the possibilities of materializing the Metaverse and implicitly the Metaverse Economy, within a short time.

Bikram (Bikram, 2021) claims that the importance of understanding the concepts of the Metaverse and the Metaverse Economy is essential for the future of the economy and society as a whole, a fact for which knowledge of the relevant literature in the field constitutes an essential research method.

This determines an overall and detailed understanding of the existing state at a given moment for the problem under research and at the same time the foundation for the generation of new knowledge (Webster and Watson, 2002).

As mentioned before, the method applied in our literature review is the specific identification of works in the field, by querying the keywords mentioned earlier on the scientific platform Scopus from Elsevier (where we found the main titles in the field) and related research engineens (for the content of the articles), such as Science Direct, Wiley Online Library, Research Gate, IEEE Xplore, Springer, Emerald Insight, up to October 2022, and selecting those works that we consider edifying for training an overview regarding our research objective.

The range of the field's pubslihed articles or conference papers starts in 1953 and picks up until 2022. Research on the keyword "Metaverse" begins in 2015 and rapidly increases between 2021 (14 articles) to 2022 (414 articles), all written in English.

For our research we collected and analyzed books on Economical and technological fields, and even bestsellers on the Metaverse concept published in 2022 in the USA.

For our study, we gathered and examined books on economics, technology and even best-sellers on the idea of the metaverse.

3. RESULTS AND CHALLENGES

Grimshaw (Grimshaw, 2013) points out that the term "Metaverse" was first used in 1992, in the novel Snow Crash, written by Neil Stephenson, as a combination of the words "meta" and "universe". The novel presented a virtual world (actually the Metaverse), in which people, having unique avatar identities, interacted with other people or virtual agents, in 3-dimensional spaces that used "metaphors" from the real world.

Other SF novels, VR games (Second Life, The Sandbox, Roblox, Minecraft, Viverse) or applications based on virtual reality have been developing for 30 years now (Lavenda, 2022) and are expanding, creating the specific technological environments of the future Metaverse Economy (Folger *et al.*, 2022).

Flowers (Flowers, 1995) described almost 3 decades later his experience in the Metaverse, as follows:

"I've been there. There were no goggles, no earphone-pumped sound, just a cyberspace world, where I could walk its streets, talk to its people and sit under its trees"

The same author considered that Metaverse was indeed still in its infancy, but a promising one:

"A scalable infrastructure for simulating virtual worlds and articulating avatars that interact with each other isn't there yet. We have a ways to go to get to a 'Snow Crash'-style environment ... but it'll be within range of the average computer consumer within two years."

The Metaverse space evolved along with the "blooming" of digital technologies (Folger *et al.*, 2022), while the increase in the physical capacities of computers and other devices represented their basis.

Co-founder and CEO of Uplandeme and Chairman Open Metaverse Alliance for Web3 (OMA3), Dirk Lueth (Lueth *et al.*, 2022) believes that subsequent technological developments were also favoured by the Covid-19 pandemic itself, the period when people accessed remote platforms more and more often, via Zoom or Teams, but also virtual, augmented or mixed reality.

The Metaverse phenomenon (Ball, 2022) gained momentum starting in October 2021. Facebook (currently Meta), but also other companies from the

global technological elite (Microsoft, Google, Nvidia, Epic Games) have announced massive investments in the creation of virtual platforms or specific Metaverse products.

From a technological point of view, the Metaverse (Lueth *et al.*, 2022) can be considered a hierarchy of persistent, decentralized virtual spaces that can interfere with the real world, such that social, commercial or personal experiences manifest through Web 3.0 technologies.

Al-Gnbri (Al-Gnbri, 2022) presents a layered vision of the Metaverse, through which the spatial Web or three-dimensional Internet (3D Web) is divided into the following three layers:

1. **the physical layer**, in which we find the world as we know it and express it through the five senses

2. **the digital informational layer**, where, through sensorization and digital mapping of the physical world, a digital twin is created for each real object with the possibility of accessing and controlling digital information through screens and dashboards and

3. **the interaction spatial layer**, in which, through state-of-the-art interfaces (smart glasses or voice), one interact with contextual information, in real-time, taken from the second layer as a result of intuitive and sensory triggers.

Currently, various authors and researchers (Hackl, 2021) express their points of view to define the Metaverse.

Ball (Ball, 2022) presents the following definition of the Metaverse, according to the current stage of manifestation of the Metaverse, that is indeed still in its infancy, but promising:

"A scalable infrastructure for simulating virtual worlds and articulating avatars that interact with each other isn't there yet. We have a ways to go to get to a 'Snow Crash'-style environment ... but it'll be within range of the average computer consumer within two years."

Metaverse technologies (Lueth *et al.*, 2022) are evolving and increasingly infiltrating various fields of social life, the economy becoming both a natural consequence of their amplification and a necessity to make transactions with various assets and services possible, which assume monetary valuation, within the Metaverse technological universe.

For now, in these virtual realities, people (users) access various decentralized platforms, which users, but also creators, want to be unified, so that users can create unique identities. Here you buy or sell properties, art objects or various other digital assets, with "adapted" virtual currencies, play games, participate in virtual concerts and social events more easily and create new virtual products, already creating new jobs and Gross Virtual Product (similar to GDP).

A classical assertion of Karl Marx (1859) states that "economic base determines the superstructure". The economic system is also the basis for the ecosystem in the metaverse. Like the real economic system, the economic system

of the metaverse is a complex economic system composed of large, heterogeneous, adaptive individual actors (consumers, producers, investors, etc.) whose interactions help shape all emergent behavior.

Therefore, in this meta-economy, various virtual assets are traded, which have unique digital identification codes, known as tokens (NFT – Non-Fungible Token). In turn, NFTs represent, at this stage, a type of digital asset in itself, which cannot be copied, substituted or subdivided, but is kept in a "blockchain" to prove authenticity and ownership. From a commercial point of view, it has value and can be demonstrated, traded and owned, without losing its identity.

We find various and complex implications for digital businesses, such as in customer communication, the creation of new markets, a new type of marketing or financial transactions.

In this context, the main challenges (Ball, 2022) related to the manifestation of the Metaverse at the societal level consist of:

- synchronization and unification of various independent platforms, currently having identical users, but with different identities from one platform to another;

- achieving persistence in the virtual environment, after the user logs out of it;

- recording and analyzing the commercial transactions that users carry out on various virtual platforms, as well as "bringing" these transactions and the related income into the physical world (for aggregation with the Gross Domestic Product and possibly for taxation);

- finding technological solutions for the specific problems of communication via the Internet, related to the accuracy of data transmissions, possible interruptions or delays of server signals (applications similar to networking applications such as Zoom, the transmission of concerts or artistic events such as Netflix, online payments with virtual currencies, commercial transactions of salepurchase of digital or Token assets);

- the realization of the specific normalization of these realities by the Institutions that have both technical, economic and legislative expertise in the field.

Ramage (2022) considers that the manifestation of the Metaverse economy is realized in fields such as online games, socialization activities, services or artistic products, but also simulations necessary for some fields, such as medicine, aviation or the army.

The author foresees the extent of expanding the use of virtual spaces and future applications from Metaverse, with a major impact on the economy, society and education, workplace training (from remote to virtual reality), communications or commerce.

Still, the conceivable items or zones to be connected are not clear at the minute, as the gap innovatio is under development handle.

Ball (Ball, 2022) summarizes that the Metaverse represents the future stage of development of the Internet, a complex system of virtual worlds based on the

Internet, in which people interact in a different virtual reality, having various ways of identification. Thus, people socialize, play and participate in artistic activities and, thus, create the premises for the realization of commercial transactions specific to these environments, with specific currencies (virtual currencies), but also the premises for the creation of new types of activities and applications. These activities and transactions that are already being carried out today represent challenges, both from a technological and economic point of view.

Challenges can be considered from two (or more) points of view: the limitations of a virtual economy for people, who are physical and spiritual creatures (the virtual side is only possible from their living status) and the ethics (morals) that must be carried out in such a liquid and intercity environment.

If the first limitation is obvious, the second one is essential for a fair development of the Metaverse ecosystem (for the creators, actors and other parties involved), given the fact that the nationality and legal borders are difficult to manage at this point. Given the challenges posed by the Metaverse Economy as a business platform, there is an urgent need to address privacy regulations and their underlying principles in a way that meets the needs of the new era.

Data is critical for all stakeholders in the Metaverse ecosystems and therefore must be managed in a way that benefits all stakeholders. The limitations of this study stem from the fact that the use of the Metaverse Economy is still in its infancy. Due to the challenges of the Metaverse as a business platform, there is an urgent need to regulate privacy policies and their underlying principles to meet the demands of the new era. Still, the sense for regulations (Anshari *et al.*, 2022) in the field is not new so far.

Thus, in 2016, in response to the anticipated release of VR consumer headsets, German philosophers Michael Madary and Thomas K. Metzinger published 'Real Virtuality: An Ethical Code of Conduct' with "Recommendations for Good Scientific Practice and the Consumers of VR -Technology" (Murray, 2021).

Their manifesto begins with an understandable warning about the unscrupulousness of governments and megacorporations that abuse new technologies, and contains many welcome and sensible judgments, such as insisting on the informed consent of VR consumers and subjects and, most importantly, rejecting the military use of remote manipulation. But the authors immediately make clear that they are most alarmed by their judgement that today's entertainment devices are a harbinger of a profound and inevitable change in the human experience.

One virtual reality becomes even more thoroughly integrated into another, which is historically unusual and poses not just novel psychological hazards, but also entirely new ethical and legal dimensions. The conscious mind of humans (Madary and Metzinger, 2016), which has evolved over millions of years under

extremely specific conditions, is now causally related and informationally weaved into technical systems for portraying potential realities.

Researches on an developing new world are the reason for a Code of Ethics for the Metaverse as a subject of academic research at certain universities (Code of Ethics, 2022), such as the Markulla Center for Applied Ethics from Santa Clara University.

Even in early stages of development and regulation, the activities and transactions in the Metaverse environment can no longer be neglected, because their value can exceed the limits considered common to the current digital economy. These already represent the future Metaverse Economy.

4. CONCLUSIONS

Technology-wise, humanity has already made significant progress. We are currently witnessing a massive introduction of instruments and technologies that only science fiction writers dared to imagine. Digitalization has truly assimilated into everyday life. All aspects of life (Mitrushchenkova, 2022) are changing as a result, and society and economy are changing as well, redefining the classical concepts and realities.

A general idea emerged from the literature studied above: the Metaverse cannot yet be clearly defined, for certain reasons, such as: either because it has not yet materialized its potential (Ball, 2022), or because it represents another paradox (Ravencraft, 2022). More precisely, for the Metaverse to be able to represent the future of the Internet, it must exist today, to some extent and in various forms.

We agree that the current major stage of economic development is the Digital Economy, which represents an economy based on digital technologies.

In fact, as Gartner (Gartner, 2020) also claims, digitization represents the use of digital technologies to change business models and create new types of income and opportunities for value production; it is the process of transformation into a digital business.

Experience shows us that the digital economy coexists in various proportions with the classical economy, depending on the degree of economic development of a nation and the degree of adoption and application of digital technologies at the level of economic processes and products: Internet, Cloud computing, Artificial Intelligence, Machine Learning, Big Data, Data Analytics, Blockchain, Internet of Things.

The year 2022 represents the year in which the large-scale manifestation of the Metaverse Economy began, also considered the next stage of the Digital Economy.

Analysis Group studies (Ramage, 2022) predict an increase of 3 trillion dollars in revenues generated in the Metaverse Economy as a share of the Gross Domestic Product, i.e. 2.4% in the next 10 years (until 2031), in the conditions of the accelerated development of digital technologies and large-scale application in

various fields, such as entertainment (games), art, education, health, commerce, army, aviation.

Through the present study, we have concluded that there are few and insufficient works in the scientific literature, in which the concept of Metaverse is clearly defined or explained, and even fewer related to the Metaverse Economy.

This study highlights the importance of the concept of a synthesized Metaverse Economy, its characteristics and implications in the context of the imminent digital developments of the last thirty years. It is clear that there are various definitions of the concept of the Metaverse, but none of the Metaverse Economy, although it is manifested and generates significant income.

Our study motivates the necessity and opportunity of future studies in the field, due to the rapid evolution of technologies and the Metaverse Economy in the world, in the context of globalization.

In this context, we will have to identify and be aware of the challenges (technological and economical limitations or regulatory parties, such as ethics) of specific technologies and the Metaverse Economy, but also the possible negative effects on society, an aspect that we have not analyzed in the studied bibliography and which will represent future research topics.

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CHALLENGING ASPECTS OF THE AI APPLICATIONS IN URBAN DEVELOPMENT

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ABSTRACT

This paper's primary goal is to identify the principal challenges in Artificial Intelligence (AI) application in Urban Development (UD). In this respect, we accomplish a literature review regarding our goal.

The results of our research reveal that the domain is receptive to this kind of technology, and the main challenges regarding the launching responsible policies at the local level concerning smart UD, the level of quality in the process of data collection by AI, the concrete solutions in the mater provided by the private sector, the assurance a high level of transparency and comprehension regarding the implementation of the new technologies in the urban sector for easier acceptance from the population part.

The originality of this research consists in that our approach is singular at this moment, and the AI assimilation is a very clear sign of manifestation for the field of urban development.

Keywords: transformation; digital; AI; urban development; smart; machine learning; artificial neuronal networks; internet of things.

JEL Classification: L85, L86, R00.

1. INTRODUCTION

Digital transformation represents an aspect of permanent change (Parra and Guerrero, 2020; Horlach *et al.*, 2016) even in urban development. According to the statistics in the field, worldwide (The World Bank, 2020) 55% of the population lives in the urban environment, and over 80% of the GDP is obtained from this population sector.

The natural consequence of such a state of affairs puts pressure at the societal level on the design and development of intelligent environments for everything that urban development means. In this sense, the solution is the assimilation of artificial intelligence in urban development; it is known that the megatrend at the societal level (Jeflea *et al.*, 2022) represents the simplification of people's lives through the technological singularity.

Our research aims to extract the main challenges that UD has to face in the AI assimilation process as a solution for the next societal leap.

2. MATERIALS AND METHODS

Informatization is considered an essential factor in increasing productivity (Titovets *et al.*, 2022) in all sectors of economic life through its role as a catalyst of the economic environment (Tugui, 2015). Titovets *et al.* (2022) also insist on a catalyst role in increasing public service quality. Currently, when we talk about the computerization process, we are practically discussing the digitization of economic processes in that field that have not yet been informatized for various reasons; computerization being essential in "the process of introducing and spreading the use of information technologies" (Titovets *et al.*, 2022, p. 2) in the economy.

From the literature (Wheeler and Beatley, 2014) we understand that the concept of urban development suppose not only the building construction and the expansion of road networks but also the electrical supply, the connection to bus and rail networks, as well as the provision of basic needs, such as education and administration. In essence, urban development is about a complex system in which IT&C assimilation is in progress, and where the process of digitalization and steady growth of cities, efficiency in planning and implementation is becoming more important every year. In this context, the urban development task is assigned to a key person that is committed by someone who has a significant role as an urban planner and who should detain a huge economic knowledge (Yigitcanlar *et al.*, 2008).

In order to deduce the main challenges of the assimilation of AI in UD, we proceeded to identify works on the Scopus platform about the research objective we assumed. Thus, from the identified papers, we obtained an image of the AI techniques used in the UD field and the directions of applicability within the UD. Finally, we deduced a series of challenges for the UD field regarding the assimilation of AI.

3. RESULTS AND CHALLENGES

Following the methodology applied through the content analysis of the identified works, we systematize the results obtained on the two levels.

Regarding the main artificial intelligence techniques used (assimilated) in Urban Development, we identified the support from the authors in the field of the following techniques:

- Caprotti and Liu (2022), Panteleeva and Borozdina (2022), and Arfanuzzaman (2021) on the use of General Artificial Intelligence (AIG) techniques;

- Pinter *et al.* (2020) on the use of Machine Learning and Artificial Neuronal Networks;

- Myeong and Shahzad (2021) on the use of the Internet of Things (IoT);

- Wagner and de Vries (2019) on Operational Research;

- Zhihui and Guangtian (2021) on Data Mining;

- D'Amico et al. (2020) on Predictive Analytics;

- Wagner and de Vries (2019) [38] on Cellular Automata.

AI-techniques are applied to the following directions of action in UD:

- Environmental Protection supported by authors such as Caprotti and Liu (2022), Panteleeva and Borozdina (2022), and Arfanuzzaman (2021);

- Economic Development supported by Caprotti and Liu (2022), and Arfanuzzaman (2021);

- Social justice and equity, Culture supported by Arfanuzzaman (2021), Myeong and Shahzad (2021), and Wagner and de Vries (2019);

- Governance supported by Caprotti and Liu (2022), D'Amico *et al.* (2020), and Wagner and de Vries (2019).

After the systematization of AI techniques and AI manifestation directions in the field, we believe that this field is particularly receptive to AI and that it is subject to the following main challenges:

1. UD expects responsible local policy that responds to the needs of all citizens, authorities, organizations, and companies. This aspect supposes handling detailed data and requires identification, consistency, and comprehensibility of data by all participants through using AI;

2. The integration and using the data collected by AI suppose data quality, data protection, and data security, considering that the data collected are personal data regarding the analysis of human behavior. This aspect represents a considerable challenge regarding the calibration of AI technics by referring to regulatory requirements.

3. In UD, the private sector often provides concrete solutions, which supposes a solid partnership between the public and private sectors. This aspect assumes a challenge in the process of regulation which must be more correlated with the private interest in applying the AI technics. 4. In the urban sector, the implementation and introduction of new technologies must be transparent and understandable for easier acceptance by the population. Thus, when we discuss the acceptance of AI technics in the public sector, including the urban sector, it is necessary to pay more attention to a just understanding of the contribution and benefice associated and to reduce threats assigned to AI in special.

4. CONCLUSION

Through our study, we succeeded in framing the economic reality regarding the use and assimilation of AI technology in the field of UD. In this sense, we applied the literature review as a research method to a series of works identified on the Scopus platform.

We managed to systematize the important AI techniques used in UD, which refer to General Artificial Intelligence (GAI), Machine Learning, Artificial Neuronal Networks, the Internet of Things (IoT), Operational Research, Predictive Analytics, and Cellular Automata. In the same approach, we identified the directions of manifestation of AI in the field of Urban Development, which refer to Environmental Protection, Economic Development, Social justice and equity, Culture, and Governance.

The results of our research reveal that the domain is receptive to this kind of technology, and the main challenges regarding the launching responsible policies at the local level concerning smart UD, the level of quality in the process of data collection by AI, the concrete solutions in the mater provided by the private sector, the assurance a high level of transparency and comprehension regarding the implementation of the new technologies in the urban sector for easier acceptance from the population part.

Finally, our contribution to this study consists of the fact that our approach is singular at this moment in the field, and this is an obvious sign of manifestation in urban development.

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THE BEHAVIOR OF IOT SECURITY COMPONENTS IN A SMART HOME

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ABSTRACT

One of the main concerns of smart homes is the problem of the components that ensure security at the level of the IoT system. The analysis of security gaps, of the indicators that evaluate the communication of the entire system at the smart home level shows how stable the home environment is or how vulnerable it can be to external attacks or even from inside the home. The security components prevent the home from reaching critical situations, the content of the paper aims to analyze the behavior of the IoT components that ensure security at the level of smart homes

Keywords: analysis; IoT; security; smart home; sensors.

JEL Classification: O36.

1. INTRODUCTION

In the last few years, the Internet of Things sphere has developed a lot due to people's desire to live comfortably, in trend with the technology and smart devices on the market, monitoring the activity and remotely controlling their own home through the Internet network.

According to Patel and Patel (2016), Internet of Things is the component that deals with communication between intelligent components through the Internet network, filtering data and securing it before and during the transfer of information locally at the level of the local network, but also at the level of the worldwide network. The intelligent components come with advanced systems in terms of security and the degree of automatic updates to the latest software versions.

A smart home is made up of a system of interconnected intelligent devices that produce actions and services designed to meet the needs of the residents which will bring a higher degree of comfort and help in the daily activities inside the house, including the basic ones. The control over the system is realized by means of a gateway which has the role of interconnecting the devices in the house, to transmit and store data.

A study of Statista (Armstrong, 2022), from March 2022, estimates an increasing number of households using various smart devices (Fig. 1).



Figure 1. The estimated numbers of household worldwide with smart devices in 2022 and 2027 (Statista) (Source: Armstrong, 2022)

Due to the large number of mobile devices, the development in terms of cloud storage and the high degree of data analysis, this field also gained impulse starting with the coronavirus pandemic, including after the critical period when people remained faithful to this intelligent way of life, as can be seen in (Kamal *et al.*, 2020).

A smart home represents the favorable environment in which the need for security can be seen very clearly, both at the level of confidential data and at the level of security of the smart components, but also of the house. The analysis of the data that goes out and enters the local network is done starting from the level of the protocols used, this being obvious in Rahman and Shah (2016).

The behavior of IoT components at the security level has changed extremely much due to the appearance of different types of attacks at the software level as well as at the hardware level, the IoT Gateway, one of the main components at the level of the IoT network, keeping the upward trend with discovered and analyzed security breaches on market.

The behavior of the intelligent components in case of attacks must be thought up in advance or at least the question should be asked if a certain scenario were to become real, how the problem can be fixed or how it can be switched to a second scenario.

The paper is structured as follows. The next section presents the problem statement. Section 3 is dedicated to security smart home analysis. The analysis continues focusing on the behavior of IoT security levels. The paper ends with conclusions and future work.

2. PROBLEM STATEMENT

As presented by Changshun and Yong (2020), the indicators that show how secure the smart home is refer to the devices used in the activities inside the home with versions that cover the existing problems/vulnerabilities tested and fixed. Authorizing access only to the appropriate persons for the various types of applications used is another point that must be treated carefully, as many problems arise from here with the corruption or publication of confidential data.

At the level of the entire ecosystem, which involves the behavior of each individual component, security problems may arise when they are connected, but also the communication between them, which for various reasons can be difficult or completely closed, often causes processes to be incomplete or lead to erroneous results from lack of certain information.

Many times, in the normal flow of information transmission from one component to another, abnormal activities are detected that take place quickly and at repetitive time intervals. These activities can be detected using several systems, like IoTArgos, a solution presented by (Wan *et al.*, 2020) or GHOST (Albany *et al.*, 2022), that deals with traffic analysis, especially regarding the activities that are not necessary in the normal flow of the operation of intelligent applications.

Aldossari and Sidorova (2018) show that the attitude of the inhabitants is necessary to achieve several objectives regarding the IoT processes that take place inside the home. First, the expected effort and performance is based on the analysis of psychological factors, security and privacy risks that can change the behavior of applications and expose sensitive information to the outside. Secondly, trust in certain strange activities must be controlled to avoid possible costs/moral damages that may arise.

As it can see described by (Serror *et al.*, 2018), IoT components may have difficulties in developing their processes due to the difficulty of using existing Internet configurations. Processes can be unnecessarily complicated by using very complex algorithms that are not so fast when executed. The complexity of some systems does not cover the security of the processes that run and bring certain

results using sensitive data, the use of specialized layers helps to avoid certain breaches.

In the design phase, privacy and security must be considered because from the beginning of the system design, these problems must be included on the list of the most important, they are closely related to human behavior because human tasks trigger vulnerabilities/security gaps. Confidential data and access to it represent the main components that must be protected against attacks, in this case it is recommended to periodically analyze the risks that may appear within the intelligent systems as the authors (Jacobsson *et al.*, 2016) describe it.

In case of attacks on the sensitive information of the people who live in the smart home, a behavior can be defined that is triggered at the time of the attack, the respective device enters the away state, and at that moment the damages that can be mitigated if the device is on. All these steps are described by (Spanos *et al.*, 2019), the mitigation having an important role because it also saves other possible material or moral damages.

The different types of behavior in the case of attacks that can take place are highlighted by (Augusto-Gonzalez *et al.*, 2019), where it is shown how the system can be educated in case unknowns appear in the equation, using existing algorithms, but also by training users. The behaviors are tested beforehand to analyze how an application used in the smart home or a device behaves in case of possible attacks.

The gateway can have problems when the physical components encounter problems, the internet connection is down can be an example.

Identity recognition when using an application or a device must be treated seriously both at the system level and at the human level, because by gaining access to authentication, all other security layers are no longer valid.

In order to function optimally and to be interconnected, the devices must be compatible with each other in order to be able to transfer information and to define specific behavior according to the different actions received, to decode certain codes that lead to activities in other components.

There may be differences between the iOS and Android operating systems related to different devices, or in connection with the components used from Microsoft, these obstacles must be dealt with from the beginning in order not to modify the entire architecture along the way.

3. SECURITY SMART HOME ANALYSIS

An essential element in terms of the smart home is represented by the residents and especially the person who thought the entire IoT network, most of the time it is the owner. The degree of involvement in trend analysis, updates to new existing technologies, identification of security gaps that exist and may appear, including their resolution, but also the way of using intelligent components influences the lifespan of the components and the efficiency in communication and processing the data.

As mentioned in (Shouran *et al.*, 2019) and (Hammi *et al.*, 2022), there are several risks related to smart home devices within a household, like:

- Disclosure of credentials;
- WiFi connection hijacking;
- Unauthorized access;
- Accessing logs;
- Accessing confidential data;
- Violating privacy;
- Traffic interception;
- Malicious code injection;
- Manipulation of sensors.

The risks can be mitigated or avoided by taking security measure at the main levels of the system. Any smart home system, based on IoT, should comply with the following security requirements: access control (authorization, authentication, identification), privacy, availability, resistance, information security and trust (Hossain *et al.*, 2015), (Sotoudeh *et al.*, 2020).

Security analysis of a smart home system should be performed at several levels, as depicted in (Fig. 2).

Since the smart home system is a complex one and the components communicate with each other, one of the main security issues is communication both in relation to cloud storage and the interdependence of the devices used.

Another problem is the degree of security at the storage level, in recent years the Cloud has become the main space for storing information of any kind, to which access must be authorized by accredited persons and by the corresponding applications. Confidential and valuable information is stored here for the personnel who live in that smart home.

Of course, the entire system built for the smart home can have security breaches both at the network level and at the physical level being the main component that incorporates all the other parts necessary to create the processes that take place. Attacks on intelligent systems can appear through repetitive tasks that do not add value to human activities, they run in the background just to try to access confidential data. These activities can be identified following the data traffic analysis, which data comes in from outside and which data goes outside, which must be checked periodically, including after updating the components. Economics and Business Administration Higher Education under the Impact of Digitalization



Figure 2. Smart home security levels

Finally, the devices also come with a level of security that solves the existing problems on the market, but on which continuous updates are made at the level of the operating system and the applications used.

4. BEHAVIOR OF IOT SECURITY LEVELS

Residents are the ones who contribute decisively to keeping data safe and avoiding security breaches through the correct behavior and process of using smart devices. Ensuring security at the levels described above is not enough without the contribution of the users of the applications or the intelligent functions resulting from their use.

At the software level, many people do not use strong passwords that correspond to the current standards for building a password, nor multiple authentications that lead to attacks that are difficult to achieve at the authorization level on the applications inside the system. Once access to one of the internal applications is gained, it is quite easy to reach the other components, thus ending up corrupting the entire system. For example, in order to avoid problems accessing applications, devices should not have an unlock code with only 3 digits, and more than that, the login flow should go through two or more authentication steps until confidential data is exposed.

The applications could provide encryption at the keyboard level, when the user enters a text to be validated with the existing passwords in the database. In this sense, encryption algorithms, various verification codes or methods already existing on the market can be used. The technologies used can bring different behavior on the applications because they come with a different degree of security offered depending on where they are provided.

In the case of the residents' sensitive data, through the methods of access to them, each individual technology exposes and gives access according to its own criteria.

Regarding security at sensor level, they differ depending on their classification, each component coming with its own behavior and its own security layer.

At the level of connectivity both to the system and to the other components with which it communicates, the technologies used must ensure different behaviors for each component that is part of the system.

These security components can be seen in (Fig. 3), each component being interdependent with the degree of security on the all levels.



Figure 3. Technologies smart home security levels

The platform itself allows the restoration of data lost by mistake, mitigation of information loss, deployments, updates and necessary transformations. Security in terms of virtualization obviously changes the behavior at the level of data storage.

The security at the connectivity level differs depending on the type, if it is done wirelessly then the technology should be considered as there are several manufacturers that offer very good quality services.

Connectivity at the component level can also produce security breaches when residents expose information that is not necessary to other applications or other less secure devices. There are some cases where the applications only deal with simple human tasks and do not need extra layers of security, being very vulnerable from the outside if they are not used properly.

5. CONCLUSION AND FUTURE WORK

The behavior of IoT components changes depending on the security at the level of the smart device, which differs from model to model, from the versions of the operating systems to the periodic updates they need, depending on the degree of security at the storage level of sensitive data that users must access based on effective authorization that does not allow data leakage, but also at the level of the IoT system/network defined by the owner with rules that must be clear and that transmit and filter the data in a fair way without allowing attacks from the outside or even from the inside.

At the level of connectivity between the intelligent components inside the house, there may be problems due to the different technologies used, but also to the models that require updates from one version to another.

There are specialized tools that show how vulnerable the applications used or smart devices are, including checking the possible vulnerabilities that can affect the behavior of the components in the system, ending up other than the one desired by the residents.

People's behavior is decisive in the use of smart applications and devices, the exposure of data or their security depends a lot on the daily routine in practicing the activities that use IoT components.

The other security layers no longer apply if a certain person gives unauthorized access to sensitive data or to some applications inside the house through which the system that coordinates the components can be easily reached, modifying their behavior.

There is a need for security both at the physical level of the components that are part of the IoT system, to ensure security at the level of the system and the components, including the communication between them, but not least the correct use by the people who live in the smart home of the elements that sum up the system.

The research will continue with a deeper analysis of several already implemented IoT-based smart home systems. Also, we plan to design and build a prototype, in order to have access and to control all levels of a smart home system.

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OPPORTUNITIES FOR THE 21ST CENTURY ROMANIAN CONSUMER

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ABSTRACT

Consumer behavior as a field of scientific investigation emerged when researchers focused more on the individual customer, rather than on the market itself. As behavioral, rather than social sciences, proved to be more effective in explaining individual behavior and preferences, there was a shift towards focusing on consumers as individuals, rather than as a mass. Countless theories have appeared in recent years, which attempt to determine and measure the forces that influence a consumer to choose a brand, product or service (e.g. place, price, and time), yet their focus remains on consumers. This article aims to identify the various factors which influence the consumers' decision-making process in the 21st century. The claims of modern consumers are consequences of changes in the environment where they live and of changes in their attitudes and motivations. Starting from the specialized literature, we have identified and analyzed 30 claims of 21st century consumers.

Keywords: 21st century consumer; consumer behavior; online business.

JEL Classification: D11.

1. DEFINING THE 21ST CENTURY CONSUMER'S CLAIMS

Free time or personal time has become more and more relevant for the 21st century consumers. They value it so much that they are not willing to trade it for almost anything or anyone, therefore, we could say that it has become sort of a rarity and as it's extremely limited, we could affirm that some people view it as a currency. The concept of time poverty which states that consumers are more pressed by time more than ever (Solomon *et al.*, 2006) is highlighting this first claim. Individuals nowadays, before signing up for an event, or even before going to a doctor's appointment, they have the everlasting first question "How much

time is it going to last?". Free time has become so valuable (Heutel *et al.*, 2014) that many consumers have started preferring looking towards products and services to-go or with home delivery which are actually "offering" them more time as companies have started completing some of the buyer's tasks and chores, thus saving some valuable time on the consumer's side.

Moreover, a characteristic which is strongly related with the consumer's free time is patience (Heutel et al., 2014). The ability to accept and tolerate delays has been decreasing sharply in the last 20 years as internet and smartphones have revolutionized and shaped today's market in terms of consumer's preferences. Attention span is a concept strongly tied with the zero-patience characteristic of consumers and to emphasize that, in 2011, there was a debate indicating that attention span has dropped from 12 minutes to 5 minutes. In 2015, it has been discussed to have dropped to 8 seconds. Not only that people are not willing to focus on something for a long time anymore, but they lost this ability to wait and take a moment to pay attention and understand what is happening around them. The rapid development of technology has encouraged this trend of constantly looking forward to things which happen fast and almost instantaneously. The technology expansion also surpassed any limits and boundaries; thus, people are spending their lasts bits of attention and patience in the virtual space, and in this way, they are losing any ability to wait for more than a few seconds. It's about the instant nature of modern technology that appealed to the consumer even from the start, and since then, it has only become natural for people to expect a focus on speed and fast responses.

Effectiveness is perceived to be important as it is strongly related to time saving. As time is considered to be the most important resource a person can have, this characteristic of efficiency values products and services which have multiple purposes like 3 in 1 coffee, universal cleaning solution and so on. Besides saving time, people prefer it due to savings in terms of costs. It seems that effectiveness in the consumer's perception is strongly related to the purchase frequency. Thus, they see effective products as time saving and cost saving.

On the other hand, enjoyment is far more important efficiency sometimes. When having a set of activities on the to-do list, people would rather spend more time doing them and make it more pleasurable, than to have better results in a shorter amount of time and put in too much effort. Effort is another word which represents a quite controversial topic for today's generation. Consumers tend to draw back from putting too much effort (Bell, 2018), and start moving towards working in a "slow-down", stress-free environment which is far more enjoyable and less intimidating for their way of living. That is why many companies today started offering their employees all kind of spaces for recreational purposes in order to make their work seem more enjoyable and relaxing.

Additionally, happiness and enjoyment are a state of mind everyone wants to be in. In Greek, there is a term "eudaemonia" which translates into "bliss". Bliss or happiness, or even enjoyment is one of the primary goals for people, therefore consumers. Enjoying life can be today set as a standard, not an extra benefit for the consumers, thus, they may claim it to be a "must" characteristic when making the final decision when choosing a product or service.

Spontaneity is strongly connected with the lack of patience people have today. Technology have enabled firms to generate instant benefits for the consumers, but the expectations of the 21st century world is far more than that. People expect instant response from companies to their requirements or problems, and if they don't receive that, they give up on the purchase or order (Solomon *et al.*, 2006). This is an extremely important claim of the current consumers especially to the online retailers. Buyers today no longer have an issue regarding finding one product, but exactly the opposite. The issue of consumer is regarding the abundance of products available and choosing something from a million of alternatives (Solomon *et al.*, 2006). All these choices are as close as their mobile devices, and they can have whatever they wish, delivered to their door in a day or two, or even in an hour or two. But if this firms don't meet the expectations of spontaneous and instant shopping in terms of the buying process, the clients will move towards other businesses which will satisfy their needs in these terms.

Diversity is one of the "it" words of the 21st century. It has revolutionized our world in every aspect and will for sure continue to do so (Kapoor and Solomon, 2011). Diversity must start with designing of the product (the conceptualization stage) and should be implemented until the end of development stages (Bell, 2018), especially at the marketing level. The question which should arise when building the design of the product or service in terms of diversity is "Is there someone involved at any level who was previously unable to participate?".

Another point which emphasizes that diversity is the "it trend" of the 21 centuries among consumers is highlighted by the way firms evaluate the impact of the design decisions of a product. Companies, in an accelerated way, have started taken into consideration, when conceptualizing something, contemporary issues our world is facing economic, cultural, and social inequalities (Bell, 2018). Being diverse is more than just launching a wide variety of products or services but enable consumers to find them despite their unique physical traits or psychosocial qualities.

Moreover, diversity in the consumer's view is striking to launch more products or services which are more adapted or tailored to people's specific needs (Szul, 2013). In this way, whatever companies sell, will become more appealing to the mass market, even though they are not addressing a wide universal consumer, but a more targeted one. The firms who will take diversity into consideration will gain appreciation through showing their customers that they want to include everyone when designing and conceptualizing an architecture of a product, thus building tolerance, and showing empathy to the everyday consumers. According to the theory of self-determination (Ryan and Deci, 2000), which is a broad one about the human personality and motivation, autonomy is part of the three basic characteristics of psychological needs among relatedness and competence. Which are more than necessary for an optimal development of a well-being.

A more modern world implies an increase in the independence among individuals. Today's literature points out that consumers want to be more autonomous and try to make purchases which will help them to accomplish that. Research underlines that people even prefer to strive to be more independent than ever and this why consumers claim to need more products and services which will encourage and facilitate them to act in an autonomous way. Consumers want to centralize their decision, rather than disperse it among the individuals around them. One example which highlights this emerging trend is seen today at individuals who give up on their job to start their own businesses. They don't want to depend on someone else for their income and are willing to take big risks to become more autonomous. Another example is underlined by individuals who prefer to have a personal account for their pension, rather than the one provided by the state. They want to have this sense of financial freedom and to some extent, they want to be independent of the government. Therefore, autonomy is relevant and important claim of the 21st century consumer who strives to be as independent as possible of the external factors and businesses must acknowledge to address their needs (Solomon et al., 2006).

Claiming that they have the freedom to experience, consumers feel the need to break the routine often. A way to highlight this increase in the need to "escape" or just feel something different sometimes is the growth in the film industry. More and more TV shows and movies have been made and released and people seem to spend a lot of time watching them in order to relax and escape reality.

We live in a decade in which people forget. All these massive quantities of information are thrown in are face every second due to technology and human beings are not capable of remembering this huge piece of facts and data. Because of this, they select what is more relevant for them, and that is composed more of feelings, than of plain, basic knowledge. Not only that, but Czeslaw Milosz, winner of the 1980 Nobel prize of literature, has made a remarkable and bold statement at that time which proved to be more than true around 40 years later. He said that we live in an age which is characterized by a "refusal to remember" and among other things he mentioned about the fact that there were more than 100 books printed which deny that the Holocaust ever happened. As people "refuse to remember" it is impossible to reach out to your target market as a company by using just words, slogans, or logos. Consumers today are extremely complex; they want to feel the benefits of the products and everything which comes with it. Therefore, they want a whole exhaustive shopping experience, and if they don't have that, most probable won't remember the brand or the product.

An experience is far more than just a visit to a store. Is a whole new dimension in which the buyers are introduced in shopping, and it has become more like an escape from reality (Solomon *et al.*, 2006), and as they spend their time there, which is extremely valuable to them, they expect back a relaxed, comforting an enjoyable time. As city breaks are an escape from work and stress, shopping is seen today more like a routine-break from reality and daily activities. Companies use all kinds of stimuli (Sandu, 2014) or to make sure that the consumers have their expectations met and make them feel good: starting with visuals and ending with kinesthetics. Today, we can forget about patterns and addressing masses, as the consumer wants to feel like he or she has a custom-made experience when shopping.

People demand that products and services are updated and adapted to their needs and preferences. Individuals ask for products which adapt specifically to their needs. An example to this customization claim is products which you can order according to your preferred color, size, design and so on. Besides customization and adaptability to consumer's needs, people expect companies to come up with solutions to their problems fast (Solomon *et al.*, 2006). If it takes a lot of time to launch a product which was demanded by the market, the consumers automatically disqualify that firm and perceives it as not updated and invaluable to them. Therefore, the speed of reaction and ability to adapt fast is a must among the 21st century consumers.

Private data and protecting it is more than a requirement today for the modern consumer. Without any doubts, consumers go towards firms which guarantee to protect their private data (Solomon *et al.*, 2006). Individuals don't want to be "exploited" and have their personal life and space to invade and that is reflected in the laws and regulations which enforce companies to follow some specific rules. As many businesses have expanded in the online environment, the buying processes can be realized only by sharing data and information like full name, email address, home address, and bank account and so on. Due to this, the sharing of information and protection of data has become extremely important, as consumers know they expose themselves a lot when using some time of services or buying products.

Moreover, the Information commissioner's office points out seven principles regarding data protection and for sure, each and every single one of them is relevant to the 21st century consumer. When processing personal data, companies must set lawfulness, transparency, and fairness. Moreover, they have to present in front of consumers integrity and promise confidentiality in order to be perceived as trustworthy. Data minimization, accuracy and storage or purpose limitations are another set of key principles.

Inclusivity is another claim of the 21st century consumer due to diversity and globalization. Inclusivity is acted-upon consequence of diversity among individuals at the consumer level. As world is not considered anymore to be flat,

the market is not flat anymore, but has a 3-dimensional perspective once the study of consumer behavior has been born through marketing. Now, in the 21st century, once inclusivity has emerged in the big picture, we can talk and debate over a 7D perspective due to the complexity of needs of the consumer needed to be covered. People have switched and moved countries across the globe, more illnesses have been appeared, more social-cultural differences are being asked to be addressed; all these factors have enforced inclusivity, from all points of view, to become a requirement in building the architecture of a product or service.

We live in a world full of routines, task, and fixed schedules. Creativity is one of the few characteristics of products or services which can have a real value to the modern consumer. Business now consider creativity as being crucial to stay up-to-date and deal with the various changes the market now faces. Thus, creativity is maybe the most important tool for success in today's society as is highly competitive and difficult to survive in (Solomon *et al.*, 2006). For the consumers is beneficial because it enables them to have access to new and valuable products or services at any given point in time. For the buyer, creativity can help recall in an item which differentiate itself through surprise, humor or even contrast.

Individuals have access to millions of products (Solomon *et al.*, 2006), so if something doesn't stand out for them, then they will not be interested in it, thus not buy it. From this point of view, creativity is "a way of living" in the market for various products or services. Besides that, we live in a world in which people want to create the universe they are living in. Consumers no longer buy products to be used, but to create their world. From this point of view, firms have a more meaningful mission than just solve certain issues or address a need, but to come out with objects which inspire and create that "WOW" effect, thus offering satisfaction at an emotional level. Therefore, today consumers claim that objects of consumption are resources in facilitating them to be creative in building their own "world".

People's ability to be creative is restrained by their resources, both psychological and material, thus products or services which enable them to be inspire are preferred over the ones which don't.

Consumers today claim to be more pretentious than ever, but one thing will remain constant in their eyes, no matter the circumstances: they will associate the how long the product remains functional with its quality. The length of a product's life is critical for the buyer as well; he or she determines the value and the willingness to pay around it (Solomon *et al.*, 2006). Due to lack of time because of the busy schedule in the consumer's life, people tend to go towards products which last longer because this means that they don't have to spend time frequently rebuying that product. It benefits them because it saves time, but also from a psychological perspective, you can get more emotionally attached to a product if

it lasts longer, but you can be loyal to a product which you always run out of or breaks all the time.

There is nothing more disturbing to the consumer than products which present themselves to be very effective but turn out to be less than promised. Advertising campaigns made the 21st century consumer more skeptical than ever because of its never-ending promises and countless unmatched expectations. Because it has become rare, individuals seek consistency. They demand products with coherence between advertisements and real benefits (Solomon *et al.*, 2006)., and if they repurchase the same product or service, they want them to be the same in terms of characteristics if not superior. Therefore, the consumers today claim the products to be consistent with one another and to be realistic in terms of advertising.

Just as today's consumers are extremely complex and have different expectations, quality is comprehensive and complex and considered to vary greatly depending on the industry and market. Literature and research states that quality is linked with the performance of the product and how well ,,the product does what it's supposed to do". Moreover, quality is perceived as a property or characteristic of a product in terms of functions or tangible aspects such as design, color, size etc. Today we can observe that the consumer is extremely selective in terms of products and services, and if the companies fail to meet the sum of expectations of the individuals in terms of characteristics, the quality is perceived as poor.

By going beyond the concept of the lifespan and quality of a product, we can observe that there has been a focus on the shift from utilitarian products towards hedonic products (Hoyer and Stokburger-Sauer, 2011) which define themselves as being more valuable in terms of emotions and experiences. Due to this change, there has been placed an increased attention on products and services which approach the consumer's tastes and highlights the fact the individuals prefer what is pleasing them from the point of view of the 5 senses. To underline that, Charters argues that "taste is a personal judgment, and that aesthetic experience relies on an individual emotional response.".

Additionally, promotions have impacted in a quantifiable way the sales of a product (Sandu, 2014) or service. From a marketing perspective by considering the big 4 P's: product, price, placement, and promotion, we could affirm that the last one mentioned is extremely relevant and important to the consumer nowadays as it can impact the price-value ratio, thus the perception of how the product is seen on the market. By recalculating this ratio, the consumer sees a greater opportunity in terms of costs, thus the value of the product increases and it's offering the customer an extra incentive to buy on the spot, without hesitation. Moreover, as promotional campaigns last for a limited amount of time, the consumers will go through the decision-making process far faster, and will most probably purchase the item or service, because they will subconsciously know that

they might miss the opportunity if they won't move fast enough. Promotions are detrimental for the today's consumers because it targets the loyal and the nonloyal categories. The first type, during promotional campaigns is able to stock on the product and save it to use it later and the non-loyal one is able to prevent buyers from choosing from the competitors, as they have this "surprise" that either surpasses or matched competitors.

Promotions can also create an impulse for the consumer to purchase a new product. It is a worldwide used strategy to determine people to try out new flavors, types or design of product and it has the potential to turn non-users to loyal consumers. Besides targeting higher sales, through promotions a firm can make a statement on the market. It has potential to reach new segments (Sandu, 2014) or to increase brand awareness and to exploit different ways through which it can increase customer satisfaction.

Every day, one person takes around 35,000 decisions. Therefore, consumers need to make decisions regarding products and services on a daily basis (Zinkhan and Braunsberger, 2004), but this decision-making process has become more and more difficult to be understood. One important significant and impactful factor of the decision-making process is the complexity of the consumer. It is perceived that the individual's complexity has the potential to be a useful framework which can facilitate the understanding of consumers perceptions and evaluations (Zinkhan and Braunsberger, 2004).

Moreover, as people nowadays are misled by advertising many times, they don't believe in a products or service unless it's been tasted, and therefore many companies give samples or organize testing booths in stores. Consumers in the 21st century claim that they lost credibility due to the high number of incidents in which companies have called various products back in factories due to negligence or other factors, and therefore consumers claim to have more trust in brands which have this testing feature in stores.

Consumers are not extremely interested in how close a store is to their current location (Solomon *et al.*, 2006). and this is due to the development of technology, transportation, or infrastructure. People are willing to pay the price which comes with the products no matter the cost, even though this would translate into effort regarding the transportation to the location of the store or the accessibility of it through infrastructure or proximity.

In the past, this claim would have been more relevant as technology was not developed as much as today and it was harder to get to the store who was not close to the buyer's location. Moreover, the whole shipping or delivery services industries were not as present as today and transportation was harder to be made because of the low numbers of automobiles and their costs. At the online level, accessibility could be measured in terms of availability of stock, efficiency of the customer service and the speed of their responses and how easily consumers can access the online store. First, the appearance and development of railroads facilitated moving from one place to another way more easily and faster at lower costs. Another innovation was made in the field of communication and this way companies could keep connected and have better information in-hand quickly. JoAnne Yates stated, "the spread of the telegraph and of railroads encouraged firms to serve larger regional and national markets, while improvements in manufacturing technology created potential economies of scale". These factors had a massive impact upon what now we call globalization, and we can see today that, at a larger scale, these two means of "transferability" has influenced the business worldwide.

Consumers find globalization as a due benefit and value it as it grants them access to products or services which are not available in their nearby areas. Moreover, it's a plus when it comes to costs, as geographical borders don't represent a limitation anymore. Moreover, consumers sometimes prefer companies which operate at a global level because this can mean for the that the company is more trustworthy. Additionally, a firm which is present worldwide, proves to be in the eyes of consumers adaptable, able to address and deal with social-cultural issues and ethics.

As the society is expanding and growing at every level, individuals ask companies address this increase in the complexity and number of needs in every way. More than that, they expect companies to address them in detailed aspects as soon as possible, instantaneously if possible (Solomon *et al.*, 2006). The speed of reaction of brands should be extremely high, and in order to do that business must forecast and expect this change 24/7. Besides studying the market and anticipate changes, they must also prepare for unexpected events and their response to it.

From a consumer's point of view, nowadays, if a business does not address fast enough a need, they label that brand as being old-fashioned or outdated and this is detrimental for a company. Buyers expect their needs to be cover by products and if in the past this was not mandatory, today is seen as more than a must.

People will always seek positivity. Optimism will always be an appealing word for the consumers because they constantly seek improvement and the satisfaction and joy that comes with it. Products and services which promise to "make the day better" or "put a smile on your face" are preferred today over others because they cover a psychological need.

People have always had this need to keep connected with each other and what is around them. Going out and building relationships or friendships points out exactly to that. Due to the strong influence of technology, individuals have made a shift from connecting in reality, to doing that at the online level (Solomon *et al.*, 2006). However, in the consumer's perspective this translates into an increase in the demand of products or services which facilitates this connection sought by individuals in real time.

Social media networks and websites appeared to cover the need of connectivity and have tried to address that to some extent by allowing its users to share all kinds of media and content, thus encouraging people to connect. Even though they manage to help persons at this level, the virtual social networks have not succeeded to cover fully, as expected. Therefore many companies are trying really hard to design products or services or processes in such a manner to cover this connectivity need at the offline level, as well as the online level as the consumers spend a lot of time on social media (Duangruthai and Klieb, 2018)

Consumers appreciate companies which are interested in their buyers and users of their products and praise firms who have a relationship with its clients, thus want to connect with them. Society wants brands who connect with different communities at a local level, as well as at a global one. Moreover, besides having consistency in relationships with its clients at micro and macro level, consumers claim that businesses should make a real effort to inform, communicate, and address people from all over the world, and even more than that, help in connecting communities and individuals worldwide. This is seen today in the online environment when all sorts of companies connect their client via various platforms to share their experience with their products or services.

As the world is constantly evolving, so does the consumer. Everyday something new and unique is discovered and an innovative product or service emerges. Consumer claim now that they need innovation as it grants them the opportunity to always update to new better and more improved products or services. From this point of view, innovation plays a massive role in influencing and changing behaviors (Awan and Zuriat-ul-Zahra, 2014). The concept of anticipated utility underlines the desire for innovative products and expectations of benefits, and it is a relevant hedonic shopping motive today (Solomon *et al.*, 2006).

Another consumer claim today is regarding corporate social responsibility. CSR is perceived to be a must for the nowadays consumers (Solomon *et al.*, 2006). as they think that companies should not only launch products or services but have a proactive real role in society when it comes to the community's concerns and issues.

By approaching it through the Triple Bottom Line designed by John Elkington we can affirm that CSR is a combined focus on 3 main pillars. The first one is about social justice and is concentrating on people, their needs and it can be underlined by today's growing trends on inclusivity, tolerance and diversity. The second one refers to the planet and the responsibility we have as consumers in terms of ecology. People and various organizations encourage us and are moving towards eco-friendly; bio and organic products and this change is seen drastically on the demand side of consumers. In almost every supermarket there is a aisle especially made for this category of customers and it has been built in the last 10 years. The last pillar in this theory written by John Ellington is the economy one, which debate over the profit and refers to the economic concerns of the companies. It is about more than that as it represents prosperity. Moreover,

it also comprehends the individuals and communities' interests. Thus, the Triple Bottom Line approach of CSR include claims of the consumers from 3 points if view: Planet, People and Prosperity & Profit.

As the world today is experiencing an increase in the expectations of the consumer from a CRS point of view, there is also a grow in the complexity of challenges in a highly complex and globalized society.

Brand status is strongly related to the People and Profit pillar of the theory mentioned earlier. Just as consumers have their own identity and acquire a status over time, brands do the same. People nowadays don't buy from brands who have a bad reputation anymore. Why? Because in these days consumers don't buy just the product or the service and its benefits, but they look forward to the label, the values, and principles the brand is presenting (Sandu, 2014) through its activities. Therefore, firms want to engage in different social aspects of communities in order to build a reputation in from of their customers. Today, a socially responsible company in the consumer's view may translate into higher profit for a firm. In an article written by Ron Robbins in Business Ethics magazine there is stated that 74% of companies said that corporate citizenship, which means you are CSR firm, can help increase profits. Consumers follow companies and what they are doing in their community and tend to orientate themselves to purchase from the ones who fight for good causes, especially nowadays.

Ecology and its importance have been growing a lot in the past few years (Brandabur, 2011). The public attention towards these concerns have increased significantly: in Romania, there are registered 76 NGO who are working for protecting the environment and he majority of them appeared after 1999 and this exemplifies the growing concerns upon environmental issues. Moreover, consumers not only that they encourage NGOs like this by donating and volunteering, but they adopt a lifestyle which is more eco-friendly by paying more attention to the packing of the products they buy or even by giving up on driving their car and use a bike instead in order not to pollute the environment.

The green movement (Solomon *et al.*, 2006) is an important driver of the 21st century consumer as it is a trend who's increased attention towards the environment has put an emphasis on the reclining of resources and designing them in such a way to lower the negative impact upon the planet.

2. CONCLUSION

Therefore, the presented claims highlight few of the most relevant characteristics found in literature of the 21st century consumers. The research, scientific writings and the trends in the occident have shown a changing behavior of these characteristics of the consumer behavior since 2000, the last year of the 20th century. Consequently, studying consumer behavior has become a 'must' in the 21st century and marketers have been trying to understand and interpret it for a long time.

However, discovering consumer's needs and demands is not enough anymore. Companies and experts should not only focus on what is at the surface, but predict changes, claims, needs, and address them as fast as possible. Lastly, it is our job as researchers is to make efforts to find out what consumers claims are, understand them and help businesses address them. As mentioned in the research, to thrive as a business in the 21st century, businesses should have on focus: the consumer.

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