JOURNAL OF INFORMATION SYSTEMS & OPERATIONS MANAGEMENT

Vol. 15 No. 1
July 2021

EDITURA UNIVERSITARĂ
Bucureşti

Foreword

Welcome to the Journal of Information Systems & Operations Management (ISSN 1843-4711; IDB indexation: ProQuest, REPEC, QBE, EBSCO, COPERNICUS). This journal is an open access journal published two times a year by the Romanian-American University.

The published articles focus on IT&C and belong to national and international researchers, professors who want to share their results of research, to share ideas, to speak about their expertise and Ph.D. students who want to improve their knowledge, to present their emerging doctoral research.

Being a challenging and a favorable medium for scientific discussions, all the issues of the journal contain articles dealing with current issues from *computer science*, *economics*, *management*, *IT&C*, etc. Furthermore, JISOM encourages the cross-disciplinary research of national and international researchers and welcomes the contributions which give a special "touch and flavor" to the mentioned fields. Each article undergoes a double-blind review from an internationally and nationally recognized pool of reviewers.

JISOM thanks all the authors who contributed to this journal by submitting their work to be published, and also thanks to all reviewers who helped and spared their valuable time in reviewing and evaluating the manuscripts.

Last but not least, JISOM aims at being one of the distinguished journals in the mentioned fields.

Looking forward to receiving your contributions,

Best Wishes

Virgil Chichernea, Ph.D.

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JOURNAL OF INFORMATION SYSTEMS & OPERATIONS MANAGEMENT

JISOM journal details 2021

No.	Item	Value
1	Category 2010 (by CNCSIS)	B+
2	CNCSIS Code	844
3	Complete title / IDB title	JOURNAL OF INFORMATION SYSTEMS & OPERATIONS MANAGEMENT
4	ISSN (print and/or electronic)	1843-4711
5	Frequency	SEMESTRIAL
6	Journal website (direct link to journal section)	http://JISOM.RAU.RO
7	IDB indexation	EBSCO, GALE Cengage Learning Index Copernicus ProQuest RePEC/IDEAS

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ISSN: 1843-4711

The Proceedings of Journal ISOM Vol. 15 No. 1

CONTENTS

INCREASING SECURITY AWARENESS THROUGH LENSES OF CYBERSECURITY CULTURE

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Abstract: *Recent years have shown that the expansion of digitalisation implies an extension of what needs to be protected. While businesses invest in technology to protect against cyber-attacks, one of the top vulnerabilities remains the human element. This questions the centrality of the human role, something which often pertains cybersecurity policy, awareness, and training. Thus, it is imperative to understand if such approaches remain good strategies in protecting an organisation's information, assets, and people. To portray the current state, this paper takes into account prior developments in the study of Security Awareness and in addition, it explores the relevance of Cybersecurity Culture. Accordingly, the proposed approach aspires to delve into the value proposition of combining the two. The research determines that attaining organisational resilience differs on how employees perceive formal (awareness and cybersecurity policy) and informal rules (i.e., culture). Further research is required to determine the long-term effects in enriching Cybersecurity Awareness in context of Cybersecurity Culture.*

Keywords: *Security Awareness, Cybersecurity Culture, Behaviour; Organisational Resiliency*

1. Introduction

To date, it is known that cybercrimes are affecting the global digital economy, organisations, and users alike [1],[2]. This matter has been investigated in many ways hence digitalisation implies a paradox of progress meaning that apart from benefits, it has exposed organisations to cyber threats as well [3], [4], [5]. Equally, cybersecurity has been gaining importance due to its vital role in protecting the growing digital infrastructure [6], [7].

This has impacted on risk response, security technologies, practices, and staff behaviour. Consequently, even though the cybersecurity is an evolving approach, failures demonstrate that efficiency is yet to be achieved. Whilst businesses invest in technology to protect against cyber-attack, one of the top vulnerabilities remains, the human element [8]. Evidence shows that security remains a twofold socio-technical challenge [9]. Technology has become inadequate in ensuring security and so the human intervention is needed in order to render a stronger response to risk; hence threats are not constant and instead require continuous adjustment [10].

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The challenge in today's context is that humans are more exposed, more vulnerable, and less motivated [2], [4], [8], [11].

As a result, there are growing appeals for transforming existing human capabilities and behaviours to help avoid potential disruption of a potential cyberbreach [1], [12]. A common strategy used to address the human side in security was addressed by prior literature under security awareness. Antecedents of security awareness research are believed to have been driven by prescriptive factors such organisational context, standards, regulations, policy compliance requirements, and knowledge gap. Traditionally, awareness has been applied in isolation, acknowledged as insufficient in shaping organisational risk culture [13]. Taken together, these factors demonstrate that managing human behaviour and culture remains to be understood [14].

On the other hand, cybersecurity culture is found to influence organisational risk response performance. So, proper cultivation could protect an organisation against loss [15]. On these premises, factors such as employees' beliefs, values, and attitude in the context of cybersecurity can either be a risk or a foundation to increase organisational effectiveness and resiliency [5]. It is known that human error or lack of motivation can lead to substantial consequences for any organisation; and where the foundation is missing, the long term effects can be problematic. Fortunately, taking steps to instil good behaviour and getting prepared for a response to threats can diminish the extent of fragility and consequences.

This questions whether attaining organisational resilience varies on how employees perceive formal (i.e., awareness and cybersecurity policy) and informal factors (i.e., culture). To portray the current state, this paper takes into account prior developments in the study of Security Awareness and in addition, it explores the Cybersecurity Culture relevance.

Accordingly, the proposed approach aspires to delve into the value proposition of combining the two, enriching Cybersecurity Awareness through lenses of Cybersecurity Culture paradigm.

In the next section, an analysis of prior research is presented, followed by section 3, which covers the theoretical framework. Then, section 4 covers the research finding, and finally, the conclusion is presented in section 5.

2. Literature review

Exploiting human flaws has become a risk and this raises the need for a more secure culture of awareness to guide compliant behaviours [5], [16]. Recent years have shown that the risk of incidents materialising is higher, and so the human factor has become an essential component in maintaining secure organisation practice [17]. On the other hand, employee negligence, whether deliberate or not, push organisations to demand stronger security policy and requirements [18].

2.1 Security awareness

The scope of security awareness emerged as a necessity to prevent breaches and help employees understand the importance of maintaining vigilant practice towards threats [11]. Habitually, organisations develop policies, procedures, and guidelines to reduce human risks [19]. In the broad sense, under Cybersecurity Management, this is encouraged to be an acknowledgement in protecting confidentiality, integrity, and availability (CIA) of information assets [8].

2.2 Organisational culture

Culture is defined as being a meaningful way to sum up a range of behaviours. The conceptual background of culture pertains to dimensions of cognitive, behavioural, attitudinal, and normative aspects [17] along with other key components such as group ethics, communication, customs, assumptions, and responsibilities [19].

Thus, developing culture can be defined as a way to increase the level of awareness, norms, knowledge, attitudes, behaviours, intentions, beliefs, shared values and a framework of ethical behaviour [17].

2.3 Cybersecurity culture as a sub-culture

In the context of cybersecurity, having a good understanding of what culture implies could become a strong prevention strategy [20] and a way to positively influence individuals' perceptions and habits towards an expected behaviour [21]. The resulting behaviour would be a more robust capability and mindset to protect information, assets, and people.

A key argument is that every organisation is different, with their own goals, risk appetite, specific practices, context, and often other sub-cultures that can trigger different results. Consequently, solutions to tackle security culture vary and are often challenging for organisations. In turn, they need to adjust and find a suitable practice in line with the organisation's overall culture [22],[23].

It is essential to acknowledge that cybersecurity culture definition is still undefined, and even though it implies the influence of fast pacing digitalisation, it seems a concept that is hard to change [21]. One of the key reasons is that culture is not understood and more concerning subcultures within business units play an influential role on the overall results.

The importance of keeping peace with cybersecurity has been defined by some as risk culture; hence motivating employees to follow procedures or learn protective skills has been acknowledged as a people-centric approach. Conversely, this ingrains fear that insecurity has become a sensitive matter. Beyond the outlined approaches, having a good cybersecurity culture is not all about setting the right policies or procedures or checking effects. It implies setting strategic risk awareness beyond mitigating controls and getting collective responsibility that has a significant impact on daily activities [3], [24].

With increased hyperconnected environments, employees face higher risks of falling victim [25], [18] and as such, organisations which seek to nurture cybersecurity culture help avoid a siloed approach of awareness and instead encourage training that highly relies on competencies and knowledge. A cultural approach would consider the effects of a secure culture of awareness in the context of perceptions and respectively behaviour. [26] highlighted that culture within an organisation is a key determinant for cybersecurity management and its security performance. It was suggested that a security-aware culture indirectly guides the protection of information and assets as well as raising awareness of risk and responsibilities. We can draw the conclusion that the unwritten practice of sub-culture impacts at various levels across an organisation as well as on the secure course of actions [26].

This widens the debate of how every employee can affect cybersecurity practice and how non-conformance can lead to vulnerability, thus highlighting how important it is to start internally with a substantial baseline, adequate policies, and behaviour monitoring [9].

It is argued that that technical and administrative control within a cybersecurity function should imply a uniform and a confirmed approach. Beyond technology and documentation, the human aspect plays a significant role in the successful application of direction of expected controls and behaviours. Thus, how to tackle a cybersecurity culture strategically and instil employee's commitment remain a challenge [9].

This could be problematic because it emphasises dependencies on long-term effects on how security is collectively perceived in a workplace. A challenging problem is that it has a causal relationship to the overall organisational security posture. It is assumed that the cultivation of cybersecurity culture in an organisational environment could influence behaviour and attitudes among individuals [27]. Thus, cybersecurity culture aspires to tweak the group mindset towards consciousness of risk as well as adherence to internal policies [28]. In addition to generic research findings, literature emphasises different dimensions of culture that overlap, namely behaviour, perception, assumptions, knowledge, commitment, accountability, awareness, attitude, communication, norms, responsibilities, or values [27],[28],[29]. All the aforementioned are believed to be predisposed by artefacts (i.e., procedures) and exposed values (i.e., guidelines) [30]. Previous studies have based their criteria on selecting a few elements and have articulated either a top-down approach or mid-level approach (i.e., operational), while some other studies focused more on awareness and emphasised a bottom-up approach. On the other hand, organisational culture is expected to constantly strengthen ethical and appropriate risk appetite. To portray this further, the standardised approach of the institutional side of culture was even described as programmed behaviour, although it is most probably a pattern under a form of expected behaviour.[30],[31].

2.4 Linking practices

Cybersecurity culture is recommended to be anchored in organisation culture and objectives [32]. Marrying the two concepts (organisation culture and cybersecurity culture) has the potential to invoke an intuitive response, change mindset, instil a readiness concept to risk, and embed all this in daily practices. In addition, if this is supported with awareness and training, among many behavioural aspects, it could lead towards greater security culture. 'Cultivating' (i.e., preventing) and not 'prescribing' (i.e., curing) as security awareness does invokes an intentional acknowledgement that technology alone is not sufficient and everyone has a role to play. Nonetheless, literature shows such approaches have been overlooked in the past [26]. Whilst cyber risks are acknowledged [4], the cyber threats still contextualise, and the human side is still one top reason a cyber breach occurs. Nevertheless, no matter how sophisticated technology and policies are, the employees' behaviour is not always expected. Too many organisations security policies do not always work, or employees do not pay interest, whilst tending to underestimate cybersecurity risks. Given the two sides of a risk, the insider threats remain amongst top 'threat agent' of breaches, either if occurs intentional or unintentional [4].

However, on other occasions, some organisations lack sufficient resources or knowledge [5],[28],[33]. To support the message and prompt regular discussion about cybersecurity, organisations review policies and expect to drive uniform behaviour. Nonetheless, uncompliant habits or misuse remain a difficult aspect to control [5].

2.5 Factors

Identifying factors that affect users' intentions to comply with cybersecurity policies is of utmost importance. Tackling this issue has a sense of urgency due to its causal relationship to motivate, determine and drive the engagement of an employee. Policies are frequently cited as the ones that guide good behaviours and drive the norms but remain prescriptive in its nature.

Nevertheless, culture in context of awareness is suggested to be a moderator and a driver for effective implementation [34]. Thus, tackling human factors require finesse due to the systemic implications and the fact they change over time. Moreover, the problem pinpointed is that the literature lacks clarity around how to enhance cybersecurity behaviour and employees' threat perception without creating security fatigue [33]. Another aspect that came to the surface is that change behaviour could be superficially tacked as awareness if deployed through presentations, policies, or one-time action [35]. How an organisation can ensure consistent and long-term results remains dependent on the influence of key determinants as outlined in Table 1.1.

Table 1.1 Determinants of cybersecurity behaviour

Key determinants of security culture		
Strategic influence	Leadership	[5], [36]
	Policies	[9], [19], [28]
	Compliance and conformity	[38], [39]
	Sanctions	[5]
	Organisation culture	[37]
	Awareness and training	[28], [35], [49], [58
	Response cost	[45]
	Reward and Recognition	[4], [45]
	Engagement and communication	[11]
Social influence	Group or co-workers' behaviours	[5], [16], [17], [21]
	Security fatigue	[33]
	Cultural differences	[36], [37]
	Group habits	[5]
Individuals' perception	Vulnerability and probability	[21]
	Efficacy in dealing with security threats	[4], [45]
	Experience/awareness	[53]
	Personality and values	[27], [46]
External rules	Regulation	[40]

Nonetheless, as observed in Table 1.1., there are key determinants which can play a role in influencing behaviour when a threat occurs. To put it another way, cultural variables can both enhance or impede behavior dependent on the interrelationship bewtwen variables [36]. For example, cultural differences are variables that can affect managerial control as well as individual evolution and input. That is to say that strategic decisions must acknowledge these variables and interrelated effects [36].

Practically, at the basis of a projected compliant behaviour are policies, procedures and guidelines. However, these findings suggests that the missing link is that each individual and organisation are unique. The organisation's vision and mission define its main goal, whilst people bring their own perspectives. Thus, approaching cybersecurity as an instrument [24] can help determine suitable patterns and approaches for awareness [28].

Notably, an organisation's core values, norms, traditions or philosophy may possibly provide understanding how risks are understood, addressed, and mitigated [37].

3 Theoretical lenses

As literature showed that culture incorporates strategic influence, social influence, individuals influence and external influence, the debates about what build good security culture remain unanswered. [33] emphasise that despite significant theoretical contribution, translating such approaches in practice might not always successfully influence risky behaviour.

To combine the cognitive variables, a model that combines variables of Protection Motivation Theory, and Institutional Theory is presented in Figure 1.1. and includes:

Institutional Theory (ITT) ─ considers the value, normative rules, legitimacy, beliefs, principles, practices, structures, processes, obligations, behaviour, ethics, and social systems establishing command and assigning responsibilities. The external rules, also known as 'rationalised myths' (traditional conformity) can influence an organisation through isomorphism [38], [39]. There are various interpretations regarding institutional views, hence the response of academics focusing on various aspects. Institutional Theory posits how mimetic, coercive, and normative pressures affect the interdepartmental linkage compliance on daily work practices [40]; including variables such as External Rules, Coercive Isomorphism, Normative Isomorphism, and Homogeneity Rules Influence.

- Coercive isomorphism describes to the informal and formal pressures an organisation gets from several sources and the resultant organisational behaviour [41]. The concept of coerciveness is about external action and the rendered effect, comparable to other organisations. Most often seen as a recognised as a professional expectation in the form of a norm, obligation, moral, standard or duty [41]. This can include, for example, the effect of peer organisations, competitors, regulatory bodies [40], political impact, control from supervisory authorities, and economic factors [42], among many others.
- Normative isomorphism reports the collective effect of professionalisation [42] and concentrates on normative social expectations to control specialist positions categorisations [39] that order responsibilities. Some examples of normative influences are professional interactions at events (e.g., conferences, professional associations meetings) among specialists [43].
- Mimetic isomorphism questions the cognitive influence of others' success to be emulated and taken granted as a solution to thrive and be recognised as legitimate [38], [42]. It analyses what leads to specific organisational decisions taken in specific practices [39] mechanism or structures [41].

Protection Motivation Theory (PMT) ─ explores the cognitive process of an individual when it is exposed to a threat [44]. The theory considers an individual

behaviour under variables such as motivation, probability, severity, vulnerability, response efficacy, self-efficacy, response cost, reward [45]. The utility of this theory is to understand to what extent threat perception triggers a positive or negative response [4]. The likelihood of such variables to materialise in predicting secure behaviour and policy compliance are incremental when implementing security measures.

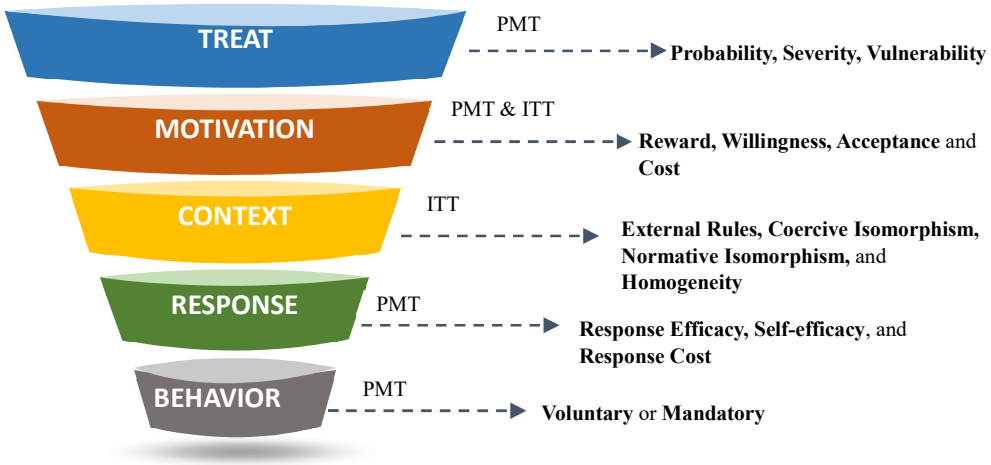

Figure 1.1 Cybersecurity culture model

As seen above, the two theories are funneling down a social system that subconsciously perceives through cognitive variables, processes, constructs and relationships that influence response and behaviours [46]. Security culture relationship with cybersecurity management is unclear within literature [47]. On the other hand, the effects of security awareness on security culture seem evident yet only help with segregated understanding and some degree of responsibility [45], [47].

This research thus proposes to include cultural aspects of cognitive behavioural responses (Protection Motivation Theory) and conformity (Institutional Theory) to security awareness programmes, so it can position an organisation to have better resilience. Organisational culture, on the other hand, is unique to every organisation and could have multiple layers from prescriptive rules to ideal behaviours. Breaking this down, the way organisations plan to mitigate risk can be expanded by understanding that norms, behaviours, attitudes and beliefs can sustain the performance of an organisation holistically. It can lead to a multi-layered approach that implies lenses of psychology, change management, and strategic management. Fostering a security mindset through the view of organisational culture, avoids limitation in implementing measures, and instead of

placing focus on the procedural side, it could expand on a broader view, incorporating perception and enculturation.

4. Data analysis and results

This research was exploratory and interpretative in nature to investigate challenges in the financial industry. The paper utilised qualitative data from 26 semi-structured interviews to investigate if cybersecurity awareness remains a sufficient strategy in protecting an organisation resiliency.

The Human factor is identified as a category that inhibits implementation relates to people-centric rapport, meaning that 30.95% of respondents reported concerns related to the ability to recognise problems and avoid human error. This finding is in line with prior research which reported that people-related risks are a common challenge for organisations [48].

A breakdown of human factors is detailed below:

(1) Skills deficiencies (13.04%) - investment in skills and knowledge of employees was reported to be another factor that affects compliance behaviour.

(2) Lack of awareness (17.91%) - investment in skills and knowledge of employees is a factor mentioned. The literature indicates that security awareness is a component of culture bearing influence over organisational effectiveness [49].

When questioning why cybersecurity controls fail, the evidence from interviews highlights that many inhibitors are people-centric and refers to human capabilities. Briefly, the respondents emphasised that there could occur a domino effect if skills deficiencies and lack of awareness are missing. The concerning result is that these two people-centric inhibitors it can affect an organisation ability to deploy suitable response. Given these facts, it is acknowledged that this can leads to difficulties in reaching effectiveness and cybersecurity maturity. Accordingly, lack of skills or awareness can deter appropriate lines of responsibility, accountability, and knowledge, all of which are essential element of cybersecurity [50].

Governance factor

(3) Inappropriate governance was pinpointed by 10.14% of respondents as being an inhibitor. Failure to understand cultural context and governance need was indicated by respondents as being detrimental for organisations. For instance, poor governance it can be hindering policy applicability, disengage business units, or even have contradictory interpretations for risk. In addition, unclear accountability (responsibility) sustains deficiencies. The readiness to overcome governance weaknesses depends on the organisation's acceptance to change, the cost involved, and the availability of resources [51], [52].

(4) Lack of management commitment (11.59%) in translating how strategy aligns to security culture makes it difficult to understand how prioritise risk.

Inadvertently, respondents believe executive ignorance it can imply a spreadable effect on employee behaviour, resistance to change and/or non-acceptance.

(5) Cultural deficiencies factor (11.59%) was found to be one of many components that could impact an organisation security organisational posture. The findings indicate concerns of respondents in this regard. Traditionally, within the literature the risk culture concept is a compound of values, past experiences, philosophy, and behaviours [53]; in addition, same author specifies that materialise in a form of pattern of conduct [53]. Detailed examination of risk culture showed that culture deficiencies are predictable and define repeatable behaviour. Much of the literature identified internal values, beliefs, knowledge, and understanding as number of limitations. Therefore, most scholars suggests that that risk culture involves two main strands: (1) organisational attitude and (2) people's behaviour under risk pressure. Accordingly, other findings show that culture deficiencies could be influenced by key elements such as leadership, strategy, adaptability, coordination, and relationship [54], [55].

Resource factor

(6) Cost - 11.94% agreed that the cost of security awareness implementation is an inhibitor. One noticeable aspect is that the intrinsic investment's purpose is to avoid cost instead of producing income [57]. The literature suggests that many organisations have challenges when intending to invest due to such perception in the latency of results [57].

To summarise the results, the findings give clarity around the fact that multiple elements interrelate. Interestingly, education, awareness, skills set, and communication were perceived as different by respondents; This result is somewhat the opposite of literature which shows that all of the above compound elements of culture. The findings also offer insight into the following:

- Cybersecurity culture depends on governance (33.32%), people (30.95%) and resource (11.94%). All interrelate, and play a significant role, thus ingraining cybersecurity culture means adopting a bottom-up approach (resources, people, technology and governance) [5]. Prioritising its effort as a community and increase resilience also means delivering security awareness, and additionally considering cultural characteristics and pain points as a whole. It fosters an environment that encourages compliance behaviours as an informal measure.

- Where cultural deficiencies remain undressed, the security awareness is unsustainable to proactively support compliant behaviour.

- Security awareness programmes are still yet to mature whilst other organisations lack a formal programme. Likewise, within the research field is believed that has not reach maturity [58].

These empirical results and the reported findings within the literature, suggest that planning and instilling a risk culture requires consideration of knowledge, behaviour, and culture characteristics. The Researcher concludes that if the concept of cybersecurity culture is embraced within a Security Awareness programme, it can lead to relevant, understandable, and personalised content and delivery which can motivate compliant behaviours (conformity) through cognitive lenses.

4. Conclusion

The research proposed to validate if Security Awareness is a sufficient strategy in current context in order to determine what other factors can help an organisation limit human-related risk. Poor behaviours demand a change of mindset in order to keep pace with technological transformations and implications whilst complacency reigns.

By answering the research question, this paper validates that Security Awareness strength can be increased through the lenses of culture concept. Additionally, this paper contributes by challenging the conceptual shift of cybersecurity awareness towards a more integrative approach. This supports the idea that both domains, culture and awareness share common dependencies and interdependence. For instance, they rely on expanding knowledge as well enforcing good practice.

Overall, this paper expands on challenges posed by how security culture is perceived due to various interpretations and consequential inconsistent outcomes. It thus proposes to include cultural aspects of cognitive behavioural responses (Protection Motivation Theory) and conformity (Institutional Theory) to security awareness programmes, so it can position an organisation to have better resilience.

Considering the pace at which digitalisation evolves, the findings are relevant for the time of writing this paper. Further research exploration is required to determine the long-term effects and implications of the cybersecurity culture paradigm. It is recommended that future research should imply more considerable empirical evidence that might determine further insight into potential trends and developments.

Another avenue of further research could be the effects of fostering cybersecurity culture across organisations through formal programmes in order to determine their sustainability in practice.

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MIXING COOPERATIVE AND COMPETITIVE APPROACHES AS A WAY TO ACHIEVE ACADEMIC PERFORMANCE

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Abstract: *As long as humans have walked the earth, people have depended on making continuous progress accomplished by learning and achieving excellence in every aspect of our lives. Developing new skills and keeping a focused mind on progress is what sets humankind apart. This paper aims to examine the available approaches and outline the benefits of mixing cooperative and competitive-based learning when studying or achieving performance. An overview of them is presented, where cooperation-based learning, competition-based learning, and a mix of both are explained in turns. Past research and findings are mentioned, analyzed, and the benefits and risks observed are taken into account. A series of tests and observations are also made that conclude that both competition and cooperation have downsides, which can be avoided when mixed. The study results show that a mixing of cooperative and competitive approaches is preferred by students and tends to give better results.*

Keywords: *Competition-based learning, cooperation-based learning, education, educational models, interactions, mixing learning strategies, performance, skills, strategies, students, teamwork.*

1. Introduction

Approaching the link between competition and cooperation is essential in establishing the correlation and differences between them and being a familiar concept and debate for several fields such as philosophy, sociology, politics, or

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psychology. The scope is to present a study to establish the relationship between these two social interaction types as strategies for improving learning and linking historical tangents on this research subject.

As a student works on formulating a response to a task, he or she must try to work together and talk to other students. The impact on exchanging ideas between students, working through misunderstandings to reach a typical result, absorbs the content more effectively and reciprocally to get an understanding. The cooperation environment leads to team participation and contributes to multilateral development, thus involving listening between students, exchanging ideas, and contradicting individual approaches. A student can bring his point of view and arguments. Moreover, an important aspect is that students run across different strategies, other styles of thinking, albeit gain experience involving these difficulties with group work.

What is the competition? Firstly, it is a competition between rivals and secondly a competition to outdo yourself. In everyday life, competition leads to an innovative environment, while competition between students is an element that turns potential into success. Competition is a significant element in our lives, so there would not have been so many technological revolutions without it.

Regarding other studies that analyze cooperative and competitive behavior, it can be noticed that these two types of social-human interaction represent two independent dimensions that introduce opposite means and approaches. However, connecting the vectors of both strategies can also involve essential advantages such as:

1. A cooperative environment in which competition takes place can lead to improved educational strategies.
2. Forcing cooperation between two competing parties would mean a product two times more efficient by complementing each other.
3. A strategy to use the cooperative environment for individualistic purposes instead of altruism could lead to crucial personal progress.

2. Overview of the approaches

A. Cooperative approaches

A notable remark given by anthropologist Ashley Montagu [1] is that cooperation is in close contact with society. Moreover, teamwork is vital for an organization, specifying that individuals must have good cooperation skills to be successful.

In the 1960s, the term cooperative learning was new and lacked attention by teachers and students. There was a giant monopoly of competitive and individualistic learning. The main idea of those times was based on social Darwinism. This approach revealed that the situation "dog-eat-dog" world [2] was

a baseline for students and must survive. The myth of "rugged individualism" was one of the most vital ideas for survival in a cooperative environment. Nowadays, cooperative learning is often used in all fields, especially in educational ones. It is a challenge to find an educational element about learning that avoids describing the use and the effectiveness of cooperative learning. So, it can be said that cooperative learning has achieved enough power to destroy the monopoly of competitive learning.

Gillies, Robyn says in his work [3] that cooperative learning is an educational instrument that transforms all the activities and lessons into the learning experience in academic and social scope. This type of learning is about structuring classes into small groups to make them work together, and every member's accomplishment depends on the group's triumph [3]. Approaching cooperative learning, it is not having side-by-side students who discuss individual performance and evaluate their assignments. It is not a "team" in which a single person does all the work, and the rest of the participants accept the job. Cooperative learning is about creating a real connection between persons. A strong interdependence of influences of each member must have a voice and a substantial role. The top part of cooperative learning is that students must work together to build and complete interdependent goals [4] and enjoy them as a group.

Cooperative learning is a teaching strategy that supposes organizing the tasks for small teams, which involve different students with different abilities to improve their understanding of a subject and perform the job together. It is different from cooperative learning because cooperation is an approach in which students impose themselves through interpretation and style, being outlined, primarily individuals. They must take responsibility for their ideas and actions and respect other individuals' choices [5]. Non-identical perceptions differently value cooperative learning. For instance, this approach was tested in lectures, and the results were conflicting. Vreven and McFadden [6] have found that cooperative learning activities are not as successful as discussed. Still, students from a case study by Cavanagh [7] concluded that cooperative learning approaches are beneficial for them because, in this way, they can interact. This matter helps them face and solve issues together, sharing different ideas through individual differences to construct better new perceptions and solutions [8, 9]. Zakaria and Iksan [10] considered that cooperative learning is more effective when students share ideas and cooperate to accomplish educational issues and tasks. Toumasis [11] has studied the effect of cooperative learning with 8th-10th graders that had to analyze and understand mathematical textbooks. He found that working cooperatively helped students create new relations, learn to appreciate, and make use of their mental differences.

Cooperative learning includes five components as presented in [4]: face-to-face interaction, individual accountability, positive interdependence, social skills, and group processing. Nam & Zellner evaluate cooperation as a positive interdependence in learning environments that can bring lots of benefits, improving

group success on doing tasks through mutual motivation and understanding roles. Based on positive interdependence, students must participate in an active way for their group voice. Morton Deutsch [12] has found that the foundation of a group consists of analyzing the group members' joint positions and motivations, which supposes a substantial role for each member of the group, being fully responsible for it. Positive interdependence can mean the positive coordination of mixed minds, which implies a healthy cohesion of a group's abilities. Thanks to this component, group members are focused on positive group goals, and so they are tented to isolate conflicts suppressing them with positive minds.

The face-to-face interaction enables the group members to address significant concerns and challenge their teammates in achieving the milestones and goals. This component facilitates productiveness, feedback, and support in the group [4]. Face-to-face interaction is about helping each other, and why not motivating. So that members challenge each other and promote each other's success. They are trying to help and complete other participants peacefully and actively. The sense of community is created and nourished through accountability and responsibility in these teams. The group's performance is associated sometimes with the weakest member, and for this, the team players help each other and maintain a good stat for the team.

Group successes depend on a series of unique effects on group success, in Slavin's opinion [13]. The group executes the social skills component intended to help weaker persons of that group. Group assignment permits a unique submission for the whole students, and this version balances the notions and helps the vulnerable group members. In 1986, Wall & Nolan evaluated group equity as a vital component for a group's future success, stating that more inequity can induce satisfaction to decrease and conflict increasing. It is substantial to have strong social skills in every cooperative group member because they keep the group united and affirm themselves. Skills include interactive communication, social and group skills such as management skills, joint decision making, loyalty, teamwork, and conflict management. Gillies and Ashman figured out that students taught to cooperate and help each other tend to be more respectful and appreciate other cooperation partners' influence [3]. For better performance of social group interaction, members should be good enough and free to listen to other persons, be objective critics, feel free to share ideas, accept different ideas, and be free to take responsibility for the group failure. To contribute to a team, each individual must have the right skills – in some cases complementary skills or the same, for the project, and in this way, the forehead goals can be reached [14]. Technical skills are required to succeed, but they also need good communication. The assertive approach can assure excellent working and planning in a team. Effective cooperation requires soft skills from its members to ensure compact and substantial group interactions[4]. When group members communicate to make decisions,

receive feedback to know what to develop, what to change, and what to reject. It aims for group effectiveness for better further results. Group processing appears when members can talk about group growth and improve the process in the group [4].

Certainly, cooperative learning strongly depends on groups. A teacher or educator has an essential role in managing cooperation between groups [3]. Cooperative base groups are heterogeneous, and teachers must be responsible for keeping the balance between members and teach needed social skills for stable and practical cooperation. To follow the vital concepts of cooperation, an educator must create the roots of all the components above specified in a group and make them meet, discuss, analyze until the moment when the group members will be ready to do these by themselves.

Teachers can make possible or improve interaction in groups, ensuring students stay near each other. This way, they can perceive each other's words, thoughts, ideas for keeping a constructive verbal and non-verbal dialog. If students can interact with their peers, they can learn to understand each other's thoughts and respectively afford others to understand their thoughts in Gillies' opinion.

Cooperative learning makes the use of different techniques, such as TPS, that allow students to approach a problem in a silent mode, putting down thoughts or keeping them in mind and then making students pair up to discuss each other's ideas. This technique is helpful because each student will have at least two theories based on a topic and will not suffer from a lack of arguments. Another technique is Jigsaw, which proposes the students split into two groups: homegroup and expert group. Once selected a topic, they are transferred from a homegroup to an expert group where they form themselves on the indicated topic. At long last, they return to their home group, but in the quality of teachers. Using Jigsaw Technique is the need to train and form teen researchers [15] in science and transform students into teachers, making them understand these differences. This plan of action is an excellent simulation of characters and their influences in science for the sake of the educational community. Timothy Hedeen created a variation called Reverse Jigsaw. The difference between the two is presented in the teaching step. In variation technique, students in teachers' roles do not return to their home groups but are teachers for the entire class.[16]. The other two techniques are the inside-outside circle. Students make rotations to meet a new partner every time to communicate for answering questions or discussing answers from teacher [16] and Reciprocal teaching with clear ideas from its title.

Having these explained, the main benefits of cooperative learning are:

- Students can learn better in groups when they can work and have an honest discussion. This setup facilitates reciprocal help to each other.

- Learning is improved when the medium is collaborative because free speech is promoted and addressed from multiple points of view.
- It allows interaction between students and teachers, and it can be applied to multiple audiences and student levels.
- Their lack of knowledge may less threaten students who learn from other students and, therefore, more comfortable asking questions from a fellow student rather than a professor that can be more explicit thanks to the similarity in thinking.
- Cooperative groups solve problems through interactive discussion among members.
- Weaker students have a great chance to exhibit and develop themselves and learn from the best ones in a group.
- Students can test themselves as listeners and teachers.

A threat among society is the constant evolution of cooperation marks Sharan. For example, managing heterogeneous groups for teachers can be a challenging idea to understand, sometimes stressful. It is a complicated challenge to keep the groups in a good state, explaining some concepts about coordination and cooperation skills. One risk is when the teachers always keep students in the cooperative space. As a result, the teacher may lose control.

B. Competitive approaches

In the Cambridge Dictionary, "competition" is defined as "a situation in which someone is trying to win something or be more successful than someone else." Competition usually preys on one's ambition and pushes him or her to strive to outperform their opponents and, most importantly, themselves. It's a vital constituent informing students into successful people, and it drives our world to a better tomorrow through innovation.

Competition can be classified into two classes: direct competition and indirect competition.

Direct competition refers to a situation in which individuals compete directly against each other to achieve better performance or win a sure reward. A good example would be a group of students who compete to earn the highest grade in a class or a race.

A situation in which an individual does not directly know his competitors and strives to achieve the most remarkable results he can muster is considered indirect competition. In particular, after graduating from secondary school, students apply to college. Only a finite number of seats are available, and the student is accepted only if he or she counts among the best students who apply. This situation may find

two students who do not necessarily compete against each other fighting for the same spot.

One of the problems of competition is that we wrongly think of it as the opposite of collaboration.

Team-based competitions require the people involved to take on challenging tasks, communicate, collaborate, cooperate and work as one. Having more teams trying to achieve the same goal goes a long way in motivating the teams to become more cohesive, collaborate, and develop new ideas. The competition also enhances social and emotional learning. Students gain a better understanding of how to deal with conflicting opinions, statements and mediate internal problems to better their competitors.

Brown, Cron, and Slocum [17] analyze competitiveness in 3 ways: trait competitiveness, perceived environmental competitiveness, and structural competition.

A person's temperament preference towards competitive situations is regarded as distinction competitiveness [18]. Educational psychology regards trait competitiveness as one of the most critical and dominant personality assemblies [19] [20]. Nevertheless, research regarding trait competitiveness in correlation to task performance is plenty, and mixed results were found. Carsrud and Olm [21], while studying entrepreneurs, found that trait competitiveness directly impacts company performance, and Brown and Peterson [22] concluded that sales performance and competitiveness are directly correlated. Other studies, using the work of Helmreich and Spence [23], found that performance is more common with people who desire to excel in challenging tasks and achieve mastery and show low levels of competitiveness.

Environmental competitiveness regards the way a person understands this race. Deutsch [12], Kristof [24], and others have declared that the most critical aspect of competitiveness is how the participant perceives competitiveness in an environment. One of the fields in which perceived environmental competitiveness is regarded as extremely important is education. Although many studies analyze the impact of competition on students in educational environments, none of them focuses on the individual and how his perspective on the importance of a particular competition affects his performance. Most studies analyze competition at a group level, trying to answer if competitive groups perform better than non-competitive groups.

Structural competition refers to basic situations in which two or more people compete against each other to win some rewards that cannot be enjoyed by all [25]. Most research regarding structural competition took place in simulated settings with groups of people, and mixed results were produced. Mueller [26] found that people tend to set higher goals in a competitive environment, while House [27]

concluded that men set higher goals in direct competition with women. On the other hand, women set higher goals if they work alone.

Studies have theorized that a competitive approach is best used when practical skills are involved [28]. Collaborative and cooperative approaches tend to specialize the people involved in certain aspects of the entire project, while competitive ones give an ample understanding of the whole mechanism. This is probably caused because one person takes on the whole workload and needs to know how every piece works and its purpose in the whole process. As for theoretical skills, cooperative approaches are preferred. More people working together implies that some of them have a clearer understanding than others, and they can share their knowledge with their peers. In sharing, the receiver is not the only one who benefits. The messenger gets to test his knowledge and find holes in his logic to understand the subject better.

When it comes to sports, the competitive approach takes the cake. It is vital when someone needs to push their limits and excel. The thought of winning a prize and being the best at something triggers the adrenaline rush and keeps you motivated in your training.

Nevertheless, some studies [29] do imply that competitions can be dangerous for children. Being part of a competition can create a risk for the participants to experience anxiety, depression and develop a poor sense of worth. Disappointing their teachers and parents may push them away from participating in other events or learning something new. Unjust expectations may put unnecessary pressure on a candidate, so it is best for children to have a close mentor for encouragement and to get them back up after a defeat.

C. Mixed approaches

Johnson & Johnson[30] stated that the two environments of cooperation and competition are very different in terms of learning, but in combination, it offers benefits to students. Following Kohn's [31] analyzes in education, it was discovered that Americans approach differently the term "competition," namely:

- The first opinion is one of "enthusiastic support" which presumes involving as many children as possible in the competition because in this way it fosters character and augments excellence.
- The second opinion sounds "qualified support", can be fun and healthy, regardless of the need to always win or be the number and eliminate competitors by pushing.

According to Kohn, it has been researched for a long time and assumed that the expression "healthy competition" is malicious, it simply harms. This process,

according to Kohn, should improve people's self-esteem and worth. But it is quite the opposite, increasing the chance of self-doubt and reducing the chance of developing as an esteemed person.

Kohn compares competition as "a recipe for hostility," explaining this expression with the fact that it can cause a problem, as one person wins when the other loses. One of the final points reached is the development of lousy relationship intentions or considering the friend as a rival / enemy. Johnson & Johnson [32][33] argue an approximately similar idea that competition has destructive consequences and should not be possible in circumstances where adolescents grow up. Both Kohn and Johnson both say that cooperation and working together are healthy ways of knowing and learning. Thus, one of Kohn's ideas is that educational practices prone to competition should be eliminated. Johnson argues that one factor that would enhance a positive attitude towards the teaching / learning experience is cooperative and non-competitive learning.

Johnson and Ahlgren [34] began contemplating learning approaches, cooperation, and competition. Following the analysis of this experiment, it was found that students were not motivated to learn because of competitiveness, but on the contrary of cooperation. Humphreys and Johnson's study shows that students' cooperative learning was more valued than competitive and individualistic learning. A central idea of these three personalities (Kohn, Johnsons, Ahlgren) highlights the multitude of problems that have a tangent with the adverse effects that the competitive environment can have.

Two different ways of approaching the way of learning are cooperation and competition. Therefore, if combined, Johnson & Johnson came up with the idea that it benefits students. The key to students' intellectual development and opportunities is the correct development of training methods and strategies that encourage both cooperation and competition. The long-standing authorities on cooperative learning, Johnson and Johnson, adopted as a necessity the inclusion of cooperative learning mixed with individualistic / competitive learning. Cooperation combined with competition is a way of working. This strategy combines elements of cooperation with some features, necessary characteristics of motivational competition through inter-group between teams of collaborative students. For instance, in 1995 Wynne came up with an interesting analysis of sports management instructors who should usefully group students into heterogeneous or homogeneous groups. As a result, these groups should be interested in seeking individual results and solving team problems. Therefore, qualify the team and increase some individual positive results. One of the important remarks in history was made by Johnson and Johnson in 1998 [2]. That remark sounds like conditions are an important factor in his research, and competitive or individualistic efforts were the pillars around which his thoughts were. His project focused on a strong idea of showing the need for more work to get results on the conditions in which these two combined are effective. Already in 2004, Tauer and Harackiewicz [14]

discovered that the motivation of the participants was closely related to the combination of the 2 methods of cooperative group learning with the inter-group competition. All the analyzes and ideas led to the fact that the participants' happiness, motivation, and well-being is in direct connection promoted by cooperation and competition.

According to Morton Deutsch [12] the theory of cooperation and competition is based on two main points:

- The interdependent nature of the goals of the people inside the situation: when both can achieve the goal at the same time (facilitating interdependence) or when only one of the participants can achieve the goal (opposite interdependence). In most life situations, there is a complex interdependence of goals, where both the facilitating and the opposite interdependence coexist simultaneously. But interdependence is a prerequisite, without which conflict will not arise.
- People act in a certain way: cooperation (coordination of actions to jointly achieve goals) and competition (strengthening their position at the expense of infringing on the interests of another).

In the same way, according to Deutsch the law of social relations: The characteristic processes and effects caused by a given type of social relationship tend to cause this type of social relationship. Cooperation will evoke and be provoked by the perception of unity, willingness to help, openness, trust, and friendliness, etc. Competition will be provoked by threats and cunning, limited communication, suspicion, emphasis on differences, etc. According to Deutsch, a conflict can arise in a cooperative and competitive environment. But the environment will influence the course of the conflict and the quality of its resolution. A conflict taking place in a cooperative environment has more chances to be resolved productively, with the achievement of a positive or even maximum positive result (as can be seen from the example of the prisoner's dilemma). The competitive environment can lead to a destructive resolution of a conflict situation. However, rivalry does not always lead to a negative result (which again can be seen in the example of the prisoner's dilemma: rivalry can maximize the gain of one, but only in conditions of loss of the other). Deutsch proposes to create a cooperative environment in a group so that conflicts within it are resolved productively. This is possible if we use the law of social relations. When creating an atmosphere of friendliness and support, with an emphasis on common goals, the participants of interpersonal interaction will help each other in achieving the goal, exchange information useful for the solution, and form positive attitudes towards each other and will also be satisfied with the joint result and their personal contribution to it. Deutsch assumed that the situations of interaction and strategies of behavior in these situations for interpersonal and intergroup (in small and large

groups) conflicts are the same, and they can be considered using identical categories.

The cooperative system of interaction will be characterized by:

- Effective intergroup communication, verbalization of a large number of ideas, and receptivity to them.
- Manifestations of friendliness and mutual assistance, satisfaction with their group. Coordination of efforts and division of labor.
- Respect and responsiveness.
- A feeling of similarity in beliefs and values, trust in-group members.
- Willingness to increase the resources, strength, and capabilities of another member of the group to achieve common goals.
- The conflict is perceived as a problem that must be solved by joint efforts. Limiting the expansion of the conflict. [35]

The competitive environment will have completely opposite characteristics and is based on the possibility of resolving the conflict by strengthening one's own single position and suppressing another, which will lead to escalation.

3. Tested approaches and results

For testing separately each approach and afterward testing their mix, we have analyzed the students' feedback and results in different types of activities. Because self-evaluations and reports are very important to us, we have created some opinion surveys using Google Forms and asked a group of 20–24-year-old students to answer 9 questions. Students were asked their closest learning strategy and the life situations they use or participate with them. To respect the privacy of users' data, we have excluded the need to enter an email address, to collect as many anonymous responses, which are as easy to express from students, as effective for obtaining important and concise results from this experiment. For the introduction of a user in this opinion poll, we made a short introduction in which we explain what the notion of cooperation and competition means, following that the person who expresses his position to approach on his own what impact they would have in the 2 forms, independently and mixed in the learning process. Subsequently, they were initially asked which of these learning environments seems to be the most comfortable for efficiency in the learning process, following the requirement to write at least one advantage and one disadvantage for a cooperative learning environment and a learning environment competitive by allowing them to freely express what these 2 approaches mean and imply for each in an educational environment. For the analysis of the results, the students were asked to express their thoughts on mixing these 2 dimensions, namely what would be the limitations

of sharing competition and cooperation for learning and what qualities they can develop in the future for participants.

To find an interdependence between students' responses, we asked them to tell us how often they are involved in events related to competitiveness and cooperation. Students prefer to participate more often in cooperative environments with a gap of 13.9% compared to competitive. Whereas, in the competitive environment, 32.6% of students occasionally go to such events. Results are summarized in Fig. 1a and 1b. The result of this experiment was somewhat expected by us. For the choice between the 3 variants, the most voted was the Mixing of competitive and cooperative approaches - 48.8% (fig. 3). Regarding competitive learning, most participants wrote that this approach is the most stimulating method of learning and that it offers a person the best way to express themselves (about 80%), while 20% considered that competition is the more efficient multilateral own development method. On the other hand, most participants (65.3%) also gave arguments against competitiveness.

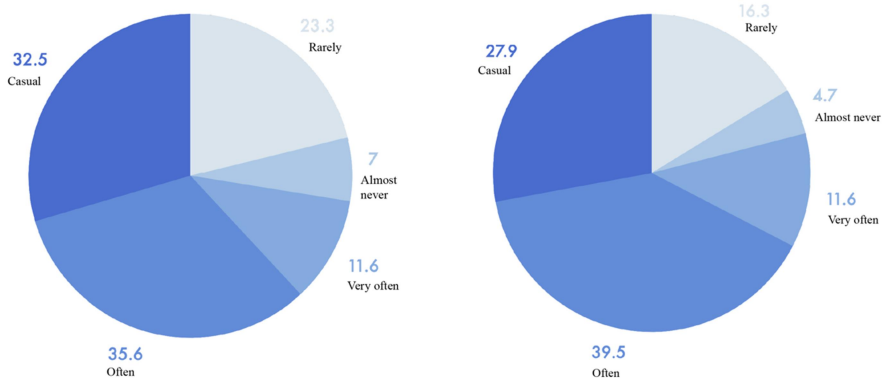

Fig. 1. a) Frequency of competitive activities, b) Frequency of cooperation activities

For example, 87.3% said that competitions can easily provoke conflicts of interest between participants, and others said that it can become a big disadvantage for shy people thus they risk not being able to express themselves.

As for the cooperative learning method, the strong points were about teamwork and the impact of the team on each member. This leads to socialization, group integration, development of social skills, and positive interdependence of members. Among the downsides, about 90% alluded to the inequality of forces in a group, which can provoke conflicts and limit efficiency quite a bit, because the weakest will rely on the most diligent or their integration would involve costs, great time, and performance.

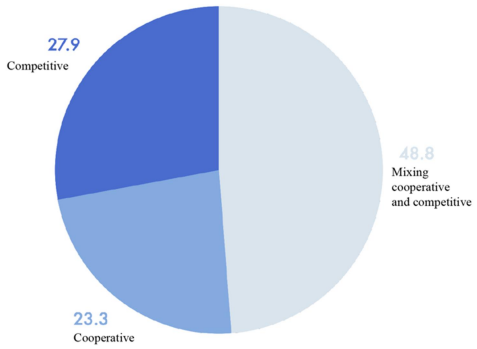

Fig. 2.

We mention that however the methods of cooperation were more preferred by the users than the competitive ones (53.5% vs 46.5%) (fig. 3). The most interesting part occurred when the survey participants had to express their opinion regarding the combination of the 2 learning models, thus managing to examine which approach has a greater weight in the selection of the best approach. Therefore, any limitations that may arise consist in differentiating members due to the competitive factor, which implies intimidation of less productive members or the risk of losing control of competitiveness to the detriment of cooperation. However, it was found that the participants largely appreciated the effects of combining the 2 educational procedures, as 62.7% emphasized the qualities of teamwork, 21% highlighted the quality of leadership and responsibility, and the rest were positive due to the social skills that maintain such an environment, such as: generosity, mutual help, friendship, or inspiration.

Fig. 3. Competition vs Cooperation

Another method by which we chose to analyze students' behavior in different strategies for learning and solving tasks was the team projects, in which we also participated, and we could observe the impact of the 3 strategies on the results inside. It is about 2 projects in the team that we had at college, which involved modern technologies, namely machine learning and web development. Obviously,

the diversity of knowledge played a significant role in these projects, and from the beginning, we tried to analyze the behavior of the participants in the process of learning and solving the project tasks. An important thing to specify was that in the first project, the participants had the opportunity to choose their project team individually, while in the second project, they were chosen randomly, which meant a greater challenge for team members to impose themselves in the project with new people. These 2 projects focused on the cooperation between the team members to complete the assignment, the second stage was the competitive process where the best projects were analyzed and evaluated. From the beginning, the members of all the teams were informed about these 2 stages, which made the mixing of the 2 strategies remain equally strong throughout the project. In addition, to validate the idea of mixing competition and cooperation in the learning process, participants were asked to give feedback and grades to teammates at constant intervals related to involvement and contribution to project development. Likewise, the participants in the projects were asked to express what they like and what they do not like in cooperation with colleagues and later. In this way, we have analyzed the discussions within the teams and feedbacks that were given at the end of the project to establish the results and conclusions on the efficiency of the combination between the cooperative and competitive approaches.

Analyzing the feedback given by project colleagues, we noticed that the results were relative, based on the quality of cooperation between team members, recording the opinions in Table 1. Students who had more experienced and responsible teammates had a healthy cooperation and fully appreciated this. However, unbalanced teams were a major problem that affected the performance indicators of the two policies. 91% of colleagues were enthusiastic about the occasion, having a good emotional state to repeat this experience, and 9% were skeptical about repeating such an opportunity.

Table 1. Advantages and disadvantages of mixing strategies

Advantages	Disadvantages
A way to improve yourself	Misunderstanding between co-workers
Efficient	Not everyone works enough
Competing for prize/grades	The desire to be the best can be harmful
Improving social skills	Slowed process
Gaining experience, motivation, and inspiration	Fear Environment for conflicts
"A new way of thinking" means a reasonable balance between cooperative and competitive styles	Strong individualism can occur because of competition

One important observation that must also be noted in this scientific paper happened during one of our university classes. During one laboratory of Software Project Management, the students were asked to pair into groups and work as a team. The assignment given consisted of playing CodeCombat [36], a well-known game in which you advance in levels by coding different "fighting" instructions to a simulated warrior. There was a limited time and the group who advanced most level would receive a bonus.

After the amount of time allocated passed, each team submitted a screenshot proving the level they reached and was asked how they approached the assignment. Once the answers were given, three working methods could be observed. Two groups of students worked together as a team, collaborating and cooperating, one group of students tackled the task by competing against each other and seeing who achieved the greatest result, and one last group combined collaboration and cooperation with competition.

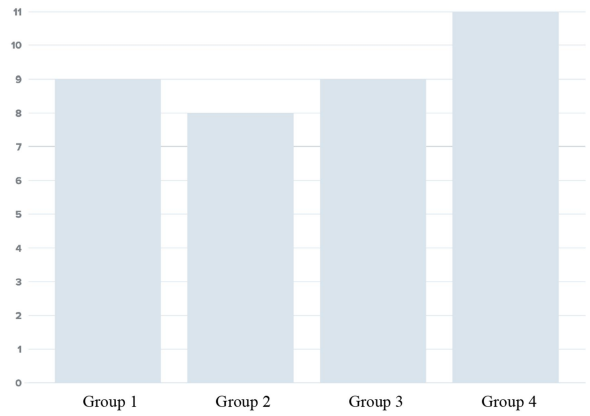

Fig. 4. Code Combat Competition: Number of levels reached

As shown in the chart above, the fourth group which mixed cooperation with competition managed to achieve the highest level in the assignment. The strategy used was to divide the group into sub-groups of 2 students, who cooperated by dividing tasks, and start a friendly competition to see which group could reach the highest level.

4. Conclusion

To summarize, cooperation learning is an interesting and valued approach and is based on those 5 essential elements, but it can become very challenging and difficult for teachers or leaders in groups and that is why it must be correctly managed by all cooperation members.

Competition itself is not bad, but the attitude one takes towards competition defines the outcome. While winning may give an adrenaline rush, failure is one the best teachers. Competitive learning is a great approach in any area if the risks of demotivating students are taken into account and actions are taken to minimize the effects of losing. Competitiveness helps to have a higher motivation within a group so that members have stronger tendencies to impose themselves for the development of the connected group and to react positively to various challenges.

Although there is an increased probability that a conflict will arise in the combination of the two methods, the appropriate regulation of mutual interaction can produce remarkable results in a qualitative environment. It is able to strengthen competitive positions in a vector of cooperation. By combining cooperativity, decreasing competition, firstly it benefits the diversity of the learning environment, secondly, it offers the chance to discover hidden talents in those who are good in the cooperative or competitive environment.

Critical to the success of cognitive development is the result that mixing learning styles leads to happiness, motivation, well-being and maintains the energy of the environment to be better and more productive. To control the sphere of influence between cooperation and competitiveness, the teacher must operate as an open-minded referee.

Acknowledgement

This work was supported by a grant of the Romanian Ministry of Research and Innovation, CCCDI - UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0689/„Lib2Life–Revitalizarea bibliotecilor și a patrimoniului cultural prin tehnologii avansate”/”Revitalizing Libraries and Cultural Heritage through Advanced Technologies”, within PNCDI III.

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THE CHALLENGES OF INSIDE MARKETING GENERATED BY THE NEW CONTEXT OF EXTENDED TELEWORK

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Marian Florin BUSUIOC[2]

Abstract: *Marketing is omnipresent in the field of business and not only; in fact, it is hard to avoid in our daily lives, in general. The current context of the pandemic changed radically the coordinates of marketing in general, and those of inside marketing in particular. Inside marketing (i. e. within one company) can be viewed as an integral part of human resources management due to its indirect, but valuable contribution to maintaining the relations with external customers. An obvious change refers to the manner in which internal communication is realized, as a result of the transition to telework. The companies' preoccupations, within the new context, are focused in order to provide the adequate technologies for communicating, motivating the workers and maintaining and building an attachment to their own brand.*

Keywords: *inside marketing, communication process*

JEL Classification: M31.

1. Introduction

Marketing is omnipresent in the field of business and not only; in fact, it is hard to avoid in our daily lives, in general. The current context of the pandemic changed the coordinates of marketing, in the sense that an accelerated digitalization process can be noticed, which has profound implications within companies, but also within a certain market.

Seth Godin (2018) states: "Marketing means the generous act of helping others become who they are looking to become." Even if he refers to an internal component or an external one, we believe that he is right, as both the customer and the employee need support in order to attain their goal.

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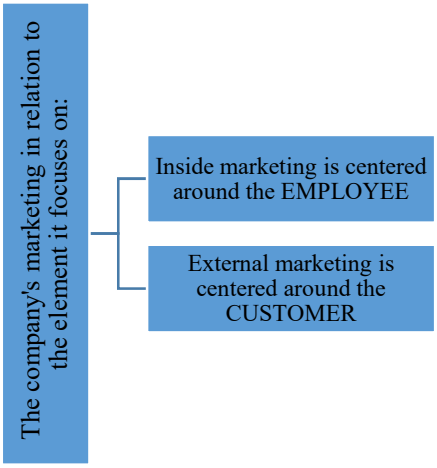

Fig. no. 1 The elements of the company's marketing in relation to the component they center around

Thus, the concept of marketing should be analyzed from a double perspective: inside and out. In short, external marketing, i. e. outside the organization, centers its preoccupations on the customer and targets the optimization of the relations with the market. Inside marketing aims at winning the "inside customer", namely the employee, and implies hiring, training and motivating qualified personnel, who is willing to offer quality services to clients. Therefore, inside marketing should precede external marketing.

Inside marketing can be viewed as an integral part of human resources management due to its indirect, but valuable contribution to maintaining the relations with external customers. The successes or failures of the marketing plans of a company depend on the employees of the respective company. The people (employees) represent the first client standard. (Kotler, 2004)

Communication is also an important component of inside marketing, even more within the new reality of telework, which, in its turn, imposes a new reality of communication, instruments and media used for communicating and interacting at the workplace.

2. Evolutions and tendencies in the field of inside marketing, generated by telework

Telework is a necessary, useful and effective variant for carrying out economic activities whether we talk about the survival, maintenance and/or development of businesses, on the one hand, or the saving of the employees' jobs, on the other

hand, within the new socio-economic context that we face, namely the context of the SARS-COV-19 pandemic.

The reality is that telework/ working remotely will continue to have a great importance in the future, possibly even a greater one, and companies should adapt their management and marketing policies to the new paradigm.

The adaptation to the new context is completed, given the fact that the pandemic began over a year ago, and now the main issue is to perfect the adaptation methods, as well as to discover or use new ones, which can generate performance and added value. These include a series of implications of a managerial nature, in this context of extended telework, and the most obvious challenges are: organizational aspects (organizational chart, co-working), the company's internal logistics, enhancing the loyalty of customers and employees.

The shift towards telework determined a series of changes within companies and they refer to:

a) introducing additional flexibility into the activity planning in order to respond to the needs of employees (isolated at home and having to carry out their activity in an inadequate space, together with family members);

b) the necessity for the company to have a higher level of agility;

c) organizing the access into the work space in accordance with the social distance restrictions;

d) marketing's new attributes, as it was mostly moved online.

Hanson (2000), on the one hand, and Vervest & Dunn (2000), on the other hand, state that marketing in the virtual world, using the internet, is not conceptually different from the classic one, but it knows different manners of expression and an unprecedented dynamic. The evolution of marketing had a series of stages, from the classic one to *telemarketing* (realized through phone or television), *e-marketing* (realized through the internet) and *cyber marketing* (realized through all the facilities offered by the new information and communication technologies). Nowadays, adding to the previous affirmations, we can state that marketing is omnipresent online, whether it is inside or external marketing, as it is carried out through all possible media.

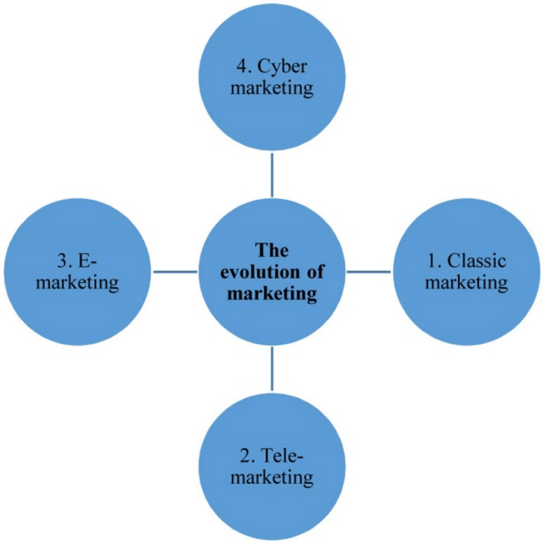

Fig. no. 2 Stages in the evolution of marketing

In the context of telework, external marketing, centered around the customer, is indissolubly linked to the activity of selling, to e-commerce, to the company's businesses, in general, which were moved online. Cyber marketing can be found at the intersection of three domains: marketing, economy and technology. The force that governs internal cyber marketing is the employee.

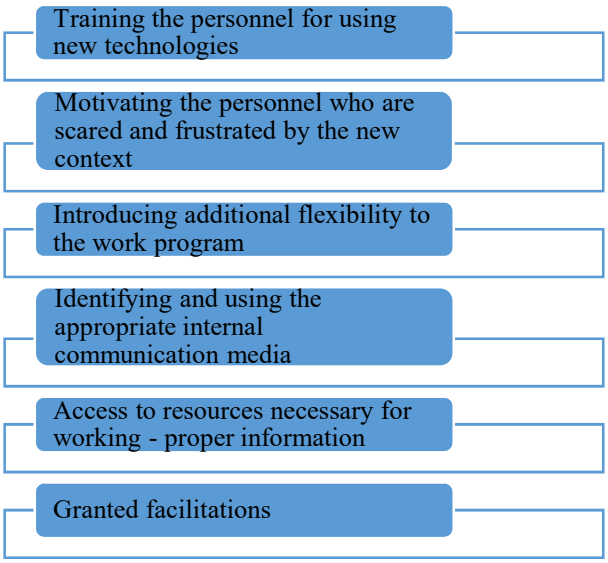

Fig. no. 3 Determinants of inside marketing in the context of telework

Inside marketing, centered on the employee, is subject to certain important challenges, such as:

a) understanding all aspects which have an impact on the new marketing style within the current context;

b) identifying the media, the key components of technology, which correspond in the best manner to inside marketing activities;

c) the exact establishment of the technical and technological characteristics which will merge with the theoretical aspects of classic marketing;

d) the interactivity of employees;

e) confidentiality, the right to a private life, intrusion in the personal life.

3. Particularities of the communication process – a basis of inside marketing

Referring to communication, Ph. Kotler & Nancy Lee (2008) state: "In the case of communication, more means less and not more efficient. The overuse of communication in order to resolve numerous economic and social problems overcrowded so much the communication media that only a small part of the messages actually reaches its target. And these messages are not necessarily the most important ones. There is a blockage on the highways of the mind. Engines overheat. Tempers flare."

An obvious change refers to the manner in which the internal communication is realized, as a result of the shift towards telework. The companies' preoccupations are oriented towards ensuring the appropriate technologies for communication; those already in place were used (e-mail addresses used only for work, phone, WhatsApp, Signal or Telegram groups – the last two are more recent), and also other free platforms (for example, Zoom, Meet or Microsoft Teams). Therefore, communication in the context of telework is mostly online, especially when it cannot be carried out face to face at all or in a hybrid format.

The lack of social interaction among employees (the formal one, but especially the informal one – which has positive or negative effects that reflect in formal communication) generated longer meetings, tensions among the team's members, the need for additional clarifications, extra time spent for carrying out certain work tasks. The interaction among employees is of major importance and necessary in order to maintain the motivation, health and productivity of employees. Starting from the above mentioned elements, we propose a chart for the process of internal communication, as a basis of inside marketing.

↑ **EMPLOYER** Message + Codification	**→MEDIUM OF → INTERNAL COMMUNICATION**	↓ **EMPLOYEE** Decoding + Perception
↑		↓
FEEDBACK // ANSWER // BEHAVIOUR		
▪ The work done ▪ Understanding the objectives ▪ Attachment towards the brand and the company's products		

Fig. no. 4 The communication process in inside marketing (adaptation after Ph. Kotler, *Managementul Marketingului* (translation), Ed. Teora, Bucureşti, 1997, p. 759.**)**

Al Ries, Jack Trout (2004) support the idea that: marketing is, in fact, not a battle of products, but a battle of customers' perceptions regarding the products. Thus, we can state that conceptual delimitations and typological classifications of different forms of marketing are no longer necessary, because the consumer becomes a generic concept and the first consumer of the products is the employee of the company that produces the respective products.

In this context, the first "product" of the company is its very message about its offer. Before being sold, the company's product/ offer communicates, transmits to those around, information, promises, emotions, sensations, commitments, experiences. And the first people who can hear the product's message are the company's employees. They are responsible for transmitting the promise of the brand, but they are also the guarantors of this promise in front of the consumers. This is the reason why their behavior (for instance, their fashion style, their tone of voice and other details about them) should be in line with the values expressed by the brand they represent. An appropriate behavior, in accordance with the company's values, which generates added value reflected in the volume of sales and in the company's profitability, is obtained through an efficient inside marketing, based on a strong internal communication process.

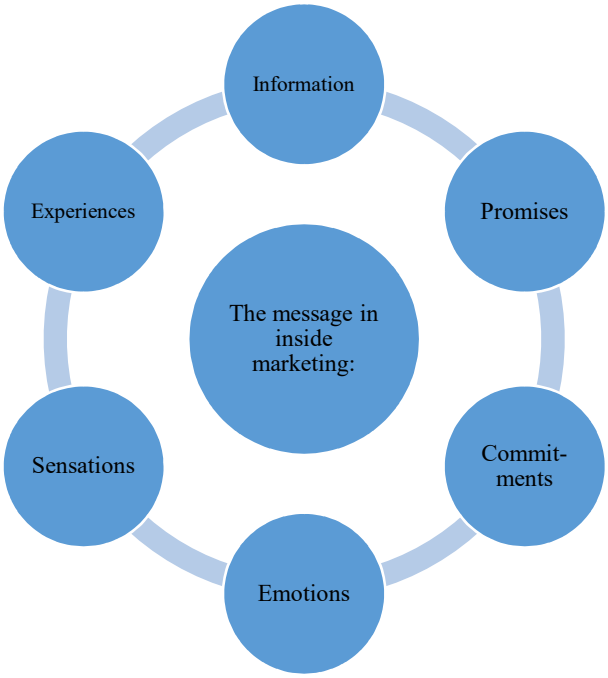

Fig. no. 5 The components of the message in inside marketing

Perju – Mitran (2015) supports the idea according to which all individuals involved in communication activities should possess a certain knowledge regarding the mission, values and objectives of the organization and its products in order to ensure the consistency of the message.

Nevertheless, why is inside marketing so important? The main element that inside marketing should build is the help of employees in order for them to establish a strong emotional connection with the company's products and services. If this connection is not created, the worst case scenario is that the employees eventually undermine the expectations that were initially established. In many cases, this happens simply because they do not understand what was promised to customers or beneficiaries, so they end up working without understanding the established objectives. In other cases, which are much worse, it is possible that they do not actually believe in the respective brand and show hostility towards the company.

Inside marketing has the role of making the employees care, believe in the brand, of motivating them, because motivated employees tend to work more and their loyalty towards the company is greater.

The commitment towards the brand displayed by the employees of an organization (Employee Brand Engagement) establishes a critical link between employees and customers; in essence, it is all about informing, inspiring and involving employees

in order for them to want to support and promote the company's brand. In this sense, there are three major aspects:

a) The emotional commitment of the employee becomes an ambassador, actively disseminating positive information about the brand;

b) By understanding the brand strategy, employees understand who are the targeted clients of the brand, how the brand is positioned in relation to the competition and what the unique and valuable brand does from the client's perspective;

c) Through a loyal relation with the brand, employees have access to instruments and data about the manner in which the brand is perceived by the clients and cultivate and actively strengthen the brand every day, with each interaction with potential or actual clients.

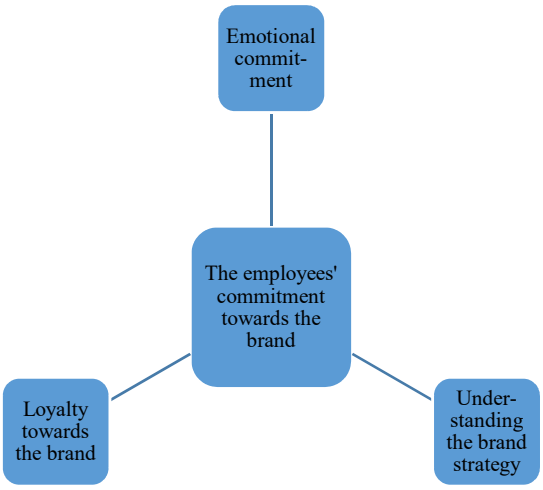

Fig. no. 6 The key elements of Employee Brand Engagement

Employee Brand Engagement does not only produce happy employees; it develops happy, involved employees, who produce the correct results. The company is not only acknowledged as a wonderful work place; creation, work itself, becomes great. And the company does not assert itself only as an employer; it lays the foundation for an excellent relation with the customers.

Conclusions

In accordance with the accepted meaning of the new normal, where telework is used and practiced in a significant proportion, we consider that the transformations

in this field are not over; in fact, they have just begun. We think that some of the challenges of telework will be: an increased emphasis on creativity and thought, the capacity to extract and understand the essence, the capacity to prioritize tasks, the creation of intangible, knowledge based "products", finding a balance between private life and work, but especially establishing clear boundaries between the two.

Regarding inside marketing, carried out within the companies that adapted to the new reality, we consider that the main aspects which should be taken into account are the following: an emphasis on the globalisation of labour, managing a multicultural team, the need for further training (as a certain certificate or diploma is necessary, but not sufficient), work relations based rather on cooperation and not on subordination, using the truly important and essential communication media.

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FISCAL, LEGAL AND ACCOUNTING ASPECTS REGARDING TELEWORK IN ROMANIA

Lucian Constantin Gabriel BUDACIA[1]

Abstract: *Employees and employers from Romania are familiar with teleworking, as it has been practiced for years, but it was only in 2018 that the first specific legal regulations appeared in Romania. Through this paper, I intend to highlight the main accounting, fiscal and legal aspects concerning telework. This subject is interesting, not only in the context of the pandemic, but especially in the context of the "new normal", which will integrate telework on a superior position compared with the way it was viewed before. This aspect is also supported by the technical and technological progress, which has an increasing importance and weight regarding economic activity in general, and work relations in particular.*

Keywords: *telework, accounting, telework taxation, employee's and employer's obligations*

JEL Classification: M 41

1. Introduction

Employees and employers from Romania are familiar with teleworking, as it has been practiced for years, but it was only in 2018 that the first specific legal regulations appeared in Romania. By Law no. 81/2018, telework is defined as "the form of work organization through which the employee, regularly and voluntarily, carries out tasks that are specific for the position, occupation or profession he/she has, in another place than the work place organized by the employer, at least once a month, using information and communication technology."
The employer has the obligation to ensure the necessary means of information and communication technology and/or safe work equipment which is needed in order to carry out tasks, and the parties can establish a written agreement regarding the teleworker's possibility to use his/her own equipment, with the specification of the use conditions (a novelty introduced by Government Emergency Ordinance 192/2020 as of November 5, 2020).
Furthermore, teleworking also includes the following situations:

- If at least for one day a month the employee works from home or from a place of business which offers him/her the necessary conditions to carry out his/her activity;

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- If the work tasks involve using information and communication technology.

According to the law, telework is realized only through a common agreement between the parties and has to be expressly stipulated in the employment contract. Moreover, the teleworker, as the employee who carries out the telework is called, can do overtime through a written request and at the request of the employer. In this sense, the employment contract or the additional act (Art. 5 Law no. 81/2018) should include:

- The clear specification that the employee uses telework;
- The period (days) in which the teleworker carries out his/her activity at a work place organized by the employer;
- The place where telework will be carried out;
- The time interval within which the employer has the right to verify the teleworker's activity, as well as the detailed way in which the respective verification is to be realized;
- The manner in which the record of the working hours is to be kept during teleworking (timesheets);
- The parties' responsibilities in relation to the place where the telework is to be carried out, including those related to safety and health at work;
- The employer's obligation to ensure transportation to and from the place where telework is to be carried out, including the transport of devices used for teleworking (for example, laptop, printer etc.);
- The employer's obligation to inform the teleworker regarding the provisions of legal stipulations, of the collective agreement and/or of the internal rules of procedure concerning the protection of personal data and the teleworker's obligation to comply throughout the duration of the telework;
- The measures taken by the employer so that the teleworker is not isolated from the rest of the employees;
- The conditions under which the employer bears the expenses derived from teleworking.

2. The employee's and employer's main obligations

According to Art. 6 from Law no. 81/2018, the teleworker benefits from all the rights recognized by the law, the collective agreement and the internal rules of procedure. In addition, the employee has the following obligations:

- To carry out his/her activity according to the received training;
- To inform the employer regarding the used work equipment;
- To inform the employer regarding the places where the activity is performed;
- To use safe work equipment, which does not put his/her safety and health in danger;
- Not to change the safety and health work conditions from the places where the telework is carried out.

On the other hand, the employer has a series of obligations:
- To ensure the necessary means of information and communication technology;
- To install, verify and maintain the equipment necessary for teleworking;
- To ensure the proper conditions so that the employee receives a sufficient and adequate training in the field of safety and health at work;
- To provide transportation to and from the place where telework is carried out.

3. Fiscal novelties regarding telework activities and mini monograph of accounting entries

The amendments to Law 227/2015 – Fiscal code stipulate that the list of non-taxable income is completed with the sums given to employees who carry out telework activities in order to support utility expenses for the place where employees carry out their activity, such as electricity, heating, water and internet, and furniture and office equipment acquisitions up to the limit of 400 lei per month. In this sense, some important clarifications are necessary:

- This regulation is not mandatory, it just sets the maximum limit, which means that the sum taken into account could also be lower than 400 lei per month;
- The goal of these amounts of money is to support utility expenses for the place where employees carry out their activity, such as electricity, heating, water and internet, furniture and office equipment acquisitions;
- This financial support can only be given to those employees who carry out teleworking activities in accordance with the law;
- The limit, the manner in which it is given and the plan of this financial support should be stipulated in the employee's employment agreement or through an additional act, or through the internal rules of procedure;
- The actual sum that the employee will receive is calculated through the correlation of the limit with the number of days in a month in which the employee carried out teleworking activities;
- The employee doesn't have to present supporting documents;
- The received sums are deductible expenses for the employer and non-taxable income for the employee. Social contributions will not be calculated and taken for this revenue given to employees;
- Tax exemption for these sums is applied starting with the revenue for the month of January 2021;
- The sums given to employees under this category, even if stipulated in the employment agreement or through an additional act, are not mentioned in Revisal;
- These expenses are deductible for the employer and the employees are not obligated to pay taxes for the received sums, up to 400 de lei.
- Also, these sums will not be taken into consideration when establishing other salary rights (the calculation of bonuses or of all types of allowances).

For a smooth implementation, on the one hand, but also for the sake of transparency in the case of certain controls, the recommendation is that the maximum amount of money which can be granted should stipulated in the internal rules of procedure, as well as the award criteria and the manner in which this financial support is to be paid. The possibility and also probability that this form of work organization will expand in Romania after the pandemic is extremely high, which will determine employers to find solutions in this sense.

The paid sums, according to the provisions of Law no. 296/2020 for the amendment of the Fiscal code, should not be requested from any state authority, because they are incurred by the legal person and given to the employees who carry out teleworking activities and who assumingly had expenses of the nature of those stipulated by the law regarding the payment of utilities, internet and/or the acquisition of furniture and work equipment.

In the accounting records, the respective operation can be registered as follows:

a) recording the sums owed for the payment of teleworkers' utilities;

6458	=	423
Other social security and welfare contributions		Other social benefits granted to employees

b) recording the payment of the sums owed for teleworkers' utilities;

423	=	5121
Other social benefits granted to employees		Cash at bank in lei

4. Fiscal and accounting implications regarding gift tickets and monetary gifts given by employers

Monetary gifts and/or in kind, including gift tickets, given by employers represent an incentive much appreciated by employees, especially in the context of teleworking; employees appreciate the fact that employers did not stop offering these incentives. According to the law, monetary gifts and/or in kind, including gift tickets, given by employers are non-taxable in so far as their value for each person, on each occasion, does not surpass 150 lei:

- ➢ they are non-taxable for the employee (there is no 10% taxation on income);
- ➢ they are not included in the base of social contributions for pensions (there is no 25% taxation for CAS – social security contributions);
- ➢ they are not included in the base of social contributions for health (there is no 10% taxation for CASS – health insurance);

➢ they are not included in the base of labor insurance contributions (there is no 2.25% taxation for CAM – labor insurance).

Regarding the situations/occasions when these monetary gifts and/or in kind, including gift tickets, given by employers, can be offered, we highlight the following:

- gifts offered to employees, as well as those offered for their underage children, on Easter, Christmas and other similar holidays of other religious cults;
- gifts offered to female employees on the occasion of the International Women's Day on the 8th of March;
- gifts offered to employees for the benefit of their underage children on the occasion of the International Children's Day on the 1st of June.

In conclusion, the conditions for these sums not to be taxable for income, pension (CAS), health (CASS) and labor (CAM) are the following:

- the provisions concerning how they are given should be included in the employment agreement;
- they should not surpass the limit of 150 lei per employee/occasion/underage child.

To illustrate, please find below a model of accounting monograph for gift tickets:

a) Purchasing benefits from the supplier.

% = 401	
5328 Other cash equivalents (the value of the gift tickets) 628 Other third party services (the commission for printing the tickets, if applicable) 4426 Input VAT (VAT for the commission for printing the tickets)	Suppliers

b) The payment of the invoice received from the supplier.

401 =	5121
Suppliers	Cash at bank in lei

c) Distributing the gift tickets among employees and recording their respective value.

6422 =	5328
Expenses with meal tickets granted to employees	Other cash equivalents

Monetary gifts given by employers

According to the law: "The equivalent value of tourist and/or treatment services, including transportation, during the leave of absence for employees and their families, given by the employer in line with the employment agreement, in so far as their total value does not surpass in a fiscal year the level of an average gross salary used for the establishment of the state social insurance budget for the year in which they were granted." In this sense, the following aspects are taken into consideration:

- The average gross salary for 2020: 5,429 RON
- The average gross salary for 2021: 5,380 RON (according to the State social insurance budget law for 2021 published in the Official Journal of Romania from March 12, 2021).

Furthermore, there is a series of conditions in order for these monetary gifts not to be taxable for income, pension (CAS), health (CASS) and labor (CAM); thus, the monetary gifts should be:

- given during the leave of absence;
- stipulated by the employment agreement;
- within a certain limit (the average gross salary).

Conclusions:

In the context of the SARS-COV-19 pandemic, telework was and still is a feasible variant for carrying out economic activities, thus for the survival, maintenance and/or development of some businesses, on the one hand, but also for keeping and maintaining the jobs of employees, on the other hand.

The reality is that telework/ remote work will have a significant weight in the future also, and companies should adapt their remuneration policies and analyze the relevant benefits in this new context, those that are more valuable for their employees, but also from a fiscal point of view. A possible variant is that in which the employee receives a monthly budget and has the freedom to choose those benefits that are relevant for him/her, some having even a fiscal advantage, such as meal tickets or holiday tickets.

Taking into account the managerial implications, in the new context of the extended telework, I believe that organizations/ companies will continue to be preoccupied with the organizational aspects, internal logistics becoming more and more important, as well as the place and role of each organizational structure in the mechanism of an economic society.

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Law no. 81/2018

Law no. 227/2015, as subsequently amended and supplemented

FROM E-LEARNING AND ON-LINE EDUCATION TO THE DIGITALIZATION OF THE MAIN ACTIVITIES IN CURRENT SOCIETY

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Eugen-Gabriel GARAIS[2]

Abstract: *The ON-LINE community, known as the family of invisible friends, is made up of members who interact mainly through the Internet using social networking sites, chat rooms, forums, e-mail, networking, etc. The members of this community can be grouped in the following categories - users, moderators and administrators of the facilities offered by the virtual environment. This ON-LINE community is permanently present in SMART CITY and e-SOCIETY. Smart ICT platforms are powerful tools that ensure access, processing, delivery and storage of information in large databases and ensure communication and development in all six dimensions of smart city (smart economy, smart people, smart mobility, smart environment, smart living and smart governemnet). The existing ITC performances in the smart-city, as well as those available in the e-Society contribute immensely to the increase of the productivity and quality of the public services used in administration, commerce, industry, education, health systems, etc. offering citizens an important step towards the transparency of the governing act, thus ensuring a significant increase in the quality of life. This article briefly presents the concepts of online community, smart city, e-Society and digitization as well as the context in which the online community must be formed, specialized and perfected to successfully use existing ITC platforms, in operation, maintenance and development, platforms which ensures the transition from the current society to e-Society and presents some facilities offered by them manly in special situations (see pandemic COVID). In today's context digitalization has a priority position in society through which all parties of a desired smart city could access knowledge, education, materialized services and goods and digital services and goods. Not only education has moved, even for a determined time frame, in the digital environment but even psychotherapy sessions.*

Key Words: *e-Learning, online comunity, online learning, smart city, e-Society*

Introduction

In this pandemic period the service that grew in digital space are the videoconference integrated and distributed platforms. Around this communication

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applications have been attached many other applications so that the outcome is a platform with many modules. So we find ourselves in front of platforms like Meet that have been integrated in eLearning platforms like Google Classroom and in front of platforms like Microsoft Teams that have integrated other modules to offer an advanced integrated system for eLearning. The last has been used intensively in last year in the University that we teach in and has been received with a great feedback from students, teachers and even ARACIS representatives that evaluated our institution.

1. E-learning, defining terms, benefits, economic efficiency

In the varied relief of computer science, where each point is identified by five dimensions, (space (3 dimensions), time (1 dimensional) and utilized technology (1 dimensional)), appeared the moment of passing the IT technical documentation from paper to magnetic support (magnetic tapes, floppy disks, CDs, etc.) [6]. This moment represents the beginning of the e-Learning concept.

In essence, e-Learning consists of the online learning process, at its own pace, using multimedia technologies for learning, improvement, and specialization in the field of user interest. Any platform intended for this process consists mainly of a database, a specific software for managing / querying this database and an IT technology suitable for this purpose. At present, almost all universities in the country and abroad offer platforms specific to the profile.

At the beginning, the documentation for e-Learning was organized on topics [1] (eg learning a programming language), and consisted of a textbook of topics, written on the principle of "programmed learning", ie each lesson was followed by a number of knowledge-fixing questions and you could not move on to the next lesson if you did not answer each question correctly, followed by a set of self-assessment tests and finally an online assessment test. For each topic there was a manual, a self-assessment test and a final assessment test, and all these digital materials were stored in a database. Later, within this e-Learning concept, an entire Education industry appeared with databases specific to the fields of pre-university education (high school, gymnasium), and university education (colleges, universities, including On-Line Colleges), and now almost every university / faculty has an e-Learning platform. Following this route, the concept of ONLINE community appeared, which has the following definition [2]: "a virtual community is defined as an aggregation of individuals or business partners who interact around a shared interest, where the interaction is at least partially supported or mediated by technology (or both) and guided by some protocols or norms".

There are currently an impressive number of e-learning systems in various fields such as: Community Colleges, On-Line Colleges, Colleges/ Universities, Middle and High School, Elementary Schools, Principals, Deans & Administrators, Online Education Service, Teachers and Trainers, Education Technology, Educational Associations, Dental/ Medical Colleges, Booksellers & Librarians, Adult Education Director and others.

2. From smart city to the digitization of the main activities in today's society

If we analyze carefully and with a little humor the evolution, over time, of human society, we realize that the greatest invention made by man was neither fire, nor wheel, nor writing machines, nor gunpowder, it was the bureaucracy [3]. This invention has employed about 40% of the world's workforce. But careful, because due to technological development, we will soon find ourselves in a situation where the number of active people in the productive field will decrease significantly and the 40/60 balance is in great danger, because the bureaucracy will increase far beyond expectations. Of course, the clear evidence of the activities in the productive sphere is essential and in this context the equilibrium solution comes from the computerization / digitization on a large scale of the activities in all fields. In the varied relief of Informatics, this process of computerization / digitization has not started now, this process has been in full swing for a very long time, both worldwide and in our country. It is enough to give as an example the Census of the population, families, buildings, and houses in Romania in 1966, the first census in Romania and the second in Europe, made with the help of perforated cards and magnetic strips and discs for storing information.

Time has passed and today we are talking about digital platforms with high-performance technological support (hardware and software), close to all fields of activity within a smart city (see fig. No. 1).

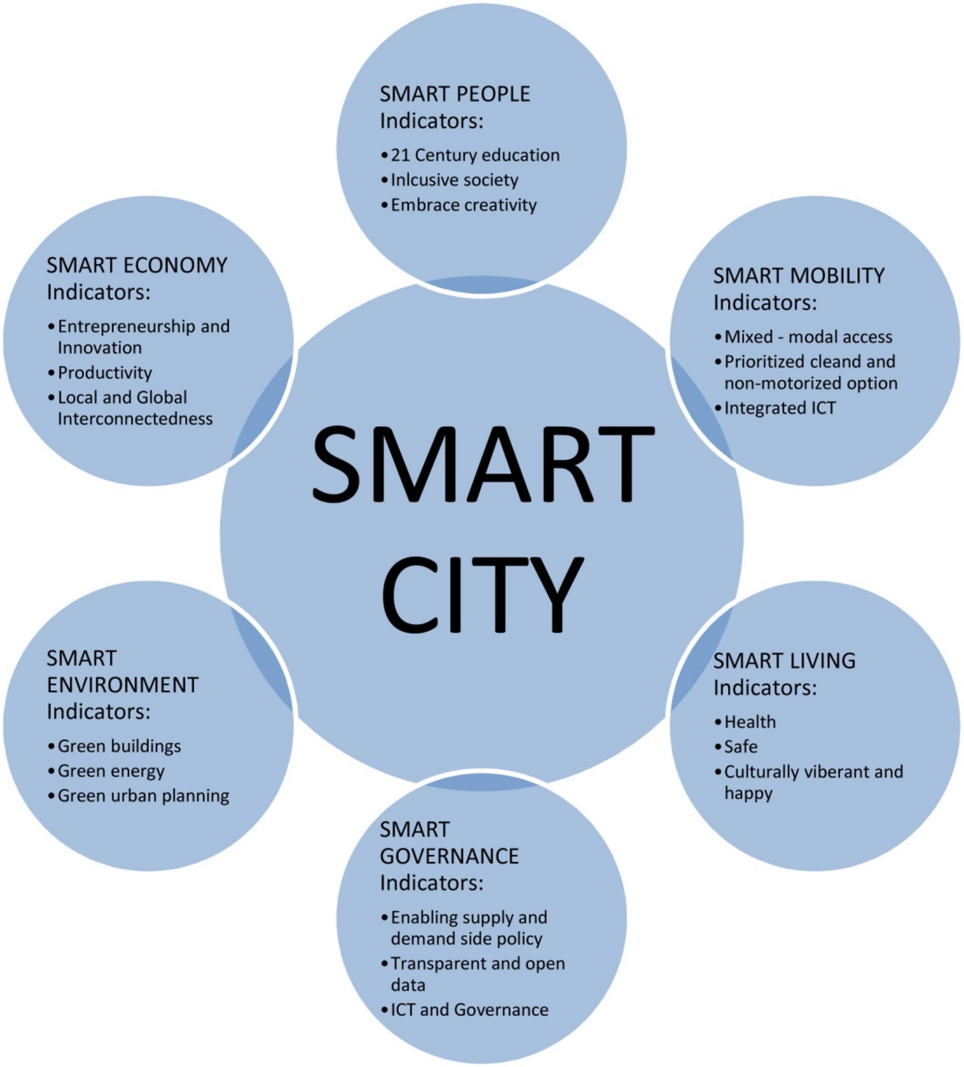

Fig. No.1. Smart City Model

Of course, for the use of these IT platforms, already in operation in almost all areas from education, health, transport, tourism, administration, etc., in online education, it is necessary to train staff in the realization and use of facilities offered by these new technologies.

The interaction of the online community with the ITC platforms in the smart city are presented schematically in fig. Nr. 2, and the members of this community can be grouped in Developers, Users, Moderators and Administrators of these platforms.

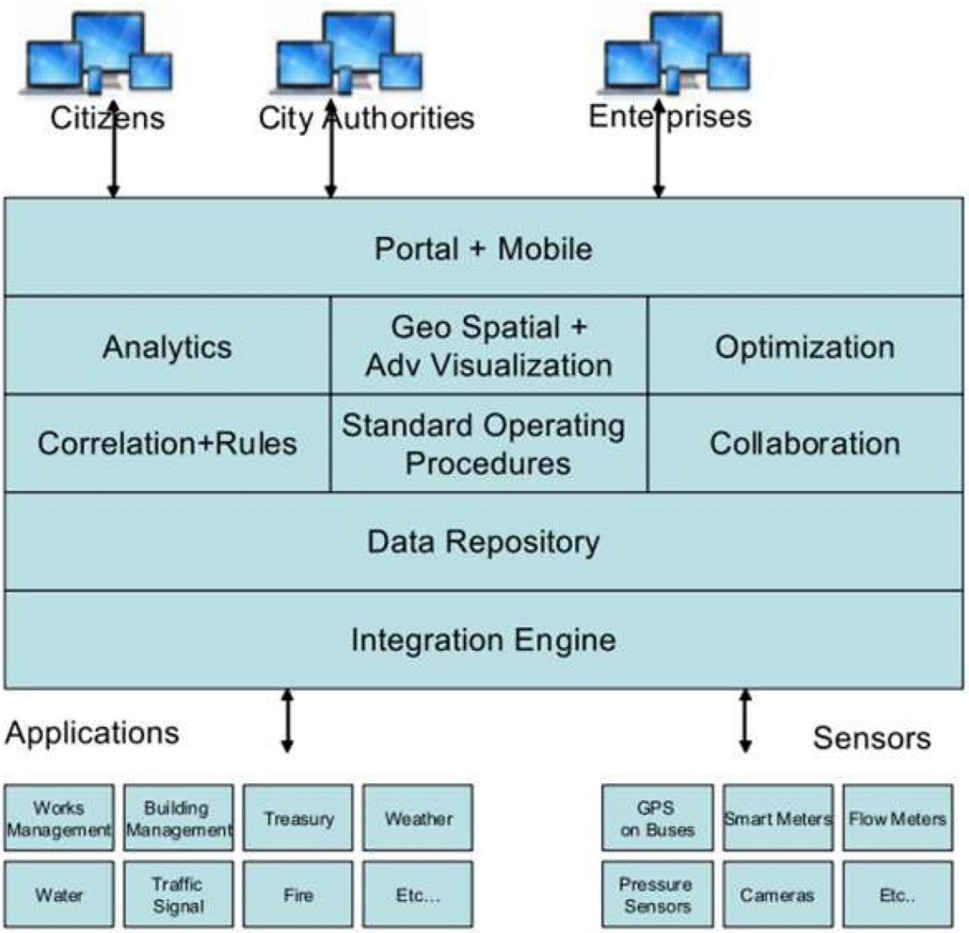

Fig No 2: Microsoft "CityNext" Aims to Build 'Smart Cities' [source [4]]

This online community existing in the broader concept of e-Society (see fig. No. 3 and No. 4) is found not only in the population of Smart City[7], the community is in fact spread throughout the country, both in urban and in rural areas), and worldwide. The training of the digital competences of the members of this community is done both in the national pre-university education process (for users), the university education (developers, users, moderators, administrators) and through the periodic training, specialization and improvement courses.

For the design, realization, implementation and operation of such platforms [8], [9] it is necessary to have a specialized staff in the field of hardware and software, trained and perfected staff and specialized through special technical courses at the technical and computer university level management.

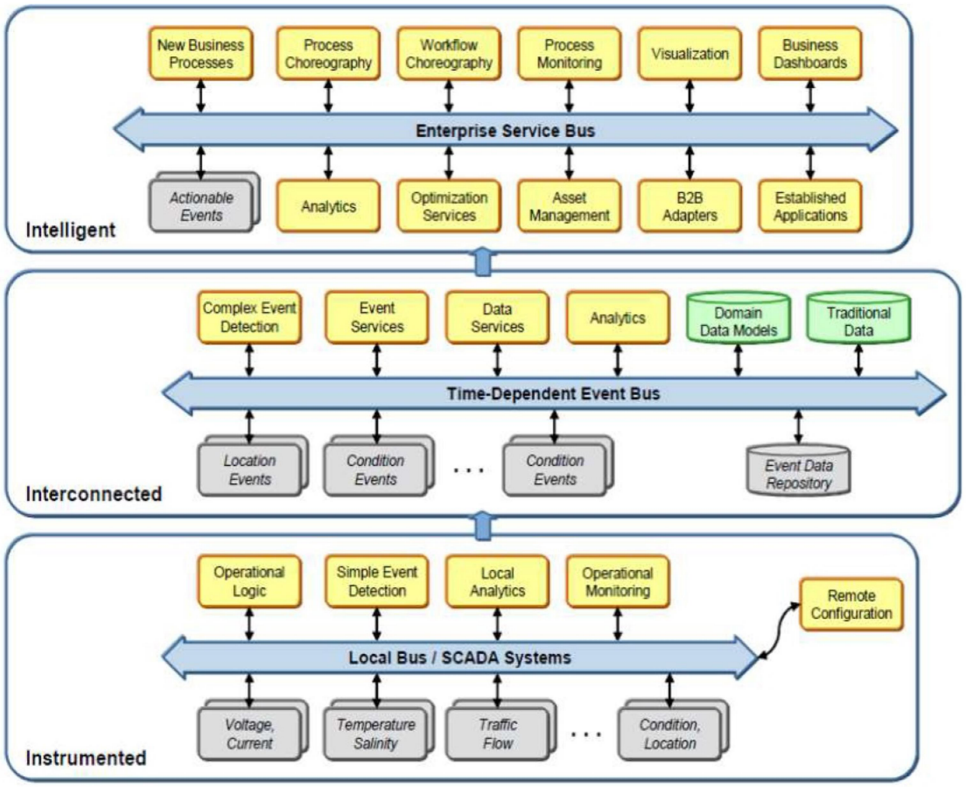

Fig. No.3 - The architecture of a Smart ICT Platform

2. Training, specialization, and improvement of the online community members in pre-university education and in higher education as a result of online education.

The preparation of the online community for the use of these IT platforms and technologies is done through special training, specialization, and improvement courses specific to each field of activity, widely using the facilities offered by e-Learning and online education[5]. In all bad and a good, namely, a real use in acquiring basic knowledge was represented by online education, because every pupil / student, regardless of urban or rural environment, had to connect and use such platforms. It should also be noted that in addition to the large mass of students, a large part of the parents of these students were involved in this online education process. They have taken important steps in acquiring the digital skills needed to use these IT platforms specific to online education, imposed by the pandemic period.

The topic of training and specialization of the IT community must be approached for each field of activity (education, health, economy, transportation,

administration, etc.) on the two distinct groups of staff, namely: IT specialists and IT users.

The training of IT specialists is done through university courses (software and hardware), focused on the study, analysis, design and implementation of these new IT platforms and technologies for each field of activity.

The topics and documentation related to this training process for IT specialists can be consulted in the curricula of the IT and Economic Informatics faculties by accessing the available study platforms [8], [9]. The process of continuous training and improvement is a permanent challenge for the preparation of the wide mass of users through training-improvement courses, specialization organized on request according to the specifics of the field and platform used.

3. Conclusion

The advancement of IT technology is always a great competition for the community in general and for the online community in particular.

IT platforms available in administration, (Ghiseul.ro, ici.gov.ro, anaf.ro, etc), in health (platforms appeared during the pandemic we are going through), in education (online education) and in various industrial branches both nationally and worldwide ensure the beginning of a broad process of digitization of activities in society. In this sense, we must welcome initiatives to establish the Authority for the Digitization of Romania (ADR), an institution recently created in 2020, an institution that aims to digitize on a large scale all activities in the administrative and governmental area.

Among the main advantages of digitization, we can list:

- Direct communication between local public administration and citizens;
- Ensuring a unique online platform for communication and automation of public administration works;
- The 7/24 accessible platform, from any place, the platform that ensures the reduction and optimization of the operational costs within the public institutions;
- Fully contributes to reducing congestion and pollution in urban transport, and users can submit and issue documents online, thus avoiding congestion at counters, etc.

The digital competencies necessary for the use of facilities of these online platforms by the members of the online community are acquired within the pre-university and university education process, according to a well-specified curriculum. Having acquired these basic digital skills, the training and improvement of users of a platform is achieved by accessing the facilities of e-Learning platforms and ensuring access to the documentation presented in the Guide (Manual) for the presentation and use of the specific platform. The

popularization of these forms of continuous learning represents the real social challenge of the stage we are going through.

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USING MACHINE LEARNING ON ENCRYPTED DATA

Catalin Emanuel CIOBOTA [1]

Abstract: *This post discusses cutting-edge cryptography techniques. Do not use examples in this blog post for production applications. Always consult a professional cryptographer before using cryptography.*

In the following lines we will discuss data encryption techniques using advanced encryption techniques. The examples presented are not recommended for use in production applications. Before applying encryption to data applied to the services of a professional.

Keywords: machine learning, cryptography.

Introduction

The present research applies to new machine learning applications developed for example with Flux.js and which are intended to be applied and implemented in other applications or users. How can we do that? There are several types and the most common would be the implementation of API functions or we send the model to users and advise them to launch it locally using their data. There are a number of problems using this technique:

1. Machine learning models are large and users may not have as much storage space or may run learning models.

2. Models change frequently and we do not want to send the new model to every change.

3. New models are difficult to generate, both human resources and hardware resources are needed that the development company wants to recover by billing these services to users.

The accepted solution is to declare the API function on the cloud. This type of machine learning business offered as a service is in vogue now. Many types of such products have appeared in recent years, and can be found on cloud platforms. The problem that arises is: is the data of those who use such services secure? Remember the user sends the data to be processed on a remote server. Is the server reliable? There are ethical and legal issues that govern how this type of data can be used. For example, in finance or even in medical services, sending data to third parties cannot be done. How can we solve this type of problem?

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New research in this area may make it possible to perform calculations using data without decryption. We will make an example in which someone sends data (images) to an API function in the cloud, which will execute the machine learning model and receive the encrypted response. The user data was not decrypted, the one who manages the server does not have access to the data, these being encrypted, nor can the prediction mode be calculated. How will we do this? We will use a machine learning model to recognize letters and numbers from handwriting (the MNIST set will be used).

HE generally

The calculation used to calculate encrypted data is called "secure calculation" and is widely used in research, with many applications and techniques for various scenarios. In this article we will use the "homomorphic encryption" technique. In the applications that use this technique the following operations are used:

```
pub_key, eval_key, priv_key = keygen()
encrypted = encrypt(pub_key, plaintext)
decrypted = decrypt(priv_key, encrypted)
encrypted' = eval(eval_key, f, encrypted)
```

The first functions are simple functions, common to those who use asymmetric cryptography. The last function is the important one. It processes the f functions on the encryption side and displays another encrypted value depending on the function evaluation. The property itself is what provides the name of the homomorphic calculus. The evaluation function is displayed according to encryption:

f (decrypt (priv_key, encrypted)) == decrypt (priv_key, eval (eval_key, f, encrypted)).

The functions f are accepted in the calculation depending on the encryption and operations. For a single f a "partially homomorphic" scheme is used. If the function f is used as a series of arbitrary circuits, the calculation will be called "somewhat homomorphic" or "completely homomorphic" if such a circuit is unlimited. It is even possible to transform certain data through a fully "homomorphic" technique and such a technique is called "bootstrapping". The completely homomorphic encryption technique is recent and was published by Craig Gentry[2] in 2009. There are also commercial solutions that implement this technique. Example: Microsoft Seal[3] and Palisade[4]. We will use CKKS encryption in examples.

[2] https://www.cs.cmu.edu/~odonnell/hits09/gentry-homomorphic-encryption.pdf
[3] https://github.com/microsoft/SEAL
[4] https://palisade-crypto.org/

CKKS High Level

CKKS[5] (named after Cheon-Kim-Kim-Song, the authors of the 2016 paper that proposed it) is a homomorphic encryption scheme that allows homomorphic evaluation of the following primitive operations:

- Elementary addition of the length n vectors of complex numbers
- Elementary multiplication of length n complex vectors
- Rotation of elements in the vector (in the direction of changing the circulation)
- Complex conjugation of vector elements

Condition n here is structured according to the Security and precision applied. It has a high standard. The example applied by us will have the value of 4096 - we must consider the security, but also the scaling in log n.

Operations using CKKS are complex. They give approximate results and users must check accurately so as not to affect the correctness of the results.

This kind of restriction is not uncommon for developers. Applications that use GPUs calculate data using number vectors. Floating point numbers use algorithm selection, use multithreading and this leads to a complexity of implementation.

In the following we will try to apply and implement the operations proposed in Julia in order to show how we can use the library in REPL.

```
using ToyFHE

# Let's play with 8 element vectors
N = 8;

# Choose some parameters - we'll talk about it later
```

```
R = NegacyclicRing(2N, (40, 40, 40))
ℤ_1329227997568081457402701207104248257/(x^16 + 1)
```

```
# We'll use CKKS
params = CKKSParams(R)
CKKS parameters

# We need to pick a scaling factor for a numbers - again we'll talk about
that later
```

```
Tscale = FixedRational{2^40}
FixedRational{1099511627776,T} where T

# Let's start with a plain Vector of zeros
plain = CKKSEncoding{Tscale}(zero(R))
```

[5] https://eprint.iacr.org/2016/421.pdf

```
8-element CKKSEncoding{FixedRational{1099511627776,T} where T} with
indices 0:7:
 0.0 + 0.0im
 0.0 + 0.0im
 0.0 + 0.0im
 0.0 + 0.0im
 0.0 + 0.0im
 0.0 + 0.0im
 0.0 + 0.0im
 0.0 + 0.0im

# Ok, we're ready to get started, but first we'll need some keys
kp = keygen(params)
CKKS key pair

kp.priv
CKKS private key

kp.pub
CKKS public key

# Alright, let's encrypt some things:
foreach(i->plain[i] = i+1, 0:7); plain
8-element CKKSEncoding{FixedRational{1099511627776,T} where T} with
indices 0:7:
 1.0 + 0.0im
 2.0 + 0.0im
 3.0 + 0.0im
 4.0 + 0.0im
 5.0 + 0.0im
 6.0 + 0.0im
 7.0 + 0.0im
 8.0 + 0.0im

c = encrypt(kp.pub, plain)
CKKS ciphertext (length 2, encoding
CKKSEncoding{FixedRational{1099511627776,T} where T})
```

```
# And decrypt it again
decrypt(kp.priv, c)
8-element CKKSEncoding{FixedRational{1099511627776,T} where T} with
indices 0:7:
 0.9999999999995506 - 2.7335193113350057e-16im
 1.9999999999989408 - 3.885780586188048e-16im
  3.000000000000205 + 1.6772825551165524e-16im
  4.000000000000538 - 3.885780586188048e-16im
  4.999999999998865 + 8.382500573679615e-17im
  6.000000000000185 + 4.996003610813204e-16im
  7.000000000001043 - 2.0024593503998215e-16im
  8.000000000000673 + 4.996003610813204e-16im

# Note that we had some noise. Let's go through all the primitive
operations we'll need:
decrypt(kp.priv, c+c)
8-element CKKSEncoding{FixedRational{1099511627776,T} where T} with
indices 0:7:
 1.9999999999991012 - 5.467038622670011e-16im
 3.9999999999978817 - 7.771561172376096e-16im
   6.00000000000041 + 3.354565110233105e-16im
  8.000000000001076 - 7.771561172376096e-16im
   9.99999999999773 + 1.676500114735923e-16im
  12.00000000000037 + 9.992007221626409e-16im
 14.000000000002085 - 4.004918700799643e-16im
 16.000000000001346 + 9.992007221626409e-16im

csq = c*c
CKKS ciphertext (length 3, encoding
CKKSEncoding{FixedRational{120892581961462917470617 6,T} where T})

decrypt(kp.priv, csq)
8-element CKKSEncoding{FixedRational{120892581961462917470617 6,T} where T}
with indices 0:7:
 0.9999999999991012 - 2.350516767363621e-15im
 3.9999999999957616 - 5.773159728050814e-15im
  9.000000000001226 - 2.534464540987068e-15im
 16.000000000004306 - 2.220446049250313e-15im
  24.99999999998865 + 2.0903753311370056e-15im
  36.00000000000222 + 4.884981308350689e-15im
 49.000000000014595 + 1.0182491378134327e-15im
  64.00000000001077 + 4.884981308350689e-15im
```

It can be seen that CSS is different from ciphertext. I gave a 3-digit ciphertext on a larger scale. We would like to reduce these things before other calculations or run out of "space". It can be done as follows:

```
# To get back down to length 2, we need to `keyswitch` (aka
# relinerarize), which requires an evaluation key. Generating
# this requires the private key. In a real application we would
# have generated this up front and sent it along with the encrypted
# data, but since we have the private key, we can just do it now.

ek = keygen(EvalMultKey, kp.priv)
CKKS multiplication key

csq_length2 = keyswitch(ek, csq)
CKKS ciphertext (length 2, encoding
CKKSEncoding{FixedRational{120892581961462917470617 6,T} where T})

# Getting the scale back down is done using modswitching.
csq_smaller = modswitch(csq_length2)
CKKS ciphertext (length 2, encoding
CKKSEncoding{FixedRational{1.099511626783e12,T} where T})

# And it still decrypts correctly (though note we've lost some precision)
decrypt(kp.priv, csq_smaller)
8-element CKKSEncoding{FixedRational{1.099511626783e12,T} where T} with
indices 0:7:
 0.9999999999802469 - 5.005163520332181e-11im
 3.9999999999957723 - 1.0468514951188039e-11im
  8.999999999998249 - 4.7588542623100616e-12im
 16.000000000023014 - 1.0413447889166631e-11im
 24.999999999955193 - 6.187833723406491e-12im
 36.000000000002345 + 1.860733715346631e-13im
  49.00000000001647 - 1.442396043149794e-12im
 63.999999999988695 - 1.0722489563648028e-10im
```

Modswitch (short for module switching) can reduce the size of the encrypted data module, and will lead to the fact that we cannot always do so.

```
ℛ # Remember the ring we initially created
ℤ_132922799756808145740270120710424825 7/(x^16 + 1)

 ToyFHE.ring(csq_smaller) # It shrunk!
ℤ_120892582014459377933155 3/(x^16 + 1)
```

There is one last operation we will need: rotations. Like switching the above keys, it requires an evaluation key (also called a galois key):

```
gk = keygen(GaloisKey, kp.priv; steps=2)
CKKS galois key (element 25)

decrypt(circshift(c, gk))
decrypt(kp, circshift(c, gk))
8-element CKKSEncoding{FixedRational{1099511627776,T} where T} with
indices 0:7:
  7.000000000001042 + 5.68459112632516e-16im
  8.000000000000673 + 5.551115123125783e-17im
  0.999999999999551 - 2.308655353580721e-16im
 1.9999999999989408 + 2.7755575615628914e-16im
  3.000000000000205 - 6.009767921608429e-16im
  4.000000000000538 + 5.551115123125783e-17im
  4.999999999998865 + 4.133860996136768e-17im
  6.000000000000185 - 1.6653345369377348e-16im

# And let's compare to doing the same on the plaintext

circshift(plain, 2)
8-element OffsetArray(::Array{Complex{Float64},1}, 0:7) with eltype
Complex{Float64} with indices 0:7:
 7.0 + 0.0im
 8.0 + 0.0im
 1.0 + 0.0im
 2.0 + 0.0im
 3.0 + 0.0im
 4.0 + 0.0im
 5.0 + 0.0im
 6.0 + 0.0im
```

I showed how to use the HE library. We will have to build the neural network application using these functions, and form it.

The machine learning model

To understand machine learning models or use the FLUX.js[6] library you can follow tutorials on Julia Academy[7]. We will continue to use the convolutional neural network model in the Flux zoo. We will have the same data preparation models and we will modify the models.

[6] https://fluxml.ai/Flux.jl/stable/
[7] https://juliaacademy.com/p/introduction-to-machine-learning

```
function reshape_and_vcat(x)
    let y=reshape(x, 64, 4, size(x, 4))
        vcat((y[:,i,:] for i=axes(y,2))...)
    end
end

model = Chain(
    # First convolution, operating upon a 28x28 image
    Conv((7, 7), 1=>4, stride=(3,3), x->x.^2),
    reshape_and_vcat,
    Dense(256, 64, x->x.^2),
    Dense(64, 10),
)
```

The model described is the one applied in the work "Secure Outsourced Matrix Computation and Application to Neural Networks"[8]. It will use the same scheme model but with the following differences:

1. The paper encrypts the model, we will not do it for simplicity

2. In our case we will apply vectors in each layer

3. In our case we will have a higher accuracy (approximately 98.6% compared to 98.1%).

Another thing is given by the activation functions x. ^ 2. If in the other models tanh or relu functions are used, light functions in cases like plain text, in the case of encryption functions they become very difficult to apply (we have to find polynomial approximation). Softmax was removed from the base model but I applied a logitcrossentropy function. It could also be done with softmax and we could do it with decryption on the client.

Performing the operations efficiently

In this chapter we will explain the type of operation that can be done. We can apply:

• Convolutions

• Square in the element

• Multiplication of the matrix

Square in the element is an easy function as we can read above. We will talk in the following about the other two. The examples will be based on a size of 64 (element vector 4096).

[8] https://eprint.iacr.org/2018/1041.pdf

Convolution

What is convulsion and how does it work? Take a 7x7 window (as in the example) from the initial matrix and each element in the window will be multiplied by an element in the convolution mask. Move the window over others (for example step 3 - so we will move 3 elements) and repeat the process (having the same mask). An example of a 3x3 convolution with step (2,2) can be seen below. Blue - input and green - output.

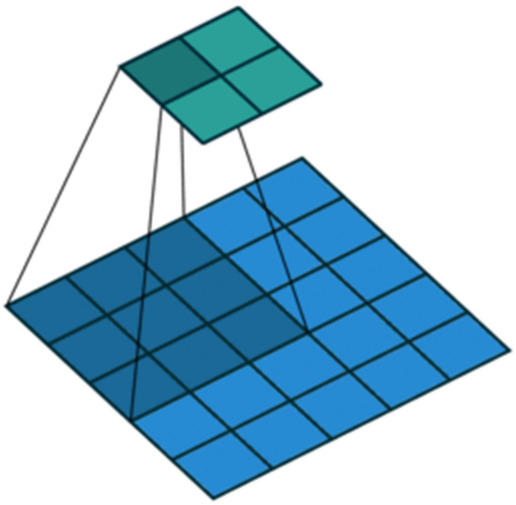

Figure 1 https://github.com/vdumoulin/conv_arithmetic

We can see that we have convolutions on 4 channels. The process will be repeated 3 times with various masks. I checked what we need to do and now apply. A preprocessing model can be made per client to simplify the works.

What will we do:

We will divide and preprocess several convolution models (we will extract 7x7 models from the images), and we will obtain 64 matrices of size 7x7. We will add the same position in each window in a vector and we will get a vector with 64 elements in each image. For a 64x64 element vector a batch of 64 (49 64x64 size matrices) will be obtained. The convolution will become a multiplication. We will scalarly multiply the whole matrix with the appropriate elemental mask and we will thus obtain the convolution or more precisely the result. It can be implemented as follows:

```
function public_preprocess(batch)
    ka = OffsetArray(0:7, 0:7)
    # Create feature extracted matrix
    I = [[batch[i'*3 .+ (1:7), j'*3 .+ (1:7), 1, k] for i'=ka, j'=ka] for
k = 1:64]

    # Reshape into the ciphertext
    Iij = [[I[k][l...][i,j] for k=1:64, l=product(ka, ka)] for i=1:7,
j=1:7]
end

Iij = public_preprocess(batch)

# Evaluate the convolution
weights = model.layers[1].weight
conv_weights = reverse(reverse(weights, dims=1), dims=2)
conved = [sum(Iij[i,j]*conv_weights[i,j,1,channel] for i=1:7, j=1:7) for
channel = 1:4]
conved = map(((x,b),)->x .+ b, zip(conved, model.layers[1].bias))
```

which (modulo a reordering of the dimension) gives the same answer as, but using operations

```
model.layers[1](batch)
```

Adding the encryption operations, we have:

```
Iij = public_preprocess(batch)
C_Iij = map(Iij) do Iij
    plain = CKKSEncoding{Tscale}(zero(plaintext_space(ckks_params)))
    plain .= OffsetArray(vec(Iij), 0:(N÷2-1))
    encrypt(kp, plain)
end

weights = model.layers[1].weight
conv_weights = reverse(reverse(weights, dims=1), dims=2)
conved3 = [sum(C_Iij[i,j]*conv_weights[i,j,1,channel] for i=1:7, j=1:7)
for channel = 1:4]
conved2 = map(((x,b),)->x .+ b, zip(conved3, model.layers[1].bias))
conved1 = map(ToyFHE.modswitch, conved2)
```

A keyswitch will not be required because the weights are public and we have not extended the ciphertext.

Matrix multiply

One of the main elements in multiplying matrices is that we can rearrange the indices. We will take into account the fact that the elements of the matrix that belong to the vector can be sorted. In case of moving the vector with a multiple size of the row size, an interesting effect will be obtained, namely the rotation of the columns. This is a sufficient hypothesis in multiplying the matrix. We will show the following below:

```
function matmul_square_reordered(weights, x)
    sum(1:size(weights, 1)) do k
        # We rotate the columns of the LHS and take the diagonal
        weight_diag = diag(circshift(weights, (0,(k-1))))
        # We rotate the rows of the RHS
        x_rotated = circshift(x, (k-1,0))
        # We do an elementwise, broadcast multiply
        weight_diag .* x_rotated
    end
end

function matmul_reorderd(weights, x)
    sum(partition(1:256, 64)) do range
        matmul_square_reordered(weights[:, range], x[range, :])
    end
end

fc1_weights = model.layers[3].W
x = rand(Float64, 256, 64)
@assert (fc1_weights*x) ≈ matmul_reorderd(fc1_weights, x)
```

Making it nicer

We can make things look even better. The code works and let's show its running (without configuring the parameters):

```
ek = keygen(EvalMultKey, kp.priv)
gk = keygen(GaloisKey, kp.priv; steps=64)

Iᵢⱼ = public_preprocess(batch)
C_Iᵢⱼ = map(Iᵢⱼ) do Iij
    plain = CKKSEncoding{Tscale}(zero(plaintext_space(ckks_params)))
    plain .= OffsetArray(vec(Iij), 0:(N÷2-1))
    encrypt(kp, plain)
end

weights = model.layers[1].weight
conv_weights = reverse(reverse(weights, dims=1), dims=2)
conved3 = [sum(C_Iᵢⱼ[i,j]*conv_weights[i,j,1,channel] for i=1:7, j=1:7)
for channel = 1:4]
conved2 = map(((x,b),)->x .+ b, zip(conved3, model.layers[1].bias))
conved1 = map(ToyFHE.modswitch, conved2)

Csqed1 = map(x->x*x, conved1)
Csqed1 = map(x->keyswitch(ek, x), Csqed1)
Csqed1 = map(ToyFHE.modswitch, Csqed1)

function encrypted_matmul(gk, weights, x::ToyFHE.CipherText)
    result = repeat(diag(weights), inner=64).*x
    rotated = x
    for k = 2:64
        rotated = ToyFHE.rotate(gk, rotated)
        result += repeat(diag(circshift(weights, (0,(k-1)))), inner=64) .*
rotated
    end
    result
end
```

```
fq1_weights = model.layers[3].W
Cfq1 = sum(enumerate(partition(1:256, 64))) do (i,range)
    encrypted_matmul(gk, fq1_weights[:, range], Csqed1[i])
end

Cfq1 = Cfq1 .+ OffsetArray(repeat(model.layers[3].b, inner=64), 0:4095)
Cfq1 = modswitch(Cfq1)

Csqed2 = Cfq1*Cfq1
Csqed2 = keyswitch(ek, Csqed2)
Csqed2 = modswitch(Csqed2)

function naive_rectangular_matmul(gk, weights, x)
    @assert size(weights, 1) < size(weights, 2)
    weights = vcat(weights, zeros(eltype(weights), size(weights, 2)-
size(weights, 1), size(weights, 2)))
    encrypted_matmul(gk, weights, x)
end

fq2_weights = model.layers[4].W
Cresult = naive_rectangular_matmul(gk, fq2_weights, Csqed2)
Cresult = Cresult .+ OffsetArray(repeat(vcat(model.layers[4].b,
zeros(54)), inner=64), 0:4095)
```

We will propose some abstractions that will make things easier. We will move from encryption and machine learning to code creation and implementation. Julia allows abstractions and we will build some. The whole convolution extraction process can be encapsulated, bringing it to a customized matrix:

```
using BlockArrays

"""
    ExplodedConvArray{T, Dims, Storage} <: AbstractArray{T, 4}

Represents a an `nxmx1xb` array of images, but rearranged into a
series of convolution windows. Evaluating a convolution compatible
with `Dims` on this array is achievable through a sequence of
scalar multiplications and sums on the underling storage.
"""
struct ExplodedConvArray{T, Dims, Storage} <: AbstractArray{T, 4}
    # sx*sy matrix of b*(dx*dy) matrices of extracted elements
    # where (sx, sy) = kernel_size(Dims)
    #       (dx, dy) = output_size(DenseConvDims(...))
    cdims::Dims
    x::Matrix{Storage}
    function ExplodedConvArray{T, Dims, Storage}(cdims::Dims,
storage::Matrix{Storage}) where {T, Dims, Storage}
        @assert all(==(size(storage[1])), size.(storage))
        new{T, Dims, Storage}(cdims, storage)
    end
end
Base.size(ex::ExplodedConvArray) = (NNlib.input_size(ex.cdims)..., 1,
size(ex.x[1], 1))

function ExplodedConvArray{T}(cdims, batch::AbstractArray{T, 4}) where {T}
    x, y = NNlib.output_size(cdims)
    kx, ky = NNlib.kernel_size(cdims)
    stridex, stridey = NNlib.stride(cdims)
    kax = OffsetArray(0:x-1, 0:x-1)
    kay = OffsetArray(0:x-1, 0:x-1)
    I = [[batch[i'*stridex .+ (1:kx), j'*stridey .+ (1:ky), 1, k] for
i'=kax, j'=kay] for k = 1:size(batch, 4)]
    Iᵢⱼ = [[I[k][l...][i,j] for k=1:size(batch, 4), l=product(kax, kay)]
for (i,j) in product(1:kx, 1:ky)]
    ExplodedConvArray{T, typeof(cdims), eltype(Iᵢⱼ)}(cdims, Iᵢⱼ)
end

function NNlib.conv(x::ExplodedConvArray{<:Any, Dims},
weights::AbstractArray{<:Any, 4}, cdims::Dims) where {Dims<:ConvDims}
    blocks = reshape([
Base.ReshapedArray(sum(x.x[i,j]*weights[i,j,1,channel] for i=1:7, j=1:7),
(NNlib.output_size(cdims)...,1,size(x, 4)), ()) for channel = 1:4
],(1,1,4,1))
    BlockArrays._BlockArray(blocks, BlockArrays.BlockSizes([8], [8],
[1,1,1,1], [64]))
End
```

Here I used BlockArrays to represent the 8x8x4x64 matrix as 4 8x8x1x64 matrices. It can be seen that we already have a more beautiful model on the unencrypted matrices:

```
cdims = DenseConvDims(batch, model.layers[1].weight; stride=(3,3),
padding=(0,0,0,0), dilation=(1,1))
DenseConvDims: (28, 28, 1) * (7, 7) -> (8, 8, 4), stride: (3, 3) pad: (0,
0, 0, 0), dil: (1, 1), flip: false

a = ExplodedConvArray{eltype(batch)}(cdims, batch);

model(a)
10×64 Array{Float32,2}:
[snip]
```

How do we implement things in encryption? We will have to do two operations:

1. Create the ExplodedConvArray structure and we will get an encrypted text for each field. The operations in the structure have the same functions as those in the original structure and have the same functions as the homomorphic ones.

2. Certain functions will need to be intercepted and have different results.

Julia has the opportunity to apply these two things. This is done through your own compiler through the Cassette.jl[9] function. Requirement number 2 can be rewritten as follows:

```
# Define Matrix multiplication between an array and an encrypted block
array
function (*::Encrypted{typeof(*)})(a::Array{T, 2},
b::Encrypted{<:BlockArray{T, 2}}) where {T}
    sum(a*b for (i,range) in enumerate(partition(1:size(a, 2),
size(b.blocks[1], 1))))
end

# Define Matrix multiplication between an array and an encrypted array
function (*::Encrypted{typeof(*)})(a::Array{T, 2}, b::Encrypted{Array{T,
2}}) where {T}
    result = repeat(diag(a), inner=size(a, 1)).*x
    rotated = b
    for k = 2:size(a, 2)
        rotated = ToyFHE.rotate(GaloisKey(*), rotated)
        result += repeat(diag(circshift(a, (0,(k-1)))), inner=size(a, 1))
.* rotated
    end
    result
end
```

In the final implementation the user must apply everything very quickly:

[9] https://github.com/JuliaLabs/Cassette.jl

```
kp = keygen(ckks_params)
ek = keygen(EvalMultKey, kp.priv)
gk = keygen(GaloisKey, kp.priv; steps=64)

# Create evaluation context
ctx = Encrypted(ek, gk)

# Do public preprocessing
batch = ExplodedConvArray{eltype(batch)}(cdims, batch);

# Run on encrypted data under the encryption context
Cresult = ctx(model)(encrypt(kp.pub, batch))

# Decrypt the answer
decrypt(kp, Cresult)
```

Of course, certain things may not be optimal. $\mathscr{R}$ ring - the function that modifies mods, keyswitch, etc. - can lead to the establishment of certain rules between accuracy, security and performance. The final product implies that the compiler analyzes, runs encrypted and parameterizes the code. Finally it generates the program.

Conclusion

The automatic creation and execution of safe calculations is a desideratum of any programmer and system. The metaprogramming system built by Julia can be used as a development platform. There are already attempts in this regard made by RAMPARTS to bring the Julia code to a library (PALISADE FHE). Lately, computing systems have achieved the performance of cryptographic information in homomorphic system with effective evaluation come close to practical utility. The future is near. Using research in the development of algorithms, homomorphic encryption will become mass technology in the field of user data protection.

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TRANSLATION –TRANSCREATION – TRANS-ADAPTATION FOR EFFECTIVE E-COMMERCE LOCALIZATION

Mariana COANCĂ[1]

Abstract: *In this paper, e-commerce localization is understood as a strategic approach for adapting a site to the local language and culture of target markets. It definitely influences and shapes online consumption globally. Based on previous research, we explore the benefits of translation support technologies for localization. Then we focus on the multi-language experience in international shopping, highlighting the impact of language on global audiences.*

In addition, we provide an example of webpage texts that are culturally and linguistically resonant with the target markets. Similarly, we highlight an example of product description translated by resort to Google Translate, which proves to be an unreliable tool as the grammar rule for forming the plural in Romanian is not applied.

As for the cultural localization, the paper highlights the need to combine machine translation with a human translator who has transcreation and trans-adaptation skills to ensure efficient and ethical communication to clients or site visitors from overseas markets. The affective and linguistic processes can influence human behavior in a consumption context. Thus, in the e-commerce localization project, translation is carried out on several levels to ensure that the writing style, tone and other important elements of the original material are translated correctly. The paper concludes that translating content and conducting multilingual keyword research with the audience in mind, proper linguistic management of texts, cultural awareness and cultural sensitivity represent the most feasible approach to make content available to international communities and consumers.

Keywords: *translation, e-commerce, localization, transcreation, trans-adaptation, multi-language experience*

1. The context

Online businesses need to improve the efficiency of their online advertising to reach global audiences. The *localization* service is the process of adapting an existing site to the *local language and culture of target markets*. Also, adapting website content to local audiences that speak the same languages but in different ways is one of the most challenging tasks of localization. This process of adapting a website in a different *linguistic and cultural context* requires much more than just translating texts. Therefore, the factors that can influence the location of a site are *programming* and *linguistic/cultural knowledge*.

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Content localization for e-commerce is a mandatory task that any brand should achieve nowadays. The localization process should ensure correct translation in the languages of targeted markets. Translation has become an essential requirement for any e-commerce that aims to connect with potential customers. Using solely machine translation, without partnering with human translators to accelerate the translating process, will create situations that cast doubt on product names and descriptions, poor text construction, serious errors in the content about legal and security aspects, which damage a company's reputation.

Adapted websites reduce the amount of cognitive effort required by site visitors to process information, which makes navigation easier creating favorable attitudes towards the website. Cookies play an important role in facilitating access to and delivery of multiple services so that the user can have an enjoyable browsing experience. They also provide site owners with valuable feedback on how their sites are visited so that they could make them even more efficient and accessible to users. Online businesses need to improve the efficiency of their online advertising to reach the global consumer.

Online shopping has grown tremendously in the European Union because of the COVID-19 restrictions and the consumers' habits and preferences for goods and services for private use. According to Eurostat, for the 2015-2020 period (see Figure 1), online shopping among internet users increased in Romania (+27 %), in Czechia and Croatia (+25 %) and Hungary (+23 %).

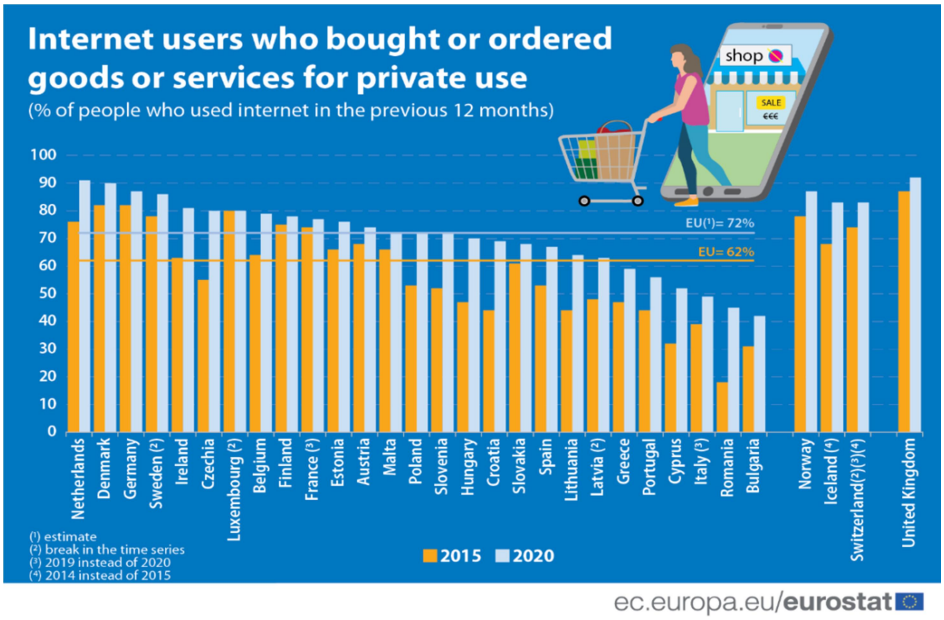

Fig. 1: Percentage of Internet users who did online shopping at EU level from 2015 to 2020 ("Source datasets: isoc_ec_ibuy and isoc_ec_ib20")

In everyday life, buyers talk with sellers about certain products using naturally their mother tongue. What happens to online shoppers who do not prefer or do not even understand site content in other languages? The number of consumers of online products and services has increased significantly in recent years, mainly due to the increase in Internet users in developing countries, but also due to the Covid-19 pandemic.

Even large e-commerce companies do not offer efficient multi-language service on their websites. Why? Most often, the answers to this question highlight that these companies have already created their network of consumers internationally and their profits are huge. On the other hand, the reason is that a multilingual service involves very high costs, because only by people, who have diverse and relevant specializations for e-commerce localization can produce this service. In this regard, linguists, terminologists, translators, site developers and administrators, project managers, communication managers, technical communicators/writers and marketing specialists can work closely to provide an undisputed multi-language service.

2. Translation support technologies for localization

Discussion and collaboration can drive effective localization services. People with different expertise can meet, present their specific challenges and work together in a supportive environment and a collaborative peer-to-peer environment where they can lend their experience to one another. A clear and coherent strategy for the management of multilingual and multicultural content will boost the global presence of companies and revitalize their corporate social responsibility. In his comprehensive study, [1] identified strategies to organize a global website, according to a three-fold approach:

- the monarchist approach focuses on the content, which is translated but seldom adapted leading to the website's lack of sensitivity to local markets,
- the anarchist approach is applied to multiple local sites using a different design, which requires high costs but no coordination and no corporate strategy,
- the subsidiary approach is a compromise between the first two approaches, in the sense that the global content is produced at central level; regional content is translated and used worldwide while the local content is created in the local language.

Nowadays the human translator needs to have *terminology management skills* and *cultural awareness* to reach global audiences. For example, according to [2], the professions of translator-terminologist and terminologist are recognized in France. A translator-terminologist carries out the following activities [3]:

- designing and applying working methods in translation and terminology,
- organizing, coordinating and following the activity of a team of terminology translators,

- defining and proposing terminological projects,
- choosing and adapting terminology management tools,
- defining the ways of collaboration with the subcontractors,
- controlling the quality of translations and terminological activities performed by internal or external collaborators,
- integrating and adapting IT tools to assist translators,
- developing partnerships with national and international networks,
- capitalizing on terminological activity in education, publications and databases. It is imperative to add here the business environment as well.

Translations made using translation support technologies, the so-called *translation memories*, differ from translations made using a text editor because they reduce the percentage of human errors that are inevitably made during a translation. This materializes in the provision of tailor-made, specialized services, for example, when a client wants a multilingual service of its e-commerce website. Therefore, the computer-assisted tools should not be confused with *automatic machine translation*, such as Google Translate. In this case, the computer does the translation whereas a human translator who uses CAT tools does the translation himself/herself, based on the translation memory, which works as a support tool, complementing the activity of the human translator.

The CAT software gradually stores in its memory the translations as the translators work in that program, so that it will automatically suggest the right words and phrases when a similar text needs to be translated. This ensures the consistency of the terminology, an extremely important parameter for achieving optimal translation quality as a whole, especially when it comes to the content of an e-commerce website. The advantages of using CAT Tools are: the undisputed quality of the translation, which results primarily from the uniformity of the terminology used and faster delivery of translations because this technology reduces not only the time but also the costs of the client as repetitive words are charged at a lower rate than new ones.

Using CAT Tools involves the use of key terms such as *perfect match, repetition, partial match* and *no match*. In all cases, a human translator needs to either revise or verify the results if they are correct or modify them, always aiming at translating the phrase or segment correctly. Undoubtedly, the result of the translating process is good when it comes to the content of an e-commerce website in several languages because a great part of the e-commerce terminology is similar in many fields of activity and industries.

CAT tools are very useful in projects in the IT sectors, the hospitality industry or in any other industry, and the documentation can consist of technical guides, user manuals, marketing materials, e-commerce website content in several languages, among many others. They give human translators the great advantage of using previously made translations that have been quality-approved in a system that stores and provides access to translation memories easily and rapidly.

3. The multi-language experience in international shopping

Creating multiple language versions of web pages is the most appropriate approach for making content available to global communities and their Internet users. Each language version of the site includes a Hreflang tag, which informs search engines about the language version. Thanks to this option, search engines offer users results from the language version of the site, according to their preferences. Additionally, subpages of additional language versions include appropriate URLs. Yet some platforms use the automatic translation of the text (the content of the web pages), with the help of Google translate, which is a completely wrong approach, because this application does not ensure an efficient automatic translation.

A relevant example is the content of the online store ZOOT (www.ZOOT.ro), whose site has several language versions - Romanian, Czech, Slovak, Hungarian, Bulgarian and Slovenian. The Romanian version reflects that the content translation contains a lot of mistakes - *inappropriate vocabulary choice and grammar mistakes such as the order of the words in a sentence and in product descriptions, the absence of the specific ending for the plural of nouns in Romanian* (see the screenshot below), etc. Generally, in Romanian, the plural is formed by adding (i) to the masculine and (e) to the feminine. Romanian has also the third gender, called "neuter" which is chiefly used for objects. In the screenshot below, the correct translation of the *Dorothy Perkins black ballerina shoes* is *"pantofi negri de tipul balerini, marca Dorothy Perkins"* or the popular Romanian version *"balerini negri, marca Dorothy Perkins"*.

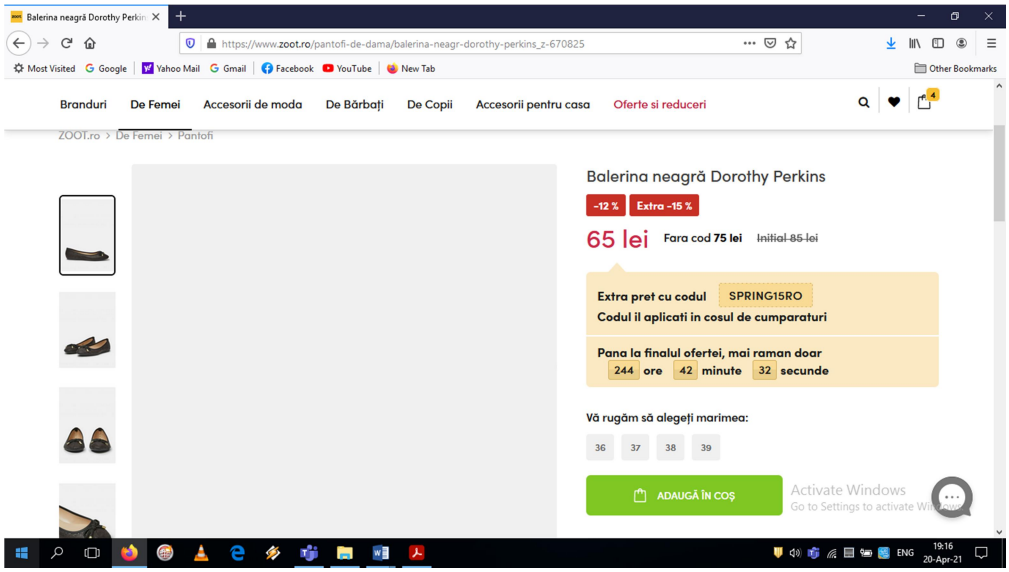

Image 1: Grammar mistake in the description of a product

On the other hand, Amazon, the largest online retail company, has its well-known website (www.amazon.com), which displays nine language versions. English has been set as the initial language for the content of the web pages, including the Terms of Use. The company informs users about its availability to translate the most important information to ensure an easy browsing, good shopping experience and efficient communication with site visitors or potential customers. It also expresses its commitment to improve the *multi-language experience* on Amazon.com, noting that many of the site's features are in Simplified Chinese, German, Brazilian Portuguese, or Spanish, but other communications are not available now. However, to remove this linguistic barrier, the company highly recommends that Internet users contact the Customer Service, which can communicate with them in these languages.

H&M is a great example of how to localize an e-commerce site to specific markets. Unlike Amazon whose website in the UK has a different design from the website in the USA, H&M websites targeted toward visitors customers worldwide have the same design and focus on the same products regardless of the market they are being targeted. The product descriptions are accurate and contain specific information about the products. To exemplify, I analyzed a description of a dress on three markets – the British, the Romanian and the Italian one and I noticed the use of key phrases to highlight the quality and uniqueness of the dress (e.g. *organic cotton, our hand-made meadow flowers, print designers, bumbac organic, colecția noastră cu flori de câmp pictate manual, i motivi dell'abito, dipinti a mano*). However, I noticed that the description in Italian does not contain the detail about the ecological cotton from which the dress is made, which could lead to clients' lack of the interest in buying this dress. In the following, I presented the description of the dress on the websites targeted toward consumers in Great Britain, Romania and Italy to justify my finding.

The British version

"Long dress in a crinkled weave with a square neckline and voluminous, 3/4-length sleeves with deep armholes and narrow elastication at the cuffs. Pearly buttons at the back, a seam with pleats at the waist and a flared skirt. *Lined. Made from organic cotton, this dress is part of our hand-painted meadow flowers collection.* The pattern was developed by our print designers Kavita, Abigail, Holly and Florentin, who picked their favourite wild flowers and recreated them in watercolour." (H&M UK, https://www2.hm.com/en_asia3/productpage. 0978256001.html)

The Romanian version

"Rochie lungă din țesătură creponată, cu decolteu pătrat și mâneci trei sferturi voluminoase, cu răscroiala adâncită și elastic îngust la manșete. Nasturi

perlați la spate, cusătură cu pliuri în talie și fusta evazată. *Căptușită. Rochia este confecționată din bumbac ecologic și face parte din colecția noastră cu flori de câmp pictate manual.* Motivul a fost elaborat de designerii noștri de imprimeuri, Kavita, Abigail, Holly și Florentin, care au ales florile lor sălbatice preferate și le-au recreat în acuarele."
(H&M Romania, https://www2.hm.com/ro_ro/productpage.0978256001.html)

The Italian version

"Abito lungo in tessuto goffrato. Scollo squadrato, maniche voluminose a tre quarti con giromanica ampio ed elastico sottile in fondo. Cucitura con pinces in vita, gonna svasata. Bottoni madreperlati sulla schiena, foderato. ……
……I motivi dell'abito, dipinti a mano, sono opera dei nostri designer Kavita, Abigail, Holly e Florentin, che hanno scelto i loro fiori di campo preferiti e li hanno ricreati all'acquerello." (H&M Italy, https://www2.hm.com/it_it/productpage.0978256001.html)

For the sake of clarity, experts in technical communication recommend the correct implementation of Controlled Language to reuse and create content that meets the needs of global audiences. Thus, a *controlled language* initiative is applied when writing for localization aiming to select a set of simple and clear vocabulary to improve communication for specific purposes. By incorporating Simplified Technical English or other controlled language practices in translation, companies can save more than 20% on the *localization* costs. In addition, this initiative increases readability and comprehensibility, maximizes content reuse, helps to manage terminology across disciplines more effectively, enhances quality control and efficiency, for example, the editors will focus on the organization, intelligence and internationalization of the content, and uses specific tools that enable benchmarking prior to and following the content editing for compliance.

The language control approaches are effective when they choose simple terms and restrict grammar, syntax, and verb forms. For example, the use of Standard English word order (a subject, a verb, and an object with an associated modifier) facilitates simpler translations from English into Romanian. Likewise, the use of relative pronouns "which" and "that" can ensure a better understanding and a smooth translation from English into Romanian. As for the concept identification, only the use of a single term ensures not only the overall consistency of translation in Romanian but also increases the related translation advantage.

High quality translation requires a high-quality content. For example, a very important aspect in the translation and transcreation for e-commerce localization is a proper description of the products in a convincing way to get website visitors to place orders. In the first stage of preparing the text, it is necessary to estimate the

expectations of the target audience regarding the products and to find out their preferences by collecting information through surveys, Google analytics, Google Data Studio, Google Optimize and Facebook insights. Next, the use of an adequate register can ensure text uniformity, a pleasant reading and a unique style of expression. Therefore, at this stage, all these elements can arouse the reader's interest:

- Writing style (formal or informal); informal expressions and jokes can lead to very good results for certain types of products and stores while formal writing is recommended to show seriousness and quality.
- How to address (direct, polite pronouns, etc.)
- Use of style figures
- Humorous elements can be used very carefully because visitors from different cultures may perceive them differently.
- Text length.

The third stage aims at specific information, explanations and constant evidence to present the advantages of the products and the benefits of the users. This presentation can have a positive impact on the global public if appropriate terminology and grammar is used for advertising such as precise verbs, descriptive adjectives and adverbs. Moreover, the use of terms that stimulate the olfactory and gustatory senses can encourage the site visitors to place an order.

Sometimes the description of a product resembles an advertisement message, which can trigger affective responses. Interestingly "when emotions are involved, what the potential consumer sees will stick to her/his mind, which increases the chances of subsequent purchase of the product being advertised." [4]. However, the translators need to pay special attention to the adjectives expressing emotive reactions because there is alternation between British and American English in the sense that different types of catalysts establish the use of prepositions after adjectives of this kind [5]. Specifically, in British English there is a tendency to use "with" rather than "at" when the catalyst is a person or an object rather than an event whereas in American English the use of "at" is normal in these cases.[6].

[7] contends that the adjective "new" is the most common in advertising to describe new benefits and features and is often used in the phrase "new and improved" to highlight that the brand is updated and the products are better than prior models. Another adjective, "sustainable", frequent on websites of clothing & apparel highlights the proactiveness of brands and their progress towards a more sustainable fashion future. Translating other positive adjectives such as *dazzling, vibrant, elegant, enchanting, ravishing, glowing, captivating, lovely, shimmering, gleaming, vivacious*, *magnificent*, *alluring,* etc. to describe products is one of the most pleasant tasks of translators because they actually present a brand that conveys only positive vibes to site visitors or clients. We agree with [8], who argues that a translated text is assessed not only at the textual level, where both the form of expression and content are targeted, with the intra- and intertextual

references that belong to it but also at the peritextual level, where prejudices or socio-cultural mentality play an essential role.

To conclude this section in a proactive manner, artificial intelligence can assist translators if it finds its place in the translating process. Thus, it can increase the quality and speed of human translation. Technology developers have already tackled solutions of AI-powered applications that can enable translators to do their best work considering that it will be very challenging for Artificial intelligence to review the translated content comprehensively. In the translation industry though, it can play a significant role in assessing the localization quality, selecting the best linguist for a particular task, assisting the project manager to coordinate & develop the resource of linguists or in replacing the project manager, fully or partially, when he/she faces a convoluted localization workflow.

4. Cultural localization

Online shopping has become popular across the globe because it avoids long lines, saves a lot of time and contributes to social distancing, the major restriction in the Covid-19 pandemic. Content localization offers a business the opportunity to enter a foreign market. Local audiences, especially by young people, visit localized e-commerce websites. *Transcreation* deals with the adaptation of the website content to another language and cultural realities from that country even with information change on the website to fit the target country. It relies on good translation services and cultural knowledge, being the ultimate level of content adaptation.

Many e-commerce websites fail to convey the message in such a way that the visitor fully understands it. It is impossible to translate advertising or marketing messages *mot à mot*. While translating the website content the translator needs to feel the emotion behind the words and translate it into another language, keeping the meaning, but adapting the words to convey the same emotion. The biggest problem with advertising and marketing messages is that they must be effective, that is, to convince the target audience to place an order. The translated message needs to have the same persuasive power as the original message. In most cases, this requires, in addition to *excellent language skills*, *cultural awareness*, *cultural sensitivity*, *creativity* and *responsiveness*. It is all about etiquette, and its rules must be respected in all fields of activity. The European Parliament has developed a new language guide for politicians and officials, with the aim of giving a clear direction to use “inclusive language” properly. According to officials, it is forbidden to use terms that may be disrespectful to certain ethnic or gender minorities (e.g. “mother”, “father”, “trans”, “gay”). Actually is a useful tool at official and political level to communicate issues about ethnicity, race, gender, disability or religion correctly.

However, when it comes to a localization strategy aligned to a company’s mission and social responsibility, marketing tools are inclusive and translation aims to meet

the requirements of producing the meaning, maintaining the initial objective of the statement and the informative content of origin. Companies that address a global audience seek to respect the cultural and linguistic features of each country. When cultural differences have their say, only *cultural awareness*, *cultural sensitivity* and *creativity* can get the translator on track. He/she needs specific competences for various translations for specific purposes, for instance, when to translate literally, when to adapt, and how to keep the meaning and message of the original text. When lacking these competences, it will be difficult for a translator to make a successful translation.

Transcreation and *trans-adaptation*, on the other hand, aim to overcome linguistic and cultural nuances, and to harmonize the extralinguistic, socio-cultural contexts of the source and target recipients through cultural sensitivity and creativity. More precisely, in my opinion, *translation* is complemented by *trans-adaptation* and *transcreation* thus leading to successful production of e-commerce localization. Sdobnikov's claims that "*Cultural adaptation* of a text performed in the process of *localization* and *transcreation* is another term for pragmatic adaptation widely used by translators and translation scholars for a long time."[9].

Habits and values are the basis of any culture, reflecting the way people think and behave at home, at work, shopping, etc. Knowing them to predict consumer behavior can therefore be of significant importance in developing an effective localization strategy. Adopting a culture-sensitive approach to understand people's preferences for colors and symbols, being transparent all the way and respecting ethical principles will always build trust with consumers.

Many localization blunders have occurred because the brand voice clashed with the cultural norms, which resulted in sales drops. Nonetheless, success stories do exist because many brands conducted multilingual keyword research and focused on cultural sensitivity campaigns (e.g. PepsiCo, Johnson & Johnson). One of the most common trends that companies from Western markets adopted is *unstereotyping,* which changed the way brands picture men, women and children in advertising. The trendsetter was Unilever, which later on urged brands to join the Unstereotyping Alliance and implicitly commit do business better when marketing products and services to global consumers. Another approach to overcome confusion and misunderstandings in localizing content is the *avoidance of slang and idioms*. Idioms do not have equivalent translations in other languages whereas slang expressions cannot be interpreted easily because they are idiosyncratic to individual cultures.

Likewise, images, photos, logos and icons used by brands convey meanings that are interpreted or perceived, by global consumers not as intended. Thus, brands must adopt a sensible and sensitive cultural approach after investigating what causes offence to customers in overseas markets. *Translating symbols or text* from other cultures to localize content requires the employment of linguists,

transcreation and trans-adaptation specialists who can polish texts so that companies could relate to international customers.

Obviously, localizing content for e-commerce implies developing not only a multi-faceted strategy for enhancing cultural awareness, cultural sensitivity, linguistic management but also innovative ways to increase traffic on the e-commerce website.

5. Conclusions

The world is increasingly interconnected due to globalization and technology. At this moment, global consumers are visiting e-commerce websites to see products, compare prices, select and purchase the desired products. Globally, e-commerce has been a consolidated area of business operating for more than twenty years, which triggers competition thus benefiting consumers because it generates lower prices and offers the possibility to choose between more products and services. In 2020, the pandemic context has led to an accelerated growth of e-commerce in Europe, which has transformed it into the most important economic sector in Romania for instance.

The paper focuses on the elements of localization that pose not only a linguistic challenge but also cultural barriers to companies expanding into new markets. As we move into a digital future, growing companies focus on transforming content to be culturally and linguistically resonant. When companies target global consumers, the choice of language for their web presence should comply with international inclusive marketing. In the translation of localized content, the company owning the website represents the communicative function. High quality content (e.g. clear information, accurate descriptions of products, culturally sensitive graphics, etc.) empower site visitors in the sense that they get all the needed answers while browsing the information and their decision to place an order occurs instantly. Yet the paper includes product descriptions to highlight an example of good quality translation, on the one hand, and an example of linguistic mismanagement due to running the text through Google Translate, on the other hand. Automatic translation produces over literal translation and has poor performance on informal, spoken language, word order and on particular genres and language for specific purposes. Hence, translating content by resort to machine translation followed by human translator's review and text adaptation with the culture of target audience in mind, and conducting multilingual keyword research to identify words that resonate with specific cultures contribute to a successful localization service.

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MASS MEDIA MODULE OF THE ONLINE PLATFORM DEDICATED TO SPIRITUAL INSTITUTIONS

Silvan-Samuel-Cristian COVACI[1]

Abstract: *After the pandemic caused by the Covid-19 virus, both religious organizations and other actors involved in religious and spiritual activity, such as training centers, theological schools, migrated to the virtual space. Online platforms have become a safe and easy to use environment. This has led to a very large number of platforms and sources, which has led to an avalanche of news, many of them fake news coming from illegitimate sources that have led to misinformation but also to religious fanaticism. This article presents the main module, a media portal, of a platform that will interconnect religious institutions.*

Keywords: *mass communication, social media, religious studies, generation Z, database, spiritual organizations, religiosity, cultural communication, online platform.*

Introduction

The online platform will be a project that will include a number of 12 modules designed to cover the main needs of organizations in the spiritual and religious field. These modules have been created to facilitate and provide a common database and easy-to-access space that will facilitate communication between religious institutions, training centers, media institutions, NGOs and government institutions.

The main module is the media portal. This module will gather the news launched in the public space in a single information system. At European level, the largest number of believers are: Roman Catholics with 41%, Eastern Orthodox 10%, Protestantism with 9% and Islam 2%. The system will take over the news launched by the most important media institutions, religious organizations, spiritual leaders and religious influencers, in a single media portal. The purpose of this portal is to provide the target audience with quality and legitimate religious information. With the outbreak of the pandemic caused by the COVID-19 virus, but also before, fake news and religious fanaticism reached alarming levels. The portal will be available through the use of multilingual translation systems and available on social networks.

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1. Description of the main project

The need for a religious spiritual media portal, started from the need to organize a communication platform structured on several modules. In this article we will present the portal dedicated to religious institutions. This portal will contain several modules. Below we will present the main modules of the portal. Different modules can be added to the specific needs of the users. Religious institutions have begun to carry out pastoral-missionary and socio-cultural activities in the online environment. The modules presented below are a summary of the main activities of these institutions. The media corner module will allow, using specific software, to integrate the news of the main press agencies of religious institutions. Each actor, whether we refer to a local parish or a international institution, can be found using a plug-in, on a specific list or on a digital map. As in the case of sports institutions, religious institutions had encountered problems in accessing funding. The module dedicated to funding will interconnect religious institutions with specialists in the financial field. Both NGOs and government organizations will have access to the platform. They will use the platform as a database but also to post and share specific documentation. In the area of universities, study programs will be available and easily accessible. The modules offered by the platform will be the following:

Modules (many are interconnected modules) such as Private Public Partnerships

1. **Media corner**
   1.1. Social media
   1.2 Live Videos
   1.3 Spiritual and Religious Documentaries
   1.4. News from all religious institutions
2. **Churches and religious monuments**
   2.1 Churches by map
3. **Founding**
   3.1 Documents
   3.2 Public Private Partnerships
   3.3 Online consulting
4. **Dropbox for shared know how and projects**
5. **Administrative zone**
   4.1. Documents
   4.2. Data Base
6. **Government Organizations**
   6.1 Documents and regulations
   6.2 Programs
   6.3 Public Private partnerships
7. **NGOs**
   7.1 Public Private partnerships
   7.2 Civic Engagement

8. **Clergy Zone**
   8.1 Training programs
   8.2 Data Base
9. **Seminars, Conferences, Meetings and Online conferences**
10. **University Zone**
    10.1. Erasmus +
    11.2. Religious High schools, Colleges and Universities offers
11. **Religious Camps**
12. **Social programs and AID**

The first module, presented in this article, which will launch the platform, will be the media portal module that will connect, as a pilot project, all of the mass media portals belonging to the media institutions of the Orthodox organizations, the 15 existing Orthodox Churches worldwide, and as well, as phase 2, with all the media institutions of other European institutions that promotes spiritual values.

This module will include a website - media portal, which will contain information and attitudes resonating with the spiritual and religious space, online courses and conferences, publishing positions from spiritual leaders and specialists, motivational texts from a spiritual and religious point of view, articles of spiritual, religious and general interest, an audio-book with recordings / interviews / music, thus offering the perspective of outlining a brand, which could later be capitalized even commercially by printing thematic almanacs (based on collections of articles published during a year, two years etc)

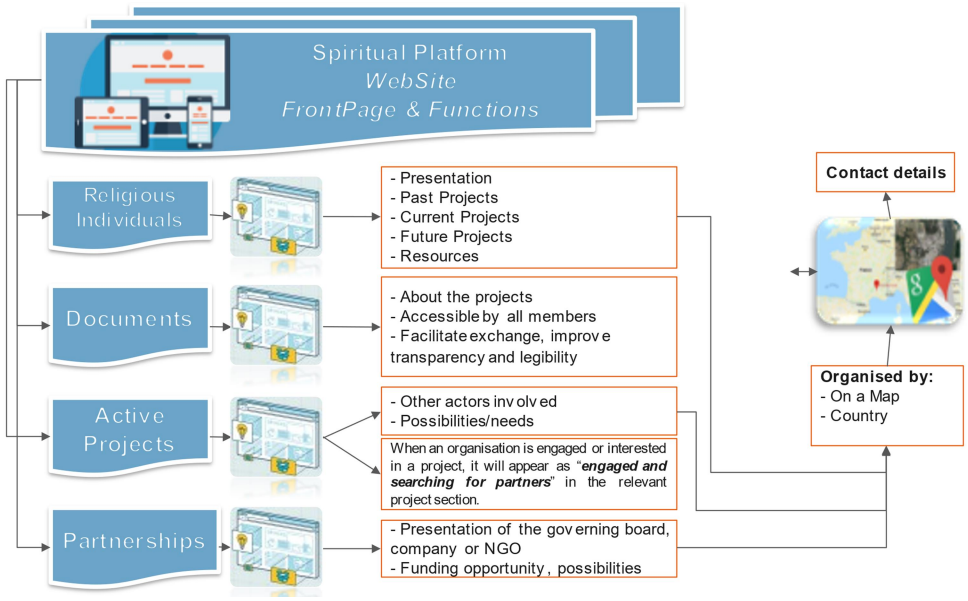

Fig 1 – Front page and functions

<table>
<tr><th>1.Religious Organizations</th><th>2. Documents</th><th>3. Active Projects</th></tr>
<tr><td>Organized by:
- Country
- On a Map</td><td rowspan="8">The platform will provide a space to upload documents - about the projects of the organization for instance -. They will be accessible by all members.

This will facilitate exchange and improve transparency and legibility.</td><td>Organized by:
- Country
- On a Map</td></tr>
<tr><td>Presentation of the individual or institution</td><td>Members involved</td></tr>
<tr><td>Past Projects</td><td>Possibilities/needs</td></tr>
<tr><td>Current Projects</td><td rowspan="4">When an organization is engaged or interested in a project, it will appear as “engaged and searching for partners” in the relevant project section</td></tr>
<tr><td>Future Projects</td></tr>
<tr><td>Resources and Co-Funding</td></tr>
<tr><td>Contact details</td></tr>
</table>

Fig 2 - Platform sections

2. Media portal

The media module will be the first module. This module was created as during the pandemic caused by the COVID-19 virus, there was an exponential increase in religious news in the online environment. Religious services were broadcast on social networks, often with technical problems. There has been a huge increase in fake news and misinformation, with many illegitimate users taking advantage of this forced migration into the online environment. This module will provide quality news, will collect all news from the Christian world and will ensure an increasing visibility of religious institutions in the virtual space. Below we will present the main functions of this module.

The proposed media portal and adjacent missionary materials aim to:

- collect all news from the Christian world;
- act as a mutual data base for spiritual and religious institutions;
- prevent fake news and religious fanatism;
- ensuring an increasing visibility of religious institutions in the virtual space;
- creating a young people friendly virtual space with easy access for religious and spiritual news;
- ensuring a pole of attitudes, messages with religious and spiritual themes in the virtual space for the legitimation, credibility and dissemination of official messages transmitted by spiritual training centers and religious institutions;
- providing a space for missionary expression for the Christian laity who wishes to take positions;
- providing a virtual missionary space dedicated to young people (sections dedicated to non-theological students) who do not know enough about the message of the Church and who do not have a direct Christian-Orthodox religious experience;
- ensuring a missionary space and dialogue between the public who want to find out more information about religious and spiritual life and able people to provide publishable answers but also religious, psychological and spiritual support;
- ensuring a space for archiving the missionary material necessary for the competent persons and the directly interested public (thematic posters, missionary leaflets-leaflets, sermon links, etc.).
- from a technical point of view, the module aims to represent a reference communication node for church communication in social networks;

3. Who will join the platform

- Religious organizations;
- Psychologists;
-Training centers;
- Mass-media organizations;
- NGO's;
- Government organizations;
- Companies and individual specialist who offers spiritual support;
- Universities;
- Learning centers;

4. Users and the Target group of the media portal

Within the media portal within the platform is defined the target group consisting of:
- young adolescents (12-17 years old) and young adults (18-35 years old) who are present on the internet and who find poor quality information in the existing spiritual and religious portals;

- young people (25-40 years old) active in multicultural and economic fields (corporations, travel, freelancers, entrepreneurs, activity at European level);
- believers who need good quality catechetical information;
- active users of social networks;
- public looking for information about a healthy lifestyle (ideas, culture, diet, lifestyle, way of thinking);
- public seeking cultural and spiritual information.
- specialized people in the psychological, religious and spiritual field.
- religious institutions.

5. Multi-annual plan:

The objectives set out below are part of the three-year plan (Years I-III), corresponding to:
- the initiation of the project;
- project launch (launch conference and mass promotion policies on social networks in the first 6-12 months);
- finalizing the editorial profile of the portal and the magazine,
- organizing and finalizing the editorial team and selecting and retaining collaborators.
- organizing and finalizing the technical team (technical editors, IT specialists, SEO manager),
- creation and dissemination of the online magazine, creation of the magazine brand;
- making, printing and distributing the yearbook, creating a positive reference point for the brand.
- initiating a radio media experience and capitalizing on it for the portal (web space).
- the integration of the media portals of the other partner, spiritual and religious organizations and the installation of software for the translation of news in Romanian and English.

The objectives set out below are part of the six-year plan (Years IV-VI), corresponding to:
- the development of a physical community of readers and followers, able to take over en masse attitudes expressed in the portal;
- the development of a large newsroom, to ensure the fluidity of the information posted on the portal, at national and international level (English, French, new Greek, Russian);

6. The team of the media portal

The project team will consist, in the debut phase: project director, IT specialist, editor-in-chief, column editors, editors, Web & SEO Manager, art director, graphic designer, audio editor and others collaborators.

It is possible to develop a wide collaboration with a team of volunteers, possible students, specialists in communication, advertising and press, who want to dedicate themselves to a missionary online media portal project. This team can be made up of volunteers who can take over the above tasks and an IT specialist, graphic coordinator, editor, technical editor, other collaborators.

7. Portal structure

The portal will be structured in sections, containing articles, teaching and catechetical materials, synthetic texts.

The thematically organized headings are:
People: Editorial (secular and clerical personalities, portal editorialists);
Points of view: Interviews;
Diaspora (editorial, comments, descriptions);
Words:
Book presentation (reviews, presentations);
Conferences;
Facts;
Campaigns;
Events (workshops, conferences, symposiums, workshops)
Social aid (missionary, social, humanitarian campaigns, how can you help?)
Thematic articles (presentations of social centers, missionaries, etc.)

Spirituality:
In the beginning was the Word (fragments from books considered holy. (Fragments from the Old and New Testaments, fragments from the Gospels)

Spiritual practices:
(missionary articles for each topic)

Culture:
Culture and sacred art
Music
Theater
Poetry and Christian literary art
Architecture

Life Style:
Deco: *The altar of the house (*thematic articles, richly illustrated for each field)
Family and children (kindergartens, cartoon file, coloring books, stickers, stickers, teaching materials for working with children)
Calm and rest (free time, holidays, pilgrimages)
Clothing fashions and trends
Gadgets (technology and / or tradition)
Addictions and healing

Biblical and modern cuisine (fasting recipes, sweet recipes, etc.)
Radio and video sections
The headings will be indexed thematically according to the widest possible SEO representation, because [the SEO process is described]

8. Editorial policy

The editorial policy of the portal will be summarized in the following principles:
- accessible vocabulary, non-dogmatical, non-specialized or theological;
- broad synonymous language to help the SEO process;
- short, concentrated articles, maximum 700 signs;
- comprehensive imaging, taken from: Database [name and description];
- photographic database of the project
- new photographic material;
- encouraging volunteering for the team and contributors (by creating a large team with many collaborators, so that the workload is accessible to a lay contributor employed in society on different levels or clergy);

9. Dissemination of social networks

Like any community, the projects need to turn to social media.
The establishment of a group and a Facebook community that would then generate a human capital to address the issues that really matter in the equation of the social moment is one of the objectives of the portal. Linking the topics on the site and adding comments will be the starting points of this approach.
SEO - Search engine optimization involves:
- site traffic optimization
- post management
- optimization of site indexing in search engines
- promoting the portal in Google Ads
- promoting the portal on Facebook and on other social media platforms;

Conclusion

Humanity went through the pandemic caused by the COVID-19 virus, that is still present globally today, but after this period, the virtual space is and will remain the main space for communication. Whether we refer to e-commerce, online banking, e-dating, online seminars, social networks, gaming, e-sports, the virtual space has become the *modern agora*, the most public and crowded space. The spiritual life slowly entered this virtual space. The conservatism of some religions, the misconceptions, the lack of the presence of religious leaders but also of some active religious influencers in the virtual environment, made the virtual space to be populated by few subjects from the spiritual life. On the other hand, the lack of spiritual institutions in the virtual space made the possibility for many illegitimate institutions and people to launch fake news and misinformation, without being able

to be combated. The leaders of the Catholic world, protestants from USA and oriental spiritual leaders were pioneers in the use of social media. On the other hand, leaders and influencers of the Orthodox religions have found it harder to use these networks. Even though monasteries with severe limitations and rules such as those on Mount Athos are active in the virtual space, the main leaders of the largest Orthodox Churches still do not have social media accounts and are not so visible in the virtual space. At religious institutional level, social media communication is still an incipient field. The pandemic caused by the COVID 19 virus has changed things a little, causing an increase in the use of these networks but also in the presence in the virtual space.

The news portal will allow ease access for religious news, will decrease the flow of fake news and religious fanatism and will allow transparency in projects established by religious institutions. This will allow large public, including younger users to have access to many religions and spirituals teachings.

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DIGITALIZATION OF ACCOUNTING - TRENDS AND PERSPECTIVES

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Abstract: *The business activity involves, through its nature, the production, collection and communication of different types of data and information. These are presented in various documents, which are largely generated by the accounting department. The production of documents may be the result of entrepreneurial needs, representing a valid support for a better management activity, or it may be expressly requested by law or even to meet the needs of other stakeholders. A very important feature of our age is certainly the accelerated evolution of the technological field, characterized by an avalanche of optimal solutions (computer programs) for economic activity. It is difficult to imagine areas such as accounting, marketing or other analysis and evaluation activities without digital tools. Due to the large flow of data, it is imperative to find effective solutions for data collection and analysis, so that they generate reliable and credible information to all economic factors. In this article, we aim to analyze the effects of digitization of accounting, mainly reflected on the quality of the data presented in the financial statements.*

Keywords: *digitization; innovation; accounting; ERP systems; financial situations*

JEL Classifications: M40.

I. Introduction

The market circumstances and its evolutions emphasize a control management that is always ready to adapt the business to the external needs of the company, orienting the company's management towards achieving the established economic objectives.

In fact, top management must have all the information and data at their disposal in a short time to measure every aspect of the company's performance. The accounting is the one that ensures the management of the enterprise and the other interested parties with financial-accounting information. Thanks to modern technological knowledge, it is now possible to obtain reports of various types,

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indispensable for the ordinary and strategic decisions of the modern entrepreneur, reconciling a significant reduction in costs with a drastic reduction in time.

Companies have realized that the full exploitation of IT investments is only possible provided that the skills needed to oversee new methods of operational management of costs and production flows as a whole are developed. And it is here that the accountant must intervene with his own professional skills: his training will be used to assist in the digitization of the tax function or in the outsourced management of compliance and ongoing activities by using the most advanced technological solutions.

Accountants are increasingly immersed in the logic of the market and in comparison with new competitors with reference to some types of services. Digitization has opened the door to new competitors in addition to those who naturally and historically preside over some activities typical of the accounting profession and which, in fact, are now perceived as real threats. Amazon, for example, has offered electronic invoicing services, some national and international companies offer services and applications that favor the disintermediation of the accountant. Of course, technology increases the transparency of information, but on the other hand it is undeniable that it facilitates the disintermediation of the accountant by clients and tax authorities.

If we measured the reactivity of the accounting profession based on the percentage of increase in investments in digital technologies, we could not fail to notice that these investments are mainly aimed at recovering internal efficiency and regulatory adaptation of the company's management systems. In other words, there is a complete lack of a real and deeper renewal of the technologies and services provided in the digital environment.

In reality, the key to understanding what is happening must go through the evaluation of two aspects: on the one hand, the speed of change that takes place, on the other hand, its intensity within the profession.

Information management and work organization remain in a traditional dimension, despite the fact that there is a more or less intense awareness of the ongoing change process. It is necessary to create the conditions for digitization and artificial intelligence to create real opportunities for accountants, but, above all, for the latter to take advantage of these opportunities. Today, the emphasis is more on the concern that automation replaces, in the near future, the professional in carrying out low value-added activities, rather than the strategic management of this phenomenon.

II. The impact of accountability digitalization

The process of continuous digitalization of the economy presents challenges and opportunities for accounting and for the professional accountant in general,

especially in the analysis of big data (Alles, 2015; Constantiou & Kallinikos, 2015; Syed, Gillela & Venugopal, 2013), artificial intelligence (AI) (Nowak, Lukowicz, & Horodecki, 2018) and blockchain technology (White, 2017). For accounting to work to the maximum benefit of companies, it must adapt to changes affecting modern business, and the professional accountant must be prepared to use digital technology. According to Botea (2018) "the accounting profession takes place in an area where 97% of activities are suitable for digitization, requiring adaptation to the new reality and reconfiguration of the accounting activity."

The evolution of information technologies must be analyzed in the light of the opportunities it offers to the professional accountant and at the same time it must be seen what is the contribution of information technologies in streamlining the work of accountants and managers in decision making. Accounting is the main source of information for managers and investors, and providing complex data on the financial situation of the company can be done only with the help of software that allows the analysis of big data. Basically, information technology reduces the working time for data collection and at the same time reduces some costs for the company.

Cuc and Almași (2016), mention that the evolution that takes place at the level of information technology influences in an alert and unprecedented way the activity carried out by professional accountants, including everything that involves the audit process that must adapt to the concepts increasingly complex. Another author, Stolojan (2016) is of the opinion that “the accounting profession has a future insofar as it will really respond to the challenges and opportunities generated by the digital revolution”. The accounting profession needs to adapt to the new challenges of digitizing the world's economies so that it can provide users with financial-accounting information, reliable and relevant information in the shortest possible time. The relevance and efficiency of the accounting profession will only increase if it makes a series of changes, converging towards digitalisation and innovation. (see Figure 1)

Digitization becomes a fundamental resource and a wealth of any organization, or rather of any field, if managed correctly. We have seen how the use of "new" technologies and, in particular, document management using IT technologies (e.g. electronic invoicing) has produced significant changes in the organization of work processes of professional firms. Digitization certainly causes fears and uncertainties; we realized that it is important to change the pace and move fast, but too often this confuses and leads to an attitude of waiting to understand how others will behave. The use of innovations in the accounting profession will increase operational efficiency, cost efficiency, control and information quality. These innovations will substantiate the decisions made by professionals, reducing errors (Botez & Melega, 2020).

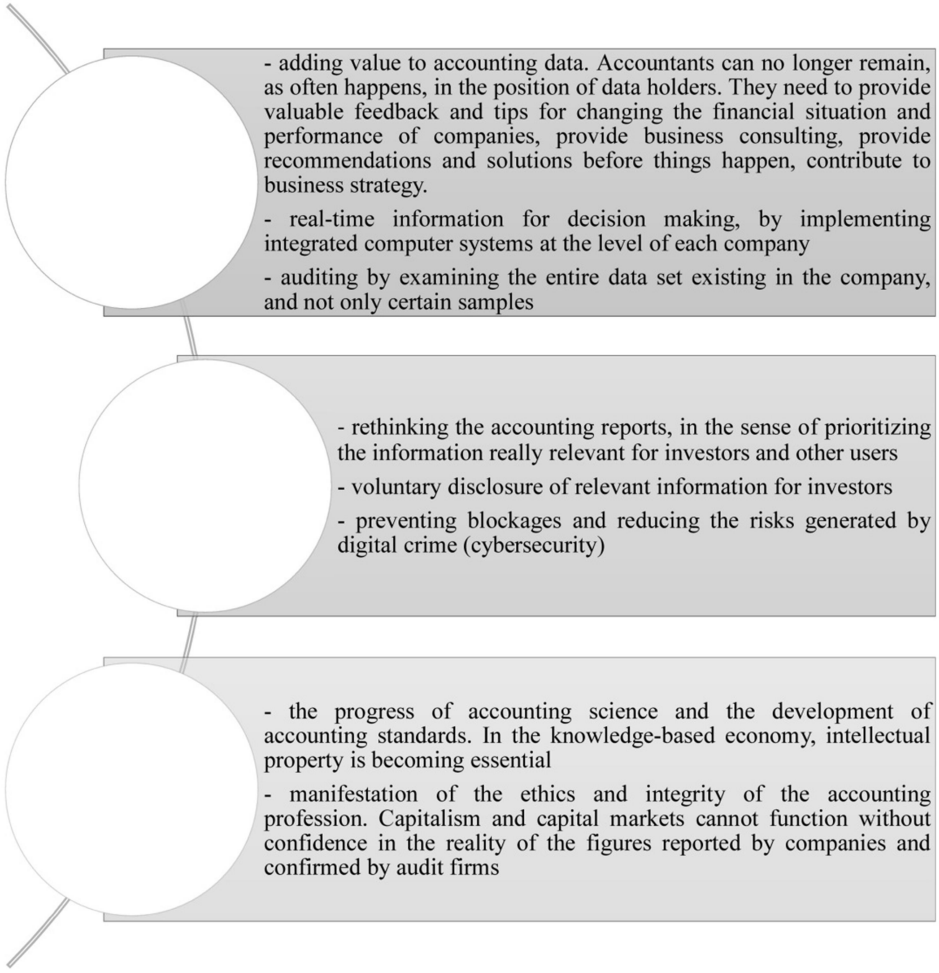

Figure 1. Adapting the accounting profession to the contemporary context
Source: developed by the author after CECCAR (2019)

New information technologies come with a number of advantages for the professional accountant and especially for the users of financial-accounting information (see Figure 2). For example, ERP (Enterprise Resource Planning) systems provide the accountant with effective tools for data analysis, providing an overview of all financial operations that take place in the enterprise. A very essential advantage offered by ERP systems is the streamlining of the accountant's work and the reduction of costs associated with accounting management.

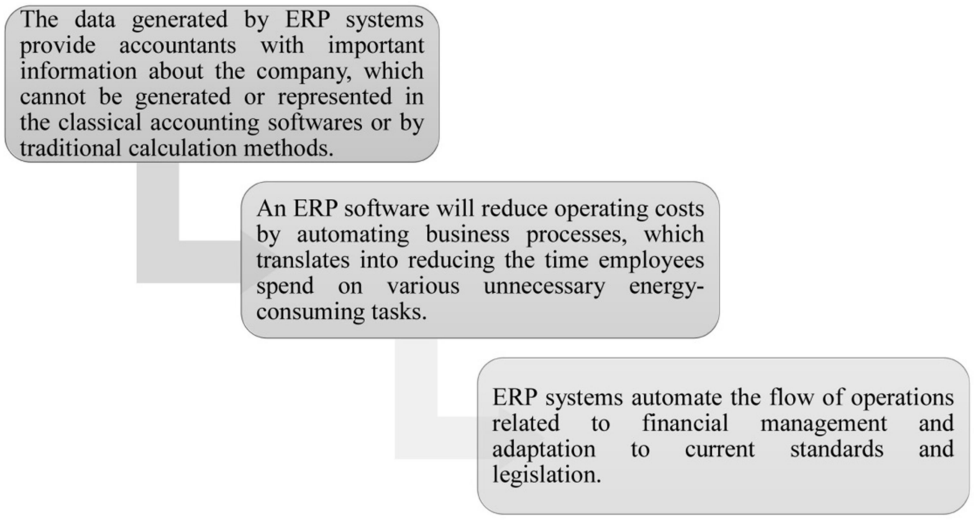

Figure 2. Advantages of ERP accounting systems
Source: elaborated by the author after: https://www.softone.ro/blog/?p=13523

Digitization of accounting is necessary to adapt it to the needs of the present. With the application of information technologies in accounting, it is imperative that the accountant has, in addition to accounting skills, also competencies in the field of new technologies. At the same time, the digitalization of accounting changes the purpose of the accountant in the person who registers and keeps records of the economic and financial operations of the enterprise in a financial consultant, who provides an interpretation of the data.

According to the opinions of several scientific researchers (Boomer, (2003); Prichi and Ionescu (2019); Ţugui and Gheorghe (2016)), "the technology considered for the future is Cloud Computing, while the digitized accounting information system is a Cloud Accounting type".

Accounting has evolved greatly, from a system of paper revenue and expenditure records to a general computer system embedded in the enterprise information system (see Table 1), which collects an enormous amount of data on the company's activities, analyzing them and giving information users a complex picture of the enterprise.

Table 1. Summary of the evolution of accounting processing techniques

Historical periods	Informing level	Technical possibilities	Accountability answer
Great civilizations	Knowledge of expenses and income	Paper, cuneiform writing	use of the simple entry
Beginnings of trade	Recording each movement of goods	Paper	The double entry emerges. The first accounting records appear.
Industrial Revolution	The importance of capital and knowing the benefits	Paper, emergence of printing	The double entry is perfected. Requests for information on financial results appear.
1960	More and more information is requested in less time	The first computers: more users at a single equipment	Automation of manual accounting systems
1981	Obtaining the financial information necessary to make decisions	Personal computers. Spreading informatics	Integrated accounting informational systems. Informing, reporting, charts
21st century	Real-time information. Electronical trade	Computer networks: Internet and communications technology	Automation of data collection. Electronic exchange of data and documents

Source: Radu (n.d.)

Information technologies give the data presented in the financial statements a greater credibility among users of financial-accounting information. Practically, by using ICT in the collection and elaboration of economic-financial documents, some risks of data omission are reduced, and the financial reports are more complex, offering an overview of the economic-financial situation of the enterprise.

Currently, most companies are investing in the purchase of software to facilitate the work of accountants, financial analysts and other participants in the business. To support businesses, the European Union has created a program of funds for digitization, offering grants of up to 100,000 euros for the acquisition and modernization of hardware, software, implementation and even training employees for using them.

III. Accounting informational system

According to the authors Palade and Tanasă (2016), the accounting information system "is generally a computerized system used to perform accounting tasks within a company". The information accounting system generates information in a timely manner for managers to make decisions, this being included in the information network of the enterprise (Ceran et al., 2016).

In other words, the accounting information system is a systemic set of basic data, processed accountably and statistically, which ensures the aggregation and decomposition of data, of various information. The accounting information system provides the company and users of financial-accounting information with support for:

- making appropriate investment decisions;
- risk management and rapid intervention in reducing them;
- determining and analyzing the results of the enterprise;
- preparation of financial statements and statements related to the activity of the company.

Naturally, in order to be able to achieve the above objectives, it is necessary to prepare not only a business and management plan that allows the coordination and transmission of all accounting information, but also an adequate control system.

Within an IT accounting system, there are several types of accounting that differ enormously both in terms of the objectives pursued and in terms of the methods used.

The first distinction that can be made is that between general and analytical or costs accounting; inventory accounting; personnel accounting; fixed assets accounting. The specific analysis of the types of accounting existing in the enterprise is a necessary condition to be able to understand both the needs and the ways of their integration in the accounting information system. For this purpose, the general accounts will be illustrated first, and among the special accounts, given the importance and scope of the information provided, the analytical accounting.

The informational accounting system consists of several components, which ensure its functionality, such as: hardware, software, communication, scientific and methodological basis, information base, users and organizational framework.

Components of the accounting information system:

- The hardware component consists of all the technical means of collecting, storing, transmitting and automatic processing of the data.
- The software component consists of all the programs and applications that perform the operation of the information system.

- The communication component consists of all the equipment and technologies used for data communication between the component parts of the computer system.
- The scientific and methodological basis consists of mathematical models of accounting processes, "methodologies, methods and techniques for creating information systems".
- The informational base consists of the totality of the informational flows and of the data to be processed.
- Users are the component consisting of all persons employed in the operation of the information system.
- The organizational framework is given by the internal regulations and by the legislative acts.

Source: elaborated by authors after Vasilescu (2008)

A very essential aspect of accounting information systems is the possibility of processing both financial and non-financial information. Accounting information systems can be adapted to the needs of companies, being practically a flexible system. The new information technologies reshape the activity of the accountant and of the entire economic-financial department.

The role of the accounting information system is the collection, processing and analysis of data, which are then transposed into the financial statements of the company. The financial statements are the main set of documents, which present the statement of the financial position and performance of the company. Most importantly, the accounting information system must generate relevant, intelligible, credible and comparable accounting information in the financial statements. Therefore, the accounting information system must be constantly updated with the legislation in force and with the new accounting standards.

IV. Conclusions

Digitization of accounting and its integration into the information system of the company is a need of the era in which we live. The information system comes to improve the company's performance, increasing its competitiveness and turning accounting into the art that "ensures the success" of the company. A very important aspect of the digitalization of accounting is the transposition of combative data into a unique information system, connected to reality.

The accounting information system contributes to the creation of organizational models aimed at creating value and meeting the needs of senior strategic management, mid-level managers and operational staff. At the same time, it should not be confused with the computer system, which is its material component, i.e. the set of hardware and software needed to collect and reprocess information.

This paper received financial support through the project entitled DECIDE - Development through entrepreneurial education and innovative doctoral and postdoctoral research, project code POCU / 380/6/13/125031, project co-financed from the European Social Fund through the Operational Program Human Capital 2014 – 2020.

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SILENCE AND BREAKS IN SPEECH IN THE ONLINE TEACHING OF FOREIGN LANGUAGES IN HIGHER EDUCATION

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Abstract: *The paper analyzes an aspect of online teaching of foreign languages to students pertaining to paralanguage, namely the use of silence and breaks in speech in the academic class activity. The study consists in two main parts, the first introducing the various contexts in which breaks in speech ensue, discussing the nature of these moments of silence and some of their characteristics along with their perception and management by both teacher and students. The second part of the paper looks at a short survey made up of two questions, which reveal relevant aspects regarding the students' perception of these breaks in speech, how it relates to their level of English and how it makes them feel, i.e. the reactions that it triggers and what these rely on. The quantitative method was mainly used for the survey, but there is a qualitative component as well, in the students' provision of details as to the cause of the main reactions triggered in them by the occurrence of long(er) instances of silence, so in the second part of the second question. The conclusions point out that silence and breaks in speech are relevant paralinguistic elements in online didactic communication.*

Keywords: *online teaching, higher education, paralanguage, breaks in speech, survey*

1. Introduction

The times of online teaching, prolonged and furthered as a result of the special context of the pandemic, have brought about changes not only in teacher-student interaction *per se*, but in our awareness as people engaged in processes of communication, in terms of the *how* of communication in general, *helping us realize aspects and facets previously unknown or deemed as unimportant*. Together with awareness regarding these, there came a tendency to perfect this imperfect communication that happens online – and we call it like this because it deprives us of a lot of elements that used to be available contextually unconditionally, such as unmediated access to the non-verbal component – determining us, willy-nilly, to, ultimately, without meaning to lack modesty, get good at it despite its disadvantages.

The things that we noticed at some point in our online interactions have become as many areas that demanded solutions, innovation, novelty, development – all of

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which urged brainstorming or just a push of intuition that ultimately turned out to give plus value to the way in which we ended up communicating. Some of the skills came along as we went in the process, as no course can really teach online empathy, which is essential – "empathy and sympathy are essential elements of an effective online learning environment in this pandemic" [1] – the creation of momentum or presence, or capturing the audience and putting everyone on the same metaphorical or virtual page – and here we do not mean the online application list of attendants.

The visual component needed not be missing from the regular online classes that we have held, at least theoretically, but it actually has been, by choice, most of the times, for the sake of the smooth running of the application (as pointed elsewhere). Hence, *the voice became paramount*, and suddenly it was not enough to envisage it merely as a support tool for the visual. *All aspects related to it increased their relevance and importance, and required more awareness and control*.

One of them was, for instance, diction. Pronouncing the words clearly and up until the very last phoneme became significant. Otherwise, the last syllable may not be heard in the virtual environment. *The electronic medium modifies the way one sounds. Recorded voice sounds even more different from what the person hears in one's head*. Sometimes, the difference is significant enough to be shocking to the individual, and there have been countless studies showing that occasionally one does not even recognize one's own recorded voice. Even if one does, the difference may create shock or even trauma, a feeling of profound dissatisfaction with how one sounds: "not liking the sound of your own voice is so common that there's a term for it: voice confrontation" [2]. This dissimilarity comes mainly from the anatomy of the skull as a resonance case, the pitch is higher when unmediated by the low frequencies created inside the bone structure of the head – i.e. the "'Mickey Mouse' quality" of the voice [3]. Even when trauma or shock is not exactly what the person witnessing his/her own voice on a recording is what (s)he is going through, some amount of surprise may be there, most of the times: "because our recorded voice does not sound how we expect it to, we don't like it" [4]. Individuals hearing themselves in such instances have the opportunity of correcting the features that they are not happy with or which create discontent, visible in what is known as the "extra-linguistic cues" present in a recorded voice, which "include aspects such as your anxiety level, indecision, sadness, anger, and so on" [5]. *The online events pertaining to higher education, such as taking a test or participating in a students' session of communications created the unique opportunity for all participants to see and hear themselves, to witness how they look and sound like while recorded*. Had the pandemic not produced this kind of context, they may never have had the opportunity to access this type of mirror in their regular existences, or not repeatedly, as it was the case in the academic online environment. Thus, this situation has fostered the perfect occasion for self-

improvement. Seeing and hearing oneself gave the individual the chance to ameliorate the aspects that one was dissatisfied – or not completely satisfied – with.

In reference to one's voice, almost all its qualities and characteristics can be adjusted or worked with. Leaving out the timber, which is innate, the rest – volume, pitch, the placement of the voice while speaking (in the palate, the throat, the chest, which modify gravity), and pace can be consciously influenced. One enjoys, due to the online teaching and learning programs, to attune and tailor one's voice to better suit one's intended message, personality and eventually identity.

Silence and breaks in speech are a voice element that may seem inconsequential at first, or at least less significant. However, with experience coming with more hours of online teaching, its importance gets revealed. In what follows, this is the element that we shall look into, trying to analyze its relevance in context and get into the matter more thoroughly. The analysis below consists, in its first part, in some comments on aspects that I have come up with as a result of personal observation in the process of online teaching. The second taps into the perspective of some of the students, and is based on questionnaires that I have asked them to complete from my role as their class seminar tutor. I used two groups of 2nd year students as my main focus for the inquiry, but the observations in the first part are based on a wider and more general student audience. The students in one group have an intermediate level of English, while the others are advanced. For this second part of the study, the fact that they have different levels becomes relevant, as we shall see.

2. Situations that involve silence and breaks in speech in online teaching

In this first part of the paper, I will make evident some situations that involve silence and breaks in speech and try to differentiate between them and perhaps even classify this absence of sound according to the respective situation. What needs to be mentioned here is that we shall not be looking into the kind of context in which the person is silent because they are not actually in front of the computer while appearing online. Also, we shall be discussing the contexts that involve intentional breaks made by the teacher, as it is the teacher's vantage point that we have in mind at this point – as opposed to the second section, where the students' perspective is mainly outlined.

2.1 The teacher's explanations

One circumstance involves the actual *teaching of new aspects, theoretical revisions, or explanations provided by the teacher*, when the students are meant to mainly listen, try to take in what is being said or presented, as well as write down the explanations, which means that the pace of talking should be slower, especially for the aspects that the teacher considers to be important. Hence, with this awareness in mind, I make short breaks after certain concepts, phrases or sentence bits in order to give them a chance to note what I am saying. Co-presence and

access to the non-verbal would provide the necessary feedback to pace my speech according to the needs of the student audience, but, in its absence, I use these *short breaks which I call estimative breaks*, i.e. pauses that I make based on an estimation of the time needed to them to write down the information. It is worth mentioning that the estimation comes with a certain anxiety caused by the obvious awareness that it cannot be as exact or accurate as it would have been in co-presence and availability of the non-verbal component. To compensate for this absence, I sometimes resort to eliciting auditory confirmation of the fact that the students have understood and had time to put down the respective data. Another observation here would be that such questions may represent disturbances of the normal flow of information and actually disrupt attention and thus somewhat defeat their very purpose of ensuring comprehension from the part of the students, which represents a disadvantage. Plus, they can be annoying. I must admit that I have also always used my memory of the students' level and personalities, in case there was such knowledge available from pre-pandemic face-to-face interaction, in order to establish just how long these short breaks needed to be. However, since such information was not always there, a certain uniformity of the breaks ensued, which did not take into account the students' personality and even, sometimes, level of English, which would obviously have had a say in deciding how long these short breaks needed to be. In principle, advanced level groups would need less time, although how well one takes notes is also about the actual speed of writing, not only about how much English one knows. Also, I could add that, overall, the breaks tended to be, on average, longer than the ones I would have made in a face-to-face context, just to cover for potential estimation errors, and to grant extra time in case it was needed rather than less, i.e. not enough, time. It can be argued that this may generally make the class less productive than if it had taken place in co-presence, face-to-face, but the difference is perhaps not that significant or worrisome.

2.2. Breaks related to solving tasks

Tasks soliciting students to apply or learn specific vocabulary through match, fill in or multiple choice exercises, as well as reading comprehension exercises based on the scanning and skimming of a (previously-read) text sometimes require, to begin with, a time given to the students to solve the exercise at their own pace, so that all of them get a chance to have a go to give their input in class even though their rhythms of work may differ. This initial individual work time was usually around five minutes. We are not considering here the investigation of this interval, as it is not relevant for our research. Once this time is over, then *students take turns to answer*, one by one, so that, ideally, most or all of them participate in giving their contribution for the respective activity. Theoretically, students offer to answer, rather than the teacher naming them, but in some cases this approach is also resorted to, especially if the students are less (pro)active, with those students who are less willing to participate, or to avoid some very active students monopolizing the seminar. One student may be indicated to give one or two answers, and then

another is invited to do the same. *There is, naturally, a short break between students*, and it is this break that is relevant for us here. Normally students know what they have to do or what is expected of them and either raise hands or start talking directly or ask whether they can be next, depending on the case and on the instructions given by the teacher. I sometimes encourage them to give up using the "raise hand" option in order to save time, if the pace is the right one. In other cases, namely if the number of the students is greater – for instance, over twenty – and they overlap in taking the floor – then the available option mentioned above is necessary to order interaction and the taking of turns. The interesting aspect is how long this short break between people actually is.

The *normal duration* for it would be, when we refer to the kind of exercises mentioned above, *between one and three seconds*, most often one or two. This interval tends to be bigger with 1st year groups in the first few seminars until they get accustomed to this type of interaction and recognize it when it is elicited from them (as there are, of course, other kinds of tasks and interactions as well, since seminar activity, when it comes to the teaching and learning of foreign languages, relies on various manners of communication). The interval also tends to be shorter with senior-year groups, who have already worked in this specific way countless times.

When students disrupt this flow of alternate talking and short breaks, the teacher must investigate why this occurs. It can be just a minor disruption with no apparent reason behind it. In this case, a formal encouragement from the teacher to move on to the next item suffices. The class manager/teacher could say something like: 'Come on, who wants to go next?', 'Who's next?', 'Who would like to continue?' or remind the students the number of the item that follows. This is usually enough to restart the flow of alternative inputs and short silences.

This flow may also get interrupted due to the difficulty of some item that requires a solution. In other words, students may stop because they have not managed to find an answer for it. The teacher can usually sense these situations based on knowledge of the material and of the group level of English etc. In this case, the teacher should try to give extra clues, rather than provide the answer.

2.3 Long(er) breaks in speaking activities – lead-in tasks and debates

One other type of activity in the teaching of foreign languages is speaking, and it can take various forms. For instance, it can be organized as a debate, in which students discuss a certain aspect or point of view providing arguments for and against the respective matter. Also, it can take the form of questions that the students need to answer, either by giving examples or bringing arguments to support their claims. Also, starting from a quote, they may need to explain the statement in their own words, in which case paraphrasing and synonymy are needed.

In the case of speaking activities, I either allow the students to read the requirement – the question, quote etc., or I read it myself, also sometimes explaining further what is expected of them. After the requirement is read aloud, a break ensues, to give them time to think of an answer or comment. In comparison with the breaks discussed above, this one is longer, because it is of a different nature. Unlike the breaks above, for the length of which the estimation is more facile, this break is to allow the students to think of arguments. For the previously discussed short breaks it is easier to guess how much time it is needed, as they are more of a quantifiable nature, so to speak; it is not so difficult to determine how long a person needs to write down a string of words, or to allow a little room for the previous person to finish speaking before they speak themselves so as not to seem that one interrupts. The first type of short breaks, the estimative ones, are reasonably measurable by imagining and taking into account an average speed of writing, whereas the second type involves common sense and politeness in speaking interactions which are more or less intuitive as well as basic common knowledge. With this third type, of longer breaks, however, it is impossible to predict the time needed to – basically – get an idea, or be inspired. There are so many variables involved in this process that it is not one that can be measured, *if* it were possible to measure it. Some of these may be argued to be the following: the students' overall IQ, the group members' extrovert-introvert type of personality, willingness to cooperate, active-passive general attitude, how well-rested the students are and thus prone to get ideas, general knowledge or/and knowledge about a certain topic, level of attention and English etc.

If the break becomes too long, the teacher may assume that the students have not understood exactly what the task is about or that they simply do not have any ideas, rather than presume unwillingness to get involved in feedback. Hence, the teacher should or could try to paraphrase and explain the task with other words, as well as attempt to provide hints to press certain buttons in the students' minds in order to stimulate the thinking process. Also, if this does not work, the teacher may think of asking other, simpler questions related to a certain aspect which, once elucidated, leads to a deduction that is connected with the main topic of the task. In other words, the teacher, acting as a fosterer, may try to lead the students towards partial conclusions before the main one is reached. Through inference, or a set of corollaries and implications, the main idea can be arrived at.

We shall now draw some conclusions based on what we have said so far. We can say that breaks are necessary in online interaction. Besides the rationale related to politeness and the taking of turns and thus efficiency in conversation mentioned above, short breaks are needed for people to get the impression that their message is received, understood and acknowledged. In this respect, *short breaks appear to be the equivalents of regulators in non-verbal communication*. Regulators are those gestures and expressions that ensure the taking of turns and show the fact that the message is being received by the person one has a conversation with [6], [7]. They

control the flow of the conversation, having a reassurance quality, letting the interlocutor know that the communication process is collaborative and runs two-way. However, the break should be short enough, and then followed by *a reply that takes into account the initial message, containing feedback, relaying to the other's words*. This response that contains a bit of the initial message or something that connects with it should be done especially when the video component is missing in online interaction, to compensate precisely for this absence of the visual which, in face-to-face interaction allows one to let the other know, through regulators, that the message is being taken in. Once the visual ingredient is gone, the verbal has to take over this relaying function. That is why the verbal and the paralanguage need to be carefully composed by the actor involved in the process of communication. This is even more important when a teacher is involved, as a teacher fulfils the roles of expert and/or facilitator, and is thus not only supposed to give feedback, but her/his feedback is deemed as essential. All the more, the teacher needs to pay attention to the way in which his verbal and paralinguistic messages are composed and make sure that this feedback component is present enough in them. Once the teacher is able to capture it in her/his speech, trust is established with the student that is involved in the speaking task, as a type of glue of the communication act, which will function as an encouragement for further involvement in the discussion. Hence, the presence of this feedback in the verbal and paralinguistic elements in satisfactory quantity, as it were, is a pre-condition and fuel for further interaction.

We need to also explain how this proof that the teacher listens and understands can be present in the teacher's paralanguage. The tone of voice needs to be more reassuring than it is in co-present interactions, when the non-verbal component is available. The student needs to sense from the teacher's voice that what (s)he says is accepted and understood. Also, the teacher's tone needs to be calm at all times, as well as kind, and the pace should not be rushed, so as to transmit the notion of acceptance and allowance of expression of self. This may sound strange, but I have personally tested this aspect in the online interaction when the visual component was absent and I can say that a rushed tone determines most often a retreat from conversation from the part of the student(s). They already feel, when they start giving their input, that they need to overcome the linguistic barrier – even the ones with a good command of English – as well as feel somehow exposed when they provide for the group and teacher personal views on something. If they feel judged in any way, even in the slightest manner, most of them will shut in – out of shyness, rebellion or boredom in the context in which they feel that they should no longer make the effort of talking, especially in a foreign language, once they are not understood. A normal or even combative tone in face-to-face conversations seems less aggressive than in an online one, because the presence of the visual somehow diminishes the so-called threat coming from the interlocutor. In the online environment, this absence of the visual image of your partner in the discussion comes with a sort of threat or danger that the person/student perceives as occurring in context, which exacerbates perception of the faintest rejection reaction in tone or

in the verbal feedback. Analyzing silence in various contexts as meaningful, Poyatos gives an interesting explanation that seems to be rooted in archetypal, psychoanalytical causes: "just as we perceive light and sound as activities, as something alive, darkness and silence evoke for us the emptiness of what is dead or, at most, asleep and inactive, as if life had been arrested" and "negative feelings seem to dominate over the positive ones in such situations" [8]. In Poyatos' view, silence finds a much deeper and instinctive association with our greatest fears, namely extinction and loneliness. That is why, in online verbal interaction deprived of the visual, what seems an exaggeratedly benevolent tone may be necessary and ensures the success of the respective communication.

Also, *interruptions are not a good idea in online communication*. They create the opposite effect of what I have mentioned in the paragraph above as positive outcomes of short breaks. Interruptions are perceived as more aggressive than in face-to-face interactions. Also, we can add that the nature of the online environment, more precisely the sound quality and/or slight delay in the sound transmission causes more annoyance and exacerbates the impression that the other is not listening or does not understand what one is saying, thus functioning as a barrier in communication.

Nevertheless, a longer or too long break can cause anxiety. It may make the sender of the message think that something has happened to the connection, or that the other person is not listening anymore, or trigger the feelings that Poyatos mentions. The teacher needs to prevent silence from becoming "*oppressive*" [9] or cause "solitude and isolation" [10]. Also, (s)he has to correctly manage the "*filled*" or "interactive pauses" [11]. The conclusion that ensues is that breaks are both crucial, on the one hand, and need to be calculated or measured, along with tone and pace in online conversations, as we have already mentioned, on the other. Some of these observations that I have been making here derive from both personal experience, what I have noticed during my classes online, and an inquiry that I conducted to verify and support my assumptions, which constitutes the focus of the second part of this research paper and which we shall look into below.

3. Inquiry into the effects of silence and breaks in speech

I used for the quiz two groups of 2nd-year students, i.e. more senior students, avoiding 1st-year ones, as I did not want aspects such as being unaccustomed to the manner of work in the foreign language seminar or in the online environment in general, or the novelty of the academic environment overall to be factored in in this research. Also, the first group, which we shall call Group 1, was made up of intermediate students, out of whom 10 were present online in the seminar at the time of the inquiry, whereas the second, Group 2, consisted of advanced-level students, and 12 of them were attending when I addressed the questions. I had made this choice of different levels to see whether there was a difference in student

perception of silence and breaks in speech depending on the students' level of English.

3.1 Question 1

The first question asked to the two groups was:

Q1) "Do you perceive as undesirable/something to be avoided: a) silence and short breaks in speech; b) silence and long(er) breaks in speech; c) neither; d) silence and both short breaks and long(er) breaks in speech?"

I introduced the third option, c), in order to allow for a negative answer, starting from the assumption that, even though I had definitely noticed this lack of comfort in the situation of breaks and silence in various contexts, I should not have automatically eliminated the possibility of denial for them as far as the discomfort of silence and breaks in speech was concerned. The results are synthesized in Table 1 and Charts 1, 2 and 3 below.

Table 1. Results concerning students' perception of silence and breaks as undesirable in online communication (Q1) per groups

	a) short breaks	b) long(er) breaks	c) neither	d) both
Group 1 (intermediate)	0	3	0	7
Group 2 (advanced)	0	10	2	0

Chart 1. Group 1 – Students' perception of silence and breaks as undesirable

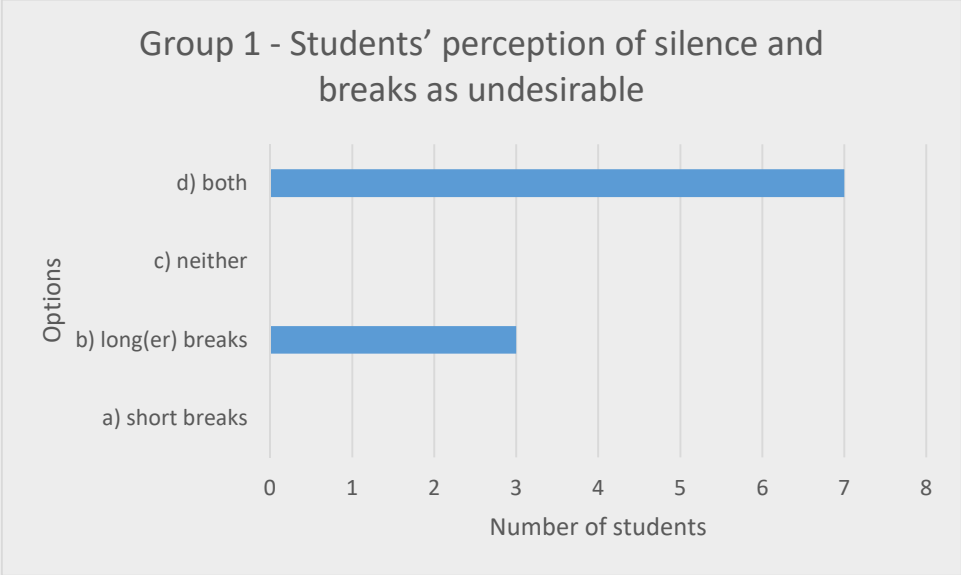


Chart 2. Group 2 – Students' perception of silence and breaks as undesirable

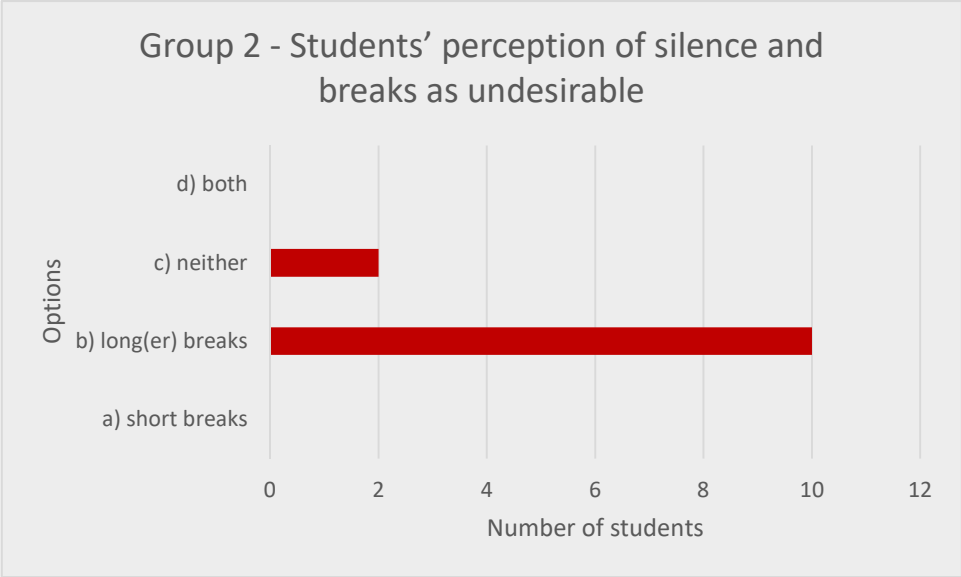
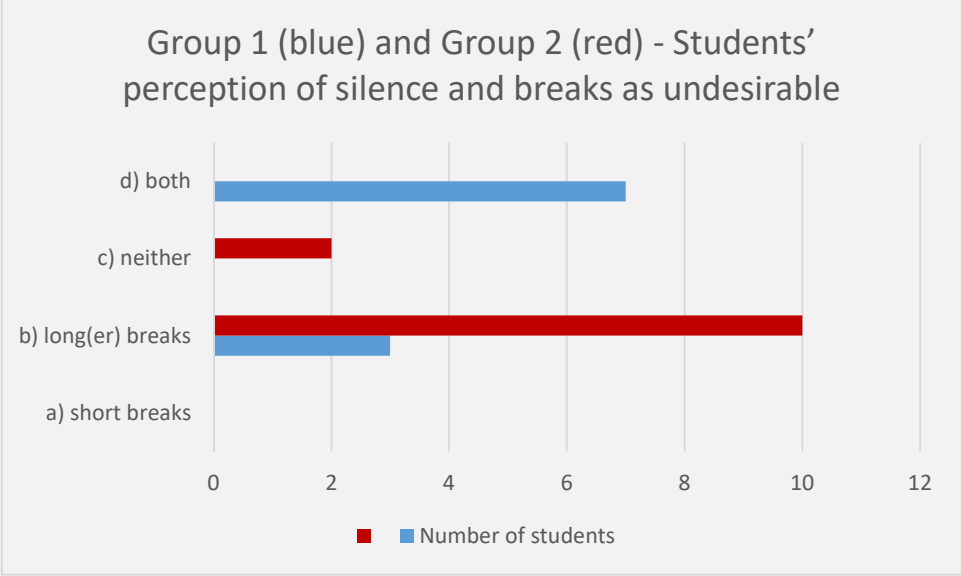


Chart 3. Group 1 (blue) and Group 2 (red) – Students' perception of silence and breaks as undesirable



In Group 1, no student gave the answer "c) neither", which means that all students perceive breaks as undesirable, most of them not differentiating between longer and short breaks, in the sense that even short breaks are to be avoided. That is why

7 students out of 10, meaning 70%, said that both types of breaks in speech are unwanted in online communication. Even the boldest ones in terms of uncomfortableness when it comes to breaks in speech, i.e. 3 of the students, are still disturbed by longer silence.

In Group 2, of advanced students, nobody seems to mind short breaks in speech, but 10 out of 12 students dislike longer breaks. Also, there is representativeness when it comes to option c), 2 students daring to claim that they are not bothered by any kind of silence, tolerating both short and longer pauses in speech.

If we compare and interpret the results, we can say that the *intermediate students, the ones in the first group, are more intolerant to breaks in speech than the advanced ones* in the second group. Also, we could say that Group 1 tends towards the extreme or pole of zero-tolerance for silence during online didactic activities, while Group 2 has a penchant for the other pole, of maximum tolerance for silence, or comfortableness with it, although we can witness that the tendency towards a radical attitude is more marked in the case of Group 1, i.e. students would overall rather have low tolerance for silence than not mind it. We can perhaps pair this with more self-assuredness manifested in terms of linguistic ability by students in Group 2, which would trigger coping with the stress of not receiving immediate feedback from the teacher better. Advanced students seem to do well on their own for a while, manifesting heightened psychological comfort and less distress. For the others, nevertheless, poorer command of English couples with the need to belong, to feel that they are in company, attended or catered for. Advanced students are more self-reliant and panic less while left to themselves and/or in uncertain situations, whereas the others need more guidance, and need it in an ongoing manner. If we were to analyze students' reactions through a cultural lens, at the micro level of this situation, we could say that advanced ones are more uncertainty tolerant than the others, whose *level of uncertainty avoidance* is high [12], if we realize that absence (through silence) means uncertainty.

The only answer that was not picked by students in either group is "a) silence and short breaks in speech". This means that all students see or unconsciously sense the need for and usefulness of breaks. This further points out the paralinguistic value of breaks in speech, and their meaningfulness.

3.2 Question 2

Question 2 of the inquiry bore on the causes of the discomfort provoked by long(er) silence and breaks in speech, enumerating a few potential sources for it:

Q2) "How do silence and longer breaks in speech make you feel?

a) uncomfortable; b) irritated; c) nothing

Describe in more detail after choosing the answer."

What I wanted to illustrate initially, in the first part of the question, by asking students to tick one option, were two broad categories, which reflect whether aggression and apprehension were directed, in the respondents' case, inwardly, as mirrored by the first answer, or outwardly, as in the second. The third answer needed to be used to cover for the possibility of students being indifferent to breaks in speech.

The answers could then be outlined more or further, i.e. the descriptions becoming more accurate, reflecting what exactly the respondents feel in detail. Hence, the students were required to explain their choice as well. Irritation, for instance, may be fueled by various things, and it is relevant which these are. Here, the qualitative aspect of the survey comes into the picture, as the previous answers relied on quantitative aspects.

Table 2. Results detailing students' reaction to the unpleasantness of silence and long(er) breaks (as: a) uncomfortable; b) irritated; c) nothing) (Q2), per groups

	a) uncomfortable	b) irritated	c) nothing
Group 1 (intermediate)	8	2	0
Group 2 (advanced)	1	9	2

Chart 4. Results detailing students' reaction to the unpleasantness of silence and long(er) breaks (as: a) uncomfortable; b) irritated; c) nothing) (Q2) – Group 1

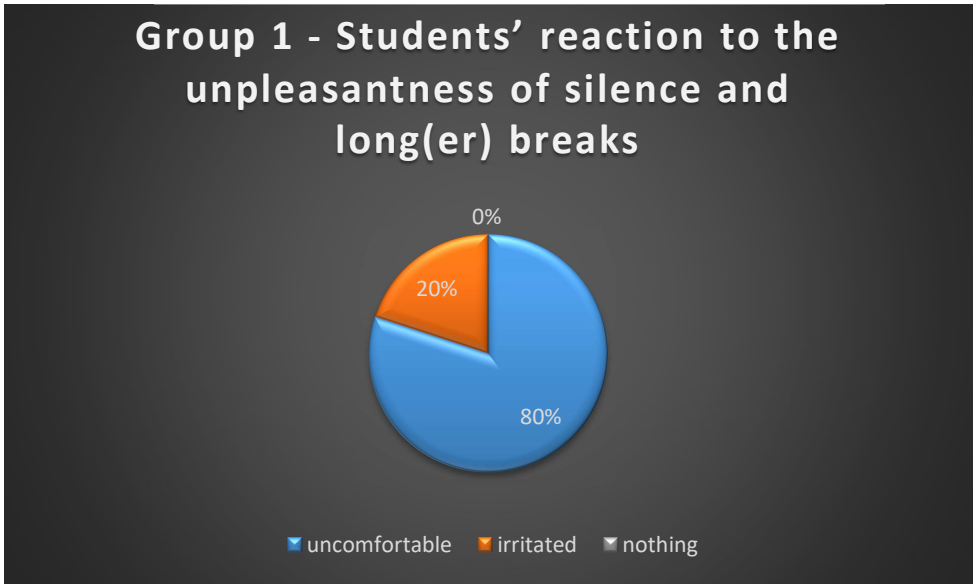
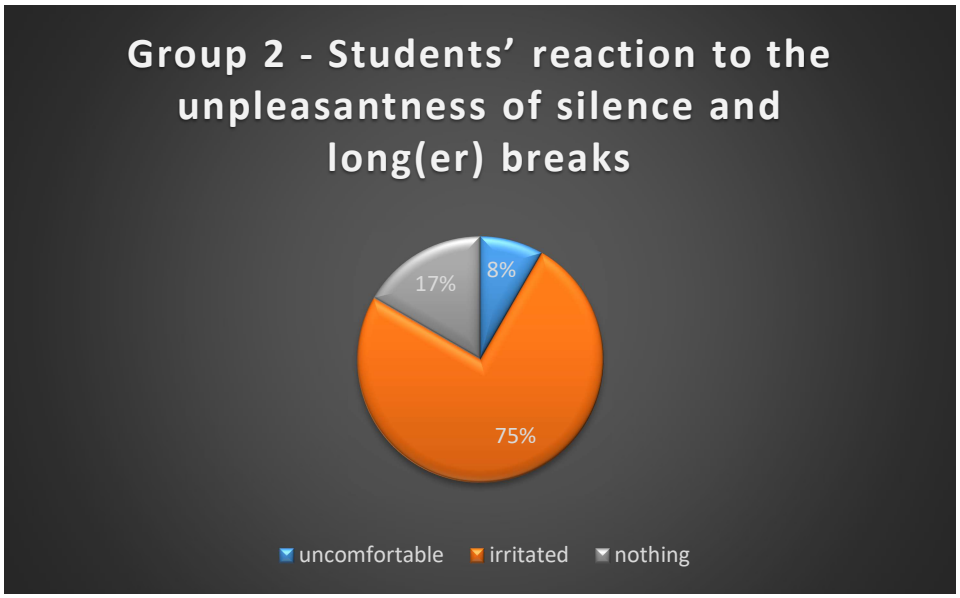


Chart 5. Results detailing students' reaction to the unpleasantness of silence and long(er) breaks (as: a) uncomfortable; b) irritated; c) nothing) (Q2) – Group 2



The immediately noticeable aspect is the way the two groups' majority of students reflect the two main reactions introduced as answer options in opposition. The *intermediate students feel uncomfortable* in a proportion of 80%, and none of them feels indifferent towards long(er) breaks, *whereas most of the advanced ones, 75%, feel irritated* by long(er) intervals of silence, a small percentage showing indifference to it. The greatest percentages in both cases – more than three quarters of the participants – are dedicated to the two contrasting features provided as options. Let us explain further *a hidden layer of contrast in the nature of the answers, which makes them not merely different, but opposite from that point of view*. We could say that for Group 1 the reaction caused by silence is self-scrutiny or inwardly directed aggression, whereas for Group 2 there is an outwardly directed aggression. While students in the first group feel put on the spot, inadequate, apprehensive, the others are on a bolder mode, of looking for an answer for the why of the situation, of placing some kind of blame on something or someone other than themselves. It is, in a simplified interpretation, *a difference between flight mode, for Group 1, and fight mode for Group 2*. We can assert this based on the qualitative, detailed answers or additional explanations provided by the students.

Uncomfortableness was described by members of Group 1 as caused by: feeling uneasy about the answers they could give and about the actual possibility of being nominated directly by the teacher because of a fear of being ridiculous or ridiculed

by the colleagues and/or due to incapacity to express themselves in English very well; desire not to be mocked at; feeling that they may misunderstand the requirement caused by not having enough English. Irritation came from feeling inadequate for not knowing English well. We notice that irritation is also directed inwards under the form of a certain aggressiveness to the self.

In Group 2, irritation came from: blaming colleagues for not offering to answer (or even the teacher for not naming someone, instead of waiting for the students to have the initiative) for time being wasted; wondering whether the application is not malfunctioning or the connection dropping; getting bored because nothing is happening, or because of the pace at which things are occurring; not being allowed to answer because they have already given their input and the teacher wants to make room for others to speak as well. Uncomfortableness came from having to share personal opinions and sometimes feeling awkward in doing so. Feeling "nothing" is actually assuming that glitches or pauses are unavoidable in, and part of online interaction, and taking this for granted without attaching any emotion to it. Students in this group, we notice, tend to direct a certain amount of aggressiveness, or responsibility – to put things in a milder form – to something outside themselves.

Overall, we realize that the intermediate students in Group 1 scrutinize themselves out of a fear of inadequacy that goes hand in hand with their lower level of English. A better level of the foreign language, on the other hand, determines students in Group 2 to scrutinize others or something exterior to themselves and look for accountability elsewhere than in their own person. They feel self-assured and secure, unlike the students in Group 1. Thus, for them silence and breaks may also be unpleasant, but cause a different type of unpleasantness, which does not go hand in hand with questioning oneself or fear, as it happens with intermediate students. Students in Group 2 could be said to "own" their breaks better because of the superior confidence that they possess in terms of language skills.

4. Conclusions

The paper starts from the opportunity that didactic activities in the online environment provide to the actors engaged in them to observe additional facets of communication and see some elements that would otherwise go unnoticed in normal face-to-face interaction. Our focus has been here the voice and voice-related aspects. The background discussed in the Introduction sees online interaction as both an impaired one and a rare chance to detect and address various minute issues intervening in the process of communication. It thus reveals and starts from the assumption of this kind of interaction being a blessing in disguise and supports it with the example of voice confrontation, which serves well the smooth passage towards the main focus of the paper, namely the voice-specific aspects of silence and breaks in speech.

There are two main parts in this study. The first is dedicated to observations made in the online interaction by the teacher, and a classification and characterization of silence and breaks in speech. The second is a short survey portraying the students' perception on the issue under analysis. This latter part also relates some of the findings with the students' level of foreign language knowledge. The two questions of the inquiry prove that long(er) breaks seem more threatening, and rely mainly on a quantitative analysis, but also include a qualitative, descriptive component that further reveals the exact feelings fueling a certain reaction. As a general conclusion, we may say that silence is more and differently weighty in online interactions that lack a visual image of the interlocutor, involving more anxiety, and that it can be capitalized upon as a paralinguistic tool.

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INTERNATIONALIZATION OF HIGHER EDUCATION - NEW TRENDS FOR ROMANIAN UNIVERSITIES

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Abstract: *On a background of significant economic and demographic changes, Romanian higher education must consider the internationalization process as a natural and extremely important step in its future development.*

In an education system where accreditation procedures and rankings became in last decade the main tendences in terms of quality and the predominant language of science is English, we believe that internationalization is not only positive, but also very relevant as a key component of the changing landscape of higher education.

Also, the participation of Romanian universities in the internationalization process is not just about earning immediate and positive aspects, it also requires greater accountability and the need to improve educational services in order to demonstrate competitiveness at European and global level.

In this internationalization process cannot be involved only private universities or public universities, the effort must be unitary and the law of education in Romania must be deeply rooted in the current economic and social realities.

Internationalization of higher education is a multivalent process. It includes many forms of cooperation in the area of research and student exchanges, massive open online courses or co-taught courses and degrees. Universities discovered that international partnerships are important, but can be costly, and many are not valuable, because of asymmetrical recognition of the reputation and branding of each university. Smaller universities that partner with more renowned universities may consider they will benefit from a transfer of know-how and branding, but later find out that their students are more interested by the university that is stronger in that collaboration (like it is the case of double degree programs).

More than ever before, especially private universities are conditioned by funds and therefore are obliged to make a selection of relevant international partners and projects, in order to achieve institution' own objectives and ambitions.

Key words: *internationalization, higher education, strategy*

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1. Main findings about the internationalization of higher education and the Romanian experience

Knight (1993) describes internationalization of higher education as "*the process of integrating an international/intercultural dimension into the teaching, research, and service functions of the institution"*.

Jowi (2009) attempts to include in the definition "*any systematic sustained efforts aimed at making higher education responsive to the requirements and challenges related to the globalization of societies, economy, and labor markets"*.

Romania, like many other developing countries, has experienced, for more than two decades, the occurrence of brain drain risk. More and more well-prepared young people prefer to study abroad and after graduation decide to continue living and working in those countries. Although some other countries are using, in their favor, international student mobility to increase their higher education capacity, and to avoid brain drain, in Romania, the results are not so encouraging.

There were created organizations at European and global level that analyze and do research related with this topic of internationalization of higher education, like *European University Association* (EUA), *Association of International Educators* (NAFSA) or *International Association of Universities* (IAU).

IAU released in 2018 the 5th Global Survey Report on Internationalization of Higher Education, being the last version released so far. IAU collected extensive data between 2016 and 2018 via online questionnaire from 90 universities worldwide.

From this research we consider important, and we want to emphasize on the following:

- Although 90% of the interviewed universities mentioned internationalization in their strategic plan, an increase was observed only at the universities with a high level of internationalization already. What is interesting is the fact that North American universities, at least one third, do not have internationalization mentioned in their mission or strategic plan. *In our opinion, an explanation for this type of approach can be the ethnocentric approach of the North American culture and society, and also, the fact that American universities are highly ranked and attract anyway a lot of international students, cooperation or can generate other synergies.*
- In terms of benefits, universities from Europe and Asia see internationalization as a good method to develop international cooperation and capacity building, while universities from North America consider it as a vehicle to raise awareness and expose their students to global issues. *In this regard, we consider that Romania cannot be congruent with this type of answer, for Romanian universities attracting international students is*

important not only for international awareness, but also as important new sources of income. From our university collaboration with American universities, we can certify the fact that exposure to new cultures and different ways of thinking for their students is a priority, and most of the American students coming to Romania stated is their first time abroad or their first international mobility.

- In terms of risks associated with internationalization, most of the universities are considering excessive competition, financial burden, difficulty to access/ recognize quality of courses or programs offered by other institutions to be the most important risks. *All these risks are recognized by Romanian universities as well, especially the first two.*
- Regarding the question on who is the most important internal driver for increased internationalization, in general, institutions from all regions of the world concluded in pinning responsibility on the president (rector) of the institution, followed by the international office, and finally, positioning faculty members in third place. *In our opinion, the leadership is very important because it sets a direction, but faculty members and administrative staff should be more involved in this process, especially in the so-called concept of "internationalization at home".*
- The research showed an increase in funds allocated towards internationalization for most universities. *In our opinion, Romanian universities are not congruent with this trend. In the most optimistic scenario, we can say that funding remained stable in the last few years.*
- Taking into consideration the human resources, international academic staff (full time), represents just a small part of the overall number, less than 5%. But 20 of the respondents do not have international staff. *Romanian universities are more likely to be in this category, they work based on collaboration with international professors or through Erasmus program.*
- In terms of international students, fully enrolled into their programs, most of the respondents mentioned they have, but the percentage is still low. *In Romania, although some universities are more internationalized and offer programs in English, French, German, or other foreign languages, the number of international students is quite low, most of them, have less than 1%, but there are some private and public universities where the percentage is higher, around 5%.*
- Respondents were also asked to provide suggestions on how internationalization could be augmented at the institutional level. The most frequently mentioned areas for improvement were:
    - *language skills of students and staff*
    - *increased funding*
    - *more comprehensive, strategic approaches to internationalization*
    - *the need for staff exchange opportunities, structured cooperation (e.g. joint degrees), and the need for more flexible curricula.*

Another relevant study is the one provided by EUA (European University Association), which conducted a survey in early 2020. Valid responses were submitted by 219 universities from 34 countries. Universities from Germany, Italy or Hungary are well represented, while countries like France, Poland or Romania not so much.

The most interesting findings of this research are the following:

- *more than half of the responding universities have more than 10% of international students*
- *more than half have less than 5% international staff*
- in terms of international activities, more than 90% are concerned on student credit mobility, EU research projects, and staff mobility. *Only few (9%) reported more complex ways of internationalization like branch campuses or shared assets.*
- *most of the universities (97%) collaborate abroad with similar institutions*, but also with businesses, NGO's or public institutions.
- *European Union area is the main geographical area for collaboration, followed by Europe outside EU, and North America*. The lowest percentages are for Australia, Middle East, or India in terms of partnerships and collaboration.
- The *frameworks for collaboration*, and the explanation for such high degree of cooperation within EU, are *Erasmus+ and Horizon 2020* programs and EEA grants, as well.
- Almost 50% of the respondents have *two or three strategic partnerships* with partners abroad. Most of them concern a *general institutional collaboration*.

These two studies, of course, have not included the recent pandemic challenges for higher education in terms on internationalization.

Initially, universities have been closed, and gradually they switched to online classes. This was a huge effort for a lot of universities around the world, and especially for those from less developed countries. Conferences have been called off, and collaboration between researchers took a downfall.

Prospective students, especially the international ones, have been unable to take examinations, and international students (including Erasmus) have been unable to travel to their campuses or to return home. Faculty members have been asked not to travel to other countries.

There will be a decrease in mobility for a year or more, with declines in global student mobility and with particular implications for the number of students enrolled in programs abroad. In Romania, the general concern is the overall quality of education. But there are some positive signs as well, associated with online

teaching, such as the decrease of dropout rate after the first year of study and higher rates of attendance.

Internationalization must be a major concern for any university in Romania. The beginning of this process was, for our university, represented by the signing, three decades ago, of a cooperation agreement with an American university, which allowed more than 150 students to study in the United States. This opportunity offered by the University was a major element of attraction among those who chose to become students.

For most Romanian universities, internationalization started with participation in the Leonardo da Vinci program and continued with the signing of the Erasmus Charter (2004). We believe that deepening the internationalization process on the axis of creating new bachelor's degree programs in English is vital for the future of many Romanian universities. Many programs have an international specific and not a limited, internal one. Once established, these programs could also be an important recruitment pool for master's programs in English. The organization of undergraduate programs in English can significantly alleviate the pressure on programs in Romanian, in the context in which the number of students enrolled in the latter is strongly influenced by declining demographics. In addition to the elements mentioned above, other actions that can contribute to deepening the internationalization process of Romanian universities, aim at:

- *obtaining an international accreditation (for instance, AACSB for Schools of Business).*
- *focusing on partnerships at the "top of the pyramid" by promoting participation in international alliances, launching double degree programs, study programs based on transnational education (especially considering the opportunities offered by BREXIT).*
- *exploring opportunities for setting up and participating in a consortium of European Universities and submitting the application to the European Commission*
- *identification, based on existing partnerships, of universities for the creation of double degree programs and continuing education.*
- *creating an internationalized work environment that meets the requirements of a diverse student body, including by selecting or allocating staff with language skills for the target countries.*
- *stimulating the operation of Summer Schools organized in partnership with foreign universities or companies, by granting credit points to participating students.*
- *identifying new international partners for participation as members in research consortia.*
- *achieving an increased number of international mobilities for both students and teachers, within the ERASMUS + program.*

- *significant increase in the number of mobility for teachers, based on bilateral agreements concluded before by the University*
- *organizing multicultural activities that contribute to raising awareness among their own, teaching, and administrative staff, about the specifics of internationalization at home.*
- *exploring the field of continuing education in partnership with foreign universities*
- *ensuring a more efficient framework for disseminating the information accumulated by teachers and students participating in international mobility programs.*

2. Conclusions

Higher education can no longer be viewed in a national context, but as a global process. Nowadays, education has become more international than ever. Everywhere, states encourage and focus on internationalization of higher education, looking for more international co-operation and exchanges. As a result of internationalization process, we can see that universities expand their strategies in terms of research departments and teaching programs.

In our view, the challenge of higher education internationalization is manifested in different aspects, such as ***language barrier*** for countries where English is not the native language, ***psychological and cultural barriers*** for students and teachers, ***economic barriers*** related to tuition fees, all these making more difficult the internationalization process.

In the EU, the mobility of students and teachers, sustained by Erasmus program, represents an important factor in transforming internationalization into a priority and can be perceived as the fastest developing aspect of it. The importance of internationalization should be stressed since the journey is long and will involve changing and improving the current trends to suit both local, and foreign policies, demands and situations.

In line with the opinion of *International Association of Universities*, we fully agree that the internationalization of higher education includes *"particular risks for some institutions, uneven benefits, and asymmetrical power relations"*. The following concerns are frequent:

- ***Although many universities created English taught programs,*** *driven by the advantages of having more international students,* ***using English*** *as a universal tool for communication* ***diminishes the diversity of languages studied or used by professors, researchers, and students***. On the other hand, there is a plethora of countries where English is the official language and for universities from there can be an implicit advantage to attract international

students and the prospective students from these countries can easily apply for English taught programs worldwide.

- ***Global competition may reduce the diversity of institutional forms of what quality higher education represents. The pursuit of a unique model of excellence symbolized in the concept of a "world-class university,"*** *frequently defined as excellence in research, may lead to the concentration of scarce national resources in a limited number of institutions to the detriment of other members of national system of higher education.* This phenomenon is manifested in many countries, including Romania, some large universities being interested to be included in rankings which are not always taking into consideration real competences and resources.
- ***Large-scale international student recruitment, sometimes very competitive and aggressive****, may cause a variety of troubles. The presence of a large number of international students may generate misunderstandings regarding the diminished opportunities for domestic students or unintentionally nourish prejudice about foreigners.* Some students from developing countries can be motivated to study abroad only to experience other cultures and societies, and not by achieving higher academic performance. A large number of students from the same country studying in the same university abroad can prevent the real understanding of local culture.
- *The development of international programs and establishment of branch campuses abroad generate several questions including how these can increase the educational capacity of host nations for the future.* Expanding internationally can generate issues regarding the maintenance of homogeneous quality of the program and to the appropriate adaptation of the program to the specific needs of the workforce of the country where the program is set up.
- *More recently we may add the uncertainty caused by COVID-19 pandemic, which transforms universities in digital hubs, which cannot replace face-to-face interaction, intercultural experiences, or collaboration with the economic and social environment.* International students analyze if enrolling at a university abroad makes sense, if tuition fees are justified and they question what differentiates universities apart from the online platforms they use in their relationships with students.

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IDENTIFYING THE FACTORS THAT INFLUENCE THE IMAGE OF COMPANIES AND PROJECTS

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Abstract: *The scientific approach initiated for research refers to perception of people within organizations and starts from the premise that in a civilized environment it is imperative to have a good collaboration between managers and employees.*

The way employees perceive the internal environment of the organization is very important for increasing productivity, but at the same time it is also very important how an organization is perceived in the external environment to increase competition. The perceived image is represented by the opinion of the environment about the Organization. Subjectively, the perception is completed by creating an image, the perceptive image that resembles but also differs from the sensory one. The resemblance to the sensory image is given by the feeling that it is a primary image that is realized in "this moment", under the conditions in which the stimuli act. The distinction is given in the light of the fact that the perceptual image is rich in content, has meaning and is in relation to a certain context in which it is created.

Keywords: *Fuzzy theory, organization, perception, image, factors, projects, culture, aspect.*

1. Introduction

The scientific approach initiated for research refers to the perception of people within organizations and starts from the premise that in a civilized environment it is imperative to have a good collaboration between managers and employees. The way employees perceive the internal environment of the organization is very important for increasing productivity, but at the same time it is also very important

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how an organization is perceived in the external environment to increase competition.

The perceived image is represented by the opinion of the environment about the Organization. Subjectively, the perception is completed by creating an image, the perceptive image that resembles but also differs from the sensory one.

The resemblance to the sensory image is given by the feeling that it is a primary image that is realized in "this moment", under the conditions in which the stimuli act. The distinction is given in the light of the fact that the perceptual image is rich in content, has meaning and is in relation to a certain context in which it is created.

In order to cope with the developing organizational environment, I developed a questionnaire research to identify the factors that influence the image of an organization, after interpreting the results, using mathematical methods, I will propose solutions to improve employee perception.

Fuzzy relationships are used for research, which can be combined with the help of the composition operation. The researchers claim that the most used method is the one of composing, over the course of research making proposals of several ways of composition [2]

The results obtained from this paper are of interest to the managers of organizations where it is desired to change the perception of its image, both from within the organization and how it is perceived from the outside.

2. Information about the papers

The scientific research that I conducted in organizations with different fields of activity, from different backgrounds (urban and rural), was aimed identifying the optimal solutions for solving the problems we face. The research was carried out on a randomly selected sample at national level between October 2019 and March 2020. 152 respondents participated in this study.

During the research, when I designed the template of the questionnaire I took into account the features that define the fuzzy system, to complete the information with elements relevant to achieving this goal. The answers to the questions in this section of the questionnaire allow me to formulate a reasoned opinion on the importance of the factors that influence the perception of an organization's image.

Subsequently, the processing of the answers received from the study participants allowed me to make some connections that helped me apply the fuzzy theory.

The fuzzy system is a system that is based on linguistic knowledge [1]. The center of the system is the fuzzy IF – THEN rule. This rule is proof that some words are described by continuous functions of belonging.

Example: IF image is large, THEN the perception is good

IF the image is small, THEN the perception is deplorable. [5] and [3]

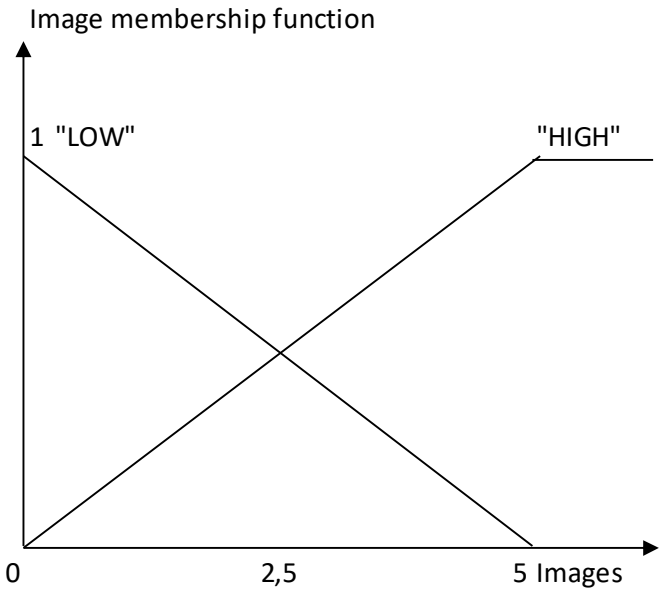

Figure.1. Image membership function

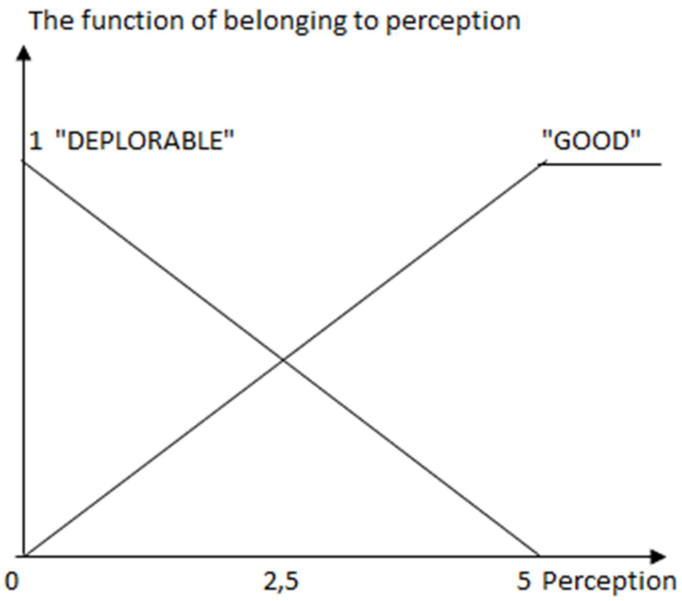

Figure.2. Perception membership function

To build the starting point and get the collection of fuzzy rules requires a very well developed IF - THEN system. In theory there are three types of fuzzy systems often used: [1]

- **Fuzzy pure systems;**
- **Fuzzy Takagi-Sugebo-Kang (TSK);**
- **Fuzzy systems with fuzifier and defuzifier.**

The example of the three systems is described / summarized below. A fuzzy system is presented in Figure 3.

The basis of the rules is based on the collection of data and its transposition into the fuzzy system according to the IF – THEN rule.
The inference engine combines fuzzy rules in a mapping from the fuzzy set to the U ⊂ Rn input spatial set to fuzzy sets in the V⊂R spatial output based on the principles of fuzzy logic.

Figure 3 shows a fuzzy system and if the dotted line exists, at that point the system becomes a fuzzy dynamic system (Fuzzy *Dynamic Systems - FDS).*

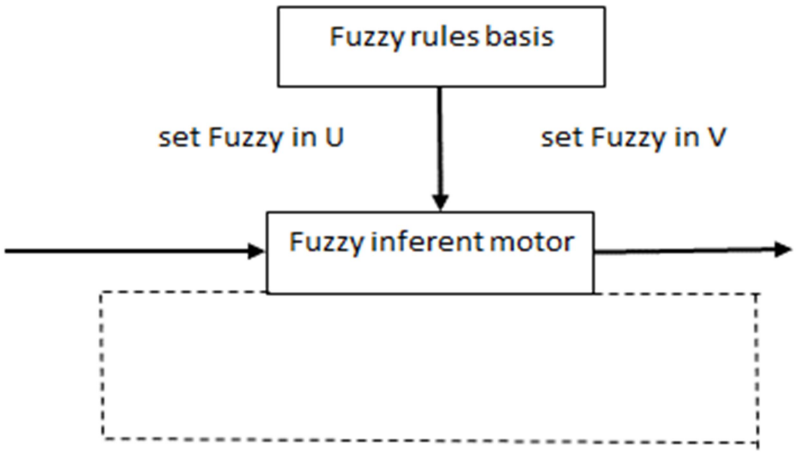

Figure. 3. Basic configuration of pure fuzzy systems

To build a database as appropriate as possible and, at the same time, to identify relevant factors that can change the image of an organization, I used the answer summary variant. Following the content analysis that I carried out at this stage of the research I had the opportunity to highlight that fuzzy theory can only be applied to culture and aspect factors, results obtained for factors vocation, social responsibility and performance the results are very clear:

- **Vocation** – degree of **great** influence;

- **Social responsibility** – degree of **average** influence;
- **Performance** – degree of **medium** influence.

Fuzzy theory cannot be applied if the results are clear, as is the case with the 3 factors. The analysis undertaken according to the criterion of identifying the factors that influence the image of an organization, confirms that the results obtained from the study conducted using a questionnaire are as follows:

2.1. Fuzzy theory applicated after the CULTURE factor

The culture factor I identified as being of medium influence, this result I obtained from the processing of data using the fuzzy system that allowed me to identify it.

The analysis of the data was also done with the help of the Matlab program, which can be used after establishing the basis of rules, as the fuzzy theory says.

IF values is x and stories is x and symbols is x and manifestations is x THEN Culture is y

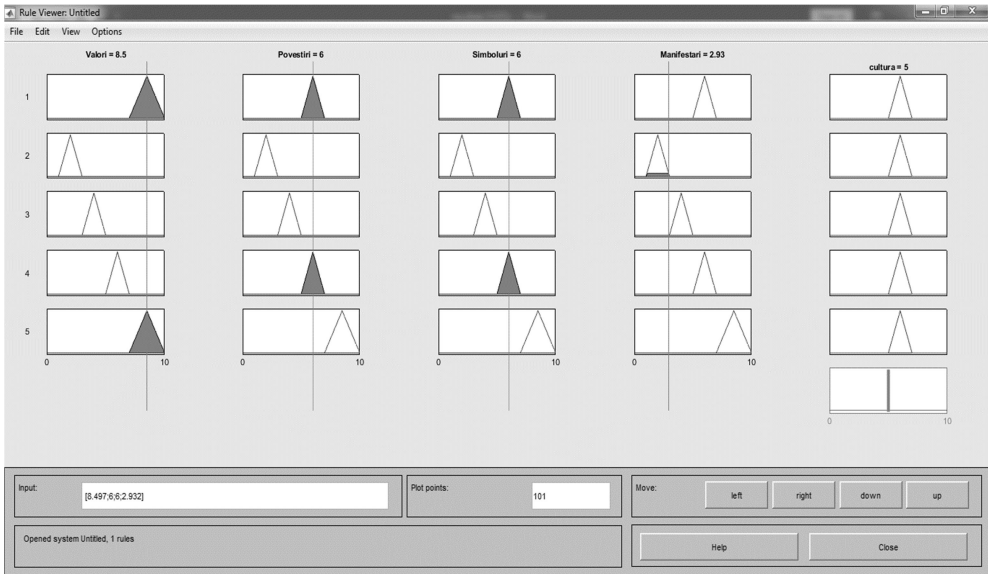

Figure.4. Representation of the results obtained

2.2. Fuzzy theory applicated after the ASPECT factor

The aspect factor I identified as being of great influence, this result I obtained from the processing of data using the fuzzy system that allowed me to identify it.

IF the appearance of the products is x and the appearance of the employees is x and the appearance of the infrastructure (buildings) is x and the brand is x THEN the appearance is y

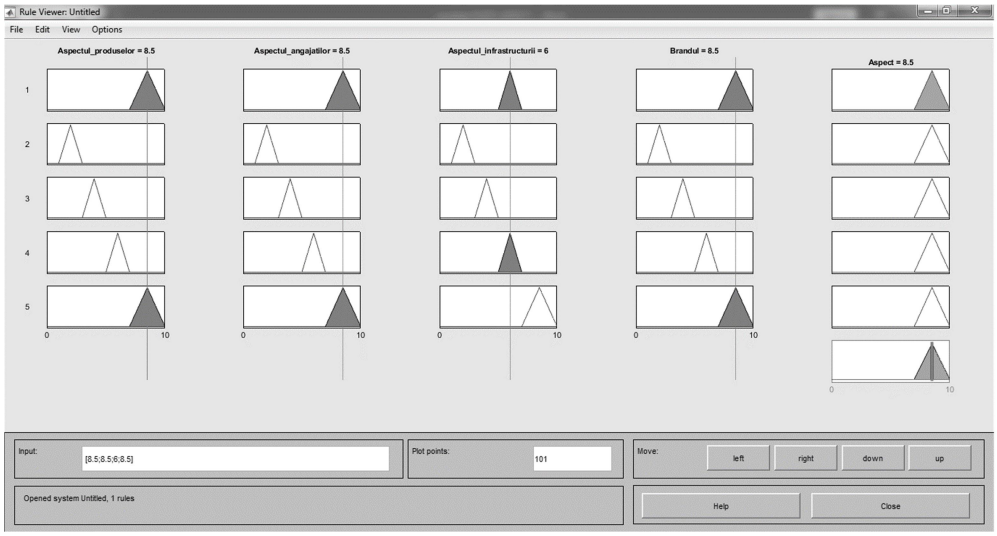

Figure 5. Representation of the results obtained

The presentation of this section of the paper on which I applied the fuzzy theory following the results obtained in the research led me to the following results:

- The degree of influence of the **vocation** is **high**;
- The degree of influence of **culture** is **average**;
- The degree of influence of **social responsibility** is **average**;
- The degree of influence of the **appearance** is **high**;
- The degree of influence of **performance** is **average**;

From the data obtained in this research, I can say that the image of an organization after the application of fuzzy theory is influenced mostly by vocation and appearance.

3. Analysis of research results after application of mathematical methods

The paradox of reality in which we live, born of the desire to have more or less necessary comfort, urges us to ask ourselves the question what is most important in an organization? Accompanied by another, essential, even defining in an organization, what do employees focus on?.

A possible response to these questions could be accompanied by careful observation of the results of the studies carried out. To complete the answers, I can add that an important part is obtained using the mathematical methods used:

1. Numeric method;
2. Percentage method;
3. Fuzzy theory method.

Referring to the results obtained and presented in the previous chapters, I cannot help but notice the similarities between them. I'm making a return to the final results obtained in the study:

- ❖ With the help of the numerical method the most important source factor is **the appearance**, and that the structural factor is the **brand**
- ❖ With the help of the percentage method the most important source factor is **the vocation**, and that the structure factor is **knowledge**
- ❖ With the use of the fuzzy theory method the most important factors are **vocation and appearance**.

For organisations wishing to perform and contribute to the achievement of the objectives achieved, a multitude of changes:

- ➢ Related to strategy;
- ➢ Management;
- ➢ Operational;
- ➢ Human resources;
- ➢ Redefining the relationships between financial performance and business;
- ➢ At the organizational culture level.

The results presented after the application of mathematical methods attest that the methods used are correctly elaborated, as proven by the relationship between the numerical method and the percentage method with the fuzzy theory. At the level of fuzzy theory we identified as important factors vocation and appearance, while these factors were the result of the other mathematical methods applied one at a time on the research. This analysis confirms the correlations between mathematical methods used.

As can be seen, the emphasis is on vocation and appearance, principles that underlie the development of organisations through the perspective of employees. Given that vocation and appearance have a strong influence on the image of an organisation, I believe that a number of objectives should be set, such as:

1. Align organisations with the standards and best practices of organisational activity;
2. Conformity of their activities with current and regulatory requirements in the field in which they operate;

3. Involvement of employees in internal assurance of the quality of the activities carried out, their participation in various refresher courses within organisations as well as in the decision-making process in the organisation;
4. Adapting knowledge and skills in the labour market;
5. Promoting professional, ethical and moral models and values;
6. Transparency in the organisation to create a climate of trust by recognising the contributions of each employee involved;
7. Periodic evaluation of employees;
8. Setting a dress-code at least when there are open-circuit conferences in the organization;
9. Promoting the brand in relation to the quality of the services provided;
10. The working environment is attractive, the building where it operates gives a sense of security.

The connections established within the organisations must be very well established according to the field of activity. Traditional management is quantity-focused in terms of the efficiency of the organisation and is based on the formation of rigid structures, preferably as predictable as possible and with restraints in taking risks and accepting change.

4. Analysis of the correlation coefficient for the replies received

The analysis of the correlation coefficient shall be carried out only for the replies received and shall indicate the Pearson correlation coefficient between the Activity Sector and the replies received following the application of the questionnaire.

For the calculation of the Pearson correlation coefficient we used the SPSS program and obtained the following results.

The correlation coefficient is a strictly linear link between two variables, in the case of this research is the link between the Sector of activity and the responses received. The Pearson correlation coefficient must be between [-1,1] and the following rules apply:

Colton's Rules (as set out in 1974):

- The correlation coefficient between -0.25 and 0.25 is a very weak or null correlation;
- The correlation coefficient between -0.25 and 0.5 (or from 0.25 to -0.50) is a weak correlation (acceptable degree of association);
- The correlation coefficient between -0.5 and 0.75 (or from 0.5 to -0.75) represents a moderate to good correlation;
- The correlation coefficient greater than 0.75 (or less -0.75) represents a strong correlation (very good degree of association);

Applying Colton's rules to the results obtained from the research shows that between the Sector of activity and the responses received is a strong correlation, no coefficient is less than 0.75.

At the same time, the organisation becomes an important factor and in order to change the perception of the image, many aspects must be taken into account, as can be seen all are in correlation, in this way contribute to the development of the organisation as a whole. The circular mechanism of all factors, if observed, can lead both to a change in the perception of the image of the organization and to the achievement of unforeseen income. The effects of using the correlation coefficient are positively felt at the level of the organisation at no additional cost, by knowing and understanding the problems they face.

Conclusions

Given that so far no scientific research has been done on this subject, the results obtained are surprising. Implementing results is a necessity for future generations, promoting the development of organizations and changing the perception of the image by determining how any public or private organization should carry out its activity in relation to the company.

The results presented after the application of the Fuzzy theory attest that the factors of particular importance are vocation and appearance.

The speed of change on all levels leads organizations to an extensive development process characterized by flexibility and adaptability, characteristics necessary to withstand competition imposed on the market.

The responsibility for ensuring important characteristics at the level of each organization lies with the manager, but also with the employees. Decisions are made following an advisory process involving all employees, but the final decision belongs to the manager of the organization.

In reality, as is apparent from the research done, the need for control prevents or even limits the manifestations of personal initiatives, imposes limits and demotivates employees. In this approach the need for freedom is necessary, the emphasis being on knowledge, skills, appearance, brand and the role of the manager in harmonizing them is essential. Employees, once they are engaged in the flow of activities they carry out within the organization, place the achievements they achieve through their own work with satisfactions.

As a result, knowledge, skills, appearance and brand are really in close contact and can change the perception of an organization's image.

O. Lund and A. Haddadi present success as "result much better than expected or normally observed in terms of cost, schedule, quality, safety and participant satisfaction". [5]

The authors address additional definitions of project success as extracted from literature, as below:

- Project success with focus on requirements and resources: "having everything turned out as hoped, anticipation of all project requirements and have sufficient resources to meet needs in a timely manner"
- Project success with focus on both performance and satisfaction: "the project is considered an overall success if the project meets the technical performance specifications and/or mission to be performed and if there is a high level of satisfaction concerning the project outcome among: key people in the patent organization, key people in the project team and key users of the project effort".

Acknowledgement

This work was developed as part of an ongoing doctoral research at the University Politehnica of Bucharest, concerning the analysis and change of perception of the organization. The title of the thesis is "Research on improving the image of an organization based on perception management".

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THE ONLINE FLYING EDUCATION: VIDEO-CONFERENCING AND DRONES

Alexandru TĂBUŞCĂ [1]

Abstract: *The Chinese origin pandemic of Covid-19 was a disaster for the world economy and the entire society during 2020 and at least the first half of 2021. But the pandemic, mixed with the Internet that actually is a given right in all developed societies and communities, also brought huge steps forward in the usage of remote and automated resources for all work environments. Virtually all companies that went successfully through the pandemic appealed to the work-from-home scenarios, in most cases at 100%. Besides standard work environments, the education field had also been forced to move online at an accelerated, some might even say staggering, pace. All over the world, from kindergarten to universities, millions and millions of youngsters moved to learning from online resources. Without the deadly virus originating from China, most of the online learning environments would have remained purely an exercise of small niche usage – being forced by the context, all education institution all over the world deployed (faster or slower) hundreds of versions of online only environments to continue deliver knowledge to their students. Another winner of this unfortunate pandemic context was the field of humanoid robotics and drones. While present for quite a long time already, they are still used only as tech demonstrators only, and are in fact deployed for real-life work environments only on a small scale.*

Keywords: Covid-19 education, drones, robotics.

1. Introduction

The Covid-19 pandemic, the scourge of this decade, was also a catalyst for improving our society's use of advanced tech resources, mostly related to the online video conferences, automated systems, and remote control. Due to the movement restrictions that were enforced almost all over the world, the employees of all categories and from all fields have been forced to rely on remote and automated systems to keep the activity going, at least at a certain acceptable level. A huge advantage for the modern societies was the extension of the Internet in almost every house. This network of networks, the Internet, is now something that we cannot live without, something that has become within the advanced societies as well as emerging ones, a standard utility thought of at the same level as tap water, plumbing, gas, heating, or electricity. The Internet was also considered a right by itself, event since 2010. In 2010, Finland was the first country that actually passed a law that stated the right of their citizens to an Internet connection. The

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piece of legislation stated that all citizens were entitled to a 1Mbps internet connection from July 2010 and to a 100Mbps internet connection starting with 2015 (minimum bandwidth) [1].

The companies that provide us with the internet connections, the ISPs[2], are nowadays business giants that have at least a relevant role into all layers of our lives: they provide the means to access the Internet, they make sure the connections and communications are maintained at a high quality and reliable level, and they indirectly influence all other services that are based on internet access… which means almost anything and everything today. Even the non-commercial activities, the charities and most notable CSR campaigns are also based mostly on internet (through social-media mostly) for reaching their goals [2].

The Internet and its ubiquitous presence made it possible for the human society to cope with the pandemic from a far. Educators all over the world deployed different online platforms in order to keep in touch with their students and continue deliver knowledge and support even from a remote location. The huge advantage of the broadband Internet connections (both classic cables, optical fibers or even mobile 4G data – 5G is still too emerging a technology to be taken into account on a larger scale) is that they can deliver excellent quality video conferences. Even though, clearly, it is not exactly the same as a face-to-face meeting, the live-online meetings are the next best thing. Moreover, in some scenarios, the live-online meetings are even a superior choice over the standard class meeting. We can just think of the case of master students, having classes from 4:30 PM, on daily bases. In vast majority, the master students are also employed during their studies and as a consequence, in a normal environment, they should run from their jobs to the campus in order to make it to the start of the classes. In a crowded city, trying to get somewhere around 4:30 PM is a huge challenge, as one might lose a lot of time in traffic. This would be one of the scenarios in which the live-online meeting for the delivery of the class content would be beneficial for all actors involved.

Also, under the constraints of the pandemic, the drones have also received a boost in usage with more and more entities thinking of using them on large scale for deliveries, instead of the classic and restrictive scenarios of aerial photography and emergency support. And we leave alone here the military scenarios, which proved drones to be highly effective both on results and costs points of view – lastly during the Armenia vs. Azerbaijan & Turkey conflict in 2020. Azerbaijan's Turkish design (and maybe even controlled if we are to believe some of the media news) military drones, especially Bayraktar TB2, have made short work of soviet and Russian equipment used by the Armenian forces [3].

And last, but not least, the humanoid and not so humanoid robots (but NOT industrial robots – a different category) were also on the upper side of the pandemic. If humanoid form robots are still hardly finding any real-life scenario in

[2] ISP = internet service provider

which they might actually bring a decisive advantage, the more specialized non-humanoid form ones have made a difference in medically challenging environments. Medical robots with UV setups have become something almost usual for sterilizing entire areas and making sure viruses are not alive anymore.

2. Live online education

Almost all countries have resorted to using live online education during 2020 and 2021. We shall present here the steps taken by several different countries, from different geographical areas – several countries with reputed education systems and the countries which are direct neighbors to Romania.

In Europe, close to Romania, Austria has deployed an extensive set of measures to ensure a successful online education system. The Austrian Ministry of Education has developed and offered an online educational platform called Edutech[3], with learning and exercising content from third party providers accepted by the Ministry. The content ranged from kindergarten to high-school. Another complementary measure was the offering of a dedicated TV educational program for all school levels pupils, through the national public station ORF-1.
Finland, a country with one of the most highly thought educational systems, has deployed a broader array of tools. Even in normal situations, the country is constantly using e-learning environments on a larger-scale (due to the natural conditions and other factors) – and as a direct consequence, they have an extend experience with such systems. Finland's public entity that supervises this sector is the National Agency for Education. They organize and supervise an entire network of solutions form electronic delivery of knowledge to students, based on different technical solutions: Microsoft365, Google Classroom, Moodle, Zoom, AdobeConnect, Ville or even the older Skype. They also make extensive use of gamification, with simulators and education gaming based on DigiVertu[4], Sandbox[5] or VirtualAutoedU[6]. Capitalizing on their already extensive experience with e-learning environments, the Finish educators can also take advantage of other established tools and repositories:

- Content Repository and Materials[7] – maintained by the National Agency for Education.
- Library of Open Education Resources – maintained jointly by the Ministry of Education and the National Agency for Education.
- Finna – developed under the auspices and with funding from the Ministry of Education as a component of the larger project: National Digital

[3] https://eduthek.at/schulmaterialien
[4] https://www.tts.fi/tutkimus_ja_kehitys/tutkimushankkeet/paattyneet/digivirtu/aineistot
[5] https://www.salpaus.fi/
[6] https://www.lumousinteractive.com/lumous-interactive/virtualautoedu/
[7] https://www.oph.fi/en

Library. It provides open access to electronic materials from museums, libraries, public and private archives throughout the country.
- Yleisradio[8] - providing free learning resources and programs through the national broadcasting company of Finland.

Our southern neighbors, Bulgaria, launched in March 2020 an integrated online learning platform through the Ministry of Education. The platform presents textbooks for the pupils of the first to the tenth grade and most higher education institutions have implemented their own individual platforms, with an approximation of around 90% of the students using e-learning systems. The Ministry of Education also created and made available an e-content repository, called the National Electronic Library for Teachers, with content in various forms (written, video, quizzes, exercises, methodologies etc.). The schools in Bulgaria have deployed the Microsoft Teams platform for their only knowledge delivery platform, with the Ministry of Education providing a centralized helpdesk and support entity.
Our brotherly neighbors from the East, speaking Romanian but snatched from their country by the aggressive Russian presence in the area (the Tsaristic Russia, the USSR or Russian Federation in different times) - the Republic of Moldova, have also managed to mount a decent answer to the Covid-19 pandemic. Different educational institutions in Republic of Moldova use the Studii.md portal in order to connect their students, the faculty and even the parents to the online e-learning education system. The portal was developed with the support provided by the United Nations Development Program. The online platform is able to provide different capabilities, such as: registration, calendar, scheduler, analytics tools, library and student info. Around 32000 users were already registered on the platform in 2020 (students, faculty, and parents).

Ukraine, already hit and weakened by Russia's theft of Crimea and the Russian backed insurgency in the East of the country, has managed only a less substantial response to the educational crises. The only centralized content delivery system for education resources was based mostly on the broadcasts from Ukraine TV. The "All Ukrainian School Online" platform is also extensively presenting the schedule of the TV broadcasts and has fewer other resources. The recordings of the live TV educational shows are also archived online on the platform and make up the bulk of its content.

Serbia has answered the pandemic, from the educational point of view, in a centralized manner. The Ministry of Education started by broadcasting educational content programs for pupils, through the Serbian Radio Television. As Serbia is still trailing in Internet availability all over the country, the Ministry instructed the schools to publish the plans and schedules of the publicly available radio and TV

[8] https://yle.fi/aihe/oppiminen

programs in places directly available without the need to access the internet: school entrances, notice boards, messaging systems, and other public places. The Ministry of Education also developed the MySchool e-learning platform at national level, which has a broad repository of e-learning content, including the recordings of the radio-tv programs. The Serbian authorities also developed and provided guidelines for different scenarios of communications between students and faculty, based on technologies such as Microsoft Teams, Zoom or Viber [4].

In Romania, the Ministry of Education already had a quite extensive set of e-learning materials, comprising actually all the manuals for all elementary, primary and high schools[9]. In the same time, the National TV (TVR) was also broadcasting specialized programs with educational content, classified for different grades.
The main challenge of Romanian educators was to provide an environment to deploy live-online video classes, as 99% of Romanian educational institutions did not even try such methods before the pandemic. The Ministry of Education, and the local authorities in several cases – like the Bucharest 1st district Town Hall for example, launched projects to buy and distribute huge numbers of electronic devices – tablets. The idea, good in essence, was actually a waste of money in quite a lot of cases. The Bucharest 1st District Town Hall rushed to buy tablets and 2 years online data plans for them, managing to deliver them well before the Ministry even started to deliver in other parts of the country. Nevertheless, another good idea was in fact detoured into a bad result. The rush was actually possible because the then-mayor was during a re-election campaign (which fortunately he lost), the price paid for one no-name medium-capabilities tablet was way to high and the vast majority of the pupils in the area (one of the best developed and wealthy in the entire country) were actually in no urgent need of those devices. Meanwhile, for several months, the schools were not able to organize and deliver online classes not because of the lack of hardware but mostly because poor organization, poor IT skills of most faculty and their disinterest in the matter. The Ministry of Education offered all educational institutions below the higher education level (which has it own autonomy) the possibility to use reputed online platforms, like Google Classroom or Microsoft365, for free. As soon as the lower-level organizations (mostly at school level) actually learnt a minimum of usage details they started to deliver e-learning content over Google Classroom. Most of the Romanian schools chose it because of its easier setup and commodity of use, even though Microsoft365 Teams offered at least the same features and several more advanced security ones, but which require specialized personnel not widely available. After the first month of lockdown in Romania, at least in the urban areas, only the teachers that did not want to deliver live-online classes were actually not delivering them. The main enemy of the e-learning systems were the teachers (again, in the urban areas where the infrastructure was not a real problem) – some because of their inability to use electronic devices/resource, and some only because they did not want to.

[9] https://www.manuale.edu.ro/

There were lots of cases even in Bucharest, even in very central schools, when teachers refused to deliver live-online classes even though they had all the needed tools and materials to do it. Within a survey conducted by the Romanian Council of Pupils, linked to the 2019-2020 live-online classes, there were around 12000 answers. Out of those, only 11% were from pupils in rural areas (see Figure 1) and only 63,70% of the respondents said that their schools used e-learning methods (see Figure 2)!

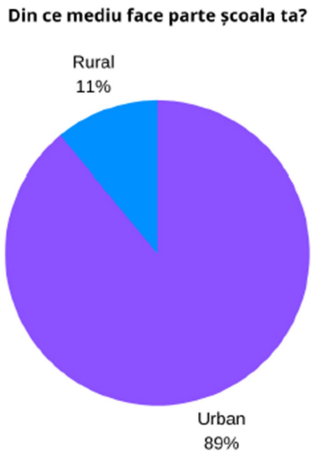

Figure 1. Where is your school situated? Rural areas (blue section) – Urban areas (violet section)[10]

Figure 2. Does your school employs e-learning and e-evaluation? No (blue sections) – Yes (violet section)[11]

Moving forward, to the higher education system, Romania finally delivered a great answer to the problem. Opposite to the elementary/primary/high schools, the

[10] https://consiliulelevilor.ro/wp-content/uploads/2020/04/Raport-privind-accesul-elevilor-la-educa%C8%9Bie-%C3%AEn-mediul-online.pdf

[11] https://consiliulelevilor.ro/wp-content/uploads/2020/04/Raport-privind-accesul-elevilor-la-educa%C8%9Bie-%C3%AEn-mediul-online.pdf

universities already had different online platforms for different services, including online e-learning resources (even though only in asynchronous mode generally). The Romanian-American University in Bucharest, for example, managed to finalize and launch a fully secure and complete live-online system, based on Microsoft365 Teams and the accompanying Microsoft365 service, in around one week of exhausting work. When RAU started the live-online meetings everything went exactly as in the standard time-table, with the exact same schedule – the only difference was that students jumped from a team to another instead of going from one lecture room to another . The results of the 2019-2020 and the 2020-2021 academic years, from the point of view of the knowledge delivery to the students, were very successful. The only issue, that is still problematic everywhere, is the evaluation system. While the delivery of content through the e-learning systems, both synchronous and asynchronous, are at quite high levels, the evaluation procedures are far form the levels of the face-to-face ones.

With the pandemic (hopefully) gone, or on the verge of going away, the Romanian educational system must seriously think of implementing at least hybrid methods of content delivery. A minimum of IT skills from the teaching staff would have saved countless lost hours for the pupils and students. All those skills, like any others, must be constantly used in order to not become obsolete and forgotten. A hybrid learning system, or maybe even fully online knowledge delivery systems in some cases, coupled with face-to-face evaluation processes are probably the best way the education can follow for the near future.

3. The Covid-19 push for drones

One of the (quite many!) technical sub-areas pushed forward by the pandemic was also the drone usage. The current drones are already used for several years now in precise and somewhat niche areas, such as emergency systems, aerial photography or remote surveillance (foto or through other sensors) [5].

Even though in most countries their legal status is still under development, the drones are more and more sought out for other tasks that they might be suitable for, with several technical tweaks maybe. The drone delivery systems are already tested and envisaged by the biggest players in retail, with some of the best-known names already displaying very well-advanced prototypes and programs.

Amazon is already advertising its future PrimeAir service, while still in development stage[12] (Figure 3).

[12] https://www.amazon.com/Amazon-Prime-Air/b?ie=UTF8&node=8037720011

Figure 3. Amazon real delivery drone – PrimeAir service trials[13]

Another delivery company, the multi-national UPS, is also constantly showing its advances in the field:

Figure 4. UPS Real drone delivery flight[14]

[13] https://www.amazon.com/Amazon-Prime-Air/b?ie=UTF8&node=8037720011
[14] https://www.ups.com/us/en/services/shipping-services/flight-forward-drones.page

But, in order to find more and more real-life scenarios uses for the drones we have to democratize access to them. During the last years, the prices for such devices plummeted, with some drones available even for less than 100 dollars on some online retail e-shops.

Nevertheless, the least expensive options are not always the best – as there is an electronic device which has a certain degree of complexity, the inexpensive drones are usually missing different features or have a very limited life-span (battery and over-all construction included here). Out of the quite extensive offer available today for educational drones I consider the Ryze Robotics DJI Tello Edu to be one of the best options.

While there are at least 6 other educational drones quite similar to the Tello – Sky Viper e1700, Robolink CoDrone, Parrot Mambo, Makeblock Airblock, Dronea Aviation PlutoX – the result of the Ryze Robotics and giant drone-manufacturer DJI is still the most complete and feature-packed solution, for this price-range. The Tello Edu is now available for around 100-150 euro online and it present a more than decent specs sheet:

- 720P HD video streaming
- 5MP photo
- ~13 minutes flight time
- Mission pads
- Scratch/Python/Swift Programmable
- Dedicated SDK
- Swarm control through programming

Figure 5. DJI Tello in flight[15]

[15] https://www.ryzerobotics.com/tello-edu/videos

The most important advantage of Tello over the other similar drones is its ability to be programming-controlled at both individual level as well as in a group (swarm) of more similar devices. Moreover, the SDK of the Tello gives the educators and the students the possibility to further their projects from simple programmed flight-paths to more complex process, such as image recognition.

For example, one can use the public OpenCV library for implementing a face recognition and tracking system onboard such a Tello drone. I will exemplify the easiness of connecting and working with the Tello video feed through the Gobot framework, a programming framework realized in Go as programming language and dedicated to the IoT and robotics. The framework puts together drivers for a large number of devices based on Raspberry Pi or Arduino, for different drones and other RC devices[16].

In order to just capture the video stream from the Tello education drone and show it live on our PC screen we just have to make sure that OpenCV is installed on the PC and also the video decoder-encoder ffmpeg is present.

We then have to make sure, in the Gobot code, that we have imported all the required elements:

```
package main
import (
        "fmt"
        "io"
        "os/exec"
        "time"
        "gobot.io/x/gobot"
        "gobot.io/x/gobot/platforms/dji/tello"
        "gobot.io/x/gobot/platforms/opencv"
        "gocv.io/x/gocv"
)
```

Especially the */dji/tello* and the */platforms/opencv* command must be present.

We also have to set the size of the video shown on the PC, as in the code below:

```
const (
        frameSize = 960 * 720 * 3
)
```

[16] https://gobot.io/

The main function of the code, quite similar to the C++ approach, is described by the *func* key word and the *main()* identificator.

```
func main() {
    drone := tello.NewDriver("8890")
    window := opencv.NewWindowDriver()
    work := func() {
        ffmpeg := exec.Command("ffmpeg", "-i", "pipe:0", "-pix_fmt",
"bgr24",
        "-vcodec", "rawvideo", "-an", "-sn", "-s", "960x720", "-f",
"rawvideo",
        "pipe:1")
        ffmpegIn, := ffmpeg.StdinPipe()
        ffmpegOut, := ffmpeg.StdoutPipe()
        if err := ffmpeg.Start(); err != nil {
            fmt.Println(err)
            return
        }
```

Inside the main function we define the drone variable by opening the Tello driver already present inside the Gobot framework, as well as the new window which will show the video through the OpenCV driver inside the framework.

The actual function which brings the video into our already designated window is presented below:

```
    go func() {
            for {
                buf := make([]byte, frameSize)
                if _, err := io.ReadFull(ffmpegOut, buf); err != nil {
                    fmt.Println(err)
                    continue
                }
                Img := gocv.NewMatFromBytes(720, 960,
gocv.MatTypeCV8UC3, buf)
                if img.Empty() {
                    continue
                }
                window.ShowImage(img)
                window.WaitKey(1)
            }
        }()
        drone.On(tello.ConnectedEvent, func(data interface{}) {
            fmt.Println("Connected")
```

```
                drone.StartVideo()
                drone.SetExposure(1)
                drone.SetVideoEncoderRate(4)
                gobot.Every(100*time.Millisecond, func() {
                    drone.StartVideo()
                })
            })
            drone.On(tello.VideoFrameEvent, func(data interface{}) {
                pkt := data.([]byte)
                if _, err := ffmpegIn.Write(pkt); err != nil {
                    fmt.Println(err)
                }
            })
        }
        robot := gobot.NewRobot("tello",
            []gobot.Connection{},
            []gobot.Device{drone, window},
            work,
        )
        robot.Start()
    }
```

Going forward, there is not too difficult a task to start processing the live video feed coming from the Tello drone in order to check for certain images (face/object recognition training). By using OpenCV also, in conjunction with any compatible programming language, such as C++, Java or Python, we can look for a certain image inside the video stream and then, using it as a trigger, start sending different commands to either the drone or to another linked device. There is an easy and far from perfect surveillance system, but nevertheless it can be a very good start for any student that wants to see a fast implement of a real-usage scenario.

For an even more complex scenario, which I will further develop in a future paper, the video stream that comes from the Tello drone (which is able now to follow a speaker for example) can be fed further to a video conferencing system (Teams, Zoom, Skype etc.) and thus having a live participant to a video conference delivering its presence through an educational drone, from an outdoor location and in movement.

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MULTIPLE EXPERTS IMAGE SEGMENTATION FOR OBJECT DETECTION

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Costin-Anton BOIANGIU[4]

Abstract: *This paper explores ways of creating an image segmentation system based on voting. Using segmentation techniques ranging from Artificial Intelligence algorithms such as Mask-RCNN to classical approaches like Mean Shift Clustering and other custom-designed segmentation techniques, the purpose of this paper is to create a mixed algorithm for image segmentation and object detection. The proposed method accomplishes the task by generating good results that compare favorably to four other related stand-alone image segmentation methods.*

Keywords: *object detection, image segmentation, voting technology, Mask R-CNN, Mean Shift Clustering, K-Means Color Clustering, Edge-Based Region Growing Segmentation.*

1. Introduction

Recent history brought us essential advancements in the domain of image segmentation and object detection. These advancements are conducted by the favorable outcome of region proposal methods, as well as region-based convolutional neural networks (R-CNNs). Even though R-CNNs, introduced by R. Girshick in [1], were computationally expensive in their original implementation, the latest research [2][3] achieves a significant cost reduction due to sharing convolutions across proposals [4]. R-CNN method implies deep convolutional

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neural networks (CNNs) to pair object proposals in order to obtain consistent object detection accuracy [2]. Compared to standard neural networks with similarly-sized layers, CNNs can be manipulated in training more quickly as they have fewer connections and parameters (the capacity of CNNs is managed by varying their depth and breadth) [5]. Despite these advantages, training is costly, and there is no positive impact on the speed of the object detection (R-CNN method performs a deep CNN forward pass for each object proposal, with no computing shared). Typically, the object detection task using this method runs in 47 s/image using a GPU [2].

A way to improve R-CNN's performance consists of using spatial pyramid pooling (SPP) networks [3]. SPP network, also called SPM or spatial pyramid matching [6][7] is an addition of Bag of Words model [8] and can reduce the training time of R-CNN method by 3 times and speed up test time by 10 to 100 times [2].

The input data of the Fast R-CNN network [2] is represented by an image and a group of object proposals. The first step is to create a convolutional feature map, based on the CNN image, considered as the entry date. The next step is identifying the region of proposals from the feature map, by Fast R-CNN, and transforms them into squares, which previously it reshaped them into a fixed size, using a Region of Interest (RoI) pooling layer, in order to be an integral part of the entire connected layer. The process continues by identifying the class of the proposed region accompanied by the bounding box offsets as can be observed in Figure 1. Even if Fast R-CNN brought many improvements, it still suffered from a couple of crucial drawbacks and limitations: the regions are still proposed by selective search, making up most of the algorithm's running time, and the process of learning was not end-to-end. The network was trainable after the selective search provided its output; however, the selective search algorithm could not be influenced to improve its predictions.

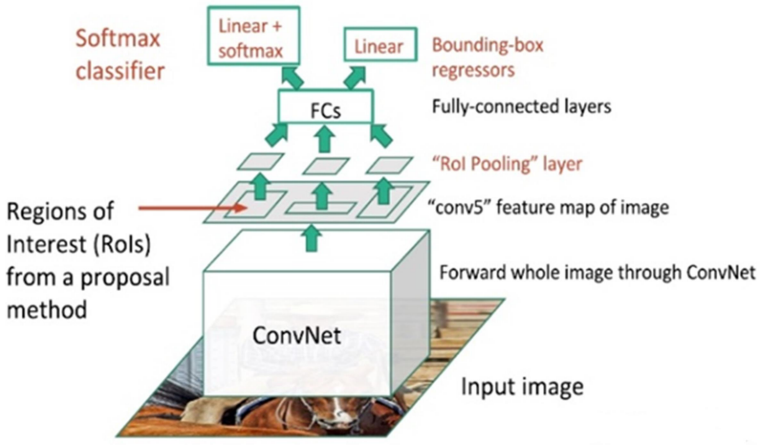

Fig.1. Fast R-CNN architecture; image taken from [2].

A more recent iteration of this approach, Faster R-CNN, achieves more accurate results than the Fast R-CNN method, S. Ren et al. introducing in [4] Region Proposal Network (RPN). This approach allows showing the convolutional features of the complete image among the detection network, the benefit consisting of the permissiveness for region proposals almost without costs. The ability to predict object bounds and unnecessary scores for each position is also a valuable asset to consider, RPN having the capacity to make proposals for quality regions in an end-to-end manner, which is an advantage in using Fast R-CNN for detection. The CNN layers provide a convolutional feature map on an image, furnished as the input data, in a similar way to Fast R-CNN. The innovative breakthrough is that the region proposals are predicted using a distinct network that has a classifier and a regressor. The schematic representation of the construction of the Faster R-CNN model is revealed in figure 2.

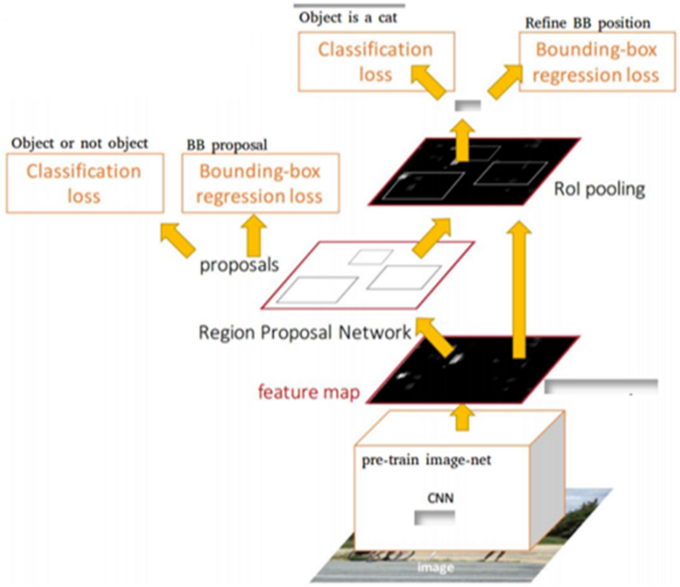

Fig.2. Faster R-CNN layout; image taken from [4].

This network works with the concept of anchors (shown in figure 3). An anchor is the central point of a sliding window. Anchor boxes are fixed-sized boundary boxes with different sizes and ratios that are placed throughout the image [4]. For every anchor, RPN anticipates the following: the probability that an anchor is an object versus the anchor is representing a background area and the bounding box regressor for adjusting the anchors to suit to the object. The classifier then determines the probability of a proposal being the target object. Regression generates the coordinates of the proposals. The remodeling of the envisaged region proposals is done using an RoI collection layer, useful in both predicting the offsets and in the proposed region's image classification.

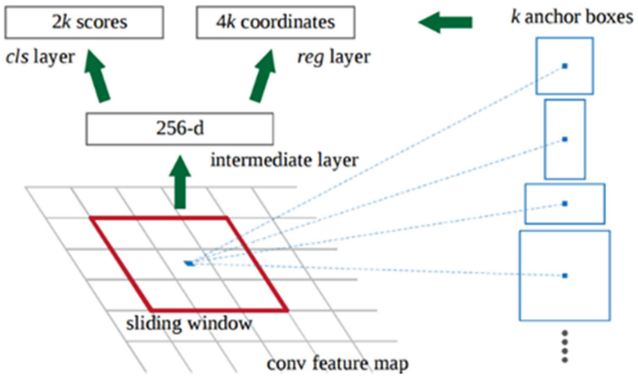

Fig. 3. Anchors representation in the Faster R-CNN model; image taken from [4].

The latest further iteration for object detection is Mask R-CNN [9], its architecture is illustrated in Fig.4. Mask R-CNN (Fig.4) is a framework made up of two steps. Firstly, the input image and the output proposals are processed (areas likely to include an object). Secondly, the proposals are classified, and the bounding boxes and masks are generated. Because Faster R-CNN works very well in tasks like image classification [5][10] and object detection [1][11][12], this method can be adapted to run pixel segmentation. Mask R-CNN accomplishes this by implementing a complementary addition (branch) to Faster R-CNN that outputs a binary mask that concludes if a given pixel represents a part of an object or not, the branch is represented by a fully CNN superimposed over a CNN based feature map.

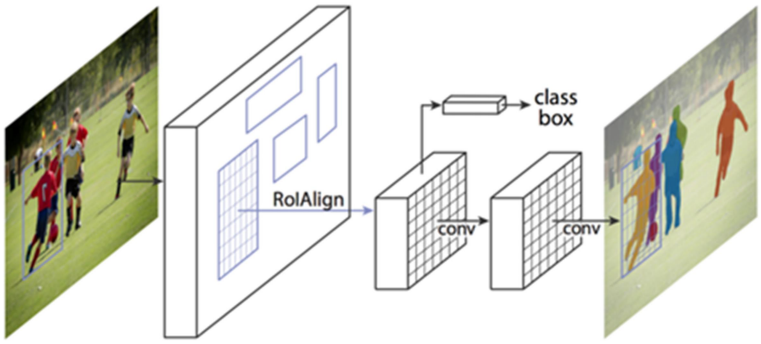

Fig. 4. Mask R-CNN architecture; image taken from [9].

A. Problem motivation

The presented algorithms and, in general, most algorithms involved in segmentation and object detection, are self-standing algorithms, based on specific techniques or heuristics. There has been little research exploring the usage of multiple such algorithms in conjunction.

This paper aims to explore a voting-based system for image segmentation, to improve both segmentation results and object detection results by correlating the results of multiple neural networks, classical and custom algorithms. This concept is similar to the process of boosting in general Machine Learning (ML).

While image segmentation through voting has been approached before [13], algorithms based on neural networks have not been included in the plethora of approaches that were discussed. This study hypothesizes that using such ML models can further improve the results of voting-based image segmentation, while further contributing to the possibility of achieving object detection at the same time.

2. Proposed method

A. Selected segmentation algorithms

For the proposed system, we handpicked several different methods for image segmentation, the first of them being Mask R-CNN [9], which extends Faster R-CNN [4] to pixel-level image segmentation. The main point in this network is to segment the classification and the pixel-level mask prediction tasks. There is a qualitative delimitation between the pixel-level segmentation and the bounding boxes, the first-mentioned presenting a more fine-grained alignment. The role of the R-CNN mask is to stimulate the RoI pooling layer (also called RoI align layer), having the effect of improving the region of interest and increasing the specificity of the mapping to the regions of the original image. For this voting system, there will make use of the head of Mask R-CNN that is responsible for the output of the masks in an image.

The second segmentation technique used in the system is Mean Shift Clustering [14]. Mean Shift is a hierarchical clustering algorithm that attempts to group data in an unsupervised manner. As opposed to K-Means, Mean Shift does not require the number of categories (clusters) to be known beforehand. It consists in several simple steps: the user defines a window (bandwidth of the kernel), and the algorithm places the window on a data point, it calculates the mean for all the points in the window, it moves the center of the window to the location of the mean, and then repeats the 2nd and the 3rd steps until convergence.

The third segmentation algorithm chosen for the proposed system is Color Clustering based on K-Means [15]. K-Means gathers among the most votes in terms of popularity and, at the same time, is the simplest from the class of unsupervised learning. For all the data points scattered in an n-dimensional space, K-Means groups the data points with some similarities in clusters. After randomly

initializing *k* cluster centroids, the algorithm performs two steps iteratively, in an Expectation-Maximization fashion. First, cluster assignment (each data point is assigned a cluster based on its distance from the cluster centroid), and secondly, it moves the centroids (the mean of all the points of a cluster is calculated and cluster centroid is relocated to the mean location). Based on the new centroid locations, the data points are reassigned to the clusters. After a certain number of iterations, if the centroids do not change positions any further, and also if the data points are not reassigned to the clusters, it is considered that the algorithm converged. In this case, the number of clusters specified at the beginning will correspond to the number of colors set to extract/cluster in the images. This color-based clustering approach creates *k* clusters, which are further split into connected components.

The fourth algorithm used here for segmentation is Edge-Based Region Growing Segmentation [16]. Among the best-known techniques used for image segmentation are edge detection and region growing. Edge-based approaches are proven to significantly reduce meaningless information while retaining the relevant information and properties coming from the structure of an image. Sometimes, region growing is often chosen on behalf of edge detection methods because it works better in cases that involve contrast issues and deals adequately with connectivity problems that edge detectors face. Recent studies provided that a combination of the two, region growing and edge detection, can lead to much better results. Some studies have highlighted, in the region growing approach, the importance of the similarity of the pixel or the neighborhood in making region joining decisions. As well as the fact that these decisions involve already extracted edges that complement each other. Also, in the case of two adjacent regions that could merge, the strength of the boundary is taken into account, as follows: a strong boundary induces the maintenance of the regions separately, while a weak boundary allows their combination.

B. Voting technique

The voting technique chosen for this paper is similar to an existing method [13]. The proposed method uses a breadth-first search (BFS) to spread each segment of the image based on voting results. The voting phase consists of each algorithm deciding if the new pixel should or should not be part of the segment currently being expanded. This is done by considering whether the current pixel is in the same segment or different segments in the output of each algorithm.

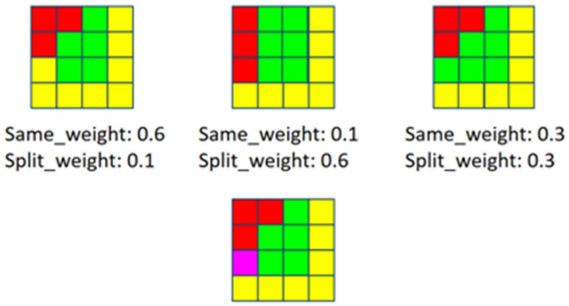

Fig.5.The voting algorithm (top: an over-segmenting algorithm, an under-segmenting algorithm, and a balanced algorithm; bottom: the voting result).

Usually, a weighted voting algorithm will assign a weight to each algorithm, which will decide how each algorithm influences the vote. The proposed method uses two sets of weights: "same" and "split". If one algorithm decides that the current pixel is in the same segment as the previous one, it contributes with its "same" weight. Otherwise, it contributes to the "split" weight (Fig.5). This modification was made because some algorithms are more credible when placing two pixels in the same segment, and other algorithms are better at splitting the pixels of different clusters. For example, if an algorithm that segments based on color clustering decides that two pixels are in different clusters, the voting should only be affected by a small margin as this algorithm is proven to create over-segmentation. Meanwhile, if this method places two pixels in the same segment, it is much more likely that these pixels belong together. Small clusters where the voting algorithm is unable to come to a decision are cleaned similarly to the outputs of the initial algorithms.

3. Results

The proposed method achieves successful object detection with excellent results by using different methods combined (Mask R-CNN, Mean Shift Clustering, Color Clustering based on K-Means and Edge-Based Region Growing Segmentation). The results of each algorithm, in parallel with the clean versions of the segmentation, are presented in figure 6 where on the first row there are found Mask R-CNN and Mean Shift, on the second row Edge-Based Region Growing and K-Means with k = 3, followed by K-Means with k = 4,5 on the third row. The output from each algorithm is cleaned, retaining only components having at least a minimum size. Some results of the proposed voting method and their corresponding original images are illustrated in figures 7 to 9. Therefore, the quality of the images is improved using the proposed method, compared to the images resulting from the application of the algorithms individually.

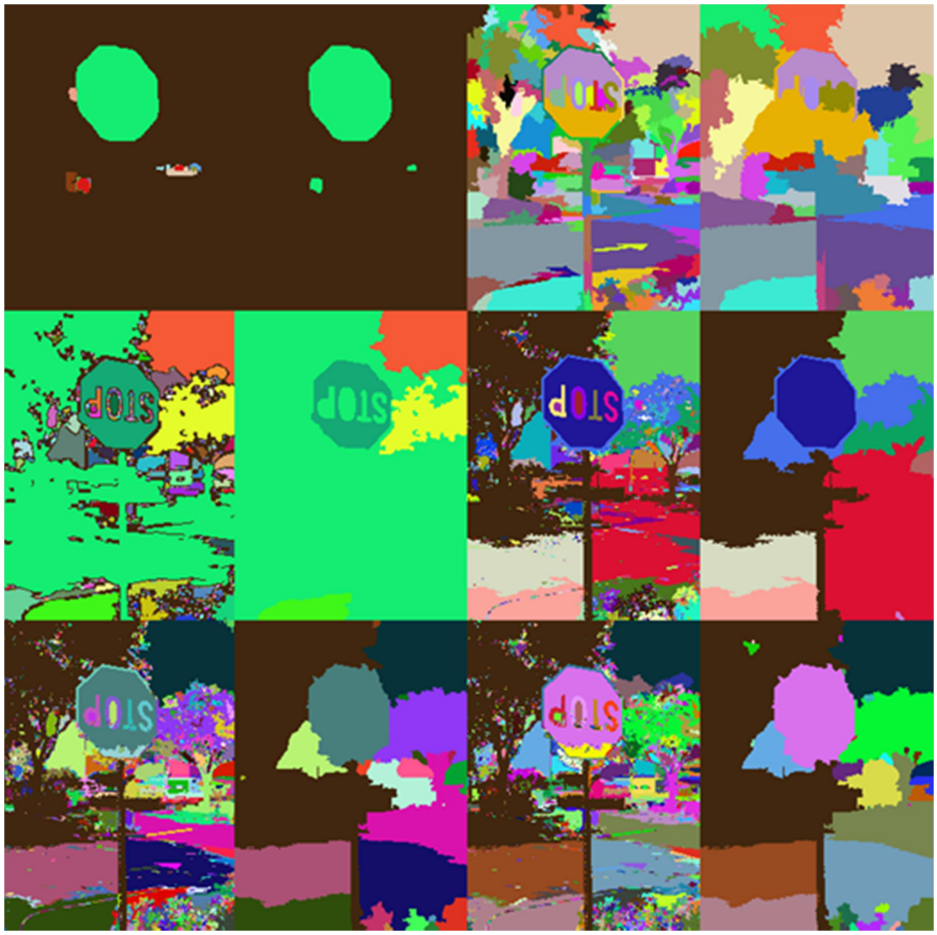

Fig. 6. Results of each algorithm, in parallel with the clean versions of the segmentation (Top: Mask R-CNN, Mean Shift; Middle: Edge-Based Region Growing, K-Means with $k = 3$; Bottom: K-Means with $k = 4, 5$).

Fig. 7. Bedroom results of the proposed method.

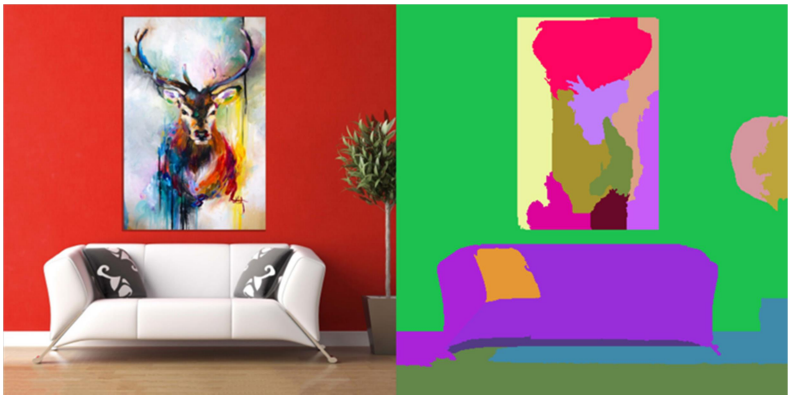

Fig. 8. Living room results of the proposed method.

Fig.9. STOP sign results of the proposed method.

4. Conclusion

While image segmentation has often been tackled through neural networks recently, classic methods are still relevant in some situations. If it is possible to combine the results of both these approaches successfully, there can be found ways for them to complement each other's deficiencies. This can be achieved through the process of voting. The proposed variant still supports improvements, the results obtained being encouraging compared to the other four methods studied in the current voting.

Weighted voting is already used in several scenarios. This paper proposed a variant of this method, based on a dual set of weights. The explanation for this is intuitive and can be further developed by optimizing these weights with a neural network or

another type of optimization algorithm. Further research into this subject may reward us with ways to segment images that are more accurate than the currently available algorithms.

A possible future development of the proposed technique will be the integration with other voting-based methods [17-19] in a system based on multiple experts' decision destined for automatic image document content conversion.

Acknowledgement

This work was supported by a grant of the Romanian Ministry of Research and Innovation, CCCDI - UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0689/„Lib2Life–Revitalizarea bibliotecilor și a patrimoniului cultural prin tehnologii avansate"/"Revitalizing Libraries and Cultural Heritage through Advanced Technologies", within PNCDI III.

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THE EFFECTS OF THE CORONAVIRUS ON EUROPEAN COUNTRIES ECONOMIES

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Abstract: *The analysis of impact of sanitary crisis for European countries is nowadays one of the most discussed subjects. In this research, 19 European countries are analyzed in order to identify and compare the effect of pandemic measures for the economy. Principal components analysis is used to reduce the number of variables from 19 indicators (about labor, trade, GDP, consumption and others) to 7 new variables, while K-means algorithm is used to group the countries in 3 major classes. The results are compared taking into account the first 2 quarters from 2020 and the number of cases registered in each country and the main conclusion is that the impact of the sanitary crisis is visible, more or less, in each economy.*

Keywords: sanitary crisis, employment, European countries, K-means

JEL classification: C38, I10

1. Introduction and literature review

The sanitary crisis caused by Covid-19 pandemic is considered one of the biggest crises for the last period of time. That gets unprepared the entire world, not only the European countries. In Europe, the measures adopted by countries governments to fight against the virus put pressure on the economies.

Entire economic activities were stopped for months and the effect is visible both on short term and long term. On short term, the employment decreased (especially on activities like restaurants, hotels, entertainment) and many unemployed persons put pressure on public expenditures and government budgets, while on long term, many of small and medium businesses declared insolvency and many of them will never recover.

On the other side, the entire economic system of a country could be considered as a complex adaptive system where small initial changes could lead to major final changes, although these systems evolve and have the self-organizing characteristic. Therefore, a sanitary crisis could have a major impact in many different areas, industries and activities from an economy.

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The main purpose of this article is to identify the impact that the beginning of the sanitary crisis had for European countries in terms of employment, GDP, consumption, trade, unemployment, house prices or gross capital formation. Some countries were highly affected since the beginning of 2020 year, while for others and the impact was delayed for a few months. Therefore, two quarters (first 2 quarters from 2020) analysis and comparison is required.

The research and the interest for this subject is widely spread among the researchers, most of relevant studies are recent, in 2020. An analysis[3] of the Covid-19 impact on economy show that countries that already had economic problems before the crisis are now the most affected economies, while the telework helped the labor market, but there are sectors where working remotely is not an option. Solutions[3] to reduce the impact of sanitary crisis are already discusses by the European Commission and take into consideration the EU budget in order to help workers affected by pandemic conditions. Another analysis (Ashraf, 2020) show that governments announcements regarding the protection measures against covid-19 have on stock markets.

Using about 77 countries stock market indicators and econometric models, the author concludes that the announcements about social distancing have a direct impact on stock market returns, while announcements about other measures (like "testing and quarantining policies") have a positive impact. Another study (Ozili, Peterson & Arun, Thankom, 2020) regarding the impact of pandemic on stock market indicators show that the economic activities were not influenced by the number of confirmed cases, but were influenced by the restrictions imposed by each country.

The idea that the pandemic might lead to a global recession is presented in a study (Açikgöz, Günay, 2020) where the authors estimate the cost of pandemic for the global economy, as well as for Turkish economy. On the other side, another study (Sumner, Hoy, Ortiz-Juarez, 2020) show the impact of pandemic situation on poverty for developing countries and concludes that "the real outcomes will be dramatic" and it depends on the pandemic duration.

This research is divided in sections like: introduction and literature review, where the latest research related papers are presented, methodologies present the main data analysis methods applied for research, the dataset and results section show the main results and comments regarding the achievement of the proposed objective, while the conclusions present the final ideas and further research.

[3] https://ec.europa.eu/jrc/en/news/jrc-analyses-covid-19-impact-economy-and-labour-markets-help-guide-eu-response

2. Methodologies

In order to analyze the impact of the Covid-19 crisis in economy, the multidimensional data analysis methods are likely to provide relevant information. The principal components analysis is the most used method to reduce the dimensionality of the dataset. The maximization problem to be solved for extracting the principal components from a dataset generates new variables that are uncorrelated. Using certain criteria, the number of principal components is determined. Based on the factor matrix, the correlations between original variables and principal components, each new variable (named principal component) is named.

On the other side, the unsupervised pattern recognition methods are used to group a set of observations into homogeneous classes. The main idea used for grouping the observations is to minimize the variability within classes (high homogeneity in each class) and to maximize the variability between classes. The K-means algorithm is one of the most used methods to group observations in classes according to the above rule.

3. Dataset and results

The dataset considered have 19 indicators and 19 European countries that have available data for the first two quarters of 2020. The main sources for data are the Eurostat and the European Centre for Disease Prevention and Control websites. For both analyzed quarters (Q1 and Q2), the analyzed indicators are: the employment (as % change on previous period) for all activities and for 10 detailed main activities (indicators i1 to i11), the unemployment rate (i12, as % of total population from 15 to 74 years), the price index for existing and new dwellings, GDP (as % change on previous period) and consumption, export, import and gross capital formation (all as % of GDP). The table from below shows the indicators names and the used indicator code.

Table 1.The details about indicators

Indicator	Indicator code
Total - all NACE activities	I1
Agriculture, forestry and fishing	I2
Industry (except construction)	I3
Manufacturing	I4
Construction	I5
Wholesale and retail trade, transport, accommodation and food service activities	I6
Information and communication	I7

Financial and insurance activities	I8
Real estate activities	I9
Professional, scientific and technical activities; administrative and support service activities	I10
Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies	I11
Unemployment (% of total population from 15 to 74 years)	I12
House price index - purchases of new dwellings (annual rate of change)	I13
House price index - purchases of existing dwellings (annual rate of change)	I14
Final consumption expenditure (% of GDP)	I15
Gross capital formation (% of GDP)	I16
Exports of goods and services (% of GDP)	I17
Imports of goods and services (% of GDP)	I18
Gross domestic product at market prices (% change on previous period)	I19

Another dataset was considered from ECDC website and presents the number of Covid-19 infected persons each day. The summarized variables (for Q1 and Q2) show the number of Covid-19 infected people in each country and each quarter. These variables are used to compare the macroeconomic analysis with the number of cases in each quarter.

	lq1	pq1	pcq1
Comp.1	3.67118	19.32198	19.32198
Comp.2	3.20709	16.87940	36.20138
Comp.3	2.57458	13.55040	49.75178
Comp.4	2.43198	12.79988	62.55166
Comp.5	2.06361	10.86109	73.41274
Comp.6	1.45623	7.66437	81.07711
Comp.7	1.18289	6.22571	87.30282
Comp.8	0.66244	3.48650	90.78932
Comp.9	0.60379	3.17787	93.96719
Comp.10	0.42524	2.23812	96.20531
Comp.11	0.32484	1.70968	97.91500
Comp.12	0.16711	0.87952	98.79452
Comp.13	0.10912	0.57434	99.36886
Comp.14	0.07040	0.37054	99.73940
Comp.15	0.02161	0.11376	99.85315
Comp.16	0.01783	0.09383	99.94698
Comp.17	0.00966	0.05087	99.99785
Comp.18	0.00041	0.00215	100.00000
Comp.19	0.00000	0.00000	100.00000

	lq2	pq2	pcq2
Comp.1	4.38803	23.09488	23.09488
Comp.2	3.40183	17.90435	40.99922
Comp.3	2.41629	12.71730	53.71652
Comp.4	1.97963	10.41912	64.13564
Comp.5	1.81122	9.53273	73.66837
Comp.6	1.76836	9.30718	82.97556
Comp.7	1.18114	6.21653	89.19209
Comp.8	0.81987	4.31509	93.50718
Comp.9	0.48616	2.55873	96.06591
Comp.10	0.29609	1.55835	97.62426
Comp.11	0.15971	0.84057	98.46484
Comp.12	0.10140	0.53370	98.99854
Comp.13	0.08151	0.42899	99.42752
Comp.14	0.06572	0.34592	99.77344
Comp.15	0.03668	0.19304	99.96648
Comp.16	0.00364	0.01918	99.98566
Comp.17	0.00158	0.00829	99.99395
Comp.18	0.00115	0.00605	100.00000
Comp.19	0.00000	0.00000	100.00000

Figure 2. PCA results for both datasets

The figure from above (figure 1) shows the principal components results in terms of variance for each principal component, the percent of total information from all original variables that is considered in each component, as well as the cumulative percent of information. For 2020-Q1 dataset, the Kaiser criteria shows that from 19 variables, 7 principal components have the variance above the unit, and take about 87.3% of total information. For 2020-Q2 dataset, the first 7 principal components summarize 89.19% of total information.

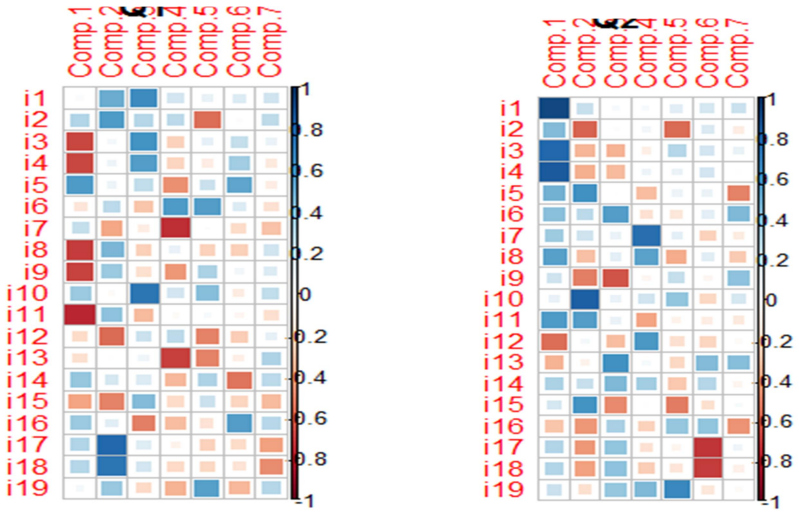
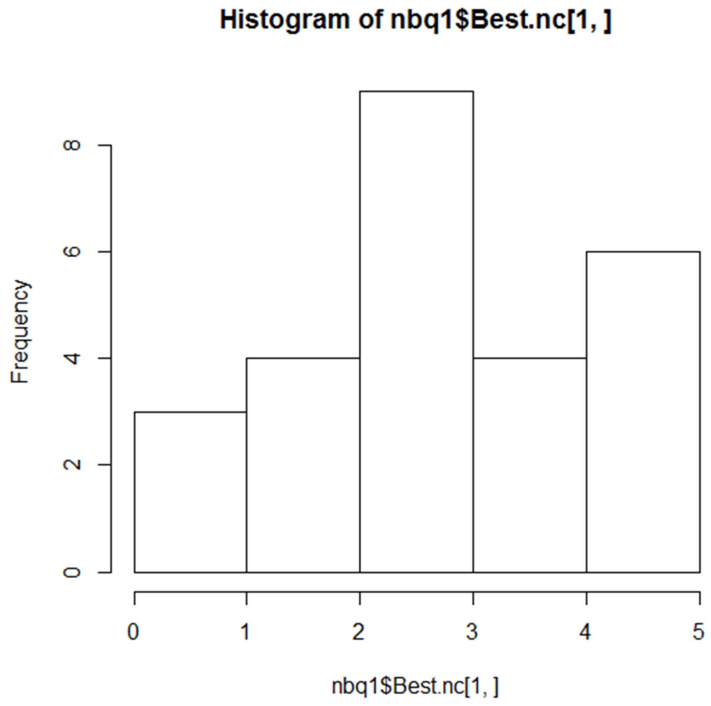


Figure 3. Factor matrix for both datasets

The correlation matrix between principal components and original variables is named factor matrix and, using these correlations, the new variables can be interpreted as (Q2 dataset):

- one principal component is highly correlated with import and export of goods and services and can be interpreted as trade component; another component is highly (negatively) correlated with the unemployment rate and with the employment (positive correlation) change for all NACE activities and different sectors (industry, manufacturing, financial activities), having the significance of main labor component, while another component have more information from the other activities (indicators like i10, i11 and i5) being another employment component;
- another component is significantly correlated with the house price index (positive correlation), real estate activities (negative correlation) and wholesale and retail trade;
- another component is correlated with agriculture employment, GDP and final consumption expenditures; another represents the gross capital formation, while another component is highly correlated with the employment change in information and communication.



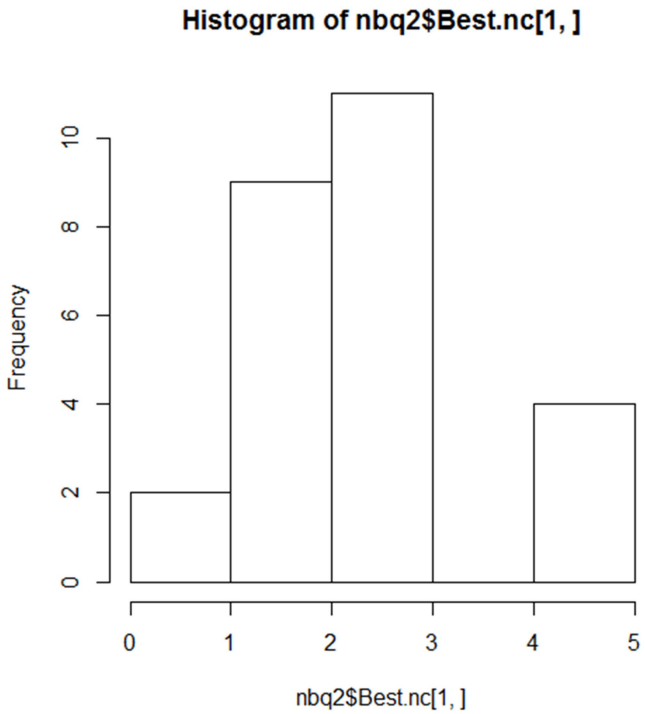


Figure 4. The best number of classes

The nbclust package in R (applied with parameters Euclidian for distance and k-means for method) provide information about the best number of classes to be considered for analysis, taking into account indices like D index or Cubic Clustering Criterion.

The figure from above show, for each dataset, the histogram of the best number of clusters: for 2020-Q1 dataset, the best number of classes is 3 (9 indices proposed 3 as the best number), as well as for 2020-Q2 dataset, for which 11 indices proposed 3 as the best number of groups.

```
> round(k1q1$centers,2)
  Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7
1  -2.19   0.00   0.82  -0.65   0.96   0.17  -0.25
2   0.71   0.92  -0.95   0.26  -0.10   0.09   0.03
3   0.95  -2.31   1.36   0.16  -0.95  -0.45   0.23
> round(k1q2$centers,2)
  Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7
1   0.44   2.58  -0.87  -0.83  -0.42   0.00   0.52
2   0.97  -0.46   0.33   0.45   0.35   0.15  -0.21
3  -3.12  -1.31  -0.03  -0.42  -0.53  -0.41   0.06
```

Figure 5. Classes centers for both datasets

After identifying the best number of clusters, K-means algorithm was applied on principal components in order to group the selected European countries in homogeneous classes. The average values for variables in both datasets are presented in the above figure. It is noticeable that the classes differ significantly.

For 2020-Q1 dataset, one class (class1) have the lowest average value for the first principal component, being a class with the highest increase of employment (in average) from previous period, in activities like real estate (especially Romania and Lithuania), arts, entertainment, industry and manufacturing. This class is characterized also by the highest decrease of agriculture employment (from the previous period), an average level of export and a high GDP change.

The second class have (in average) the highest level for export, an average value for GDP change, real estate activities employment and high change in agriculture employment change.

The third class have in 2020-Q1 the highest indexes for house price, high unemployment rate and a high decrease of employment in real estate activities. Among the countries from the third class, Italy and Spain show the first signs of economic impact of sanitary crisis in Q1, having the highest decrease of GDP from the last period.

For 2020-Q2 dataset, the first class is the most affected in terms of employment in agriculture, real estate activities and arts, entertainment and recreation activities. High impact of sanitary crisis is visible also for the first class in final consumption expenditure (the highest percentages in GDP, over 84%, in average) and the lowest gross capital formation, import and export levels and GDP change from the previous period. Romania is part of this class, with the highest impact in employment in real estate activities in Q2.

The second class have the majority of European countries and have a moderate impact of sanitary crisis in labor market or economy, while the third class have countries that are strongly affected by the pandemic situation: decrease of employment in all activities, increase of unemployment, decrease of GDP, high imports.

In the above figure (figure 5), each class in each dataset is represented with a different color.

In Q1, some countries are more affected by the sanitary crisis than others, while in Q2, there are signs that some highly affected countries from Q1 try to restart the activities. For example: Cyprus, Romania and United Kingdom were moderately affected in Q1, but highly affected in Q2, while Italy was highly affected since the beginning of the pandemic in Europe.

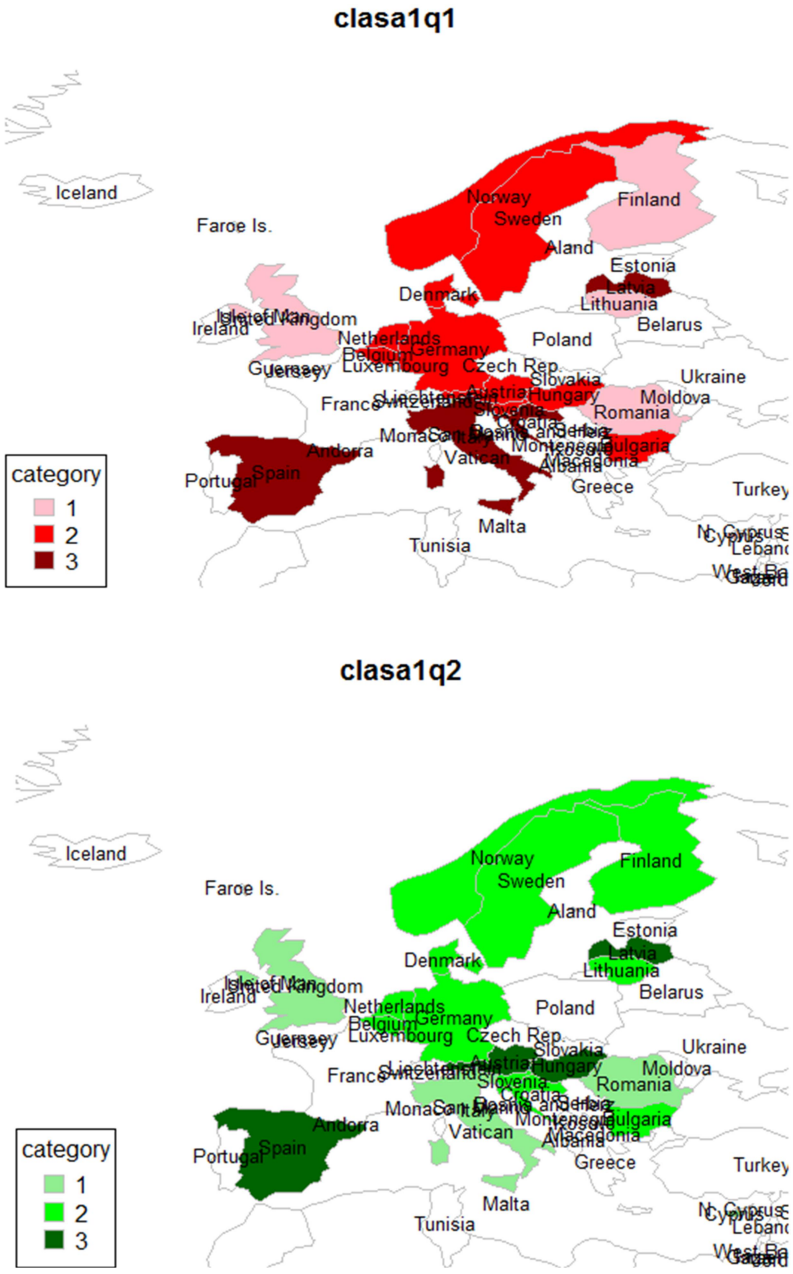


Figure 6. Classes graphically representation

Another country that "changed" the class from Q1 to Q2 is Finland that is moderately affected by sanitary crisis in both analyzed quarters.

	clasa1q1	1	2	3
[1000;10000)		2	4	0
<1000		2	3	2
>10000		1	3	2

	clasa1q2	1	2	3
[10000;100000)		1	4	0
<10000		1	6	3
>100000		2	1	1

Figure 7. Classes and Covid-19 cases in Q1 and Q2

The figure (Figure 6) from above shows a frequency between the number of Covid-19 cases[4] (cumulated for Q1 and Q2) and the classes presented above. In Q1, most studied countries have fewer than 1000 cases, included countries that have a high and moderately impact.

In the second quarter, most countries that have fewer than 10000 cases (only in Q2) are not very affected (these countries are from the second class).

The main conclusion here is that there is not a direct and strong connection between the number of cases and the impact of sanitary crisis in economy.

4. Conclusions and discussions

The impact of pandemic on labor market and economy in general was visible (more or less) in most European countries since the beginning of the sanitary crisis. The crisis situation cannot be ended suddenly, and its effects will be visible for long term.

Many companies that were closed due to sanitary crisis in Europe already faced insolvency issues and some may never return to initial state. Considering the economic system as a complex adaptive system, these companies that closed the activity can cause a major imbalance on other interconnected systems (like labor market) in such a way that a chain reaction could lead to potential economic crisis. Therefore, economic measures should be considered in order to reduce the impact of sanitary crisis in the entire economy.

[4] data source: https://www.ecdc.europa.eu/en/publications-data/download-todays-data-geographic-distribution-covid-19-cases-worldwide

For further research, the main idea to be studied is the connection between the distressed companies (as a result of pandemic situation) and the economic indicators.

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[5] ”https://ec.europa.eu/eurostat/web/covid-19/data accessed oct. 2020

[6] https://www.ecdc.europa.eu/en/publications-data/download-todays-data-geographic-distribution-covid-19-cases-worldwide accessed oct. 2020

[7] https://en.wikipedia.org/wiki/Complex_adaptive_system#Characteristics accessed oct. 2020

[8] https://ec.europa.eu/jrc/en/news/jrc-analyses-covid-19-impact-economy-and-labour-markets-help-guide-eu-response accessed oct. 2020

CONNECTION AND INTERCONNECTION BETWEEN FINANCIAL AND ACCOUNTING INFORMATION AND THE RISKS OF THE ECONOMIC ENTITY

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Abstract: *Most economic entities aspire to success, as performance management has become a work process that is not only useful but also mandatory. However, the much desired success cannot be achieved without a proper analysis, a situation in which information becomes the basic element in any transaction.*
Accounting information aims to meet the needs of a diverse range of users, needs that are complex and sometimes contradictory, and the dissemination of accounting information is a source of power, which requires that this process resulted from negotiations and trade-offs between the economic entity and external factors to be characterized by dynamism and reason. Obtaining and capitalizing on accounting information and, respectively, financial and non-financial information, in real time, has become an indispensable element in the current context of the market economy, taking into account the risks to which an organization is subject.

Keywords: *financial-accounting information, accounting model, financial and non-financial reporting, financial statements, information users, financial risk.*

JEL Classification: *M41 – Accounting.*

1. Introduction

Accounting is considered an informational discipline, studying the effects of economic transactions, but also other events, on the economic and financial situation and performance of a company, in order to inform internal and external users[6].

Since in the past the financial information was considered in the first place, nowadays the economic entities realize that it offers them only the consequence of the analysis of some economic-financial indicators, so with the extension to the social and environmental indicators we speak of a new value given to the entities' performance called global performance.

The success of an entity involves the gathering of economic, social and environmental information. Most economic entities aspire to success, as

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[6] C.Caraiani, L.Olimid (coordinators),"Bazele contabilităţii", Publishing House ASE, Bucharest, 2000.

performance management has become a work process not only useful but also mandatory; not being able to achieve the desired success without proper information, a situation in which performance evaluation is the basic element in any entity.

The decision-making process is perhaps the most important step in the functional architecture of an entity, due to the profound implications of their affiliation. In the decision-making process, the manager is forced to apply a certain reasoning, the purpose of which is identified in the implementation and monitoring of a certain solution based on financial-accounting information. Risk, defined as a variable event that can occur and have a negative impact on the organization's objectives, is one of the topics that have gained momentum, and its evaluation has become one of the management's objectives. The evaluation of the financial risk, that risk that characterizes the fluctuation of the result indicators under the incidence of the financial structure of the enterprise, has an important role in the management of the organizations, with impact on the planning and control functions, and especially on the decision making process. In the current economic context, the success of a business is a matter of adaptation to the environment, and the connection of the accounting information to the economic and social environment is a premise of the entity's functionality.

2. Literature review

Accounting models have been an intense concern of researchers, their influencing factors, as well as the differences between them being identified in a wide range of works, both in foreign literature (as reference names F. Choi, C.A.Frost, G. Meek with the work “International Accounting”, C.Nobes, R.Parker authors of the book “Comparative international accounting”, etc.), as well as in Romanian literature (N.Feleagă “Sisteme contabile comparate”, M.Ristea, L.Olimid, D.Calu “Sisteme contabile comparate”, I.Ionaşcu “Dinamica doctrinelor contabilităţii contemporane”).

The main objective of the research is the detailed analysis of the theoretical foundations of accounting models, the aim being to demonstrate the connection between their evolution and financial risk assessment, identifying the correlation of accounting information - interest and risk assessment methods, but also if this evolution has changed the concern for measuring and assessing risk.

The specialists in the field emphasized the importance of knowing the financial accounting information and the evolution of the accounting models, trying to establish a link with the risk management activity; activity that started to take shape after the financial crisis. As Shimell P. (2002) points out, risk management in the new 21st century economy is different from the same activity in the 20th centuryThis new economy, dominated by technology, media and

telecommunications has transformed businesses, which are experiencing an exponential development as they have never had before. Companies were preoccupied with dominating the economy and stock markets with the help of rapid growth, profits and assets. While the world economy and stock markets were growing, risk management was neglected by many companies, but in times of crisis this became critical. [7].

The diversity of the existing accounting theories influenced without precedence the accounting models, establishing a basis of their constructions. The great Littleton and Zimmerman[8] (1962) specify that accounting theory is the result of a careful examination of accounting practices, thus coming from seriously analyzed experiences, and also providing a logical explanation.

"Accounting is considered the language of business, and plays an important role in ensuring and maintaining good corporate governance," explains N.C.Shil (2003). Risk management is an important part of a company's corporate governance. Thus, the amendment of the Organization for Economic Cooperation and Development (OECD) presented by R. Anderson in the study "*Risk management and corporate governance*" (2009), highlights the importance of its integration in the culture of the organization, stating that it must bring a perspective to management on complicated issues that appear in complex organizations. Developing a smart organization in terms of risk requires understanding the maturity of risk management throughout the organization"[9].

3. Accounting information - the main link between the accounting model and risk analysis

In any organization, accounting is a quantitative reflection of economic processes and circumstances with the role of presenting relevant financial information that is used for the successful management of the organization. Knowing how accounting has developed is useful to be able to anticipate its changing directions. One can also understand certain accounting models by knowing the factors that influenced their development. The industrial revolution, the evolution of taxation, the development of capital companies, the evolution of financing and governance, the regulatory factor and the development of professional bodies are the factors that influenced the evolution of accounting and led to scientific thinking.

The main methods of transmitting accounting information is financial statements but, in general, financial reporting is not associated with business planning, decision management or understanding of information systems. Managerial and

[7] P.Shimell, "The universe of risk", Ed. Pearson Education, Londra, 2002, pg. XVII

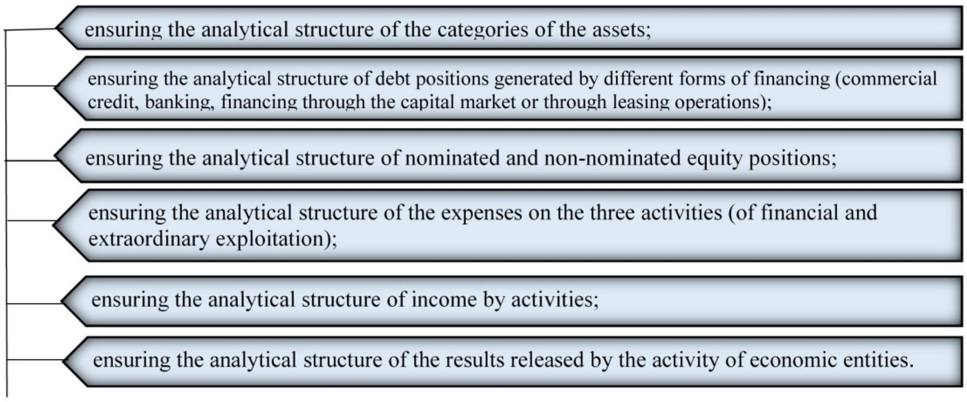
[8] A.C.Littleton, V.K. Zimmerman, „ Accounting Theory : Continuity and Change", 1962, Ed. Prentice-Hall.

[9] R.Anderson, "Risk management and corporate governance", Organization for Economic Cooperation and Development (OECD) reports, 2009

financial accounting are seen as two systems independent of each other, but the process of accumulating financial information for the preparation of financial statements for reporting purposes can be integrated into other business processes. The same information can be used by the management, marketing or even legal teams of the organization.

The financial statements form the informational support that is the basis of the financial analysis necessary in formulating a financial diagnosis, but also the basis of the risk analysis for estimating the possible exposure. The objectives of the analytical accounting of the structures of the financial statements are delimited to the environment of use of the accounting policies and accounting options which illustrate more requirements. Objectives regarding, the presentation of the entity's performances through the analysis and evaluation of a variety of final or interposed performance indicators, total or partial, through which to analyze the economic-financial management of the entity[10].

Figure no. 1. Objectives of analytical evidence on the structures of financial statements



Source: own projection

Success reported using performance indicators based on relevant financial information is based on just ideas that reflect reality and highlight fundamental assumptions of the entity's economic governance. The process of using and budgeting working capital, as well as guaranteeing self-financing or economic and financial stability are related to indicators such as: commercial margin; added value; exercise production; gross operating surplus; self-financing capacity; managerial reserve; working capital; the required working capital; net cash.

Risk management is an activity described as the art of making decisions in a world ruled by uncertainty, being a complex process of identifying, analyzing and

[10] Caraiani, C., Dumitrana, M., Contabilitate şi control de gestiune, Publishing House Infomega, Bucharest 2004, pag.11.

responding to the risks to which the corporation is exposed. With the help of the above mentioned objectives, the financial statements prepared on the basis of the accounting information "move" the participation limits of the treatment of the target managerial objectives beyond the limit of the capitalization activity, on the field of the financial activity of the entities. The materialization of the forecasts and the control follow the creation of the provisions in the balance of incomes and expenses of the overall activity of the entity but also the creation of the partial budgets by functions or activities of the entity represented by: the general activity budget; production activity budget; the budget of the investment activity and the budget of the financing activity.

Within the risk management process, one of the most important stages is the process of accumulating and processing the necessary information. Thus, the efficiency and quality of the information obtained directly depend on the efficiency of the risk assessment. The configuration of the information collected and its implementation in the integrated financial reporting is done by using models of situations with reference to: mission and assessment of the entity, performance policies, fundamental purpose of social responsibility, area of competitiveness and its effects, success, indicators used in appreciation of results and concern of all stakeholders in achieving objectives.

Acknowledged as basic tools for maximizing the trust of different categories of users (consumers and investors), financial-accounting information is found not only in reports such as annual financial statements, but also in non-financial reports. The latter produce additional information that expresses the consequences of effective social involvement and the environmental protection measures accepted by the entity. Through these reports, the application of the corporate social responsibility in practice is carried out.

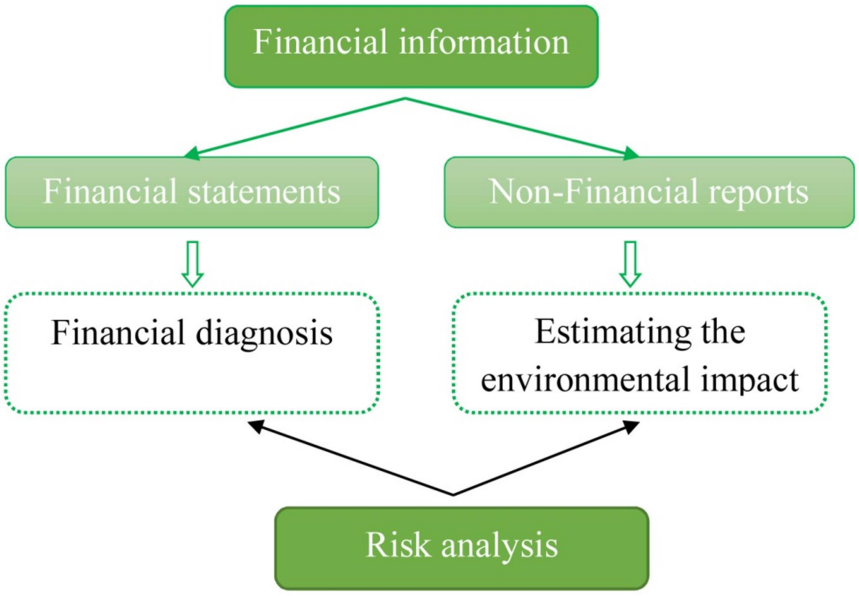
Users operate financial-accounting information for various financial and non-financial analyzes, in order to substantiate economic decisions. The elaboration of all types of reports serves the management of the enterprise for the observation of the economic-financial performances, but also as a basis of the environmental impact on the future activities.

A study conducted in 2010 and revised in 2012 "*Does mandatory IFRS adoption improve the information environment*?" demonstrates that as a result of the transition to international standards, the accuracy of estimates and other measures of the quality of the IT environment have improved significantly, especially for companies required to adopt IFRS, than for those that have voluntarily or have not yet adopted them. The same study showed that improving the IT environment can be attributed to the quality of information as well as increasing the comparability of results[11]. Also, the increase in the accuracy of the estimates following the

[11]A. Horton, G.Serafeim, I.Serafeim, "Does mandatory IFRS adoption improve the information environment? ", Contemporary Accounting Research, no.X, pg.2,2012

mandatory adoption of IFRS is associated with the increase in opportunities for companies to manage gains close to targets.

Figure no. 2. The role of financial information in risk analysis



Source: own design.

Analyst estimates are an important part of the decision-making process, as well as risk management, being a basis for these processes. Reducing the asymmetry of information received by potential investors, creditors and other stakeholders, the comparability of financial statements are also a benefit of implementing international standards, as shown in a paper by specialists from Harvard Business School. They demonstrate that most improvements are made in countries whose national standards differed significantly from IFRSs.[12].

Banks, insurance companies and listed companies were the first to be required to adopt international financial reporting standards, ensuring a greater degree of transparency in financial statements. In order to make the obligation to apply IFRS much more clearly, the supervisory bodies of these institutions - the Insurance Supervisory Commission (CSA), the National Bank of Romania (BNR), respectively the National Securities Commission (CNVM) - applied sanctions for non-compliance with IFRS, which went until the withdrawal of the operating license of that institution.

[12] F.Brochet, A.Jagolinzer, E.Riedl, "Mandatory IFRS adoption and financial statement comparability", 2011, pg.2

This confirms the hypothesis of the overwhelming importance of credit institutions and insurance companies in increasing public confidence and economic development. It also attests to the need for a healthy capital market, a sponsor of future investments. Organizations in the Romanian business environment obligated to apply IFRS will certainly encounter difficulties. There is an acute need for the translation of all targeted materials, for the training of specialists in the application of standards and for the subsequent dissemination of their knowledge, activities that generate serious costs and time consuming, but the procedures started in this regard continue successfully.

In fact, these efforts serve to achieve a degree of transparency in financial-accounting communication and to easily interpret the financial-accounting information provided by organizations around the world, a process from which will ultimately gain organizations and specialists in Romania.

The acquisition of a fund of knowledge and experience regarding the application of IFRS must be doubled by solving the problems related to the technical conditions for transition to these financial reporting standards and to cover the additional valuation costs generated in order to determine the just value of assets in their own balance sheets. Valuation costs depend on the structure of the organization's assets and its type. The lowest costs will be generated by foreign organizations[13], where audit, evaluation and expertise practices are an old custom. Unfortunately, it seems that local organizations will cause significant costs, especially for those with a large volume of tangible assets. The additional costs related to the preparation of the financial statements according to IFRS will be endorsed by the organizations concerned. And the list of problems can go on. The Romanian organizations selected according to the established criteria, forced to apply IFRS in the financial-accounting activity, starting with 2007, are enterprises with public responsibility, in which there is a high degree of interest from investors or shareholders, based on financial external reporting in obtaining information about the organization. At the same time, in the Romanian economy, the international norms will be applied to the enterprises that have responsibilities related to the provision of a public service of vital interest by the nature of the activity carried out.

The application of IFRS as an accounting basis involves resolving interactions with the provisions of applicable law, so as to avoid uncertainties, confusions or inconsistencies that could affect the quality of accounting reporting that is compliant to IFRS. It is necessary to analyze to what extent the accounting information produced according to IFRS standards can be used for prudential purposes, when calculating distributable profit or tax profit and what are the solutions for optimal coexistence, taking into account the objectives of different regulations.

[13] Horomnea, Emil - Fundamentele ştiinţifice contabilităţii, Editura Tipo Moldova, Iaşi, 2010, p. 107.

The role of financial accounting is to record the transactions of an organization with its external environment, for the periodic and systematic determination of the patrimonial and financial situation, as well as the results of the operations performed; the financial accounting information is retroactive and is made public, according to the legal provisions in force.

Management accounting produces most of the information intended for decision-making processes, and from the financial accounting can be extracted, in addition, data for the current management of customers or suppliers relations, for substantiating investment and financing decisions, for correcting the effects of inflation on the management's decisions. The information produced by financial accounting falls within the scope of economic-financial analysis, and will contribute to the substantiation of managerial decisions. Analysis of costs per product, work, service in case of productive economic organizations, taking into account the type of cost (operational, structural, functional), economic content (partial, complete), the temporal aspect of the information (default cost, pre-calculated or real cost) should highlight the ratio between the expenses of the period reflected in the financial accounting and the costs of products and services reflected in the management accounting, the ratio between variable and fixed costs, between direct and indirect costs, between justified costs and those with activities that do not create value.

In the literature, the hypothesis that a high-performance accounting model (such as the one based on IFRS) determines a quality accounting reporting that improves the transparency and comparability of financial information, which has the effect of reducing the cost of capital for economic entities, exists. Until this date, however, the relationship between the quality of financial reporting, the quality of accounting regulations and the cost of capital is not clearly empirically substantiated, among the issues raised being the way of quantifying (operationalizing) the quality of reporting [14] or the cost of capital (both own and borrowed). In addition, the issue has become more difficult in terms of awareness considering the existence of institutional factors specific to each country that affect the cost of capital independent of the provisions of accounting regulations[15].

In the exercise of his profession, the professional accountant must conduct his activity on the basis of the norms of professional deontology and on the application in good faith of the accounting regulations and of the professional judgments. To always improve, to be always up to date with the new regulations, to know the tendencies in the field of European and international accounting regulations is practically about our self-respect. We are constantly preparing to face the new challenges of the profession, to develop our knowledge and put it at the service of

[14] Haussaire, A., Pujol, J. P. - Organisation du système d'information comptable et de gestion, Dunod, Paris, 2004, p. 97.
[15] Kroenke, D. M. - Management Information System, Mitchell McGraw-Hill, 1992, p. 115.

our clients. Continuous improvement, in the current conditions, is an obligation that if we do not honor it we lose the tough competition on the market. Businesses are becoming increasingly aware that a professional accountant has an important role in the economic and financial management and hence the growing importance that our activity will have. Accounting remains, at the moment, a very dynamic field at international level. The accounting profession has long ceased to be confined to the image of the "sleeve employee" who makes additions and subtractions. The activity of a true professional accountant is very different, creative, based on a knowledge that must go beyond the scope of application of domestic and international legislation in force regarding the accounting and auditing of organizations. A representative of the accounting profession, today, must have an integrative vision on the overall activity of an organization, to have knowledge of economic-financial analysis, evaluation, control, financial audit, informatics, strategic management, ethics etc., so that he can practice this profession and be able to easily collaborate with other specialists, in order to obtain and capitalize on financial-accounting information in the interest of the organization, in substantiating its decision-making processes, thus being an efficient professional accountant.

4. Limits of financial - accounting information in risk identification

Financial-accounting information has certain limitations that can interfere with risk management. For example, if there is a delay in obtaining and reporting financial - accounting information, it may lose one of its important features, namely relevance. Thus, a balance must be found between meeting deadlines and sufficient credibility. To provide timely information it is necessary to report all aspects of a transaction or event. We thus deduce a balance between relevance and credibility, taking into account the satisfaction of users' needs in the decision-making process.[16]

The main feature, but also the limit of financial indicators in the classical accounting system is that they measure the past and what is easy to measure. Due to the limitations of financial information and its impossibility to capture all facets of performance, more and more non-financial information is required, especially in the interpretation of the values resulting from the calculation of formulas for certain risks.

The balance between the advantages and the costs with which the information is obtained constitutes a general restriction, the advantages obtained by the users of the accounting information must be superior to the cost of its provision. Also, obtaining an adequate balance between the characteristics of the accounting information, but also their accurate presentation are necessary to satisfy the

[16] D.Matis, O.Candrea, R.Mustata, "Comunicarea informaţiei economice", Tribuna Economică, Bucharest, 2005

objective of the financial statements, because they are the result of the application of the main qualitative characteristics and the appropriate accounting standards.[17]

Thus, the limits of financial-accounting information that can influence decisions are:

- the use of historical cost and inflation - the data provided by the accounting are expressed in historical figures, not being adjusted with the consumer price index, so in order to ensure the comparability of the data it is necessary to reprocess them;
- the use of different stock valuation methods (FIFO, LIFO, CMP) - creates difficulties in making comparisons between entities.[18]

In the case of the standardized accounting model, these limits are eliminated by using fair value measurement, which is an important step especially in relation to investors, due to the implications on the credibility and comparability of financial statements.

Accounting was categorized by the great researcher Jean Fourastié as the safest method of economic observation, being coordinated by finality principles. He is of the opinion that accounting models must evolve under the influence of needs. Bernard Colasse also states that "accounting is the oldest of all management sciences […] it is history itself: accounting books have a vocation to keep track of a number of events with economic consequences"[19], but we must not forget that accounting models are currently in a continuous development, even if they are based on the historical evolution of accounting. In any organization, accounting is a financial reflection of economic processes and circumstances. The role of accounting is to present relevant financial information that is used for the successful management of the organization, being, at the same time, an element of manipulation in providing stakeholders with clear details related to the course of business and its financial impact.

The first purpose of accounting is to inform the outside world. Stakeholder groups, such as shareholders and creditors, want to be informed about the amount that was created or lost in the previous period, the sources from which the money came and how it was spent, and, finally, how the financial situation evolved during that period. That is why it is very easy to carry out a mass manipulation using financial-accounting information that presents the organization in a favorable light, even if the reality is completely different. The presentation of less transparent and coherent reports, respectively the distorted presentation of transactions and events, will only lead to a negative influence on the future of the organization in order to execute the rights and obligations.

[17] D.Matis, O.Candrea, R.Mustata, "Comunicarea informaţiei economice", Tribuna Economică, Bucharest, 2005

[18] N.Todea, I.Dorin, A.Udristoiu, "Calitatea informaţiei contabile suport al deciziei manageriale", Analele Universităţii "Constantin Brâncuşi" fromTârgu Jiu, Economic series, no.3/2011, pg.156

[19] B.Colasse, „Comptabilité générale", 9e édition, Ėditions Economica, Paris, 2005

The role of accounting information is to support financial and operational management through the internal monitoring of the organization. The availability of real, detailed and specific information enables the responsible persons to follow the course of the business in accordance with their mandate and to perform economically. Only in this way does accounting play an important role in internal management and decision-making.

5. The importance and the stages of financial risk management

Smart companies recognize risk management as one of the responsibilities of boards of directors. New requirements and guidelines related to corporate governance, financial reporting and company law make it necessary to manage and report company risks in a holistic and precise manner.

One of the factors behind the rapid development of financial risk management is the high level of instability of the economic environment in which companies operate - environmental volatility. It exposes companies to higher financial risks, causing companies to identify more efficient ways to manage risks. To this volatility is added the intensification of trade activity since the 1960s and the development of information technology. Improving the latter has made possible the computational power (new techniques can be used) and the speed with which calculations are made[20]. In the contemporary period, other important factors have led to the emergence of new methods of financial risk management. Of these, the most important are globalization and relocation to countries with cheaper labor.

Financial risk management is the process by which the company copes with the uncertainties resulting from the financial markets. This includes assessing the financial risks facing the organization and developing management strategies in line with internal priorities and policies. Proactively addressing financial risks can give the company a competitive advantage. It also ensures that management, operational staff, stakeholders and the board of directors agree on key risk issues.

Financial risk management requires organizational decisions linked to the risks that are accepted, versus those that are not. The passive strategy of not taking any action is equal to accepting all risks. A variety of strategies and products are used to manage financial risks, and it is important to understand how they act to reduce risk in the context of the company's tolerance and objectives[21].

Financial risk management is a component of the company's financial management, seeking to control instability related to certain operations or operating costs (operating risk related to cost structure, risk of indebtedness related to the effect of the company's financial structure, risk of bankruptcy), but also to

[20] K.Dowd, „An introduction to market risk measurement ", Ed. John Wiley&Sons, 2002, pg.2-3
[21] K.Horcher, „Essential of financial risk management", Ed.John Willey&Sons, New York, 2005, pg.3

control the influences exerted on the enterprise by the inherent instability of some environmental variables (exchange rate risk, interest rate risk), or by the special transformations that take place in the institutional environment (administrative risk and political risk)[22].

Risk management according to P.Hopkin[23] has 7 stages, in some of these, the accounting information provided by the accounting model is of significant importance.

Table no.1. Stages of risk management and correlation using accounting information

Stages of risk management	Using accounting information
Recognizing and identifying risks	Yes – accounting primary source of information.
Classification and assessment of risks in terms of magnitude and probability	Yes – accounting primary source of information.
Responses to significant risks, including decisions on the most appropriate ones - tolerance, reduction, transfer or elimination of risk.	Yes – calculating risk impact on results.
Resource control to ensure that the necessary control activities can be introduced and supported	Yes – budget analysis.
Reaction planning and / or event management	No.
Reporting and monitoring performance, actions and events related to risk	Yes – monitoring information with the analysis of results.
Review of the risk management system, including internal control procedures and revisions, and improvements to the risk architecture, strategies and protocols.	No.

Source: own design.

[22] I.Vasile,"Gestiunea financiară a întreprinderii", Ed. Meteora Press, București, 2002, pg.19
[23] P.Hopkin, „Fundamentals of risk management", Ed. KoganPage, Londra, 2010, pg.39

We consider that in 5 out of 7 stages the information provided by the accounting model is essential for an efficient risk management. Accounting is an important source of information underlying the identification and assessment of risks. But this is not the only function it has in the risk management process, calculating the impact that risks can have on results is of particular importance on making the right decisions about how to approach them. However, these decisions require financial resources, and information about the possibility of their implementation cannot be taken without a financial analysis of the company's results. We deduce accordingly that the activity of financial risk management is closely related to the information provided by the accounting model.

The main purpose of this process is to provide decision support. As we can see from the steps presented above, we start with risk identification, risk analysis and description. All analyzes performed are frequently referred to as risk assessments[24]. From our point of view, this stage of risk assessment is very important, as the other steps directly depend on it.

The link between risk and the accounting model can only be one of interconnection and mutual determination, accounting information being the main common point. The different objectives of financial reporting, influenced by the economic, cultural and social environment of the country in which the company operates, lead to different ways of approaching risks, a different prioritization and implicitly different valuation methods.

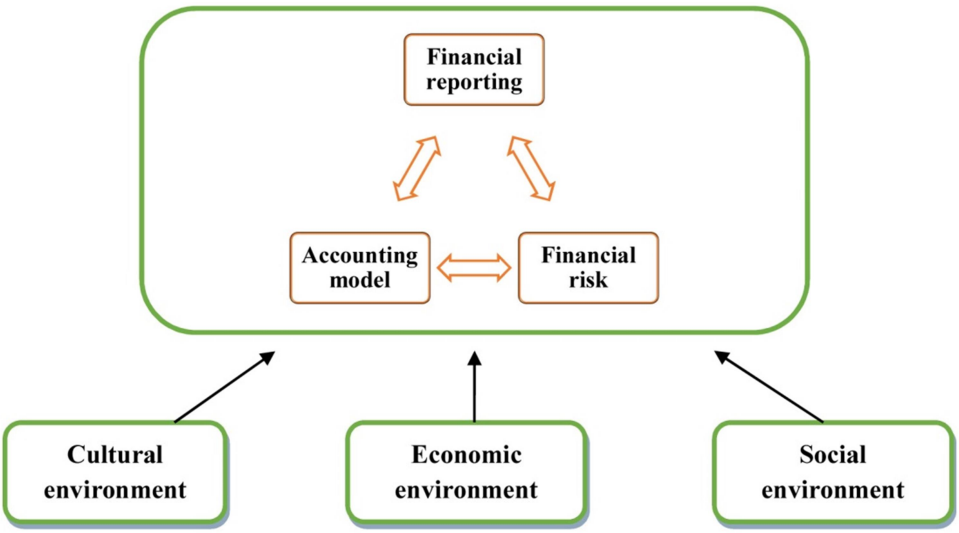
We ask ourselves if "financial risk can be considered a determining factor of the accounting model?". We consider that the importance of financial risk assessment and management has implications for accounting information needs, determining different reporting methods. At the same time, the evolution of the notion of risk is based on changes in the business environment, and the progress of valuation methods has been possible due to changes in accounting models. In our opinion, the relationship between financial risk, accounting model and environmental impact can be outlined as follows:

Generally, an accounting system processes data describing all activities, for which numerical information is available, attested by supporting documents and expressed in monetary standard, which must serve the planning, control and presentation of the balance sheet of an organization. The multitude of informational needs of the various users of accounting information determines the constitution of two representations of the same reality: an "*internal*" representation and another "*external"* one. Formally, this dual representation finds its concretization in the existence of two components in the accounting information system of the

[24] T.Aven, „Risk analysis and management.Basic concepts and principles", R&RATA # 1, Vol.2, 2009, pg.57

enterprise: general or financial accounting and management accounting or managerial accounting.

Figure no.3 The relationship between financial risk - accounting model - environmental impact



Source: own design

Another question we ask ourselves and seek answers to is "can financial risk be considered a determining factor influencing financial audit activity?".

We consider that we are dealing with two aspects of the quality of the financial auditor's activity, namely the quality of the audited financial-accounting information and the quality of the audit itself, both addressing the same "clients", respectively the beneficiaries of financial-accounting and auditors reports (opinions). The quality of the financial-accounting information, respectively the information from the financial statements, is as well defined by IFRS / IAS as it can be (General Framework. Qualitative characteristics of the financial statements). However, these definitions lack some references to economic information in a broader sense and to the predictive potential of this information, elements that prove to be extremely important for users, which can meet the expectations of beneficiaries (users) of information in financial reporting - accounting, in the sense of their credibility and usefulness, but within the limits of the applicable professional standards accepted.

A reference system for quality assurance is the one developed by ISO (International Organization for Standardization), respectively ISO 9000. The purpose of these standards would be to make comparisons between equal companies ("ISO" in Greek means "equal"). These standards provide a baseline on how to achieve the basic quality goal, meeting customer expectations through the participation of all organizational components to the quality optimization efforts and to the documentation of specific systems and procedures.

The quality of the information provided through financial reporting, which directly involves International Accounting Standards, is an end in itself. They must add value to the financial reporting system in support of the stability of the financial system and economic growth. The International Accounting Standards, through the general framework of IFRS 1 identify four qualitative characteristics that determine the usefulness of the information in the financial statements. This information must be[25]:

- easy to understand by users;
- relevant for the users to make decisions;
- believable;
- to correctly represent the transactions and other events that they either represent or are reasonably expected to represent;
- to represent transactions and other events in accordance with their substance and economic reality, not only with their legal form;
- to be neutral, which means impartial;
- to fight the uncertainties that may inevitably arise in some situations and circumstances by exercising caution;
- to be complete within the threshold of significance and cost;
- to be comparable to the information provided by the entity in its statements over time and to the information provided in the financial statements by other entities.

The usefulness of the information contained in the financial statements depends on a number of characteristics, such as: relevance, exact representation, comparability, verifiability, opportunity and intelligibility.

Relevance: Relevant financial information has the ability to help information users make decisions. On the other hand, financial information has the ability to help information users make decisions whether they have predictive value, confirmatory value or both. They have predictive value if they can be used as inputs in user-applied processes to predict future results. In order to have predictive value, financial information does not have to be a forecast or a prognosis.

[25] *** International Financial Reporting Standards issued on January 1, 2018, part A, Publishing House. CECCAR, Bucharest, 2018

Exact represantation: The annual financial statements describe economic phenomena in words and figures. To be an accurate representation, a description must be complete, neutral and error-free. A complete description includes all the information necessary for a user to understand the described phenomenon, including the necessary explanations.

Comparability: Information about a reporting entity is much more useful if it can be compared with similar information about other entities and with similar information about the same entity for another period or date. Comparability is one of the qualitative characteristics that allows users to identify and understand the similarities and differences between elements. Unlike the other qualitative characteristics, comparability does not refer to a single element. A comparison requires at least two elements.

Verifiability: Verifiability helps to assure users that the information depict exactly the economic phenomena they aim to represent. Verifiability means that different independent and knowledgeable observers could reach a consensus the fact that a particular description is an accurate representation.

Opportunity: Opportunity means that information is available to decision makers so that they can make timely decisions. Generally, the older the information, the less useful it is. However, some information may remain relevant long after the end of the reporting period because, for example, some users may need to identify and appreciate trends.

Intelligibility: The classification, characterization and presentation of information in a clear and concise manner make it intelligible. Some phenomena are inherently complex and cannot be transformed into easily understood phenomena. Excluding information on these phenomena from the financial statements would lead to the situation that these reports would be incomplete. Financial reports are prepared for users who have sufficient knowledge regarding the business and economic activities and who study and analyze the information with due attention. However, the presentation of the financial statements must be made in such a way as to allow their understanding by the different categories of users of the information contained therein.

In Romania, the evolution of accounting has been correlated with international changes, characterized by attempts to ensure a common framework for preparing and presenting financial statements to provide information that meets the conditions specified above to investors, financial creditors, managers, and other users interested in the accounting information; to make it possible to assess the risks inherent in the investments, as well as the income they may bring.

6. Conclusions

Knowledge and dissemination of information is a complex process of reflecting the practical reality in people's consciousness and in their productive activity, a permanent approach of man to the phenomena and processes of nature and society. This is done gradually, reflecting reality. The results of knowledge - verified in economic and social practice - are authentic knowledge, which constantly moves from relative truths to absolute truths. The perception of information in literature is that information is "a generic element of the process of knowing and representing reality, as well as conception and communication, inherent in human action, at the scale of society - in general - and organizations - in particular".

The parameters of information efficiency are determined by the degree of *subjectivity - objectivity*, by its servitude to the user, by the temporary duration taken as reference, but also by the qualitative and quantitative aspects, in this sense the most expressive example being the notion of "accounting information". The information is associated with a *utility value*, representing the possibility of saving, this being calculated starting from the difference found between the effects of a decision promoted by and without the *knowledge component*. The value of utility is directly influenced by the physical and moral depreciation, which becomes predominant. The information is exposed to a high degree of degradation, this being automatically included by the production and dissemination of actions resulting from the diversified and polyvalent interaction with the sum of information from a certain environment.

Accounting information can be assimilated and analyzed through the prism of three aspects: *semantic, syntactic and pragmatic*. The *semantic* aspect of information refers to the importance it has for the receiving element. The *syntactic* side highlights the way in which the signs that compose the information remove an element of uncertainty, of determining the phenomenon, and the practical utility of the information for the user synthesizes the *pragmatic* aspect. *Therefore, economic information is characterized by the fact that it expresses explanations on* economic resources, production, distribution, exchange and consumption of results, being formulated on the basis of a set of indicators that together form the "data repertoire" indispensable for coordinating an efficient economic process.

Based on the general principles stated regarding the functioning of economic systems, as well as the purpose of financial accounting information in establishing information links, we can conclude that, while the content of information is conditioned by the managed system, its form is given by the management system. If in the process of obtaining information, their form may involve changes depending on the means and procedures used, the content will remain the same, regardless of the structure of the system that led and leading.

The pace of change, registered in Romania in recent years in the financial-accounting sphere, is far ahead of the evolution of economic performance. The observed realities have substantiated and will continue to influence the recommendations received by the organizations from the Romanian economy in many other directions, related to the optimization of management and financial-accounting communication such as, for example, the corporate governance model specific to Romania. Against the background of the globalization of national economies, we are currently witnessing a phenomenon that could lead to the formation of a universal accounting professional.

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JOURNAL of Information Systems & Operations Management

ISSN : 1843-4711

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