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## Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics  
Düsternbrooker Weg 120  
24105 Kiel (Germany)  
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)  
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**University of Aveiro**



# **Economic and Social Development**

104<sup>th</sup> International Scientific Conference on Economic and Social Development

## **Book of Proceedings**

Editors:

**Marcelo Jasmim Meirino, Ivana Martincevic, Zvonko Merkas**

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# TEACHER'S COMPETENCES IN EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD) ORIENTED BY VALUES: A SYSTEMATIC REVIEW OF LITERATURE

**Raquel Lenziardi**

*Department of Engineering, University Federal Fluminense, Brazil  
raquel.lenziardi@gmail.com*

**Margarida Lucas**

*Department of Education and Psychology, University of Aveiro, Portugal  
mlucas@ua.pt*

**Patricia Sa**

*Department of Education and Psychology, University of Aveiro, Portugal  
patriciasa@ua.pt*

**Mirian Picinini Mexas**

*Department of Engineering, University Federal Fluminense, Brazil  
miriam\_mexas@id.uff.br*

## ABSTRACT

*The development and application of competences frameworks and models for education for sustainable development (ESD) have increased during the past several years. The competencies that students, the general public, and teachers need to develop are identified, examined, and evaluated using these models. In this study, we conduct a systematic literature review (SLR) about the frameworks and models that present teacher competences in ESD, focusing on values. Values for ESD can be considered as a set of ethical, moral, and cultural principles that underpin sustainable development and provide guidance for what's right or wrong, supported by norms and rules (UNESCO, 2014; UNESCO, 2020). We analyzed 13 papers out of an initial sample of 75 over the last five years. All the competences's indicators found in these materials were listed, summarized, and, through a content analysis, a list with the competences related to the concept of "values" for ESD was produced. This list of competencies can demonstrate what is expected of teachers in relation to their values for the promotion of ESD. Those models and frameworks analyzed aim to present a list of universal competences of values related to ESD, but they were predominantly produced in developed countries. For future research, it is therefore recommended to complement this framework by considering perspectives and educational contexts from around the world.*

**Keywords:** *Competences, Education for Sustainable Development, Systematic Literature Review, Teacher, Value-oriented for ESD*

## 1. INTRODUCTION

Education for sustainable development (ESD) aims to empower individuals, communities, and societies of different generations to create a sustainable future by integrating economic, social, and environmental dimensions into all aspects of education, from policy formulation to curriculum design and teaching methods (UNESCO, 2002; UNESCO, 2018; UNESCO, 2020). The opportunities and challenges presented by ESD have been described in numerous international statements, such as the Rio Earth Summit in 1992 and, ten years later, at the last World Summit on Sustainable Development in Johannesburg in 2002, where world leaders acknowledged the urgency with which they must address sustainability challenges in order to improve people's quality of life globally by pro-moting social fairness, responsible economic

growth, and environmental preservation (UNESCO, 2002). In 2015, ESD was specifically included as one of the Sustainable Development Goals (SDGs) by the United Nations (UN), SDG 4 – Quality Education, with the specific target to “ensure inclusive and equitable education and promote lifelong learning for all” (UNESCO, 2017, p. 3). In recent decades, ESD has become increasingly important in the world as a key strategy for achieving a more sustainable and equitable future. Teachers are considered key drivers of the ESD agenda, as they are responsible for providing knowledge and skills, as well as guiding students to adopt sustainable values and attitudes. Therefore, how can we identify, examine, and evaluate what ESD competences teachers need to develop to address this challenge? Do they truly care about ESD enough to generate significant changes? In the literature, there are several studies that propose ESD competences for teachers (Sleurs, 2008; UNECE, 2012; Rieckmann, 2018a; Vare *et al.*, 2019; Corres *et al.*, 2020; Imara & Al-tinay, 2021; Leal *et al.*, 2021), even considering the teacher’s role in different dimensions, such as transforming themselves as individuals, contributing to society, and meeting the demands of educational institutions (EIs). However, despite some studies indicating values as a specific area of competence to be developed, few of them have highlighted values as the central area of competence. Value is an important component of competence in ESD because it can be considered as a set of ethical, moral, and cultural principles that underpin sustainable development and provide guidance for action and decision-making (Sleurs, 2008; UNESCO, 2018; UNESCO, 2014). Thus, it is important to understand, and even stimulate and develop, teachers’ principles and perceptions about ESD, considering value as the center of ESD competences, for example as expounded by Lambrechts *et al.* (2013). By a systematic review of literature this study presents a list of competences included in models and frameworks to proposed to develop teachers’ competences to guide them towards the values related to ESD.

## **2. VALUES AND ESD COMPETENCES FOR TEACHERS**

Values for ESD can be considered as a set of ethical, moral, and cultural principles that underpin sustainable development and provide guidance for what’s right or wrong, supported by norms and rules (Sleurs, 2008; UNESCO, 2014, UNESCO,2020). The relation with education is the integration of “principles, values, and practices of sustainable development into all aspects of education and learning” (UNESCO,2020, p. 1). Development and growth in terms of sustainability are possible when considering ESD competences for teachers (Sauvé & Orellana, 2002), and the enhancement of these competences is an opportunity to improve ethical reflection on development and growth as well as other socioeconomic, political, cultural, and ecological dimensions shaping sustainability (Grange, 2017). “Educators remain key players in facilitating learners’ adoption of sustainable lifestyles in an era where information is available everywhere and the role of educators is changing.” (UNESCO, 2020, p. 30). The concept of competences in relation to teacher EDS is in continuous development (Sleurs, 2008; UNECE, 2012; Rieckmann, 2018a; Vare *et al.*, 2019; Corres *et al.*, 2020; Imara & Altinay, 2021; Leal *et al.*, 2021). Analyzing these literature, Wiek *et al.* (2011) and Wiek *et al.* (2015) in a meta-analysis, identified, based on the numerous documents analyzed, a set of five key competences that were almost always present, although, in some cases. Following this work, the authors became a reference for subsequent studies, such as the competences presented by UNECE (2012). However, values are both explicitly and implicitly present in all ESD frameworks or models that approaches values. Values represent the worldview of specific groups regarding sustainability, as well as the importance placed on it, adherence to norms and rules, and approaches to problem-solving and action. In an article that applies the Delphi Analysis methodology, there was a recognition of the potential need to consider values-thinking competences as providing the normative orientation for all the other competences.



According to specialists in this study, “the competences alone, without being placed within a sustainability context, can [...] be utilized for distinctly unsustainable nefarious purposes [...] and lead to very unsustainable outcomes” (Brundiers *et al.*, 2021, p.20). Ethics and values are one of the five domains of competences in the CSCT-Model (Sleurs, 2008). The authors considered that norms, values, attitudes, beliefs, and assumptions guide our perception, thinking, decisions, and actions. The Joint Research Centre (JRC) of the European Union developed a set of competences for ESD, called Green Comp, defining specific domains about values, considering the incorporation of sustainability (Bianchi *et al.*, 2022). Values are deeply ingrained beliefs reflected in our personal behavior, influenced by factors like ideology, religion, gender, class, culture, and life experiences. They encompass all aspects of human life, from religion to politics to social and economic spheres, defining who we are as individuals. Values serve as a moral compass, guiding our judgments of right and wrong. Ethical behavior aligns with what is considered right or moral, but determining what is universally "right" can be a complex task (Sleurs, 2008; UNESCO, 2014; UNESCO, 2020). It is crucial that teachers take on the commitment to education and sustainable ways of life, in the various spheres of social intervention and their professional dimensions, in order to contribute both individually and as a member of a community to the creation of a more just and sustainable world, combining equity and social solidarity with dialogue (Sleurs, 2008). They also should act like an example, lending credibility to speeches and actions.

### **3. METHODOLOGY AND RESEARCH**

This study investigates models and frameworks about teacher's competences for values of ESD through a SRL by years 2017 – 2023 in the SCOPUS database. We chose this approach because it explicitly and broadly systematizes investigations of a specific subject through an organized, transparent process that leads to conclusions that can be replicated and verified (Tranfield, Denyer, & Smart, 2003; Okoli, 2019). The search in database was made in April 2023 with keywords: education for sustainable development, framework or model, competenc\* and teacher. As a result, it was identified 75 titles. Analyzing the content of these material, some articles were excluded, and the final sample was composed by 13 articles. Some papers were excluded because no framework or model of ESD was conceived, presented, applied, or discussed in the articles. Through this first screening, we discarded 62 papers, and the remaining 13 articles were considered in the final sample that was totally and carefully reviewed (figure 1).

*Table following on the next page*

Num. Doc.	Authors, Title
D1	"Connecting competences and pedagogical approaches for sustainable development in higher education: A literature review and framework proposal." (Lozano <i>et al.</i> , 2017)
D2	"Devising a competence-based training program for educators of sustainable development: Lessons learned." (Vare <i>et al.</i> , 2019)
D3	"Developing ESD competences in higher education institutions: Staff training at the University of Vechta." (Scherak & Rieckmann, 2020)
D4	"A novel improvement strategy of competency for education for sustainable development (ESD) of university teachers based on data mining." (Weng <i>et al.</i> , 2020).
D5	"Integrating education for sustainable development competencies in teacher education." (Imara & Altinay, 2021)
D6	"University teaching staff and sustainable development: an assessment of competences." (Leal <i>et al.</i> , 2021)
D7	"Pre-Service Geography Teachers' Professional Competencies in Education for Sustainable Development." (Ammoneit <i>et al.</i> , 2022)
D8	Differences in Teachers' Professional Action Competence in Education for Sustainable Development: The Importance of Teacher Co-Learning (Isac <i>et al.</i> , 2022)
D9	Measuring professional action competence in education for sustainable development (PACesd) (Sass <i>et al.</i> , 2022)
D10	"Teacher Action Competence in Education for Sustainable Development." (Vukelić, 2022)
D11	"Education Stakeholders' Viewpoints about an ESD Competency Framework: Q Methodology Research." (Chaaban <i>et al.</i> , 2023)
D12	"Teaching and Learning Approaches: Curriculum Framework for Sustainability Literacy for Technical and Vocational Teacher Training Programmes in Malaysia." (Chinedu <i>et al.</i> , 2023)
D13	"The Development and Validation of an Instrument for Assessing Science Teacher Competency to Teach ESD." (Eliyawati <i>et al.</i> , 2023)

*Figure 1: Analyzed Academic Articles in the SLR*  
(Source: Authors, 2023)

These sample have the average of 2 publications per year, with the years 2022 and 2013 being the years with the largest number of publications. These articles were from five journals, majority, with the majority from the Sustainability journal (69%). The studies analyzed were represented by different countries, including Japan (1 article), China (1 article), Malaysia (1 article), United States (1 article), Qatar (1 article) and European countries (8 articles). They were developed within formal education contexts, including teacher training institutes and the participants consisted of teachers in primary and/or secondary education (6 articles) and university-level (7 articles). All competences regarding ESD for teachers, as well as their respective descriptions and indicators, have been listed. Then, the value domain present in the identified competences were filtered (Figure 2).

*Figure following on the next page*

Num. Doc.	Values competences for ESD	Values competences descriptors or indicators related to ESD
D1	Justice, responsibility and ethics	Application of concepts of ethics, justice, social and ecological integrity, and equity. Description, negotiation, and reconciliation of principles, values, aims, and goals for sustainability. Responsibility for one's actions. Ethics and sustainability of personal and professional behaviour.
	Empathy and change of perspective	Ability to identify own and external perspectives. Understanding and sympathy for the needs, perspectives, and actions of others. Ability to deal with internal and external value orientation. Compassion, empathy, and solidarity with others across differences. Accepting and embracing of a diversity of opinions, experiences, or perspectives. Transcultural understanding.
D2	Responsibility	The educator of ESD may be in the fortunate position of recognizing that they are carrying out meaningful work and thus contributing to a meaningful life. As well as acting transparently and responsibly themselves, the educator of ESD will have a range of tools, e.g., role play, simulations, real-world engagements, through which to develop their learners' abilities to act responsibly. In this way, they will encourage long-term thinking about what kind of human beings we want to be and what kind of world we want to live in.
D3	Values	The educator develops an awareness among learners of how beliefs and values underpin actions and how values need to be negotiated and reconciled.
	Responsibility	The educator helps learners to reflect on their own actions, act transparently and to accept personal responsibility for their work.
D4	Competence for ESD	The ability of ISEC teachers to fulfil the responsibility of education for sustainable development. ISEC teachers should guide students to establish the idea of sustainable development, acquire relevant knowledge and abilities, improve the lifestyle, prepare to be responsible citizens in the future, and contribute to the sustainable development of society, economics, environment, and culture.
D5	Values and Behaviours	Promote sustainable use of natural resources. Promote social tolerance and equity. Optimism towards contributing to ESD. Responsibility for environmental problems. Acknowledgment of the importance of the idea of SD as a task for society as a whole. Acknowledgment of the role of education as a resource for tackling of this societal task. Normative and cultural competence. Application of ethical principles related to the values of sustainability.
D6	Ability to value varying perspectives	Shapes personal and collective identities and the formation of responsible citizenship.
	Commitment to SD	Demonstrates "doing by example" in respect to conservation of the environment, social responsibility, ethics and cultural diversity.
D7	Values ESD competences	Diversity of values, cultures and living conditions. Globalization of religious and ethical models.
D8 e D10	Self-efficacy regarding education for sustainable development	Develop students' ability to reflect on their own actions. Develop students' ability to express their own views on sustainability issues, make students realize that there are conflicting interests on the road to sustainable development. Develop students' ability to act for sustainable development at a local level (e.g., in the school).

		<p>Develop students' ability to act for sustainable development at a regional level (e.g., in the municipality).</p> <p>Develop students' ability to act globally for sustainable development (e.g., boycott certain goods).</p>
	Willingness to implement education for sustainable development	<p>Each day, I make sure that I have enough opportunities to dedicate myself to education for sustainable development.</p> <p>ESD is typically me.</p> <p>ESD is close to my heart. Without ESD I wouldn't be myself.</p> <p>Implementing ESD gives me energy.</p> <p>I try to plan my daily work so that I have as much time as possible to spend on ESD.</p> <p>When I'm working on ESD, I experience that as an intense experience.</p> <p>ESD will play an important role in my life.</p> <p>I often feel a strong urge to work with ESD.</p> <p>I am often really looking forward to working with ESD.</p> <p>Many of my personal goals are related to ESD.</p>
D9	Knowledge of ESD-specific teaching principles	<p>Create participative learning environments.</p> <p>Create an appreciative atmosphere respecting diversity.</p> <p>Use the knowledge base from multiple disciplines, take into account multiple perspectives.</p> <p>Use real world problems to create learning tasks</p> <p>Foster critical thinking.</p> <p>Expose learners to uncertainty, dilemmas and conflicts of interests.</p> <p>Integrate values into teaching and make assumed norms explicit.</p> <p>Inspire creativity and innovation.</p>
D11	Value in ESD	<p>Have knowledge of local culture.</p> <p>Have knowledge of local education policies.</p> <p>Foster emotional connectedness and community.</p> <p>Participate in school decision-making.</p> <p>Apply ethical principles.</p>
D12	Specific ESD competences	<p>To identify the principles of sustainable development.</p> <p>To explain the key principles of SD such as equity, ecological balance and protection, education, responsible citizenship, responsible production and consumption, peace, conflict resolution, human security, social justice, and so on.</p> <p>To explain ethics in sustainability.</p> <p>Demonstrate sustainable behaviour for responsible citizenship.</p> <p>Demonstrate the capacity to reflect on actions that contribute to economic, social, and environmental issues.</p> <p>Explain the role of students in sustainability through participation in civic learning.</p> <p>Explain the place of ethics in educating students for a sustainable future.</p> <p>Explain the concepts of ethical behaviour and attitude.</p> <p>Explain the role of fairness and justice in building an equitable society.</p> <p>Analyse existing models to explain the social, environmental, economic and cultural aspects of SD.</p>
D13	Attitudes	<p>Responding to social, economic, and environmental changes by being involved in communities and society.</p> <p>Having tolerance for students.</p> <p>Demonstrating a consistent and positive attitude and lifestyle.</p> <p>Cooperating with students and communities across different cultures.</p> <p>Having work discipline in achieving personal and family well-being.</p>

*Figure 2: Values Dimensions Found in Published Articles about Competences for ESD in the SLR*  
*(Source: Authors, 2023)*

The aim was to understand what had been investigated about teacher's competences for ESD, related to values and, based on this overview, propose a new framework to develop, in teachers, competences about ESD with values as the foundation. Finally, a conventional content analysis (Bardin, 2015) was conducted, and the key words that appeared in the competence descriptions and indicators were counted (Table 1). The objective was to comprehend what research has been done on teachers' competences for ESD in relation to values. The key words that appeared in the competence descriptions and indicators were then counted as part of a traditional content analysis (Bardin, 2015).

Words	Number of words	%
Responsability	11	8%
Social	10	7%
Ethical	8	6%
Culture	7	5%
Values	7	5%
Ecological	5	4%
Equity	5	4%
Perspectives	5	4%
Community	4	3%
Diversity	4	3%
Economics	4	3%
Environment	4	3%
Principles	4	3%
Conflict resolution	3	2%
Justice	3	2%
Citizenship	2	1%
Dilemmas	2	1%
Education policies	2	1%
Local	2	1%
Negotiation	2	1%
Respect	2	1%
Tolerance	2	1%
Other words	38	28%

*Table 1: Keywords of the values' competences for ESD for teachers  
(Source: Authors, 2023)*

In the competence descriptions or indicators, it is possible to observe central themes like social and cultural context at the local and global scale (Lozano *et al.*, 2017; Corres *et al.*, 2020; Imara & Altinay, 2021; Ammoneit *et al.*, 2022; Isac *et al.*, 2022; Sass *et al.*, 2022; Chaaban *et al.*, 2023), personal values, beliefs, and assumptions (Lozano *et al.*, 2017; Scherak & Rieckmann, 2020; Isac *et al.*, 2022; Sass *et al.*, 2022; Eliyawati *et al.*, 2023), knowledge and actions regarding key concepts about values related to ESD, as well as other concepts like citizenship, environment, and other rights and responsibilities related to ESD (Lozano *et al.*, 2017; Vare *et al.*, 2019; Scherak & Rieckmann, 2020; Chaaban *et al.*, 2023, negotiating within HEIs regarding aspects of ESD (Lozano *et al.*, 2017; Scherak & Rieckmann, 2020; Chaaban *et al.*, 2023), including concepts about values related to ESD in academic activities, curriculum, methodologies, and instructional materials (Vukelić, 2022), pedagogical activities (Vare *et al.*, 2019, Vukelić, 2022), motivating and inspiring students (Weng *et al.*, 2020; Scherak & Rieckmann, 2020; Isac *et al.*, 2022; Sass *et al.*, 2022; Chinedu *et al.*, 2023; Eliyawati *et al.*, 2023), and understanding norms and rules related to ESD (Imara & Altinay, 2021; Leal *et al.*, 2021; Chaaban *et al.*, 2023, Chinedu *et al.*, 2023). When examining our findings from the SLR, seven studies explicitly included competence focused on values (Lozano *et al.*, 2017; Vare *et al.*, 2019; Scherak & Rieckmann, 2020; Imara & Altinay, 2021; Leal *et al.*, 2021; Ammoneit *et*

*al.*, 2022, Chaaban *et al.*, 2023), which highlights the importance of developing a specific model that emphasizes values as the foundation of ESD. It is also important to discuss the limitations of the SLR implemented in this study. Our search within the SCOPUS database was conducted in English, which excluded academic literature published in other languages and through other databases from our review (e.g., Latin-American or French-speaking African countries). This suggests that further research, considering different cultures, should be undertaken to enrich our understanding of how teachers' competences regarding values related to ESD are being conceived worldwide.

#### 4. CONCLUSION

The main objective of this study was to map a set of frameworks or models about ESD competences for teachers and summarize their competence indicators regarding values to understand how the central values and principles of ESD are being addressed in the literature published in the last six years. Through the analysis of this list of frameworks or models, we were able to identify the most frequently mentioned words related to competence values for ESD and summarize the core competences about values. The SLR reveals a growing interest in recent years in teachers' competences for ESD. Most of the articles provided frameworks or models where values were specified as competences, while others indirectly addressed values as competences but recognized their importance. Most of the analyzed articles originated from European countries, the United States, and other developed countries, which can be seen as a limitation in terms of possible approaches to competences for ESD teachers worldwide. While we agree with the existence of an open environment for universal values (Leal *et al.*, 2021), when we propose a framework where values are at the core of ESD competences, we must not forget that values express the culture and worldview of a community. Therefore, it is important to acknowledge that different regions and cultural contexts may have unique perspectives and priorities when it comes to ESD. Hence, it is crucial to consider diverse perspectives and adopt a culturally responsive approach when developing competences for ESD, ensuring that the values and needs of specific communities and contexts are considered. This could involve adapting existing models or developing new frameworks that are sensitive to the local cultural and societal context while still aligning with the broader goals and principles of ESD. Further studies should explore this framework in other contexts, including different ways of knowing and perspectives, and involve experts from other regions, like Latin America to address the cultural limitations of this study.

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## LITERATURE REVIEW: HYBRID WORK IN SUSTAINABLE ORGANIZATIONS

**Andrea de Sousa Figueira**

*Universidade Federal Fluminense, Brasil  
andreafigueira@id.uff.br*

**Stella Regina Reis da Costa**

*GOVCOPP Universit of Aveiro  
Universidade Federal Fluminense, Brasil  
stella@ufrj.br*

**Izabela Simon Rampasso**

*Departamento de Ingeniería Industrial  
Universidad Católica del Norte, Chile  
izarampasso@gmail.com*

### ABSTRACT

*Hybrid work models quickly became the most common work arrangement for many employees after the coronavirus pandemic. In recent decades, environmental, social, and governance (ESG) issues related to sustainability have also gained importance in science and management practices. Currently, companies worldwide are concerned about their financial performance and the environmental and social impacts of their operational activities. This study aims to identify, through a systematic literature review, the relationship between sustainable management and hybrid work. To achieve this goal, the study method used is a systematic literature review in international article databases (Scopus and Web of Science). The findings suggest the main themes related to hybrid work and sustainable management, including urban mobility, sustainability, gender equity, talent retention, health, medicine, hybrid work models, opportunities and challenges, construction, pollutant emissions, leadership, and technology. It was identified that the term hybrid work is often confused with other terms related to telecommuting, and there is a knowledge gap linking hybrid work and sustainable management to the Sustainable Development Goals (SDGs). Given the constant technological advancements, the transformation of the post-pandemic globalized society, and the emerging forms of work, more studies are needed to consolidate the terms and concepts related to hybrid work and to meet the premises of sustainable management. Additionally, support tools should be developed for governments, companies, institutions, and organizations. Thus, it will be possible to meet the demands of society, science, and businesses.*

**Keywords:** *Flexible Work, Hybrid Work, SDG, Sustainability, Sustainable Governance*

### 1. INTRODUCTION

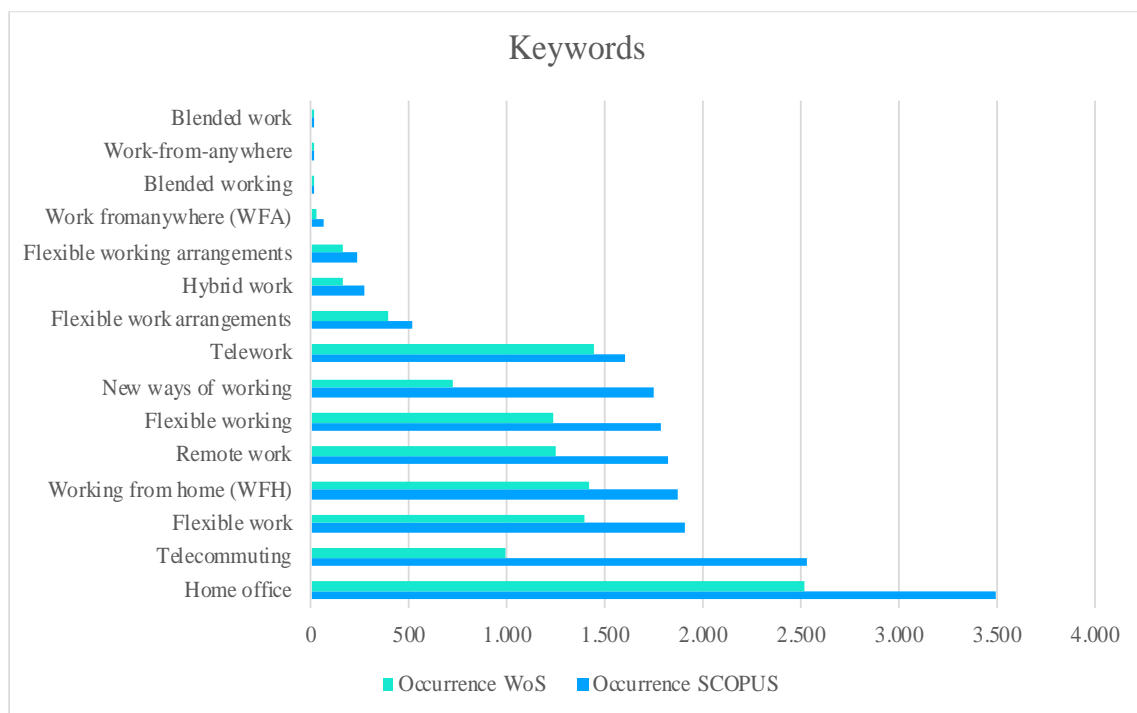
The Future Forum's research shows that in 2022, hybrid work was the dominant business model for 49% of knowledge workers worldwide (Future Forum, 2022). Sustainable management practices have also taken center stage in discussions regarding the ESG (Environmental, Sustainability, and Governance) concept. In this context, companies have been concerned with their financial performance as well as the environmental and social impacts of their activities. To achieve this goal, they have been following the principles of corporate governance and environmental practices, as well as establishing relationships with society and the community (DASGUPT& ROY, 2023). In line with these efforts, the United Nations General Assembly launched the 2030 Agenda for Sustainable Development in September 2015, aiming to guide the actions of businesses, governments, and society.

This Agenda introduces 17 Sustainable Development Goals (SDGs) (UN, 2023) and calls on all governments and private companies to support the achievement of these specified SDGs (RANJBARI et al, 2021). Among these goals are commitments to decent work (SDG 8), gender equality (SDG 5), and good health and well-being (SDG 3), where hybrid work can be an important tool to support companies in achieving synergy between these SDGs. Flexible work arrangements (FWAs), telecommuting, and hybrid work offer many strengths and opportunities to support these SDGs (MOGLIA et al, 2021). Despite the relevance of hybrid work for sustainability in the post-pandemic world, there is limited research on this relationship. In this study, no literature reviews on the topic were identified, so this article seeks to fill this knowledge gap regarding hybrid work in sustainable management.

## 2. LITERATURA REVIEW

### 2.1. Hybrid Work

Different terms related to hybrid work are identified in scientific literature, such as, for example: flexible work and blended work. To clarify these terms, an analysis of the number of citations of keywords related to hybrid work was conducted in the Scopus and Web of Science databases. The word grouping used was: "hybrid work" or "flexible work". The result was 1,705 articles, in which the keywords with the highest incidence were identified, as shown in Graphic 1.



*Graphic 1: Keywords related to hybrid work in July 2023  
(Source: Scopus & Web of Science)*

The terms "home office" and "working from home" (WFH) are synonymous and refer to working at one's own fixed residence (MESSENGER & GSCHWIND, 2016; XIAO et al., 2021). They are among the different forms of work that fall under the definitions of terms like telecommuting, telework, remote work, work-from-anywhere, flexible work arrangement, blended working, new ways of working, and hybrid work. Telecommuting refers to remote work carried out through communication technology, such as computers, phones, and the internet (GAJENDRAN & HARRISON, 2007). Therefore, it also falls under the other aforementioned terms.

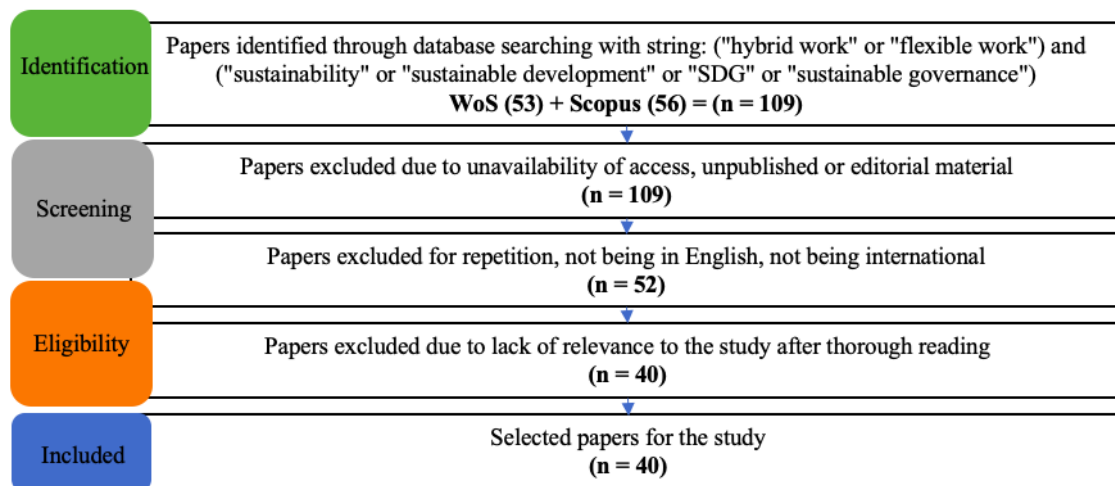
Telework and remote work are synonymous terms, encompassing work conducted outside of company premises, whether on a full-time or part-time basis (BELZUNEGUI-ERASO & ERRO-GARCÉS, 2020; WANG et al., 2021). This term is included in all other definitions. The terms "work-from-anywhere," "flexible work arrangement," "blended working," "new ways of working," and "hybrid work" share similarities in their definitions (CHOUDHURY et al., 2021; GROEN et al., 2018; WÖRTLER et al., 2021; JEMINE et al., 2021). They refer to work that can occur at any time or place, either on a full-time or part-time basis. Therefore, the most suitable term for the purpose of this study is hybrid work.

## **2.2. Sustainable Governance**

To support the selection of terms used in the literature review, a theoretical framework was conducted on sustainability, sustainable governance, SDGs, and ESG. The study by Billi et al. (2021) on the relationship between the terms sustainability and governance indicates that this relationship operates in two directions: governance can be a path to achieving sustainability as much as sustainability can be framed as a way to achieve governance. The concept of sustainability encompasses three different dimensions: economic, social, and environmental aspects of human lives within society, the environment, and the economy for the benefit of current and future generations (RANJBARI et al., 2021). Sustainability and sustainable development have become key concepts in science and political agendas to ensure that human activities remain without significant harm to the environment, society, and the economy. Similarly, the global initiative of SDGs and ESG principles have also become key concepts related to sustainability. The SDGs involve governments, organizations, and society in addressing global challenges and have emerged as an expression of commitment to sustainability goals at transnational levels (BILLI et al., 2020). This has led to reforms in public and private institutions that have demonstrated a commitment to sustainable development principles, seeking to ensure that stakeholders integrate the value creation process by incorporating sustainability issues into their corporate reporting (ERIN et al., 2022). The SDGs have a broader scope than ESG principles. ESG principles are used in the context of investments and corporate performance evaluation, providing tools and metrics for companies and investors to assess and promote sustainable practices in the corporate realm. According to Cardoni et al. (2021), governance is the fundamental pillar of sustainable value. Unlike the terms environment ("E") and sustainability ("S"), governance ("G") and its strategic orientation are complex as they are related to financial outcomes and integrate financial markets and company strategies, especially corporate sustainability. According to Bazzan et al. (2022), in the case of countries, sustainable governance is the ability to govern, implement sustainable policies, and possess participatory and supervisory competencies over actors, institutions, and the executive branch. In the case of companies, since the adoption of the SDGs, companies have recognized their critical role in the success factors of sustainable development. Based on this theoretical framework, the keywords for this study were identified: sustainability, sustainable development, sustainable governance, and SDGs.

## **3. METHODOLOGY**

To identify the relationship between sustainable management and hybrid work in the systematic literature review, a strategy was employed based on four phases: research protocol, analysis, synthesis, and writing (FERENHOF & FERNANDES, 2016). Figure 1 provides an overview of the search process in Web of Science and Scopus. The application of this methodology enabled the mapping of the primary research outcomes.



*Figure 1: Search Results*

*(Source: Own elaboration based on the articles search 2023)*

#### 4. RESULTS AND DISCUSSION

There were 40 papers analyzed and their subareas were identified. The main theme of this study is primarily related to the subareas of urban mobility, sustainability, gender equity, talent retention, and health. Table 1 provides a synthesis of the studies by their objectives and results, along with their literature references.

*Table following on the next page*

Subarea	Objective and/or results of papers on hybrid work and ther subarea	Literature reference
Urban Mobility	Proposal of hybrid work for specific areas with the aim of urban regeneration	Glackin et al (2022)
	Suggest flexibility in working hours and location as a means to reduce traffic congestion	Wang et al (2018)
	Proposal of new urban models for sustainable neighborhoods through innovative workspaces	Di Marino et al (2023)
	Analysis of sustainable public transportation in urban areas through hybrid work	Gao et al (2019)
	Introduces the benefits of hybrid work for urban mobility management	Nijland & Dijst (2015)
	Suggest mobility strategies through hybrid work	Guzman et al (2020)
	Introduces hybrid work as a sustainable management tool for urban mobility	De Toledo et al (2023)
Sustainability	Relationship between hybrid work and SDGs for enhancing sustainability outcomes	Moglia et al (2021)
	Introduces hybrid work as a source of social sustainability	Blake-Beard et al (2010)
	Identifies sustainability and operational agility through hybrid work	Bouguerra et al (2021)
	Analysis of the benefits of hybrid work for achieving sustainability	Brewer & Hensher (2000)
	Links hybrid work to individual, social and economic sustainability	Svensson et al (2022)
Health	Introduces the impact of hybrid work on the health of professionals	Bolisetty et al (2023)
	Suggests hybrid work for professionals responsible for individuals with disabling conditions	Vecchio N. (2015)
	Proposal to support the health and productivity of professionals through hybrid work	De Carlo et al (2022)
	Proposal for a management model for the promotion of overall health	Weber & Stich 2002
	Proposal for an action plan for health in hybrid work	Björntoft et al (2021)
Gender Equity	Presents the challenges faced by female scientist and hybrid work as a factor for well-being	Fhatima et al (2020)
	Suggests hybrid work to address gender equity demands	Wilson et al (2023)
	Relates gender equality in organizations, based on SDGs 5 and 8	Kemehchian et al (2023)
	Proposal for promoting gender equity in organizations	Ivanov, I. (2020)
Talent Retention	Introduces hybrid work as one of the benefits for the millennial generation of professionals	Sutcliffe & Dhakal (2018)
	Suggests hybrid work as a strategy for maintaining the healthcare workforce	Weidman A. J. (2022)
	Highlights hybrid work as a strategy for retaining professionals	Lin & Wang (2022)
	Analyzes hybrid work as one of the benefits for the millennial generation of professionals	Goswami & Pandey (2019)
	Presents talent management trends for hybrid work in organizations	Da Silva et al (2022)
Medicine	Proposal for hybrid work to meet the demands of oncologist physicians	Kirby et al (2019)
	Suggest hybrid work to address medical demands	Wang Z. et al (2021)
Hybrid Work Model	Proposal for a hybrid work model framework	Stoian et al (2022)
	Identifies the SDGs related to hybrid work and hybrid work project	Hopkins & Bardoel (2023)
Challenges and Opportunities	Identifies the opportunities and challenges of hybrid work post-pandemic	Chafi et al (2022)
	Identifies the opportunities and challenges of hybrid work for improving employee performance	Wang & Xie (2023)
	Presents the opportunities and challenges of hybrid work with a focus on sustainability	Asatiani & Norstrom (2023)
Constrution Industry	Proposal for adopting hybrid work for professionals in the construction industry	Yaakob et al (2021)
Pollutant Emission	Analysis of sustainable policies for air quality improvement with a proposal for post-pandemic hybrid work	Silva A. C. T. (2023)
Leadership	Study on leadership in implementing hybrid work with a focus on sustainability	Gunasekara et al (2022)
Safety	Suggest guidelines for hybrid work for sustainable and safety	Baek & Jeong (2021)
Technology	Proposal for interactive virtual platform technology for hybrid work	Tran & Kim (2023)
Inadequated Hybrid Work Practices	Critical analysis of adopting hybrid work as an organizational advantage at the expense of employees	Murthy & Guthrie (2013)

*Table 1: Analysis of the papers  
(Source: Own elaboration based on the articles search 2023)*

A greater number of studies can be observed that relate hybrid work to sustainable governance, particularly in the subareas of urban mobility, health, sustainability, gender equity, and talent retention. They refer to hybrid work as a measure to reduce vehicular traffic in cities, highlighting its positive impact on sustainability, as well as its effects on the physical and mental health of professionals. It is also seen as a means of promoting women's inclusion in the workforce and as a way to retain talent in companies and organizations. The remaining subareas cover hybrid work in the field of medicine, identify opportunities and challenges, address issues in the construction industry, emissions of pollutants, leadership, security, and technologies.

## 5. CONCLUSION

The aim of this study was to identify the relationship between sustainable management and hybrid work. It was necessary to understand the meaning of the term "hybrid work" and its relevance to the study, as well as the connections between sustainable management, the ESG concept, and the SDGs. This allowed for the appropriate selection of terms and keywords for the literature review. The results yielded articles that link hybrid work and sustainable management with urban mobility, sustainability, gender equity, talent retention, health, medicine, suggested models of hybrid work, highlighted opportunities and challenges, addressed issues in the construction industry, pollutant emissions, leadership, security, technologies, and pointed out the inappropriate adoption of hybrid work for certain companies. All of these articles can be utilized in constructing a sustainable management model for hybrid work. It is worth noting that few articles directly correlate sustainable management with the SDGs, indicating a gap to be addressed in future studies. The limitations of this research included a lack of consensus on the terminology surrounding hybrid work, which complicated the analysis of the topic and expanded the scope of the research. A proposal for future studies is to suggest sustainable management models for hybrid work in organizations and companies.

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# THE RELATION BETWEEN QUALITY OF COMMUNICATION AND EMPLOYEE'S SATISFACTION

**Mihaela Slakoper**

*University of Zagreb, Faculty of Organization and Informatics Varazdin, Croatia  
mihaela.slakoper@gmail.com*

**Violeta Vidacek Hains**

*University of Zagreb, Faculty of Organization and Informatics Varazdin, Croatia  
vvidacek@foi.hr*

## **ABSTRACT**

*Quality communication is one of key aspects in everyday human life and one of the key factors for maintaining quality private and business interpersonal relationships. Communication has an important role in business organizations, it enables better performance of tasks, leads to a sense of belonging to the organization and to building trust. Employee's job satisfaction is also due to the motivation that drives employees to perform work tasks as well as possible. In addition to rewards, motivation can also be in the form of a positive working atmosphere, which certainly affects job satisfaction. The research part of the work provides insight into the connection between the influence of communication and motivation on employee satisfaction in a construction company. In order to examine the impact of communication and motivation on employee satisfaction, research was conducted in the form of an online survey. The participants (N=74) are employees of the observed company. The questioner with 50 items was created for the purpose of this research. They gained insight into the elements of communication and motivation that have the greatest impact on employee job satisfaction. Results showed that employees prefer different frequency of using face to face and online communication with their supervisors compared with the frequency that use for everyday business communication. Respondents reported that the higher level in tasks autonomy, higher level of education, price awarding, interpersonal relations and positive feedback provided by supervisors are positively related to the employee's motivation in performing activities. Results could be used for creating working environment that is positively related to the employee's motivation, work performance and employee's satisfaction.*

**Keywords:** *Employee satisfaction, Communication, Motivation*

## **1. INTRODUCTION**

### **1.1. Communication**

Process of transmission and understanding information. is helpful in choosing a quality communication strategy that helps in achieving work tasks and goals (Verma et al., 2022). There are different internal and external types of communication in business organizations. Internal communication implies communication between different levels of managers, between managers and employees and the employees themselves, while external communication, implies contact between managers and employees with suppliers, consumers, partners, social community etc. Bolfek et al., (2017) and Babić (2022) reported that honesty and clear communication are important parts for successful communication. Development of digital technology connects employees all over the world, enables flexibility and speeds up work processes. In order to prevent misunderstanding, it is necessary to make good preparation and adaptation for the online communication (Cakula & Pratt, 2021). Borovac et al. (2021) enhanced the importance of non-verbal communication in business. Nonverbal communication can make a strong impression and can completely change the meaning of the message.

## 1.2. Employees motivation

Motivation represents a psychological process that focused behavior towards a certain goal and is one of the factors that encourage employees to increase their work efficiency. The motivation can be in the form of rewards, praise, quality work atmosphere etc. (Sharma, 2022). Habits, knowledge and skills are acquired through the process of employee's motivation together with creativity, concentration and persistence (Krstinić & Pauković, 2020). Raine (2022) emphasizes the importance of low wage compensation on employee motivation. Employees who actively participation in the process of critical thinking are more self-confident and have better performance (Sharma, 2022). Brnad et al. (2016) find that job security is a very important factor for employees' motivation, while their job satisfaction is less affected by company policy. Motivation of employees and quality of work can be increased by managers using different rewards (Babic, 2022). Entrepreneurs must be sufficiently motivated in order to successfully transform daily operational activities into innovations within the existing organizational structure (Turuk, et al., 2021). Strategies of motivation can be material and non-material, such as social rewards. Material rewards often refer to salaries, bonuses, incentives, scholarships, school fees, various insurances, bonuses, etc., while non-material ones are manifested through employee participation in decision-making, positive feedback, flexible working hours, training, etc. (Prahin & Katavić, 2021). The main goal of this research is to find out which communication and motivational factors positively affect the job satisfaction of employees at the case study in one construction company in Croatia. The specific goals are to investigate which methods of communication employees most often use to communicate with colleagues and superiors in the organization, and which methods they would like to see used more, which factors motivate them in performing their work, and to what extent demotivate influences employee's satisfaction.

## 2. METHODOLOGY

### 2.1. Participants

The respondents are employees aged between 18 and 58 (N=74). There are N=25 (33.8%) female respondents and N=48 (64.9%) male respondents. The majority of them have completed a secondary vocational education N=40 (54.1%), followed by employees who completed university level of education (N=14, 18.90%) and a higher professional degree (N=16, 21.6%), while N=4 (5.4%) of respondents have not completed a professional education. Majority of respondents are young respondents 26-33 years old (37.8%), then 18.9% are 42-49 years old, 14.9% are 34-41 years old, 13.5% are 18-25, 12.2% are 50-57 years old and 2.7% have 58 years or more.

### 2.2. Measuring methods

The Questioner *MotEmp* was created for the purpose of this research. The questionnaire consisted of about 50 questions divided into 3 sections, of which the first section refers to general information about employees, the second two questions about communication, and the third section consist of questions about motivation. Consent for the questionnaire research was collected from the director of the observed company. The survey questionnaire was adapted for the needs of this research.

### 2.3. Data collection

The survey was conducted from May 24<sup>th</sup>, 2022. until June 26<sup>th</sup>, 2022. Survey participation was completely voluntary and anonymous, and it was indicated that all terms apply to both sexes. All questions were mandatory, and about the duration of the survey lasts about 10 minutes. Written permissions from the director of the observed company were obtained prior to the survey.

### 3. RESULTS AND INTERPRETATION

#### 3.1. Communications with supervisors

Respondents reported that they use different communication channels for everyday business communication with their supervisors: direct face to face communication, social networks communication, text (SMS) messages, phone calls, online mobile platforms (WhatsApp, Viber etc.) and video conferences (Skype, Google meet, ZOOM. BBB ...), but some of them are used more often and some of them not so often. Respondents' answers are presented at the Figure 1.

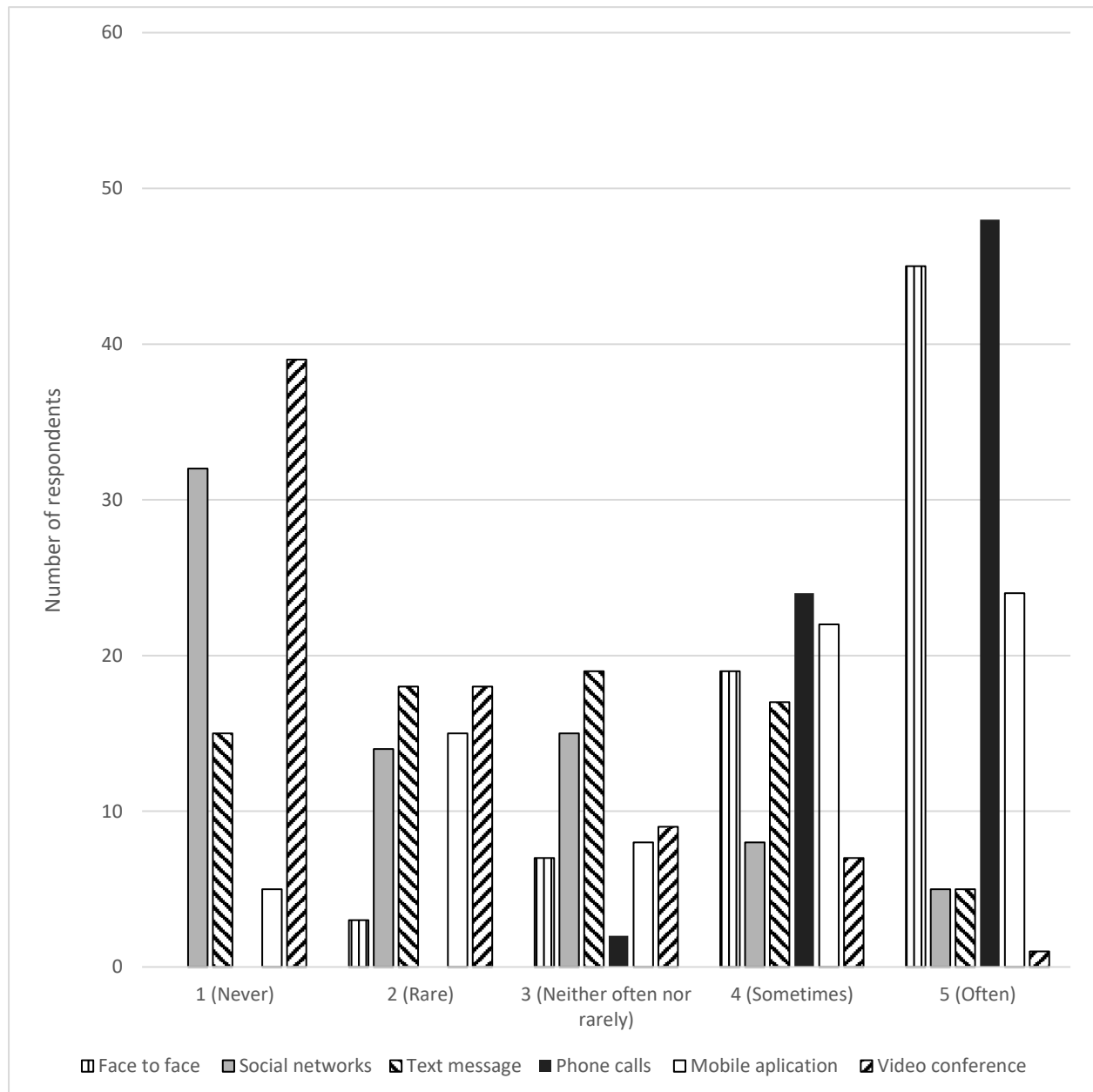


Figure 1: Communication channels used for communication with supervisors (N=74)

Results presented at the figure 1 showed that employees often use telephone calls and face to face communication, while they rarely used social networks for communication with their supervisors. Additionally, respondents are asked how often would they prefer to use those communication channels (face communication, social networks communication, text messages, phone calls, online mobile platforms and video conferences) in business communication with their supervisors. Respondents' answers are at the Figure 2.

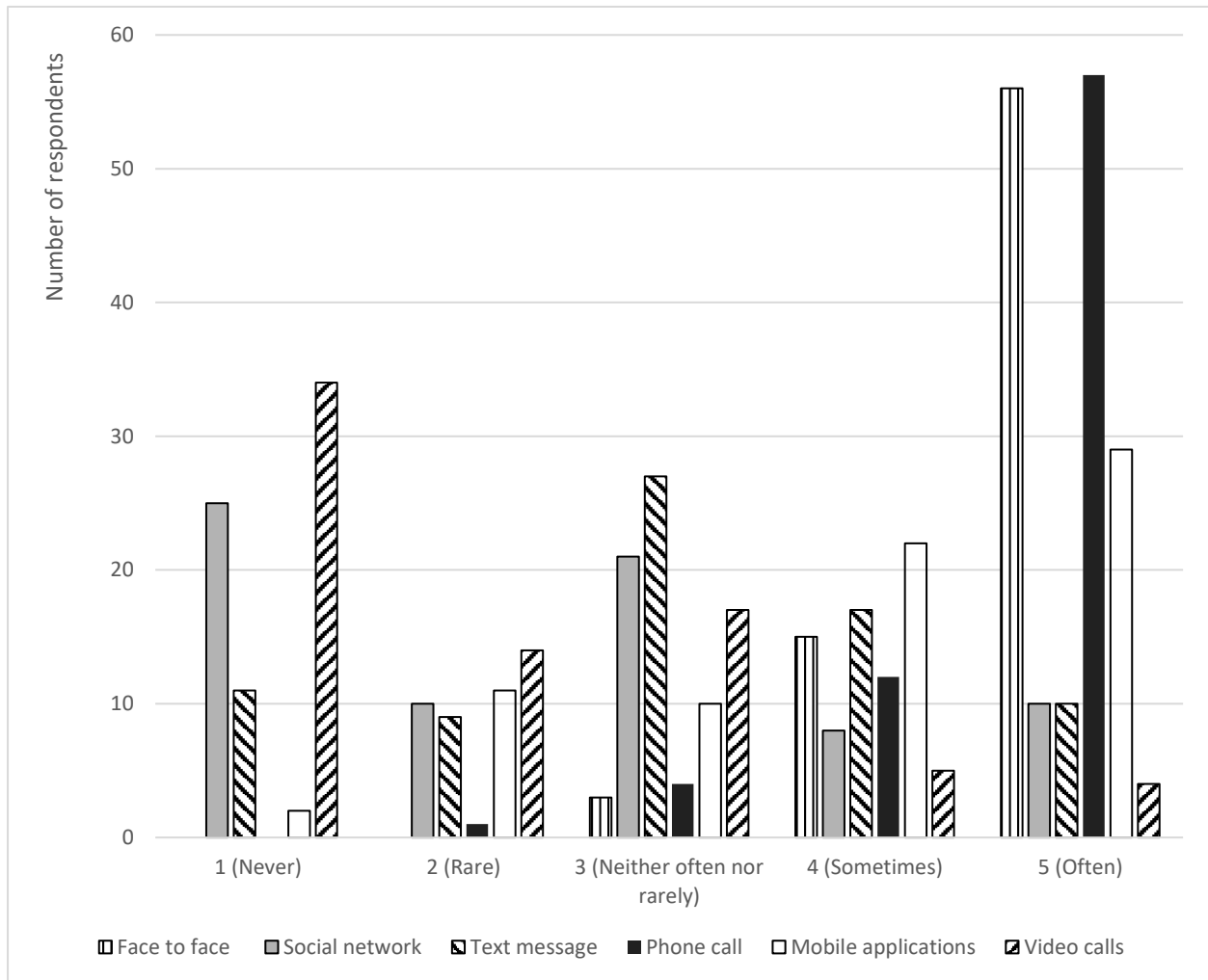


Figure 2: Communication channels that employees preferred for communication with supervisors (N=74)

It was analyzed if there is any difference in frequency of using different communication channels (such as face to face communication, social networks communication, text SMS messages, phone calls) with superiors that employees prefer compared with the frequency of different communication channels that you use in practice. The hypothesis is that there is no statistically significant difference in frequency of using different communication channels (such as face to face communication, social networks communication, text SMS messages, phone calls) with superiors that employees prefer to use comparing with the frequency of different communication channels that they use in practice. Results are as following: face-to-face preferred / in practice used for communication with supervisors ( $X^2=18.593$ ,  $df=6$ ,  $p<0.05$ ); communication on social networks preferred / in practice used with supervisors ( $X^2=75.044$ ,  $df=16$ ,  $p<0.01$ ); Text (SMS) messages preferred / in practice used with supervisors ( $X^2=72.259$ ;  $df=16$ ,  $p<0.01$ ); phone call preferred / in practice used for communication with supervisors ( $X^2=17.722$ ,  $df=6$ ,  $p<0.01$ ); video calls preferred / in practice used for communication with supervisors ( $X^2=78.511$ ,  $df=16$ ,  $p<0.05$ ). Hypothesis is rejected, results of statistical analyses showed that there is statistically significant difference in frequency of using different communication channels (such as face to face communication, social networks communication, text SMS messages, phone calls) with superiors that employees prefer compared with the frequency of different communication channels that they use in practice.

### 3.2. Working environment and motivation

Respondents are asked to report factors of working environment that are positively related to their motivation for higher job performance. There are statistically significant relatively low correlations between variable of motivation for higher job performance and with autonomy in performing tasks ( $r=0,248$ ,  $p=0.033$ ), with higher level of education ( $r=0,419$ ,  $p=0.000$ ), with receiving price and positive feedback from their supervisors ( $r=0,237$ ,  $p=0.042$ ) and with good social relations with coworkers ( $r=0,251$ ,  $p=0.031$ ). The multiple regression analysis showed that there are two variables in the predictor set of variables which can predict the employee's motivation for higher job performance: working conditions ( $\beta = 0.268$ ,  $t\text{-value} = 2.185$ ,  $p\text{-value} = 0.03$ ) and the independency ( $\beta = 0.385$ ,  $t\text{-value} = 3.161$ ,  $p\text{-value} = 0.002$ ). There are some methodology limitations that needs to take into consideration for interpreting research results: relatively small number of respondents and ration between male and female gender. Further research could be conducted in order to explore more details for employee's motivation related to higher job performance.

### 4. CONCLUSION

Employees use different communication channels for everyday communication such as direct face to face communication, social networks communication, text (SMS) messages, phone calls, online mobile platforms and video conferences. Respondents reported that they prefer to use those communication channels but some communication channels more often or less often. Additionally, employees with the higher level of education prefer to be more independent and have autonomy in performing tasks. The emphasize the good social relations with coworkers and positive feedback are the very important part or working environment. Results could be used for creating the training for providing a sense of security, stress reduction in working environment, the creation of a positive working atmosphere and good interpersonal relations. Further research could be conducted at the larger sample of respondents in different industries and could be focused to the specific elements of communication that are related to quality of interpersonal relations.

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## **CITIES FACING TORRENTIAL RAINS: THE ECONOMIC AND PUBLIC MANAGEMENT IMPACTS OF PLUVIAL CLIMATE TRAGEDIES IN RECENT BRAZIL**

**Antonio Elias Amil Lisboa**

*Universidade Federal Fluminense, Niteroi, Rio de Janeiro, Brazil*  
*antonioamil@id.uff.br*

**Renata Goncalves Faisca**

*Universidade Federal Fluminense, Niteroi, Rio de Janeiro, Brazil*  
*renatafaisca@id.uff.br*

**Marcelo Jasmim Meirino**

*Universidade Federal Fluminense, Niteroi, Rio de Janeiro, Brazil*  
*marcelojm@id.uff.br*

### **ABSTRACT**

*This research evaluates the economic and public management impacts of pluvial climatic tragedies in the Brazilian territory and their influences on the affected region's public budget. The most notorious recent cases of rainfall disasters involving the mountainous regions of Rio de Janeiro state and São Paulo northern coast state region were analyzed, both locations with a long susceptibility history to these tragedies and that make up the largest urbanized and inhabited region in Brazil, named as Rio-São Paulo megalopolis axis. This region was notable for the biggest climate tragedy in Brazil's history, in 2011 in the Rio state mountainous zone, and for the most recent climate tragedy occurred in 2023, in São Sebastião, São Paulo state north coast city. Based on bibliographical and documentary research this study evaluated comparatively the expenses involved in the reconstruction and urban reconstitution after the tragedies with the prevention public policies expenses. It is established the financial advantage of adopting public prevention policies. It is evident the costly and lofty government spending on reconstruction, mitigation, and contingency measures affects the entire public budget and creates a political culture of no-solution for a periodic and not recent problem that affects the whole region's development. The existence of a public budget destined for the cause but its non-use due to political questions and management failures negatively testify against the government's management about this subject. In summary, government management suffers from its omissions and mismanagement, making a recurrent and well-known problem onerous and potentially tragic, which could have been previously mitigated with the correct prevention policies and investments.*

**Keywords:** *climatic pluvial tragedies, economic impacts, government management, prevention, public policies*

### **1. INTRODUCTION**

The scientific proof of the impacts of human climate change leaves a profound mark in 2023. The world is experiencing innumerable climatic disasters. Strong storms and climate change have claimed many lives, from Typhoon Doksuri in northern China to the deadliest tropical cyclone Daniel ever recorded in the Mediterranean region. The extent of human responsibility for global warming has long been debated; nonetheless, scientific consensus on the matter has been reached. Approximately 180 years ago, with the start of industrial advancement, the world began to steadily warm. Unfavorable weather affects every region of the planet in some way (Abraham et. al, 2016).



### **1.1. The Brazilian climate crisis**

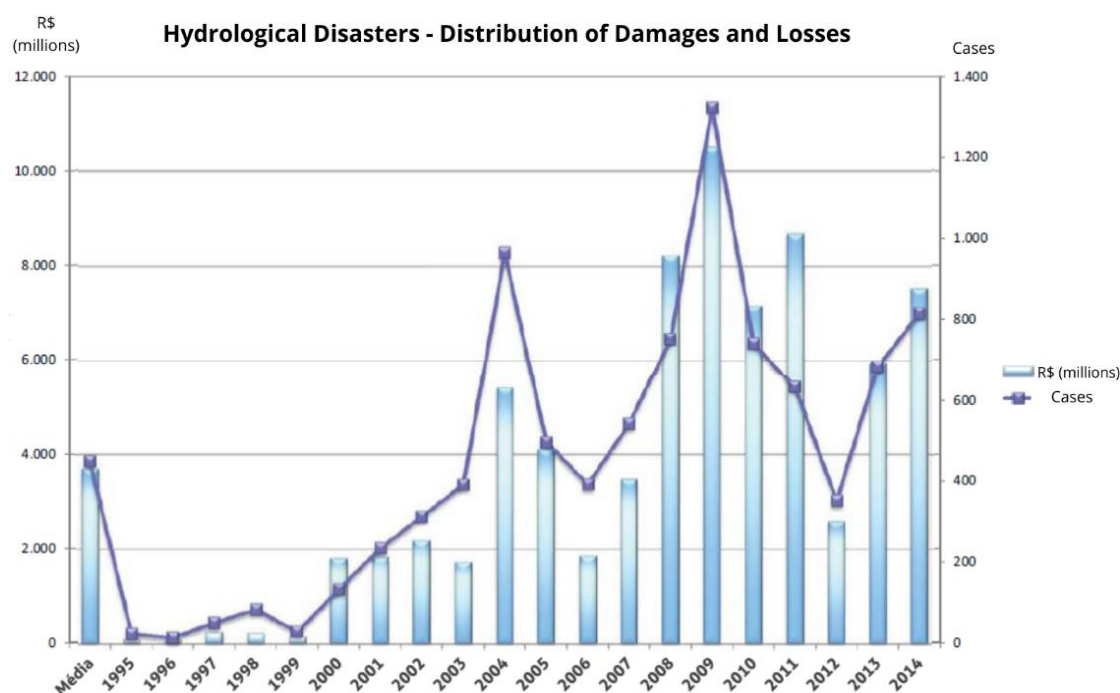
The catastrophe scenario in Brazil is mostly represented by flood tragedies and landslides, as large rain volume consequences. These events have a growing and terrifying prospect for Brazilian territory (De Lima, et al. 2021; Castellanos, et al. 2022). In recent Brazilian history, there has been no shortage of major rain tragedy examples. With large numbers of victims, costs, and physical intensity. This scenario of occurrences and impacts brought a whole reaction and discussion on the part of Brazilian government entities in their multiple spheres in the last decade (Soares, 2023). However, regulations and political advances regarding the topic do not seem to have had the desired effects yet, as past tragedies are repeated and intensified, increasing their catastrophic potential. The maintenance and intensification of these events tell us a lot about the government's stance. The political agent's inaction in the face of such events has been evident. It is not only a sin to do nothing, but also to be incapable of managing and taking preventive measures. This could be due to neglect and poor management, as there are policies and resources available that could transform the current situation, but they have failed to materialize.

## **2. CONTEXTUALIZATION**

### **2.1. Where is Brazil on the topic?**

Three political and legal processes mark a stance change in Brazilian politics regarding rain tragedies. The first two are the National Civil Protection and Defense Plan and the National Risk Management and Responses to Natural Disasters Plan, both from 2012. The first one establishes two moments for the government's approach to climate tragedies. An approach before the disaster occurrence, with risk management and prevention, and mitigation actions. Another approach after the disaster occurrence, with disaster management and response recovery actions in affected areas. The second divides four axes for the organized action of entities: mapping, monitoring, prevention, and response. The third regulatory framework was the National Climate Change Adaptation Plan in 2016, to promote the management and reduction of climate risk in the country in the face of the adverse effects of climate change. The first text spoke about disasters comprehensively, the second and third specified the tragedies resulting from climate change (Brasil, 2012 e 2016). Both acts emerged because of the country's biggest climate tragedy, in the mountainous region of the State of Rio de Janeiro, which killed more than 900 individuals and estimated losses of over R\$ 4.78 billion at the time. This notorious case demonstrated the serious Brazilian urban situation and its lack of preparation for such situations. However, it was not a unique or isolated case, the Brazilian urban situation was highly susceptible to the occurrence of disasters and the situation had become unsustainable in previous years, already indicating the possibility of major catastrophes. Graph 1 below shows the evolution of damage and losses from climatological disasters in the last two decades before 2014, which already demonstrated a worrying worsening of rain tragedy scenarios.

*Figure following on the next page*



*Graph 1: Hydrological Disasters – Distribution of Damages and Losses – 1995 to 2014. Adapted from Report on Material Damages and Losses resulting from Natural Disasters in Brazil – 1995-2014 (World Bank, 2016)*

In recent years, the frequency and severity of rain-related disasters have significantly increased in the country. Data from the National Confederation of Municipalities – CNM indicate 1.777 deaths registered because of excessive rainfall in the period from 2013 to 2022. Between 2019 and 2022, 72% of the total is concentrated. The year 2022 alone is responsible for 25% of these numbers. The survey considered the period from January 1, 2013, to May 31, 2022 (CNM, 2023). Events such as the one in February 2022 in Petrópolis, located in the mountainous region of Rio de Janeiro, contributed to these numbers, floods and landslides killed 235 individuals and left 4,000 homeless. In May of the same year, in the metropolitan region of Recife, in Pernambuco state, a highly dense and urbanized place, there were 134 deaths and 130,000 affected by the consequences of heavy rainfall. In December 2022, 94,600 were affected and 43 municipalities were in an emergency resulting from heavy rains in the south of the state of Bahia (CNM, INMET, 2023). The year 2023 is even more intense for climate catastrophes with cases across the entire Brazilian national territory. In February, on the north coast of São Paulo, there were a total of 65 deaths, 64 of which were in the city of São Sebastião, where the highest incidence of precipitation in Brazil's history was recorded, a record of 683mm in 24 hours. In March, in Acre state, more than 21,000 people were displaced due to floods. In April 2023, again in the extreme south of Bahia state, 5,000 people were displaced for the same reason. In Rio Grande do Sul state, in August and September 2023, an extratropical cyclone at sea caused major storms on land, totaling 51 deaths, 108 municipalities, and 404.6 thousand affected (INMET, 2023).

## 2.2. Costs and losses

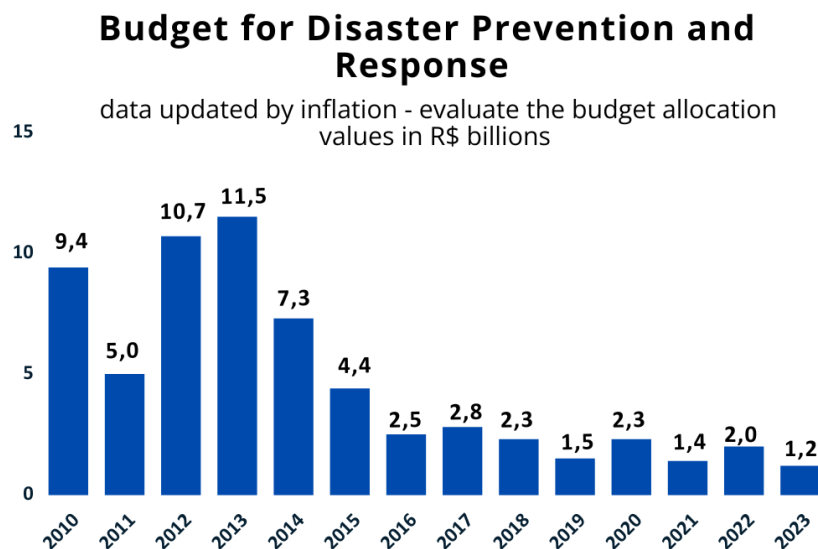
The disasters from anthropogenic climate changes have been increasing and statistically observed for years in different ways. This growth can be measured in purely climate-based statistics, as demonstrated by the First Report of the National Assessment on Climate Change, which points to a 20 to 40% increase in rain incidence in the South, Southeast, and West regions

of Amazonia. (Ambrizzi and Araujo, 2014). It is also noticeable due to the increase in losses caused by excessive rainfall in recent years, as assessed by the National Confederation of Municipalities. The values generated by such losses jumped from R\$ 3.6 billion to 17.2 billion between 2017 and 2022. Accounting for a total amount of R\$ 55.5 billion. In the same period, the total number of houses destroyed grew from 1,648 to 7,574 homes. The number of homeless individuals jumped from 14,920 to 61,786, and the number of displaced people from 69,059 to 226,786. Only in December 2022, there were R\$ 931.4 million in losses across the country, generating an average of R\$ 30 million per day (CNM, 2016 and 2018). The perception of sumptuous economic losses due to rain tragedies in Brazil is not new. For the period from 2000 to 2010, a total of up to R\$ 54.5 billion in losses and damages from disasters is estimated only for Rio de Janeiro state (Young, et al, 2013). A World Bank report indicates that only in the disaster in the mountainous region of Rio de Janeiro in 2011, total damage and losses were in the order of R\$ 4.8 billion at the time, omitting relevant impacts such as in the health and education sectors, which were not evaluated based on unavailability data (World Bank, 2016). The most affected sectors are infrastructure, which includes houses, roads, bridges, and other constructions. Also, the agricultural sector and all the inflationary consequences in the food production chain. The tourism sector is strongly affected in places that have this vocation. In the last 10 years, excess rainfall generated, respectively, R\$ 30.3 billion and R\$ 5.6 billion in losses in agriculture and livestock. The number of emergency decrees and public calamities due to rain in agriculture and livestock totaled just one case in 2014, while in 2013 no cases were registered. In 2021 there were 405 decrees, and in 2022 there were 641. (CNM, 2016 and 2023). In tourism, the extreme precipitation incidence, during the periods from December to January in coastal and coastal regions, is strongly associated with potential destinations and periods of strong tourist bias (Rocha and Silveira, 2020) This is notable in the south Bahia state region, a highly touristic area, and severely punished by rain in the last three years. As indicated by Grimm (2019), this forces the entire tourism sector to remodel, with the necessary climate adaptations, with the emergence of highly damaged regions to others detriment.

### 2.3. The investments

According to Liberato (2016), there was a notable discrepancy between government spending on rain tragedies in the period from 2005 to 2014. At the time, 98% of spending corresponded to emergency response and reconstruction actions and only 2% on prevention actions. The poor public management and allocation of these resources can worsen the government's stance. Between January 2013 and February 2023, disasters caused R\$ 401.3 billion in losses throughout Brazil. During this same period, the Union allocated only R\$ 4.9 billion for disaster risk management actions. In other words, only 1.2% of the generated losses number. However, the amount initially authorized by the federal government in its budget for transfer to municipalities in the same period was slightly higher, R\$8.2 billion. This amount was allocated for risk management, prevention, preparation, response to disasters, rehabilitation, and reconstruction of affected regions. But of this total, only R\$ 6.6 billion was committed. And only the already mentioned R\$ 4.9 billion was paid. In this path of authorized, committed, and paid value, the already insufficient amount decreased to less than 60% of the initial value. The government shows a clear inability sign to allocate the tiny resources (CNM, 2023). This percentage decrease is nothing new in government action. According to the NGO - Agência Contas Abertas, an independent institution that analyzes the federal budget, from 2004 to 2016, the R\$ 27 billion invested in disaster prevention, reconstruction, risk management, and drainage programs represented only 53% of the total authorized for the same period, which was R\$ 52 billion. Specifically in 2007 and 2012, only 30% of the planned resources were used. Between 2000 and 2012, for every R\$ 5.00 allocated in the Union Budget to avoid natural calamities, only R\$ 1.22 was invested. (Agência Contas Abertas, 2017)

In addition to this dizzying decrease in final resources, there are other government contradictions in approaching the issue. One of them is the disproportionate allocation of resources between actions before and after the disaster occurrence. The federal budget prioritizes response actions rather than disaster prevention. From 2000 to 2011, according to the Brazilian Integration Ministry, R\$ 7.3 billion was invested in “Responses to Disasters and Reconstruction” and only R\$ 697.8 million in “Prevention and Preparedness for Disasters”. In 2011, it was spent seven times more on disaster response than on measures that would minimize their effects. In 2017 the pattern was maintained, with R\$ 604.1 million spent on disaster response actions and only R\$68.1 million spent on slope containment and urban drainage works (Agência Contas Abertas, 2015 and 2017). The managerial incapacity of the State turned into neglect and became government policy, especially from 2015 onwards. During this period, public funds allocated to preventing and responding to natural disasters plummeted dramatically. As an example, the amount allocated to CEMADEN – National Center for Monitoring and Alerts of Natural Disasters, created by the federal government to prevent and anticipate climate events, fell from R\$ 91 million in its creation year to just R\$ 17.9 million in 2021. (Soares 2023). Even more aggravating was the shameful political action of the federal executive government from 2019-2022, which, during its electoral budget cuts and adaptations, allocated only R\$ 25,000 for “emergency mitigation and reduction works” in the 2023 future budget. whereas in the previous year, R\$ 2.8 million was allocated for the same purpose. For “execution of projects and works to contain slopes in urban areas” the resource dropped 94% for the previous year, from R\$53.9 million in 2022 to R\$2.7 million in 2023, respectively. Constitutional Amendment Proposal nº32/2022, informally called Transition Proposal by the media, was made to allow budgetary adjustments for the newly elected government, increasing this last value to R\$156.7 million, allowing more spending space and resources for the next government. (Cortês, 2022) This also reveals that the political ideologies of government agents matter in natural disaster management as explained by Soares (2023). Graph 2 shows this decline.



*Graph 2: Budget for Disaster Prevention and Response. Adapted by the author from NGO – Associação Contas Abertas*

### 3. CONCLUSION

In the last decade, Brazil has been exposed to numerous heavy rainfall events and this has brought a new approach to the issue in the public and social environment. Public agents debated and initiated the outline and scope of a new policy and a new approach on how to face and

manage a new climate reality, aggravated by potation critical events. This occurred in response to record events and in anticipation of a new climate reality, but this encouraging start was not continued. After 2014, investments in disasters and climate consequences abruptly weakened, On the other hand, the occurrence of new disasters has intensified with an explosion in costs and losses. Table 1 compares the government investments with the costs and prejudices for the last 10 years in Brazil.

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Government Investments</b>	11,5	7,3	4,4	2,5	2,8	2,3	1,5	2,3	1,4	2,0	1,2
<b>Disasters prejudices</b>	0,015	0,04	22,7	35,1	34,8	34,9	26,9	54,3	63,6	105,1	24,1
<b>Investments ÷ Prejudices</b>	767	183	0,20	0,07	0,08	0,07	0,06	0,04	0,02	0,02	0,05

*Table 1: Comparison between government investments and losses from disasters in the last 10 years. Values in Reais billions. Adapted by the author.  
(Source: CNM, 2023)*

The evident decrease in Brazil's public spending on prevention and response to disasters contrasts with the high increase in costs and losses generated by these same disasters. These two numbers – investments and prejudice – are closely linked, in an inversely proportional ratio. The less you invest in preparing for possible climate disasters, the more you suffer when they occur. The literature and global practice establish the financial benefits of implementing public prevention policies. According to Mediondo (2006), on a global scale, each R\$1 invested in prevention is equivalent, on average, to between R\$25 and R\$30 that will be spent on post-event reconstruction works. The public fund's existence and their non-use reveal flaws in the government management process. Previously, municipalities have had difficulties in preparing engineering projects, work plans, and tenders to obtain federal government funds. After disasters occur, the declaration of an emergency or public calamity by municipalities allows engineering works to be carried out without bidding processes, which allows for less control over these expenses and the receipt of a greater volume of resources. This created a political culture of non-solution and postponement of climate tragedies, with the loss of lives and their belongings being irreparable. There has been a shift in Brazil's government perspective and approach towards climate disasters resulting from recent rain events. This is largely due to the increased incidence of these events. However, despite this increase in relevance on the topic, there is a lack of effective policy measures that can generate prevention actions. Rain disasters generate expensive costs for the government budget. It is necessary to reallocate these expenses into preventive actions to mitigate not only financial but also human damage.

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# IDENTIFICATION OF RISKS AND OPPORTUNITIES INVOLVED IN THE PROCESS OF IMPLEMENTATION OF QUALITY MULTI-MODELS IN IT COMPANIES OF SMALL AND MEDIUM ENTERPRISES (SME) OF INFORMATION TECHNOLOGY

**Elaine Mara Marcal Machado**

*Universidade Federal Fluminense, Brazil*  
*elainemmm@id.uff.br*

**Mirian Picinini Mexas**

*Universidade Federal Fluminense, Brazil*  
*mirian\_mexas@id.uff.br*

**Lidia Angulo Meza**

*Universidade Federal Fluminense, Brazil*  
*lidiaangulomeza@id.uff.br*

## ABSTRACT

*Implementing multi-model quality management aims to improve internal processes to make the organizations more attractive and competitive in the global market. However, implementing quality multi-models in Brazilian small and medium-sized companies (SMEs) in the information technology (IT) area is challenging and involves many risks. Within this context, this work aims to present in a structured way the risks involved in implementing multi-quality models and the opportunities when one chooses to follow the guidelines, rules, and requirements of quality model certificates for IT SMEs. This research is based on exploratory bibliographic and research action in a medium-sized Brazilian Information Technology company that adopted some quality models to improve its processes. This way establishes a risks list, and map with opportunities to adopt these models. These findings seek to present to IT SMEs the main issues involved, in terms of risks and opportunities, to provide support so that these companies have material to decide whether or not they should adopt one or more quality models, evaluate whether this path adheres to the strategy of these companies and thus enables the best application of this investment, facilitate and better planning for the adoption of quality models, as well as reducing the implementation period when the implementation of one or more quality models is included in the strategy. It is worth highlighting that there are no references to risks and opportunities to implement quality multi-models. It is understood, therefore, that this work contributes to better support and boost IT SMEs.*

**Keywords:** *Implementation, Multi-models quality, Opportunities, Risks, Small and medium-sized companies*

## 1. INTRODUCTION

For small and medium-sized companies (SMEs) in Brazil's Information Technology (IT) segment, surviving in a highly competitive market is very complex. Brazilian SMEs are forced to compete with large, regionally dominant multinationals, encompassing various challenges. (Ribeiro 2022, p. 6). In addition to this issue, IT SMEs live with continuous innovation, constant changes, new technologies, high customer demands, and with a globalized market, competitiveness becomes increasingly fierce and dynamic for companies and IT SMEs. (Rahmani, Sami & Khalili 2016). In this scenario of great complexity and competitiveness, Aires and Salgado present that “quality is essential for the survival of organizations in the face of the accelerated evolution of technologies and demands of the globalized world” (2017, p. 1).



Therefore, implementing a quality model is one of the ways to support and sustain these companies in this market. As presented in the Brazilian standard ABNT NBR ISO 9001, which presents the requirements for quality management, “the adoption of a quality management system is a strategic decision for an organization that can help improve its global performance.” (ABNT 2015, p. 7). Giachetti, De La Vara, and Marín (2023) research states that “it is possible to reduce the effort required from expert practitioners to perform the analysis and improve development processes to ensure the fulfillment of specific quality standards”. Companies that have quality processes implemented seek to improve their processes and formalize them for the market by obtaining official quality certificates, increasing credibility and visibility for the national and international market (Guedes, Guedes & de Vasconcelos 2015) and thereby increasing its customer base, catalyzing time-to-marketing and reducing costs with standardized processes (CMMI Institute 2019). With these certificates, SMEs have attestation and recognition of quality by the competent bodies and their competitors (Machado 2021). However, implementing quality management models is not simple, especially for IT SMEs that present several difficulties in implementing a quality improvement process, causing many uncertainties, risks, attention, and problems that must be considered (Machado, Mexas & Meza 2023), (Aymerich Fuentes & Jenkins 2022), (Muñoz & Peralta 2020) and (Sánchez-Gordón & O’Connor 2016). IT companies adopt various techniques, frameworks, or management models to guide continuous improvement efforts in their internal processes. As presented by Garcia, Oliveira, and Salviano (2016), a recent trend is the simultaneous adoption of more than one management model in the same environment, resulting in process solutions with several combined models. It observes that it may be possible to present a process proposal for implementing not just one model but several models, that is, multi-models, to create a unique instrument in quality management organizations as a strategic mechanism to generate transformation and effective improvements to SMEs (Machado 2021). In the work of Machado, Méxas, and Meza (2023), implementing quality multi-models reduces risks and makes companies potentially more competitive. Reinforcing this statement, Levstek, Puchihar, and Hovelja (2022) comment that some IT management models are aimed at large companies, not designed for SMEs, and, as a result, carry significant risks. Fonseca (2019) shows that adopting processes to achieve certifications involves a transition that inevitably involves obstacles and gaps that must be overcome. One way to minimize this situation is to adopt risk-based policies. Based on these statements, this work seeks to present a proposal with a map of risks and opportunities involved in implementing one or more quality management models for IT SMEs, aiming to offer guidance and encourage these companies to decide whether to implement a strategy of one or more quality models.

## **2. METHODOLOGY**

This research is based on exploratory bibliographical research through a literature review, as suggested by Gil (2019, p. 78), with consultation of the academic databases Scopus (Elsevier), Web of Science, Emerald Insight, IEEE Xplore, SpringerLink and Check and Conferences ESD (Economic and Social Development). The document survey and action research (with focus groups and interviews) are also used in a medium-sized Brazilian company that provides IT products and services. The research ends with triangulation of the results, achieving some objectives. Among these objectives, a map of risks and opportunities was obtained that can serve as a basis for other companies so that they can serve as support for the implementation of quality management processes and practices. It is worth highlighting that the company that is the subject of this study has in its strategic plan to increase capillarity by obtaining national and international quality certificates, to improve its internal processes, continuously and thereby increasing the quality of its IT products and services, and consequently, boost customer satisfaction (Machado 2021).

In the following sections, there is greater detail on this research, based on a proposal for implementing multi-quality models, a list of risk, and a list of opportunities found throughout this research.

### 3. QUALITY MULTI MODEL IMPLEMENTATION PROCESS

To better address the findings of risks and opportunities for implementing quality multi-models, it is essential to present the process of implementing quality multi-models in a macro way. As can be seen in Figure 1 it presents a proposal for this process. (Machado, Mexas & Meza 2023)

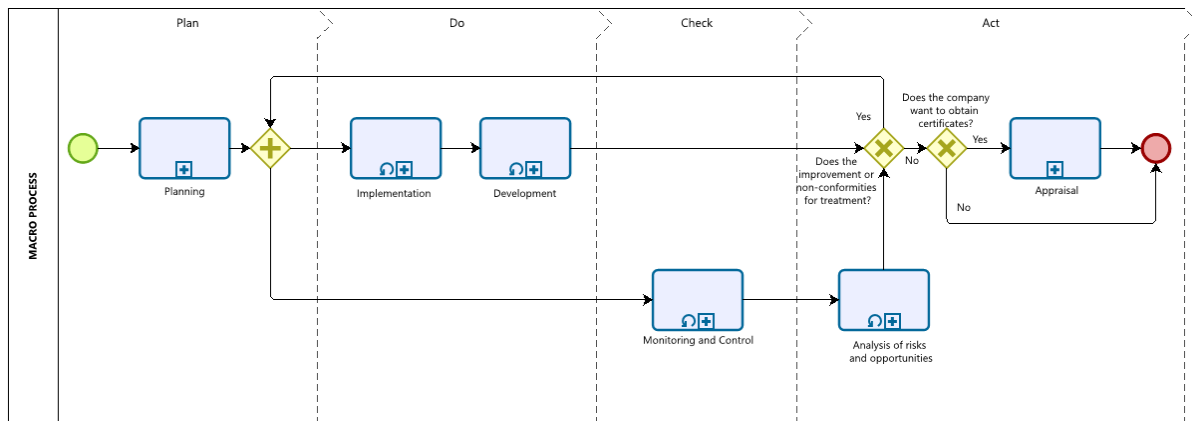


Figure 1: Quality multi-model implementation process

Source: (Machado, Mexas & Meza 2023)

In order to improve the understanding of the proposed process, a correlation of the phases of the PDCA cycle (ABNT 2015), presented, that is, Plan, Do, Check, and Act, for each process, as suggested in the organization of the ABNT NBR ISO 9001 Standard (ABNT 2015, p. x), to the “Quality multi-model implementation process” which can be seen in Figure 1. The “Planning” process is contained within the Plan phase and is responsible for planning the certificates that the company wishes to obtain. These certificates must align with the company's strategic plan. Critical at this stage is the commitment of senior management to the project and the selected certificates to obtain. The “Do” phase contains the execution processes, namely Implementation, where all documents, models, processes, and procedures are created, creating a library of assets of what needs to be used, followed, and met according to the rules and requirements of each certificate selected for the company in the projects. The Development process is responsible for evaluating and auditing the documents prepared, publishing them for the entire company, and training all employees in the new process developed and designed to support the projects. The “Check” phase contains the Monitoring and Control process, which is the practical application and follow-up of all assets prepared and the respective verification, monitoring, and control of the proposed quality process. The Act phase contains the processes “Analysis of risks and opportunities” and “Appraisal”. The “Analysis of risks and opportunities” process obtains a list of risks and opportunities to improve the internal process of implementing quality multi-models. This list of possible risks and opportunities is obtained by executing the previous processes. It is necessary to evaluate all suggestions received and select what adheres to the strategic plan and the certificate rules. From this list, there is continuous improvement in the quality process. The “Appraisal” process is an evaluation by a competent body to obtain the official certificate of the model(s) implemented in the organization. In the work of Machado, Mexas, and Meza (2023), there is detail of the activities of these processes to improve the understanding of implementing quality multi-models.

It is worth highlighting that risks and opportunities occur, it is identified throughout the entire implementation process (“Planning”, “Implementation”, “Development,” “Monitoring and Control,” and “Appraisal”). However, the process “Analysis of risks and opportunities” consolidates and analyzes the identified risks and opportunities. The following section describes the findings regarding risks and opportunities.

#### **4. RISKS AND OPPORTUNITIES FOR PROCESS IMPLEMENTATION**

##### **4.1. List of risks for implementing quality multi-models**

ISO 31000:2018 is the standard that deals with risk management guidelines. This standard states that risk is the effect of uncertainty on the objectives intended to be achieved. This deviation can be positive, negative, or both, which results in opportunities (ABNT 2018). ISO 9001:2015 comments that the “risk mindset enables an organization to determine the factors that could cause deviations in its processes and quality management system concerning planned results.” This standard also reinforces that “practice preventive controls to minimize negative effects and maximize the use of opportunities that arise.” (ABNT 2015). ISO 9001 treats it as ‘risk mindset’ which is “the replacement of preventive actions with a risk-based mindset provides an opportunity for resources to be applied to the uncertainties that represent the greatest risk” (Tomic & Spasojevic Brkic 2019, p. 13). It is also observed that “during the execution of processes, strengths, weaknesses, and opportunities for improvement can be identified that will feed initiatives to improve organizational processes.” (Softex 2011, p. 119). The MPT.Br quality standard, which deals with Brazilian test improvement, presents that “an important source to guide improvement actions are reference models (...)” (Softex 2011, p. 119), that is, potential sources of opportunities. As commented by Fonseca (2019), adopting quality processes to achieve certifications involves excellent learning, and it is inevitable to have obstacles in projects that need to be overcome. This same author proposes that adopting risk-based policies is a way to reduce or eliminate possible problems. For this reason, it is considered relevant to present a list of risks and opportunities, which are detailed in the following subsections. Identification describes uncertainties that may prevent an organization from achieving the project objective. As presented by Wallace, Keil, and Rai (2004, p. 5), this identification is grouped into the categories of knowledge areas of the PMBOK - Project Management Body of Knowledge edition 6 (PMI 2017) for better organization of risks, understanding, and possible strategies during the management of the quality implementation project, for monitoring and respective responses to identified risks. It is decided to group the risks into nine areas of knowledge: Scope, Schedule, Cost, Resource, Communications, Procurement, Quality, Stakeholders, and Integration. The “Risk” knowledge area makes up a total of ten areas, as suggested by the PMBOK. The latter, “Risk”, did not enter the group, as it is understood that all risks identified throughout the project fall into this group. Therefore, a list of risks, as described in Table 1: List of risks identified during the implementation of the quality improvement project.

*Table following on the next page*

ID	RISK DESCRIPTION	KNOWLEDGE AREAS
1	Internal political changes with adverse effects on the project.	Stakeholders
2	Changes in senior management during project execution.	Stakeholders
3	Instability in the organizational environment, with unforeseen strategic changes.	Integration
4	Appointment of new consultants to be part of the project team who need to become more familiar with the processes, requirements, and agreements signed.	Resource
5	Absence or reduction in sponsorship from senior management.	Stakeholders
6	Deprioritization of the improvement project.	Stakeholders
7	Impossibility of implementing any requirement, and consequently the model, due to some organizational restriction.	Integration
8	Company does not have the maturity to implement quality models.	Integration
9	Resistance from people due to implementing new activities or changing how they carry out them.	Resource
10	To deploy multi-models, do not deploy any of the selected certificates and seals.	Scope
11	The selected models were divergent, inserted more complexity, and increased the deadline as necessary.	Scope
12	Deadline to meet stakeholder expectations that do not adhere to project implementation practices of an identical nature.	Schedule
13	Longer and more comprehensive multi-model implementation deadline than planned.	Schedule
14	Inadequate estimation and procurement for the project.	Procurement
15	Insufficient project planning, with poor mapping of needs, activities, resources, and acquisitions.	Schedule
16	Ineffective project communication	Communications
17	Inexperience of the person responsible, Project Manager, for conducting the project.	Resource
18	Project progress needs to be monitored more closely.	Schedule
19	Lack of an effective quality project management methodology to efficiently track and manage the project progress.	Quality
20	Change of crucial consultants in the project team.	Resource
21	Sharing of resources in other more relevant projects.	Resource
22	Team responsible for implementing the model diverted to other activities.	Resource
23	Conflict between employees when defining or carrying out activities.	Communications
24	Lack of commitment from the team appointed to participate in the project.	Integration
25	Lack of requirements required by certificates, as agreed in planning.	Scope
26	Change of the version of adopted standards before completion of implementation.	Scope
27	Implement more activities than necessary to meet the models, creating a more costly process.	Cost
28	Deploy fewer activities than necessary to meet the models.	Scope
29	Increases bureaucracy to meet the rules and requirements of the selected models.	Scope
30	Needs a specialized consultant in matters for which the company does not have a consultant within the deadline required for the project.	Resource
31	Unavailability of human resources, or absence of specialized personnel with knowledge of the selected certifications, necessary for the project.	Resource
32	Lack of knowledge on the subject covered or low technical quality of the interviewees to survey or define the process requirements.	Quality
33	Team is responsible for implementing quality models, with inadequate training to conduct a project of this nature.	Quality
34	Team responsible for implementing the quality model does not have the specialized skills required by the project.	Quality
35	Maintain the process and procedures active after implementing the rules and requirements of the models.	Integration

*Table 1: List of risks identified during the implementation of the quality improvement project. (Prepared by the authors (2023) from (Machado et al. 2022), (Machado, Mexas & Meza 2023), (Machado 2021) and adaptations (Wallace, Keil & Rai 2004))*

The project identified 35 potential harmful risks, distributed across 9 areas of knowledge. This section is dedicated to the risk with a negative effect; however, a risk or even a positive deviation arising from a threat can offer an opportunity for the project and, consequently, the organization (ABNT 2017). The following section presents the list of opportunities identified throughout this research.

#### **4.2. List of opportunities for implementing quality multi-models**

The list of opportunities will largely depend on each organization and how much it sponsors the quality improvement project. Furthermore, opportunities are improvements identified

throughout the implementation project. For the opportunity(s) to be implemented, they must meet criteria defined by the organization. The criteria used in this project are presented below, such as a) adherence to the company's strategic plan and model rules, b) add value to the process, and c) viable to be implemented in the organization. It is understood that the three criteria must be met simultaneously. This opportunity is grouped into a “Knowledge Area” for better organization (PMI 2017). Opportunities are grouped into the same risk categories, such as "Scope," "Schedule," "Cost," "Resource," "Communications," "Procurement," "Quality," "Stakeholders," and "Integration." The “Risk” knowledge area makes up a total of ten areas, as suggested by the PMBOK, not used to group opportunities. However, it is worth highlighting that the Risks that occur must have positive effects. Table 2 identifies all accepted opportunities according to established criteria and their inclusion in the Knowledge Area.

ID	DESCRIPTION OF THE OPPORTUNITY	KNOWLEDGE AREAS
1	Shares knowledge about quality models with more employees in the organization.	Integration
2	Create a quality culture in an organizational way	Integration
3	Implement a culture of continuous improvement	Quality
4	Increase the organization's maturity in terms of quality management	Quality
5	Implementing multi-model projects reduces costs, as there is only one project, planning, training, and changes to documents and processes. With greater reuse, avoid rework, compared to implementing just one model. In addition to providing the reuse of documents, models, and processes.	Procurement
6	Has been recognized in the market for standardization and delivery excellence.	Communications
7	Greater transparency of the process and procedures for everyone involved.	Communications
8	Enable more investment by senior management in quality management projects	Cost
9	Enable the reduction of costs and deadlines for the improvement project, with each new model implemented	Cost
10	Materialize new business opportunities, entering new clients and opportunities that require implemented models.	Scope
11	Has a working standard and consequently less rework and labor costs.	Cost
12	Lower expenses, less waste versus higher quality of deliveries, and consequent profitability.	Cost
13	Enables the reaching of new maturity levels of selected certificates.	Scope
14	Prepare planning so that certifications happen quickly to use the same evidence as the selected projects.	Schedule
15	Improve team productivity in terms of quality project definitions.	Quality
16	Enables the absorption of new people due to the company's image in the market.	Resource
17	Increases people's motivation by participating in an institutional quality improvement project.	Resource
18	Establish change agents and opinion leaders.	Resource
19	Create a knowledge base for new projects of the exact nature.	Scope
20	Have a specialist in implementing multi-models in the company	Resource
21	Implement multi-models, be a new niche for providing services to companies.	Integration
22	Improve the implementation process with each new certification or seal to be implemented.	Scope
23	Enable the inclusion of new certificates not planned in the initial project.	Integration
24	Improve the perception of gain, implementing quality models.	Quality
25	Absorb knowledge in a way that does not require consultancy support.	Resource
26	Increase the maturity level of the quality improvement process.	Quality
27	Improve the perception of gain to the stakeholders.	Stakeholders

*Table 2: List of opportunities identified in the multi-model implementation Project.  
(Prepared by the authors (2023) from (Machado et al. 2022), (Machado, Mexas & Meza 2023), (Machado 2021) and adaptations (Rahmani, Sami & Khalili 2016))*

Just like risk management, opportunities management must be recurring in the project and occur from the beginning of planning until the effective delivery. It observes that the list with 27 opportunities obtained during this research project is a validation of the responses in the literature (Ribeiro 2022), (Giachetti, de la Vara & Marín 2023), (Guedes, Guedes & de Vasconcelos 2015), (Aymerich Fuentes & Jenkins 2022), (Muñoz & Peralta 2020) and (Sánchez-Gordón & O'Connor 2016).

With the implementation of several quality models, there is a promotion of the quality culture in the company and synergy to adopt other models. Another point of attention is that the models recommended for implementation must be minimally convergent to justify implementation simultaneously and avoid waste.

#### 4.3. Comparison of the Knowledge Area of the continuous improvement project's Risk List and Opportunities List

The common attribute between the Risk list and Opportunities lists is the “Knowledge Areas,” which are project management areas, as described in the PMBOK (PMI 2017). In the Figure 2 shows, the identified risks are classified as harming the project like an effects negative, and all opportunities are positive risks. “Resource” is the area that stands out the most, both in terms of risk and opportunity. Then there is a difference between them, where for “Scope” and “Integration” for Risks, there is more incidence, and “Quality,” “Scope,” “Cost” and “Integration” for Opportunity.

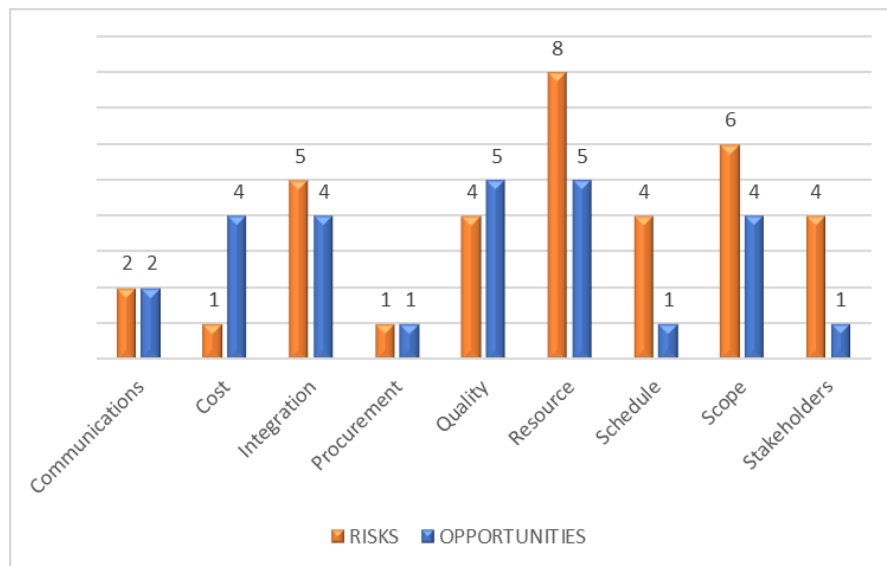


Figure 2: Knowledge Area - Compare Risk and Opportunities

(Prepared by the authors (2023) from (Machado et al. 2022), (Machado, Mexas & Meza 2023), (Machado 2021) and adaptations (Wallace, Keil & Rai 2004) and (Rahmani, Sami & Khalili 2016)

## 5. CONCLUSION

Implementing quality improvement processes in IT SMEs requires the sponsorship of the company's senior management, as it is an investment project where the return for the company is achieved in the medium and long term. Having this sponsorship is a way of reducing part of the risks and promoting opportunities. This research resulted in a list of 35 Risks and 27 Opportunities accepted in the quality improvement project. It is observed that it is essential to have a senior project manager in the quality project with Knowledge of quality processes (Risk Id 17). As noted, the implementation of several quality models (multi-models) promotes a quality culture in the company (Opportunity Id 2) and continuous improvement of processes (Opportunity Id 3). It can envision new paths and business opportunities for the IT organization (Opportunity Id 21). In the list of risks, the most cited areas of Knowledge are “Resources,” “Scope,” and “Quality,” fully adherent to the quality improvement project. Comparing the two lists (Risks and Opportunities), “Resources” is the most cited area of Knowledge between the two lists, reinforcing the statements in the literature regarding adopting quality practices.

It is understood that these lists of identified Risks and Opportunities are another powerful tool for IT SMEs to assess whether it is worth investing in adopting higher quality standards in the company. In case of adoption, monitor and control the risks that may materialize, and the opportunities listed. For future research, applying these conclusions to new projects of the exact nature of IT SME companies is relevant. It grows the map of risks and opportunities and uses weights of which risks are most relevant and opportunities for IT small and medium-sized enterprises.

**ACKNOWLEDGEMENT:** *This study would not have been possible without the interviewees' participation and the company that made its assets available to support this work. Special thanks to the Fluminense Federal University.*

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## NEW BUSINESS MODELS IN SMES: CONTRIBUTION TO SUSTAINABLE DEVELOPMENT

**Adelina Baptista**

*The Research Unit on Governance, Competitiveness and Public Policies (GOVCOPP),  
Águeda School of Technology and Management, University of Aveiro, Portugal  
University of Aveiro, Portugal  
adelinabaptista@ua.pt*

**Elisabeth Brito**

*The Research Unit on Governance, Competitiveness and Public Policies (GOVCOPP),  
Águeda School of Technology and Management, University of Aveiro, Portugal  
University of Aveiro, Portugal  
ebrito@ua.pt*

### ABSTRACT

*Small and medium-sized enterprises (SMEs) represent the majority of companies worldwide, they are the main drivers of economic development, job creation and innovation. However they generate negative environmental impacts because they generally don't have sustainable practices in their processes, strategies or long-term vision, as they are considered expensive and difficult to adopt. Alignment with key elements to establish a strategic sustainability perspective is crucial. This includes encouraging and motivating to ensure top management support for sustainability, both in terms of product innovation and the effective integration of sustainable considerations, encompassing social dimensions throughout the entire lifecycle and delegating responsibilities, as well as employing tools to guide decision-making. Implementing sustainability in SMEs may seem challenging, but with a well-structured plan and consistent actions, it is possible to achieve positive results. This paper presents a case study of a Portuguese textile microenterprise, in which this concept is exemplified, that combines social innovation with environmental innovation through its sustainable practices. It also seeks to promote reflection on the social dimension of sustainability, which often receives less attention compared to the other two dimensions, economic and environmental, leading to a limited perception of the complexity of sustainability as a whole.*

**Keywords:** *Case study, Microenterprises, Sustainability*

### 1. INTRODUCTION

Small and medium-sized enterprises (SMEs) are the main drivers of economic development, job creation, and innovation. They ensure social integration and significantly contribute to market competitiveness, as SMEs often act as suppliers to large companies (Siegel et al., 2019). SME businesses are characterized by high levels of competitiveness and demand-side uncertainty, cash flow problems, lack of standardized business practices, skill shortages, and higher employee turnover (Dey et al., 2020). Implementing sustainability in small and medium-sized enterprises may seem challenging, but with a well-structured plan and consistent actions, positive results can be achieved, both internally (e.g., improved ethical behavior of employees) and externally (e.g., positive public image) (Ruth, 2004). The adoption of sustainable practices by SMEs, such as lean approaches, ecological design, Circular Economy (CE), green and local public procurement, employee well-being measures, etc., can bring economic performance benefits. This study will develop an approach to the relationship between sustainability in SMEs, consumer behavior, European sustainability policies, and new sustainable business models as fundamental drivers for creating a greener and future-oriented business environment.

The main objective is to present the case of a Portuguese textile brand that combines social innovation with environmental innovation through its sustainable practices. re.store® is a brand that develops eco-responsible textile solutions and promotes an attitude of valuing resources and people to raise collective awareness for the need to change consumption habits through social inclusion. The aim is to promote reflection on the social dimension of sustainability, which often receives less attention compared to the other two dimensions, economic and environmental, leading to a limited perception of the complexity of sustainability as a whole."

## **2. LITERATURE REVIEW**

Small and medium-sized enterprises (SMEs) play a vital role in the economy, often accounting for a significant portion of employment and economic production in many countries. However, they frequently face limitations in financial and technical resources, which can hinder the implementation of sustainable practices. These practices are increasingly demanded by consumers who are becoming more conscious of sustainability issues and seek products and services that align with their environmental values. The European Union (EU) is not indifferent to these concerns and has been implementing stringent policies regarding carbon emissions, waste management, energy efficiency, and agricultural practices, directly impacting businesses. Simultaneously, the EU encourages SMEs to adopt sustainable practices by offering subsidies and financial incentives to invest in eco-efficient technologies and processes.

### **2.1. Sustainability in SMEs**

Small and medium-sized enterprises (SMEs) represent the majority of businesses worldwide and contribute to job creation and global economic development. They account for 99% of businesses in the European Union (EU) and are responsible for two out of every three jobs in the private sector, contributing to over half of the total value added created by businesses in the EU<sup>1</sup>. SMEs are characterized by: a horizontal hierarchy with few management levels; integrated business functions instead of a set of business units; highly active leadership with limited delegation; greater adaptability and flexibility in response to customer needs; increased reliance on external assistance due to lack of specialization; informal and simple procedures that facilitate flexibility and rapid response to customer behaviors; their culture reflects the attitudes and values of managers and/or owners; the work environment tends to be innovative, and change is more readily accepted due to the smaller number of employees (Siegel et al., 2019). In the practice of sustainability in SMEs, four essential facilitative elements have been identified: integrated strategy, continuous improvement, stakeholder engagement, and process optimization. Conversely, six main obstacles have been identified, including lack of financial resources, time constraints, lack of knowledge, risks associated with implementing sustainable practices, existing regulations, and organizational cultures that hinder the adoption of sustainable business practices (Caldera et al., 2019). To establish a strategic perspective on sustainability, alignment among various essential elements is crucial. Therefore, it is necessary to encourage and motivate to ensure top management support for sustainability, both in product innovation and in the efficient integration of sustainable considerations, encompassing social dimensions throughout the product life cycle and delegating responsibilities, as well as employing tools to guide choices. Fiscal constraints are also presented as significant obstacles to development and innovation. Hence, organizations must prepare their financial plans in conjunction with market analyses, considering all aspects to overcome potential financial limitations, such as estimating costs associated with creating the business model, financial agreements, and product pricing (Hina et al., 2022).

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<sup>1</sup> <https://www.europarl.europa.eu/factsheets/pt/sheet/63/pequenas-e-medias-empresas>

For SMEs, the economic dimension is of great importance for their continuity, but adding social and environmental dimensions enhances their competitiveness, creating new competitive advantages. Therefore, it is essential to investigate sustainable development in SMEs to improve understanding of the economic, social, and environmental impacts of their operations. If SMEs successfully address these challenges, they can play a significant role in advancing Sustainable Development Goal (SDG) 12 - Responsible Consumption and Production (UN, 2023).

## **2.2. Sustainability – The Role of the Consumer**

Consumers are seeking a healthy lifestyle and are increasingly showing interest in products produced through responsible processes that prioritize environmental concerns (D'Agostin et al., 2020). The presence of multiple environmental certifications provides an opportunity to promote more sustainable practices in the production and consumption of goods. However, this can lead to confusion for consumers. The diversity of criteria, standards, and logos used by different certifications can make it challenging for consumers to clearly understand the environmental characteristics of a product. Lack of standardization among certifications can create ambiguities and even suspicions about the truthfulness of environmental claims. Moreover, evidence suggests that the processes driving the adoption of sustainability certifications do not necessarily push the industry toward an ideal standard for social well-being (Prado, 2013). The literature on eco-labels and other quality certification systems has long recognized that consumer confusion is a significant barrier to their adoption and effective use (Harbaugh, Maxwell, and Roussillon, 2011). To mitigate this misinformation, it is crucial to make efforts to increase the transparency, clarity, and reliability of environmental certifications. Organizations and governments should play a pivotal role through initiatives aimed at harmonizing criteria, adopting internationally recognized standards, and promoting consumer-accessible information. This promotes consumer education about different certifications and how to interpret their messages. Addressing the challenges of misinformation is vital to ensuring that consumers can make decisions based on accurate and reliable information. One strategy to reduce confusion caused by labels involves promoting the adoption of mandatory labeling or investing in improving specific labels to make them especially "central" and reliable. This can help alleviate uncertainty and prevent strategic manipulation of labels by companies.

## **2.3. Sustainability Policies of the European Union**

In pursuit of sustainability outlined by the United Nations' Agenda 2030, the EU has adopted strategies known as the European Green Deal<sup>2</sup> and the European Pillar of Social Rights<sup>3</sup>. The former is oriented towards growth, while the latter focuses on social well-being. The European Green Deal outlines the foundations of a competitive, circular, clean, and efficient European economy that addresses climate and environmental challenges while ensuring a fair and inclusive transition. Its implementation will contribute to achieving 12 of the 17 Sustainable Development Goals across the 27 EU member states. The European Pillar of Social Rights, through its twenty principles, ensures justice and equity in transitions towards climate neutrality, digitalization, and demographic changes. It aims to improve equal opportunities, access to high-quality and inclusive jobs and education, as well as fair working conditions and social protection.

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<sup>2</sup> <https://www.consilium.europa.eu/en/policies/green-deal/>

[https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en)

<sup>3</sup> <https://www.consilium.europa.eu/en/policies/social-rights-eu/>

In this context, the European Commission has adopted what it calls "integrated governance"<sup>4</sup> for the implementation of the Sustainable Development Goals (SDGs). This approach includes various policy aspects such as: (1) transformation policies defined within the European Semester framework<sup>5</sup>; (2) commitments established through the Multiannual Financial Framework and NextGenerationEU<sup>7</sup> with stakeholders, especially civil society; (3) monitoring and reporting for the creation of more suitable regulations for tracking objectives; (4) the EU's commitment to the world, maintaining policy coherence for sustainable development. Without policy measures in the European Union, user information needs about sustainability would not be met, and consumers, producers, investors, and policymakers, among others, would have a very weak decision-support process that could not clearly take into account sustainability-related risks and opportunities. In this regard, on July 31, 2023, the European Commission approved the first set of European Sustainability Reporting Standards (ESRS)<sup>8</sup>, complementing the Corporate Sustainability Reporting Directive (CSRD)<sup>9</sup>. Additionally, in September 2023, the Council and the Parliament reached a political agreement on the proposal for the directive empowering consumers for ecological transition<sup>10</sup>. Thanks to the new measures, EU consumers will have access to reliable information to make the right ecological choices, they will be better protected against misleading ecological claims, and they will be more informed about product repairability before purchase. The EU's Sustainability and Circular Textiles Strategy<sup>11</sup> aims to make textiles more durable, repairable, reusable, and recyclable by 2030. In July 2023, the Commission proposed: holding producers accountable for the entire lifecycle of textile products through extended producer responsibility, accelerating the development of a sector dedicated to selective collection, sorting, reuse, and recycling of textile products, as Member States are required to establish selective collection of household textiles by January 1, 2025, and addressing the issue of illegal exports of textile waste.

## 2.4. New Sustainable Business Models

A business model articulates the strategy through which a company generates and delivers value to its customers and, consequently, to society as a whole. Moreover, it defines the structure of revenues, expenses, and gains related to this specific value (Teece, 2010). While economic value plays a fundamental role in defining a business model, the integration of sustainability into its strategy is crucial (Porter and Kramer, 2011). There are various possibilities for sustainable business models for small and medium-sized enterprises (SMEs), such as Circular Economy and recycling; development of eco-friendly products or services; product rental and sharing; offering consultancy services in energy efficiency and renewable energies; creating clothing made from organic, recycled, or waste materials; and even a business focused on educating about the importance of environmental and social responsibility and promoting sustainable practices. The application of digital technologies (such as IoT, big data, AI, blockchain, and machine learning) has the potential to provide substantial value to businesses engaged in sustainable practices (Pizzi, 2021). The merger of digitization and sustainability presents new possibilities for companies to use digital resources to analyze their impact on the environment and assess how environmental changes affect their operations (Kiron and Unruh, 2018).

<sup>4</sup>[https://commission.europa.eu/strategy-and-policy/sustainable-development-goals/eu-whole-government-approach\\_en](https://commission.europa.eu/strategy-and-policy/sustainable-development-goals/eu-whole-government-approach_en)

<sup>5</sup>[https://commission.europa.eu/business-economy-euro/economic-and-fiscal-policy-coordination/european-semester\\_en](https://commission.europa.eu/business-economy-euro/economic-and-fiscal-policy-coordination/european-semester_en)

<sup>6</sup><https://www.consilium.europa.eu/en/policies/eu-long-term-budget/>

<sup>7</sup>[https://next-generation-eu.europa.eu/index\\_en](https://next-generation-eu.europa.eu/index_en)

<sup>8</sup>[https://finance.ec.europa.eu/news/commission-adopts-european-sustainability-reporting-standards-2023-07-31\\_en](https://finance.ec.europa.eu/news/commission-adopts-european-sustainability-reporting-standards-2023-07-31_en)

<sup>9</sup>[https://finance.ec.europa.eu/regulation-and-supervision/financial-services-legislation/implementing-and-delegated-acts/corporate-sustainability-reporting-directive\\_en](https://finance.ec.europa.eu/regulation-and-supervision/financial-services-legislation/implementing-and-delegated-acts/corporate-sustainability-reporting-directive_en)

<sup>10</sup><https://www.consilium.europa.eu/en/press/press-releases/2023/09/19/council-and-parliament-reach-provisional-agreement-to-empower-consumers-for-the-green-transition/>

<sup>11</sup>[https://environment.ec.europa.eu/strategy/textiles-strategy\\_en](https://environment.ec.europa.eu/strategy/textiles-strategy_en)

Financial technology (Fintech) has also revolutionized the business world with the introduction of mobile payment platforms, artificial intelligence, big data, IoT, blockchain, and cryptocurrencies (UN, 2019). Blakstad and Allen (2018) proposed that Fintechs have the potential to act as a facilitator to drive the creation of innovative solutions and new business models, which, in turn, can contribute to advancing the Sustainable Development Goals (SDGs). With such widespread impact on the economy, Fintech was recognized by the United Nations in 2019 as one of the key innovations that could facilitate the achievement of the Sustainable Development Goals (UN, 2019).

### **3. METHODOLOGY**

This study began with a literature review that provided a comprehensive understanding of the current state of knowledge in a specific area and established a solid foundation for the research by analyzing and synthesizing existing publications, identifying gaps, trends, debates, and relevant discoveries. The case study methodology was employed in this research work with the aim of describing and analyzing the context and content of elements related to the topic under consideration within a specific organization. The "case study" research methodology is an approach used to examine in detail a specific phenomenon, event, organization, group, or individual. It is a qualitative research strategy that allows for an analysis preserving the comprehensive and meaningful characteristics of real-life events. This encompasses, for example, organizational and administrative processes, international relations, and industry development (Yin, 2010). According to the perspective of researchers using case studies, current scientific research has shifted from the broad and general scope to the specific, local, and timely context. Thus, the case study approach provides authors with the opportunity to analyze specific phenomena following a predefined research plan, as well as to develop theories through analytical reasoning or make well-founded claims (Bernardo et al., 2018).

### **4. CASE STUDY PRESENTATION**

#### **4.1. Case Study Contextualization**

The problem of excess materials in the textile industry is a complex issue with significant environmental, economic, and social repercussions. This surplus of materials ranges from fabrics to accessories, resulting in a series of problems such as: the waste of raw materials and the environmental impacts associated with their production; the financial costs of wasted materials and their disposal in landfills; the costs of storage, transportation, and disposal of these "excesses." Often, fabric remnants are not sufficient to produce complete pieces, limiting the creativity of designers and the variety of products offered. It is in this context that re.store® emerges. re.store® is a Portuguese textile brand launched in 2019 by the micro-enterprise Creative Zone (CZ), with the aim of addressing this common problem in textile companies in Northern Portugal. re.store® positions itself as People and Planet friendly, based on the principles of the Circular Economy – RE.cycle, RE.use, RE.duce – and social responsibility, combining social innovation with environmental innovation and educational efforts to change current consumption habits. Through its actions, re.store® contributes to 4 Sustainable Development Goals (SDGs) (Figure 1), namely: reducing inequality (Goal 10); sustainable cities and communities (Goal 11); responsible consumption and production (Goal 12); and combating climate change (Goal 13).

*Figure following on the next page*



*Figure 1: ODS da re.store®®*  
(Source: <https://restore.com.pt/restore/>)

#### 4.2. Objectives and Targets

Currently, three indicators measure the impact of re.store®'s work on the community and the planet, making it a sustainable and socially responsible company:

- Quantity of reused fabrics and textile accessories: 5.4 tons to date.
- Remuneration of social partners: 54,000 euros to date.
- Number of educational activities with educational institutions and other organizations: over 20 to date.

The goals the company has set for the next 2 years, based on the results obtained so far and planned actions, are:

- Increase the quantity of reused fabric and accessories by 30% by 2024 and 50% by 2025.
- Increase the total remuneration to social partners by 20% by 2024 and 30% by 2025.
- Increase educational activities by 20% by 2024 and 30% by 2025.

#### 4.3. Specific Actions

Corporate Sustainability Programs (CSP) are initiatives adopted by companies to demonstrate their commitment to social, environmental, and economic well-being. These programs aim to contribute positively to society and the environment while generating shared value for the company and its stakeholders.

- 1) Community Engagement: re.store®'s core work is to create an impact on the community and contribute to collective awareness regarding the need for responsible and socially conscious consumption habits. By working with social partners, re.store® provides them with financial compensation (fair and above-average wages) and emotional compensation by enhancing self-esteem, a sense of belonging, promoting learning, and encouraging unique individual development.
- 2) Environmentally Responsible Practices: re.store®® reuses fabrics and accessories from textile companies' waste, leftovers, and production tests as raw materials. The brand's label is woven with recycled polyester yarns, and the brand signature label is printed with environmentally friendly water-based ink using thermal sublimation techniques. The bags sold by the brand have handles made of 100% organic cotton fabric or remnants from trimmings, promoting sustainability. The brand's value proposition paper label is made from cotton waste and plant seeds, which can be planted in a pot and grown into a plant.

- 3) **Ethics and Transparency:** re.store®'s communication is based on transparency principles, as its activities are monitored and scrutinized by the public and market players in two highly observed areas: sustainability and social inclusion. This approach ensures credibility in the market and among its stakeholders.
- 4) **Employee Involvement:** re.store® employees are inherently committed to People and the Planet. Fundamental requirements during their hiring process emphasize their growth as professionals but, above all, as individuals. This personal growth significantly impacts the brand's stakeholders and its community.
- 5) **Responsible Business Practices:** re.store® products are entirely manufactured by its social partners, valuing and compensating their work and self-esteem, promoting their inclusion and social integration. Through its work and processes, re.store® contributes to engaging people related to its cause (suppliers, partners, customers, employees, decision-makers, etc.) in raising collective awareness about the need for responsible consumption habits.
- 6) **Stakeholder Focus:** re.store®'s activity depends on engaging its suppliers in its cause of reusing textile materials. When approaching a new supplier (such as a factory, warehouse, distributor, or other player willing to embrace this cause), re.store® is already creating shared value by contributing to reducing the textile sector's ecological footprint. re.store® customers are referred to as the "Tribe" by the brand because that's how the brand identifies them: people with a common purpose who defend, promote, and share it with others. In practice, they are brand advocates, promoting the brand's interests, as they see this brand as a way to contribute to a more sustainable and socially inclusive world. Local communities served by re.store® know that by partnering with the brand, their work will impact the community in terms of the work done and the financial compensation received. This is also one of the reasons for the involvement of local authorities, as re.store® has an impact on their social and sustainable responsibility through its actions, bringing visibility and recognition to the territories where they are executed.
- 7) **Sustainability Reports:** The brand's activity and continuous update of its impact indicators serve as a dynamic and updated report of its best practices. However, due to the brand's growth in terms of stakeholders involved, internationalization plans, and investment, the preparation of a sustainability report in 2024 is one of its goals to be achieved.

## 5. ANALYSIS AND DISCUSSION

Paraphrasing Porter and Kramer (2011), integrating sustainability into a company's strategy is crucial. In defining a business model, the re.store® brand was created with the purpose of addressing two problems/challenges: the ecological footprint of the Portuguese textile industry and the social and professional stigma faced by unique individuals due to their differences. In this sense, re.store® assists its suppliers in complying with the July 2023 proposal from CE<sup>12</sup>, which holds producers accountable for the entire lifecycle of textile products, while promoting social inclusion. In essence, re.store® is a Corporate Social Responsibility (CSR) program that adds value, engages, acts as a driving force, and motivates its stakeholders to conduct business in an environmentally and socially responsible manner. Hence, elements facilitating sustainability practices, integrated strategy, and stakeholder engagement are identified (Hina et al., 2022), inspiring other companies to follow this path. The merger of digitalization and sustainability opens up new possibilities for businesses to use digital resources to analyze and evaluate how environmental changes impact their operations (Kiron and Unruh, 2018).

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<sup>12</sup> [https://environment.ec.europa.eu/strategy/textiles-strategy\\_en](https://environment.ec.europa.eu/strategy/textiles-strategy_en)

In this regard, re.store® utilizes e-commerce for promoting and selling its products, digital payments, and social media to engage with stakeholders. This mode of communication has enabled re.store® to create a loyal customer base, referred to as the "Tribe," forming the foundation of its operations and validating its essence. This achievement serves as one of its success indicators in terms of positive impact on people—its primary focus. This approach minimizes the impact of multiple existing environmental certifications on the market, which often lead to confusion and mistrust among consumers. It's worth noting re.store®'s participation in events providing accessible information to consumers, promoting education to attract individuals committed to its purpose, encouraging them to disseminate these values in their professional and personal spheres. The EU has recently introduced various tools aimed at enhancing transparency regarding sustainability reporting, including the European Sustainability Reporting Standards (ESRS), Sustainability Reporting Directive, Corporate Sustainability Reporting Directive (CSRD), and a proposal for a directive focusing on consumer empowerment for ecological transition. In this context, re.store® plans to prepare its sustainability report by 2024.

## 6. CONCLUSION

Corporate Social Responsibility (CSR) programs are a significant way for companies to actively promote sustainable development and contribute to solving social and environmental challenges. These initiatives can also have a positive impact on a company's reputation, customer loyalty, and attraction of talents dedicated to sustainable values. The case presented here exemplifies these initiatives, representing one of the sustainable business models that can be implemented in micro and small enterprises. re.store®, with its mission to "transform many small worlds, one at a time, every day," aims for the transparency and credibility of the brand to be unquestionable, setting an example of best practices for a microenterprise that has chosen the promotion of sustainability through reutilization and social inclusion of unique individuals in their diversity.

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## HEALTHCARE ORGANIZATIONAL CULTURE IN THE ENERGY SECTOR: SOCIAL INITIATIVES IN SUSTAINABILITY REPORTS

**Djynnana de Azevedo Avena**

*Petrobras Petróleo, Brazil*

*djynnana@petrobras.com.br*

**Stella Regina Reis da Costa**

*GOVCOPP, University of Aveiro*

*Universidade Federal Fluminense, Brazil*

*stella@ufrrj.br*

**David Nunes Resende**

*GOVCOPP, ESTGA, University of Aveiro, Portugal*

*david@ua.pt*

### ABSTRACT

*Organizational culture assumes a role of extreme relevance in the context of companies operating in the energy sector, significantly influencing both their operational efficiency and their sustainability-related initiatives. Thus, this article aims to perform an analysis of the actions linked to the organizational culture of health in a given company in this sector. The objective of the study is to investigate the information pertinent to the theme of health, which was published in the social dimension of the sustainability reports, analyzing the period between 2018 and 2022. The sustainability reports issued by this organization have served as a primary source for understanding the values and objectives that guide its corporate culture. This qualitative research consisted of the careful analysis of this information, to identify and understand the culture expressed through the actions and symbols described in these documents. The methodology used was content analysis, an instrument used to identify values, beliefs, and practices related to health, as well as aspects correlated with sustainability. The approach to the actions that permeate the organizational culture of health in companies in the energy sector is of unquestionable importance, given the significant repercussions of this theme on the health of workers, the surrounding communities, and the environment. Understanding the approach and communication plays a key role in assessing your commitment to aspects associated with life and well-being. The results presented provided opportunities for (re)organization, (re)alignment, and revision of its strategic guidelines and, consequently, of its health practices, in the search for more effective and more integrated actions. In addition, the research can be used as a reference point by other companies in the sector that seek to improve their approaches to health and sustainability.*

**Keywords:** *Organizational Culture, ESG, Health*

### 1. INTRODUCTION

In an increasingly interconnected world, large companies play a crucial role in addressing global challenges such as climate change, social inequality, and responsible corporate governance. It is in this context that the acronym ESG (Environmental, Social and Governance) has emerged, bringing with it the idea that the evaluation of a company should not be limited to market criteria, but should also consider environmental, social, and corporate governance attributes that have an impact on business decisions and operations. The rationale is that companies that perform poorly on ESG criteria will tend to lose relevance, while those that perform well will be recognized and valued.

Thus, sustainable practices have served as guidelines for the construction of corporate, institutional, and governmental strategies in the search for solutions that go beyond profit maximization and point to the achievement of competitive advantages (IRIGARAY and STOCKER, 2022; BELINKY, 2021; ALMEIDA et al., 2018). Historically, investors have focused on environmental and governance issues. More recently, however, with the advent of COVID-19, there has been an increased interest in social aspects of companies, highlighting the importance of employees, communities, and workers to their financial performance. This crisis that began in 2020 has led investors to pay more attention to the long-term financial impact of companies' actions. As a result, the social dimension has gained a prominent position in this discussion (GOLDMAN SACHS ASSET MANAGEMENT, 2020). Social indicators are comprehensively addressed by companies and represent the relationship between companies and their stakeholders (NEILAN, REILLY, and FITZPATRICK, 2020). They cover a range of factors such as: customer rights, community relations, product safety, employee health and safety, labor relations, employment, education, slave and child labor, diversity, financial inclusion, human rights, toxic waste, and many others (NOLTING, 2019). In this context, human capital is recognized as a strategic element where the challenge of addressing issues related to the health and well-being of workers is evident. There are numerous reasons for disclosing ESG actions, including reducing information asymmetries between the company and stakeholders, strengthening organizational commitment, improving risk management, and strengthening corporate reputation (SILVEIRA, 2018). This does not exclude aspects such as the intention to highlight the company's strengths and minimize weaknesses, or the need to explain policy changes and repair a damaged reputation (FATEMI, GLAUM and KAISER, 2018; BURKE; CLARK, 2016). The purpose of this study was to understand how the issue of workers' health and well-being is presented in sustainability reports. The main objective of this research was to analyze the information contained in the social dimension of the documents of a Brazilian energy company, with a focus on the issue of health. The relevance of this research is supported by its innovative approach, since few similar studies have been identified, and by the opportunity to deepen the understanding of health policies and practices related to ESG aspects, within the framework of a specific company. The challenge was to highlight the disclosed policies and practices and to identify how the values and goals that guide the corporate culture relate to this issue.

## **2. LITERATURE REVIEW**

The term ESG first gained prominence in the "Who Cares Wins" document published in 2004 by the Global Compact in collaboration with the World Bank. In this framework, financial institutions were encouraged financial institutions to incorporate elements of sustainability into their capital markets. This concept was later disseminated as a set of principles justifying the establishment of criteria and practices aimed at companies that play a fundamental role in sustainable development. Its importance was reinforced with the adoption of the 2030 Agenda and its 17 Sustainable Development Goals (SDGs) in 2015. This agenda, accepted by all member countries of the World Health Organization (WHO), recognized the need to reformulate the global system of production and consumption, as well as to improve governance and the distribution of resources needed to promote human well-being (BELINKY, 2021). The acronym ESG represents the foundation of responsible business development, based on three essential pillars (triple bottom line). These pillars cover economic, environmental, and social aspects and establish guidelines and practices for companies to minimize their impact in these areas (FAROOQ et al., 2021). Companies have therefore focused on adopting initiatives in line with best practices. These actions are not limited to their employees and business partners, but also extend to the community in which they operate.

This movement is in line with ESG principles and has a positive impact on their reputation and relationships with their various stakeholders (WINTER and PUGIOLI, 2021). However, acting sustainably is not an intuitive process. To cope with the complexity of the environment, organizations have sought to integrate sustainable practices into their strategies, culture, and business models. This requires continuous learning over time to assimilate concepts and share knowledge. In this way, organizations are recognizing these concerns as essential elements that must be incorporated into their strategies to create value (BENN, EDWARDS, and WILLIAMS, 2014). Embedding a corporate sustainability policy is a complex journey involving a combination of values and tools. It develops gradually as it is integrated into operations, culture, and business initiatives (LOSANO, 2015). When addressing organizational culture, it is essential to understand its impact on various aspects, from employee performance to task quality, productivity, innovation, and quality management. Organizational culture reflects the shared values, beliefs, and norms that influence employees' mindsets, behaviors, and attitudes and shape their perceptions and actions (HARRISON and BAIRD, 2015; KHOULY and FADL, 2016; WARRICK; MILLIMAN; FERGUNSON, 2016). Implementing sustainable practices in companies requires a cultural shift in which sustainable development becomes an integral part of corporate strategy and organizational culture (MARCON and SORIANO-SIERRA, 2017). This requires significant investments in infrastructure and new projects related to health and education (UNDP, 2015). In 2019, the global crisis generated by COVID-19 has led to a collapse of markets and raised important questions about the adaptation and survival of businesses. This has affected not only the financial sphere, but also the health and safety of workers. Companies have been forced to redesign their workplaces, deal with unforeseen absenteeism, and offer incentives to employees and customers, while balancing aspects of health, social security, and profit. These changes in the dynamics of work have been fundamental in meeting the challenges posed by the pandemic, highlighting the importance of health in the corporate environment (HUANG; CHEN and NGUYEN, 2020; TAN and KALYEBARA, 2021; PICCAROZZI; SILVESTRI; and MORGANTI, 2021; GARCÍA-SÁNCHEZ and GARCÍA-SÁNCHEZ, 2020; ANTWI et al., 2021). Integrating social aspects into corporate governance can improve corporate performance and resilience in times of crisis, as was the case in Covid-19. This highlights the importance of considering health and sustainability in business efforts (LATEEF and AKINSULORE, 2021). However, despite the growing importance of occupational health and safety, its impact on the financial health of companies is underestimated, to the detriment of workers. It is crucial to recognize that access to a safe and healthy working environment is a fundamental human right, as reflected in three of the 17 UN Sustainable Development Goals (SDG 3: Health and well-being, SDG 8: Decent work and economic growth, and SDG 9: Industry, innovation, and infrastructure), reinforcing its importance in the global agenda to be achieved by 2030 (ALVES and RAMOS, 2022). Today's organizations have never been more sensitive to sustainability. The issue has gained prominence and has come to play a role in the longevity of companies. However, it is not enough to adopt sustainable policies; they must be translated into concrete practices and the results must be communicated. Thus, sustainability reports have emerged as a tool to measure, disclose and account for organizational performance, with a focus on progress towards responsible development. They represent how companies share the initiatives they have implemented and incorporated (ARAÚJO and RAMOS, 2015; BEYNE et al., 2021).

### 3. METHODOLOGY

A qualitative exploratory and descriptive study was carried out, and the results were interpreted using content analysis. The exploratory stage began with a literature review. The documentary stage took the form of collecting information from the Sustainability Reports published between 2018 and 2022 by a company in the energy sector.

The decision not to include other companies in the analysis was driven by the specific objective, which required a more in-depth study of this organization. The choice of the five-year period was justified by the fact that these were the most recent reports made available by the company at the time of the research. The documents were collected directly from the company's website to identify the relevant information for the research. To interpret the data, we used content analysis, an approach that comprises a set of techniques designed to analyze communications, looking for indicators, whether quantitative or qualitative, that allow inferences to be made about the knowledge related to the conditions of production and reception of the messages (BARDIN, 2011). The stages of the process, as proposed by Bardin (2011), included pre-analysis (selection of material and preparation of information), exploration of the material (coding and classification of units into categories), and interpretation of the results (description, inference, and treatment). It is worth noting that the reports analyzed adopted the Global Reporting Initiative (GRI) Sustainability Reporting Guidelines and their updates. In addition, they responded to the Sustainability Accounting Standards Board (SASB) indicators for the oil and gas sector that were appropriate for the organization studied (exploration and production, midstream, and refining and marketing). As a complementary reporting methodology, the reports used as primary sources followed the International Petroleum Industry Environmental Conservation Association (IPIECA) Sustainability Reporting Guide and were also aligned with the Global Compact principles and the United Nations Sustainable Development Goals (SDGs).

#### 4. RESULTS AND DISCUSSION

The quality of the information disclosed is associated with principles such as comparability, accuracy, reliability, and relevance, and can be translated into the transformation of stakeholders' knowledge about corporate strategy (FERNANDEZ-FEIJOO, ROMERO, and RUIZ, 2014). In this sense, it is essential to identify the topics highlighted in each document analyzed, since the demands and expectations evidenced play a significant role in guiding sustainability strategies and formulating goals and objectives linked to corporate responsibility.

Topic areas	2018	2019	2020	2021	2022	Comments on the grouping
Health Indicators	X	X	X	X	X	Described in all documents. Restricted to data on accidents at work, absenteeism, and occupational illnesses. They can be compared because they are presented systematically, but without other information or complementary data.
Well-being Programs	X	X	X	X	X	They are presented in the context of health programs until 2020. From then on, they are associated with topics such as: listening, welcoming, stress management, and aspects involving support networks. In the 2022 report, the topic took on more space, associated with mental health.
Health Promotion	X	X	X	X	X	They present a variety of programs and actions (healthy eating, physical activity, flu vaccination campaigns, oral health, pregnancy and breastfeeding care, prevention of alcohol, tobacco, and other drugs, among others). They are cited as examples of activities carried out in the company, without quantitative data that expresses the scale of the actions.

Chronic Non-Communicable Diseases		X	X	X	X	They are mentioned occasionally in all the reports (except 2018, when they do not appear), without describing any action, activity, or quantitative data.
Mental Health		X	X	X	X	The topic appears occasionally in the reports, until 2022, when it is dealt with in more detail, with details of quantitative data and actions taken. It has gained significant space since 2021.
Occupational Accidents	X	X	X	X	X	It is mentioned in the context of safety culture, although it is related to the issuing of Workplace Accident Reports, which is the responsibility of the health team. However, no health-related data is presented in the documents analyzed.
Absenteeism	X	X	X	X	X	The topic appears in all the documents analyzed, in relation to the Lost Time Percentage indicator. The documents lack qualitative analysis and data on absenteeism in the company.
Communicable Diseases, Outbreaks and Epidemics			X	X	X	This topic presents the response actions to COVID-19, adopted in accordance with the recommendations of the health authorities, with the priority of protecting people and guaranteeing the company's safety and operational continuity. They detail the strategy adopted in the crisis: social distancing, screening, testing, quarantine, and the adoption of different work regimes to reduce exposure. The information appears more expressively in 2020 and 2021, with less emphasis in 2022. Specific notifications of diseases such as dengue, malaria and measles are also described.
Occupational Diseases	X	X	X	X	X	Although it appears in all the reports, the topic relates only to the figures presented as health indicators. There is no quantitative information or more in-depth qualitative surveys. It is linked to the incidence of occupational diseases. Points such as the identification of occupational risks and aspects related to notifications do not appear in any of the reports studied.
Impact on Community Health	X	X	X	X	X	It indicates existing health and safety risk assessments in its products and services but does not present more detailed data or actions. There are no reports of health care or actions with communities.
Health Committees and Commissions		X	X	X	X	The documents present the formal health and safety committees and commissions that the company has, and the issues discussed in each of them.
Contractual requirement of		X	X	X	X	The documents mention that the service contracts include annexes with health and

health aspects in the qualification of suppliers (contracts)						safety requirements that must be met by the contracted companies, without further details.
Supplementary Health	X	X	X	X	X	Focus on users' main complaints, which are related to the company's health plan, without further information.
Telemedicine			X	X	X	It appears as a measure to increase the safety of those assisted by the health plan, in the face of the coronavirus pandemic.
Voluntary actions aimed at the external public about health			X	X	X	Donations of Covid-19 detection tests, hygiene kits and personal protective equipment, equipment, funding for actions in hospitals, oxygen cylinders (to combat COVID-19). These actions were intensified in 2020 and 2021. In 2022, donations were concentrated on social demands, and there was no evidence of donations related to health.
Use of computerized systems to manage health data			X	X		Description of the use of the Computerized Health System, Data Panels and Health Information Access Portal for employees. These are considered management tools used to support the needs of the company's organizational units.
Evidence of Management Systems used in Healthcare		X	X	X	X	Discussion of the management systems used, with a strong emphasis on safety. In 2019 and 2020, management aspects are presented more concisely. From 2021 onwards, the topic becomes more comprehensive, but its relationship with health is little explored in all the documents studied.
Health Training			X	X	X	Limited to health trainings for employees.

*Table 1: Health topics covered in the reports analyzed  
(Source: Prepared by the authors<sup>1</sup>)*

Workers' health and safety are human rights topics of great relevance to society and companies. However, it often receives less attention, even though its actions contribute to increasing the productivity and sustainability of companies (MALAN, 2017). An examination of the sustainability reports studied reveals a progressive increase in the disclosure of information related to health, although the topic has a reduced participation in the documents. Despite the increase in the presentation of the topic over the years analyzed, there are points that need substantial improvement. More detailed disclosure is essential, including specific metrics that allow for a comprehensive analysis of the impacts of corporate actions. Health-related content tends to be qualitative, making it difficult to identify a consistent pattern in the presentation of data, which varied on an annual basis. Elements such as the lack of comparability between the parameters used, as well as the absence of a more obvious guiding policy for health actions were highlighted. There is a description of the actions carried out without any quantification to assess their magnitude and scope.

<sup>1</sup> The markings in the table indicate the documents in which the topics were identified. No marking indicates that the topic was not present in the analyzed document.

This is detrimental to evaluating the performance and effectiveness of health policies, programs, and interventions since comparisons over time are fundamental to identifying trends and improvements. It is worth mentioning that, according to the ILO (2019), it is necessary for companies to adopt effective systems for collecting occupational health and safety data, and to improve the analysis and dissemination of this information. To ensure sustainable economic and social development, broader approaches to occupational health and safety are essential, including elements such as the informal economy, new and emerging risks, and the physical, mental, and social well-being of workers. Dissemination actions are needed to raise awareness among stakeholders, improving their awareness (RAMOS and PATRÍCIO, 2018).

## 5. CONCLUSION

In this study, health forms an integral part of a corporation's social sustainability dimension. Its relevance lies in the care for individuals, the pursuit of quality, and safeguarding workers' lives. Within the health sector, ESG principles are, by nature, implemented to attain a positive impact on people. However, research confirms a long-standing observation. The health industry concentrates on singular operational aspects, sidestepping the adoption of the holistic ESG approach. An increasing emphasis on mental health and prioritizing the well-being of employees has been noted. Nevertheless, enhancing the organization of information to accentuate quantitative data, incorporating qualitative information to bridge gaps in health topic descriptions for comparative analyses, and stimulating superior strategic assessments require improvement. To incorporate health into the company's culture of sustainability, it is necessary to align its health practices with its sustainability values and treat health as an essential corporate responsibility.

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## **PROPOSAL OF ACTIONS TO LEVERAGE THE PERFORMANCE OF STUDENTS IN THE NATIONAL HIGH SCHOOL EXAM: ANALYSIS IN A FEDERAL PUBLIC SCHOOL IN RIO DE JANEIRO**

**Kylenny Rachell Mendes Ferreira**  
*University Federal Fluminense, Brazil*  
kylenny@gmail.com

**Stella Regina Reis da Costa**  
*GOVCOPP, University of Aveiro*  
*University Federal Fluminense, Brazil*  
stella@ufrj.br

**Augusto da Cunha Reis**  
*CEFET-RJ*  
*University Federal Fluminense, Brazil*  
professoraugustoreis@gmail.com

### **ABSTRACT**

*The National High School Examination (ENEM) became the main access to college education in Brazil, and its results are used as a requirement for participation in a lot of programs offered by the Federal Government such as: FIES, Sciences without Frontiers, SISU, SISUTEC, among others. Given this, the students finishing high school, specially the ones coming from public school, are required to take the test with the obligation to achieve a good performance, if they intend to continue their academic life or to participate in the offered programs. Therefore, the objective of this study was to identify the main difficulties faced by the high school student in the performance of the test, through a diagnosis made at a Federal Public School located in Rio de Janeiro, in order to propose actions that can improve the student's performance in the ENEM. For this, a bibliographical research was carried out, based on theoretical themes such as the High School reformulation, ENEM, influence factors on student's performances, among others. It is a qualitative study with bibliographic, documentary and field researches as much as direct, applied and participant observation. The field survey was performed using the questionnaire technique, applied to all teachers and students of the 3rd year of High School in two Campuses of the Institution, aiming at the analysis of the influence variables such as: the student's knowledge about the exam and offered programs through their results, gender, origin, school environment, family environment, encouragement given to student by teachers and school, the student's understanding of the theoretically proposed interdisciplinary character in elaborating ENEM's issues. The result of this study demonstrated that the High School students are facing challenges that begin with the lack of Vocational Guidance in schools. These youngsters feel lost and have difficulty choosing the career they intend to follow. That is a fact that contributes to the student's struggle, they start feeling anxious, withdrawn, sad and unmotivated. The study showed that the student's greatest difficulty in the test is not necessarily the lack of content received at the school, but the lack of knowledge applying what they have learned by solving the ENEM issues, which are based on a specific approach. It was also found that a large part of the students is still unaware of most of the programs offered by the Federal Government through ENEM results, including the SISU main gateway for Federal Public Universities, pointing out that there is an urgent need to divulge the programs and their proposals to the basic education institutions of the country.*

**Keywords:** *National High School Examination, Performance, Challenges, University education entry*

## 1. INTRODUCTION

Currently, the world is transforming in such a way that the search for and need for higher education and a place in the job market is becoming more and more urgent. In Brazil, students who complete high school are faced with a decision that may be the most important of their journey up until that point: choosing whether to continue their studies or enter the workforce. Entering higher education in Brazil is still a challenge: there are not enough available spots for all those who complete their basic education. Therefore, students must strive to the maximum to gain admission to a university, facing challenges such as the lack of vocational guidance during basic education and other factors that this study aims to identify. The National High School Examination (ENEM), which used to only evaluate high school education in the country, has become the main gateway to continue one's academic life. What are the factors that can influence the student's performance in this evaluation? Therefore, it has become of great importance to identify and analyze the main difficulties, weaknesses, and challenges that students face in their attempt to enter higher education and the world of work, in order to propose actions that can mitigate them. The objective of this research was to identify the main difficulties faced by high school students in taking the ENEM exam, in order to propose actions that could improve their performance in the exam.

## 2. LITERATURE REVIEW

Students, when reaching the final grades of Elementary School and/or entering High School, tend to feel unmotivated (CAVENAGHI; BZUNECK, 2009). Generally, parents and teachers are taken by surprise when they notice this lack of energy and realize that students become apathetic and humorless. However, it's important not to generalize. There are those who remain engaged in school activities. Bzuneck ([2009]) complements this theme by affirming that for the teaching staff, the lack of motivation among students has proven to be a major challenge. Teachers notice the students' lack of interest, especially in the final years of basic education. They complain about the students not completing the proposed in-class activities and homework, even when they are graded. Teachers report that students hesitate to start an activity, easily get distracted, refuse to answer proposed questions, or simply respond with "I don't know." Meanwhile, others fall asleep in the classroom or confront the teachers. Pessoa and Reges (2016), creators of the PRÉ-VEST/PRÓ-ENEM project at the Federal University of Paraíba, point out that inclusive education is of paramount importance in the lives of young adults who aim to enter higher education. It holds the power of transformation, and it is necessary to expand projects like the mentioned program, serving as an educational tool and promotion of human rights as it maximizes the entry of low-income youth into universities, and consequently the training of the professionals involved. It is through these professionals that effective material equality and social justice will be achieved. Zirondi and Nascimento (2006) and Zirondi (2006) assert that the ENEM exam is part of the set of texts produced for national assessment contexts, and these texts have characteristics that differentiate them from the "tests" that schools administer to assess the teaching/learning of the mother tongue and the various subjects that make up the basic school curriculum. In the ENEM, the text expects the candidate to direct attention to and reflect upon the purposes and objectives expressed in the test command statements. In other words, before answering a question, it is assumed that students, in addition to having to understand the text that gives rise to the question as a social practice in its particular context of production, circulation, and reception, should be able to recognize the characteristics of its textual infrastructure and extrapolate these capacities to determine the function of the text that triggers the question in relation to the objectives of the test command statements. This requires the evaluated individual to capture a new dimension of the production context that now constitutes them (ZIRONDI; NASCIMENTO, 2006, p. 291-292).

Bock (2014) emphasizes that choosing an occupation was not considered a problem for the human species. Only more recently, considering the history of mankind, did humans begin to reflect on this issue, as our ancestors survived through collecting and later hunting, and there was not much differentiation of roles, except those determined by sex, strength, and consequently, caused by the organic specificity of the species. It was with the arrival of the form of production established by capitalism that professional orientation began to gain importance. Bock (2014, p. 4) states that: "The transition from feudalism to capitalism represents important and profound changes in the way of producing and reproducing human existence." Therefore, the new social order brought with it distinct characteristics from the feudal times: it took away from the worker the ownership of the means of production that would guarantee their subsistence, which led the individual to view their labor as a means of ensuring their livelihood. With this, the worker became free to dispose of their labor force, putting an end to the relationship of "serfs and lords." The objective of work ceased to be solely for the satisfaction of human needs, and from then on, profit became the main focus (BOCK, 2014). Barros, Noronha, and Ambiel (2015) affirm that choosing a profession is a complex decision-making process as it is an important activity in a person's life and is influenced by various environmental, familial, and personal factors, with personal characteristics such as personality, interests, and skills being especially prominent. Therefore, Career Guidance is a service that can assist in the decision-making process, where Ribeiro (2003) considers that there should be a concern from public and private entities to create alternative strategies to enable access to professional and occupational information. Campos and Noronha (2016) understand that helping young people understand the difficulties of career indecision so that they can make a mature and well-adjusted choice is an important objective of Career Guidance. Considering that access to elementary education is practically universalized, the great challenge for Sabóia, Soares, and Kappel (2016) is to increase the educational level of young people through policies that involve socioeconomic aspects and integration into the labor market, focusing on high school and Youth and Adult Education. There is an increasing demand for higher education qualifications for better-paid jobs, therefore, it is the need for the development of projects that seek to improve high school education and vocational training, in their educational and professional dimensions, in a school committed to youth demands. The double school shift, with the division of time between study and, can interfere with the performance and academic achievement of these young people who end up being disadvantaged because they are in a more unfavorable situation and generally need to balance study and work to supplement the family income. In addition, the reduction in the number of positions in Federal Technical Schools further restricts their access to quality education and training for work. The conditions of late and peripheral economic development and the high demand from young people in the disorganized and precarious Brazilian labor market, according to Santos and Gimenez (2015), are expressions of the country's social exclusion model that prevents the younger layers of society from having equal conditions in the competition for the labor market. Frabetti et al. (2015) understand that processes of Vocational Guidance based on new paradigms and focused on the social environment allow young people to reflect on themselves, on the relationships and contexts that permeate professional and work issues, which can, at the moment of choosing a career, minimize suffering and, in the future, maximize work relationships. As they seek to meet demands related to doubts, anxieties, and desires in the construction of life projects, Vocational Guidance can be guided by dialogues and reflections on interests, skills, values, dreams, and perspectives, while also promoting the expansion of knowledge about professions. The career choice is a very important moment for young people, however, Bock, Gonçalves, and Furtado (2011) emphasize the need to consider the specificities that individuals experience due to the pressure from the social groups they belong to. Career guidance is meant to help students in planning their life project, instead just directing young people towards choosing a

higher education course. Silva (2016) asserts that with process of mediation and cooperation from specialized professionals, assisting in the development and construction of a life project involving knowledge of choice, the professional environment, and self-awareness of individuals in development, this practice becomes more useful and effective. According to Ogushi and Bardagi (2015), higher education institutions need to be organized, generating secure policies that guarantee the implementation and effective use of support services for students, as well as a welcoming and preparatory academic environment for the integral development of their students, preparing them to act responsibly and consciously in society, generating greater confidence for students, stimulating them to develop and manage the numerous challenges they encounter when entering university and the professional life. The current economic crisis results in an increase in unemployment and job offerings, which prevents young people from getting their first job, creating a climate of insecurity for students who are concluding their secondary and higher education. Facing this historical and social scenario, the job market has become increasingly competitive, forcing the new generations to confront situations marked by uncertainty and unpredictability in job availability. Therefore, educational institutions must realize as soon as possible that their function is not only the transmission of knowledge, and their mission does not end when students complete their courses, but they must commit to continue supporting them in the short, medium, and long term transitions to work to ensure that their entry and permanence in the job market are as successful as possible. (DELORS et al., 2010; URBANO, 2011; SOUSA; GONÇALVES, 2016).

### **3. METHODOLOGY**

In this study, the case study was used as a strategy and research method, as the study is confined to a public organization, being conducted in the field, as classified by Vergara (2007). In this context, the data collection procedure used in this research employed the following sources of evidence: literature review with articles published in journals available in electronic databases on the Internet, such as Scopus, SciELO, and Science Direct; documentary research through the search for documents that demonstrated the students' performance history in ENEM, socioeconomic aspects, among others; application of a structured questionnaire developed by the authors based on the theoretical framework; and direct observation, which is necessary when conducting field research and visiting the "location" of the case study, which provides elements of direct observations (YIN, 2005). The field research was conducted by applying a structured questionnaire to the teachers of the 3rd year of high school. The questionnaire targeted the teachers and was administered to a total of 13 (thirteen) teachers, with 4 (four) at the Central Campus and 9 (nine) at the Engenho Novo II Campus, out of a total of 41 when combining both campuses that constituted the defined population. With a response rate of 31.70%, direct observation was conducted during the interaction with the teachers.

### **4. RESULTS AND DISCUSSION**

From the results of documentary analysis, it can be perceived that students who entered the through public lottery in the 1st year of elementary school are facing difficulties when starting the final years of elementary school. The data shows that 56.86% of students failed in this second phase of Basic Education. Taking into consideration the percentage of students from elementary school, which is 43.40%, we can see that practically all of them fail in one of the final years of basic education. On the other hand, among those who were admitted through a competitive exam, the failure rate is 8.57%. This result corroborates the thoughts presented by Soares and Gomes (2000), who based their study on Ericson's theory (1964), stating that primary school experience directly influences future stages, with the phenomenon known as epigenetics, where the way crises are resolved in each stage influences how the following stages will be experienced, allowing each stage to update itself in the next, always based on the

experienced experiences. The authors confirmed, through studies with postgraduates and subjects who did not continue their academic life after high school, that the majority of those who did not pursue further studies did not have good experiences during the initial years of basic education and were unable to develop a satisfactory self-esteem, whereas postgraduates had high self-esteem and greater satisfaction in continuing their studies. Studies that differences in student performance are also associated with differences determined by the contexts in which groups of learners are inserted (BRYK; LEE, 1989; FRANCO et al., 2007). The lack of professional/vocational guidance was identified as another difficulty faced by the student body. Students feel demotivated because they are unsure about which course to pursue, corroborating what Lucchiari (1992) states that it is important to facilitate this choice for young people by participating and assisting them in thinking, coordinating the process to overcome any difficulties that each individual may have. The author states that this work must be done by qualified professionals and also mentions that groups of "coordinated" individuals will present different specific characteristics, and it is these differences that will guide the development of the process. The author explains that it is not about direct guidance, but about assistance, as the professional also does not know the best path and should therefore facilitate it in order for the young person to discover their own path.

- 1) Implementation of Benchmarking tool in the educational process of the Institution This study demonstrated the importance of gathering best practices used in the different Campuses of the institution. The analysis was conducted in only 2 (two) out of the 14 (fourteen) Campuses that form the structure of the Federal Institute of Education. The sample showed that, despite the institutional pedagogical project being unique, there is some discretion among each Campus in the implementation of projects, courses, and support offered to students due to their decentralized and autonomous nature. As a result, there are different performance outcomes, proving the usefulness and importance of institutional benchmarking. It is interesting that the development of the tool should be done specifically for the Institution, taking into account all the particularities of a school that caters to students from early childhood education to high school, thereby enhancing the overall teaching and pedagogical potential and helping to make institutional performance equitable. Furthermore, after cataloging, the best practices can be disseminated to provide guidance to other public or private educational institutions, promoting benchmarking in national education.
- 2) Continuous training for the Teaching Staff There is no doubt that the rules have changed. Students born in 2005, who have grown up in the digital era, will be turning 18 in 2023, while the majority of their teachers may not have had the same access and ease with the current digital age when they were training. Consequently, they were not prepared to deal with numerous new situations that have emerged, such as preparing their students for exams like the National High School Exam (ENEM), which is based on Theory of Response to Item (TRI) corrections. Teacher training usually happens at a significant distance from practice. Educational institutions should include provisions in their planning for funds and time to continuously train their teaching staff, so that teachers feel engaged and part of the process. In this way, teachers will have the opportunity to update themselves and keep up with the changes implemented in the country's education system.
- 3) Offering advanced courses, workshops, and practice tests with item response theory (IRT) correction focused on the ENEM. It became clear that the encouragement given to students by the school and teachers, through reinforcement and workshops, directly impacts the students' results and motivation. And good practices should be replicated. The research showed that the Campus Centro, the campus with the best internal results among the campuses located in the capital of Rio de Janeiro, has made efforts in this direction, offering

students an in-depth course focused on preparing for the college entrance exam, in which the students' participation has been very effective, with over 70% of the student body voluntarily attending classes. This experience should be shared, as it will certainly benefit the other campuses. It is common for both teachers and students to focus only on school exams throughout the year. However, evaluation should be seen as a means and not an end. The results of the tests should serve as an important tool for pedagogical intervention, where changes are implemented during the school year. The use of practice tests for the ENEM with IRT correction can prepare students to face situations different from those experienced in school activities. The student will learn to deal with anxiety and create strategies for time management in a different way, checking how long it will take to fill in the answer sheet, which major area to start the test with, how much time is spent on each question, and gradually discovering what works best for them, thus preparing for what they will face at the end of high school. On each day of the ENEM, students have to take tests that require over 4 hours of concentration and problem-solving, and they need to prepare for that. There is a huge physical and mental strain that is part of the exam, and the practice test will help the student adapt. Another differentiating factor is making the reference matrix used in the ENEM known in the school and by the students as a way to increase productivity, as well as offering lectures and information within the school about the opportunities offered through the ENEM results.

- 4) Offering career guidance: Each campus has a supervision and pedagogical guidance department - SESOP, typically composed of educational affairs technicians, psychologists, and pedagogues. However, these professionals, despite their willingness to help and guide students, do not receive any professional guidance training from the institution, which may hinder the implementation of projects in this regard. It is proposed to consider the training of the staff involved in guiding the student body, so that they can professionally assist students in discovering their true aptitudes and consequently reduce the pressure of making the wrong choice for the young person, motivating the student in the right path to follow. The school should offer extracurricular work involving visits and contact with various professions and the daily lives of professionals, familiarizing the student with various fields. Seeking partnerships with universities, so that students can participate in laboratories and activities and become familiar with the courses offered, can also have a positive effect in this decision-making process.
- 5) Improve the relationship between school and family: The relationship between school and students' families has proved to be a key point. It has become evident that parents and guardians have a great influence on students' performance, and it is of utmost importance to maintain an open, constant, and direct dialogue with family members. In general, students' families are not aware of the school's mission and objectives. It is important for parents and guardians to know what type of student the school intends to shape. A good strategy would be to present the Pedagogical Political Project (PPP) to the students' families, as this will allow the school to contextualize and give meaning to the tasks, activities, classes, and projects offered to the students. Only then will the responsible individuals be able to understand and assess the alignment of the activities with the PPP, facilitating their perception of the school's long-term objectives for the students. Another facilitator is to bring parents into the school and involve them in the suggested meetings, which is an ideal opportunity to establish a partnership focused on the same objective: the education of their children. It is known that parents do not always have available and compatible schedules for school meetings, so it is ideal to define them early in the school year and schedule them at convenient times for working parents. Additionally, it would be beneficial to take advantage of these meetings to present the school's infrastructure and staff to the parents, in order to increase their participation and interaction.



Awareness lectures offered to parents and guardians can help them understand how their involvement and engagement with their children during this stage of life can help the young ones feel more confident and accepted, reducing anxiety and doubts regarding the path they should follow. Parents should be guided to respect their children's choices and encourage them to find their own path, as they may not always choose to follow their parents' professional choice, and such pressure will only serve to discourage and confuse them.

## 5. CONCLUSION

As a result of this study, it was found that students go through the entire Basic Formal Education without receiving information that helps them mature their perception of their own abilities and determine which path to follow at the end of high school. Specifically regarding the difficulties faced by students in the ENEM (National High School Exam), it was concluded that the lack of knowledge and training for the exam has been a hinderance. However, in general, students receive the curriculum content in the classroom, but they do not practice applying that same content in questions similar to those on the exam, demonstrating that the way content is assessed in the ENEM exam is still not reflective of the school reality. The majority of students are still unaware of the programs offered by the Federal Government through the ENEM and their proposals. Finally, based on the research results, it can be affirmed that the teaching staff already realizes that one of the difficulties for students lies in the lack of focus on the ENEM exam in schools, making it essential for teachers to be involved in the development of projects aimed at enhancing learning mechanisms that yield good results for students in the ENEM and, consequently, increase the enrollment rate in higher education in the country.

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## **MODEL OF ADVISING DEPENDING ON THE PRODUCTION INTENSITY AND THE FORM OF AGRICULTURAL ENTITY**

**Ruzica Loncaric**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
rloncaric@fazos.hr*

**Sanja Jelic Milkovic**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
sajelic@fazos.hr*

**Vedran Stapic**

*Agroklub Ltd., Sv. Leopolda Bogdana Mandića 157, Osijek, Croatia  
vedran@agroklub.com*

**Tihomir Florijancic**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
tflorijanc@fazos.hr*

**Zdenko Loncaric**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
zloncaric@fazos.hr*

### **ABSTRACT**

*Eastern Croatia is the most important agricultural region in the Republic of Croatia in terms of agricultural area and production. Recently, agriculture faced significant changes — integration of new digital technologies and adaptation to more sustainable agricultural production and challenges — climate changes, depopulation, etc. Consequently, there is an increased need for advising farmers in terms of applying new techniques, mechanization and equipment in agriculture and generally all aspects of digitalization in agriculture. The aim of this paper is to provide proper kind of advisory (extension) service in the form of verbal model according to the organizational form of agricultural entities and intensity of agricultural production, which is shown on the example of Eastern Croatia. Among 5 counties of Eastern Croatia, Osijek-Baranja County is the most intense in terms of agricultural area and livestock units. The most important organizational forms in Croatia are family farms (154,697), self-supply farms (10,250), trade associations (3,039), trading crafts (2,299) and agricultural cooperatives (355). In Eastern Croatia, the situation is similar. Chronological display of the development of Advisory Service in Croatia is presented herein, as well as the scope of its activities and methods. Based on the presented results, it was concluded that integrated advice, means of mass distribution and online services are suitable for all forms of entities and levels of farming intensity. Whether individual or group counseling is the most suitable method depends on the entity complexity and intensification level. For the simpler forms of entities and lower levels of intensity, group counseling method is more suitable because it encourages dialogue and decreased isolation of farmers, while being a more rational method for the advisors, but at the same time requires a high level of skills. For the more complex organizational forms of entities with higher level of intensification, individual advising is more suitable because it requires more advisory time per farm and a higher level of adaptation to individual needs.*

**Keywords:** *advising, agricultural producers, production organizations, production intensity*

## 1. INTRODUCTION

The region of Slavonia and Baranja, located in the eastern part of Croatia, is characterized by its good agroecological prospects for the development of agricultural production, local food and the hospitality of its hosts. However, this part of Croatia has been facing numerous problems and consequences of events from the past years, which today ranks it among the most underdeveloped parts of Croatia. Affected by poverty and lack of jobs, there is an exodus of young people (especially in the age group of twenty to forty) and highly educated residents from the region, which has a great impact on the further increase of negative economic trends. Common name for Eastern Croatia is Slavonia and Baranja. The fact that Slavonia (and Baranja) does not exist as a region in the institutional sense means that there are no adequate opportunities for economic and regional development. This area includes the eastern continental part of Croatia and unites the entire area of five counties: Vukovar-Srijem, Osijek-Baranja, Pozega-Slavonia, Virovitica-Podravina and Brod-Posavina. The area of the Slavonia and Baranja region is one of the largest in the Republic of Croatia, occupying 22% state territory with about 20% of the population (Glavaš and Čizmadija, 2004). It is located in the eastern part of Croatia between the three largest Croatian rivers: Drava in the north, Sava in the south and Danube in the east. The border in the west (with Koprivnica-Križevci County, Bjelovar-Bilogora County and Sisak-Moslavina County) is not naturally defined, but is rather a result of contemporary events. There are a total of 22 cities, 105 municipalities and 998 settlements in the aforementioned five counties (Boranić-Živoder et al., 2018). Unpolluted, fertile soil and other natural resources, rich cultural and historical heritage, potential for development of industry, rural tourism and the IT sector are just some of the prospects that can enable the region to realize economic recovery and further growth (Gugić, 2023). In the European context, intensification of agricultural production is in contrast to sustainability, biodiversification and ecosystem preservation. Agricultural intensification is therefore a multifactorial process that leads to increased yields (Donald et al., 2006; Herzog et al., 2006; Matson et al., 1997). Crop and livestock specialization, increased synthetic inputs and soil-disrupting operations or removal of semi-natural elements and landscape features are all components acting at the field and landscape levels which have led to similar rates of local species loss for several taxonomic groups across the European agricultural landscapes (Robinson and Sutherland, 2002). Massive use of entrants also has additional detrimental effects, such as soil and water eutrophication and contamination, whilst soil-disrupting operations favor erosion (Stoate et al., 2001). Agricultural intensification has been related to biodiversity declines both globally and notably within the agroecosystems of the European Union, where biodiversity has developed and been shaped by agricultural land-use history (Emmerson et al., 2016). Agricultural intensification is a process of raising land productivity over time through increases in inputs of one form or another on a per-unit area basis. Agricultural intensification through sustainable approaches will become increasingly important in the 21<sup>st</sup> century, to meet both the production and conservation objectives. Reliable methods for measuring agricultural intensity are essential for studies that seek to compare farms or regions, monitor agricultural change, or identify the factors that drive agricultural change and intensification. According to Shriar (2000), some of these methods are: output as a measure of agricultural intensity, cropping frequency and farm unit cropping area as surrogate measures and the use of agrotechnology and other inputs as a surrogate measure. Caraveli (2000) made comparative analysis on intensification and extensification of Mediterranean agriculture in terms of Less Favorite Area (LFA) policy. The author concluded that the implementation of CAP (common agricultural policy) measures in the Mediterranean countries has reinforced the processes of intensification of productive practices in the more fertile areas of the lowlands and extensification (i.e. abandonment or marginalization and the collapse of traditional farming systems) in the uplands – LFAs, which have been going on for decades.

Both processes have serious adverse effects on the environment and the landscapes. In the last few decades, agricultural production has undergone significant positive changes due to information technology, along with some new challenges, primarily due to climate changes and the depopulation of rural areas. At the same time, the integration of new technologies (Internet of Things, data science, deep learning, artificial intelligence) into digital agriculture represents a huge potential for improving efficiency, productivity and sustainability of agricultural production at the farm and global level (Lončarić et al., 2023). On the other hand, there is an increased need for advising farmers in terms of applying new technology, mechanization and equipment in agriculture and generally all aspects of digitalization in agriculture. The aim of this paper is to analyze and propose proper kind of advisory (extension) service according to the organizational form of agricultural entities and intensity of agricultural production, with the example of Eastern Croatia.

## **2. MATERIAL AND METHODS**

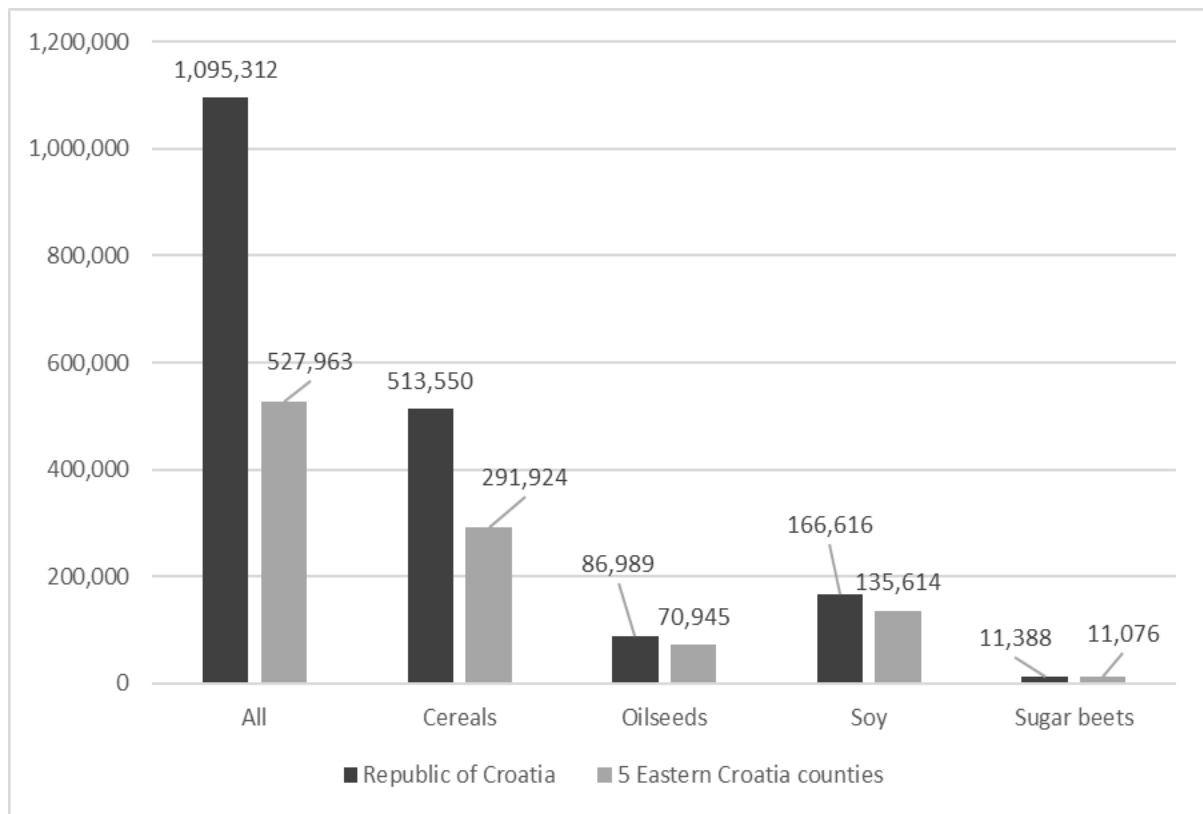
The paper uses recent literature in the field of agricultural production, entities in agricultural production, intensity of agricultural production (concept and measurement) as well as advisory (extension) service role in the Republic of Croatia. Intensification of agricultural production on the example of 5 counties of Eastern Croatia is presented via the number of hectares under the most important field crops - wheat, barley, corn, sunflower, rapeseed, soy, sugar beet, vineyard and orchards. Furthermore, the livestock production is calculated via livestock number and livestock units by counties. The livestock included in this calculation includes: cattle, horses, donkeys, pigs, sheep and goats. The representation of livestock in a production unit or in an area can be expressed by natural and value indicators. Of the natural ones, livestock unit of cattle is the most often used one. Livestock unit is a calculation unit that is created by multiplying the number of physical heads of livestock with the corresponding coefficient. To calculate the coefficients, the average body weight of the livestock head is used, according to the type and category of livestock. Coefficients for calculating the number of livestock unit are as follows: cattle – 1, horses – 1, donkeys – 0.8, pigs – 0.25, sheep – 0.1, goats – 0.1 (<https://ec.europa.eu/eurostat/statistics>). The proper kind of extension service methods will be proposed according to the intensity of agricultural production and the form of agricultural entities, on the example of Eastern Croatia.

## **3. RESULTS WITH DISCUSSION**

### **3.1. Role of Eastern Croatia in the agriculture of the Republic of Croatia**

Modern development of Croatia is marked by deep structural and dynamic weaknesses, due to which entire Croatia is classified among problematic areas of the EU. Such a spatial and developmental condition primarily arises from demographic and economic development; depopulation and aging of the population on the one hand, and multi-year recession on the other hand. That is why Croatia is specific in terms of spatial development with its distinct developmental disparities (Pejnović and Kordej-De Villa, 2015). Structural and dynamic weaknesses in particular stand out in the Eastern Croatia counties, primarily as a result of interdependent influence of several factors: direct and indirect consequences of the Homeland War, deindustrialization, inappropriate ownership model transformation and privatization as well as deterioration of the sector structure (Matišić and Pejnović, 2015). Eastern Croatia is the most distinct lowland region of Croatia and the traditional agrarian area which is, thanks to its natural and geographical potential, focused on primary activities sector (Lukić, 2012). In the middle part of the last century Croatia was predominantly agricultural and rural country, and in 1953 Eastern Croatia stood out with the highest share of active population in the primary sector (58.2%), as well as with the highest share of agricultural population (62.3%) (Živić, 2018 according to Lukić, 2012).

However, modernization processes (urban industrialization, deagrarianization, deruralization) that occurred during the second half of the 20<sup>th</sup> century had, in addition to positive, a number of negative effects on rural areas (Živić, 2018). The share of the active population in the primary sector of Eastern Croatia decreased to 20% in 2001, while in other parts of Croatia this reduction was even steeper. Today, the specialization index of the economic structure indicates that Eastern Croatia is functionally still oriented towards agriculture, forestry and fishing (Pejnović and Kordej De Villa, 2015). Unemployment is an important issue in the context of the study of contemporary depopulation in Eastern Croatia (Majstorović, 2020).



*Figure 1: Agricultural area of the most important agricultural crops in the Republic of Croatia and Eastern Croatia (ha)  
(Source: PAAFRD, 2020).*

When analyzing Table 1, we can confirm the essential role of Eastern Croatia counties in agricultural activities of Croatia, particularly its share in agricultural area. Generally, it participates almost with the half of total agricultural area, with 81% in oilseeds and soybean production, 56% in cereal production and almost all area in sugar beet production (97%).

### 3.2. Intensity of agricultural production in Eastern Croatia

The intensity of agricultural production takes into account the cultivated area under the most important crops (wheat, barley, corn, sunflower, rapeseed, soy, sugar beet, vineyards and orchards), total production and yields (Table 1), as well as the display of livestock numbers for the 5 counties (Table 2). From the data presented in Table 1, it is evident that Osijek-Baranja County is the county with the highest participation in the Eastern Croatia when taking into account the agricultural land, as well as the agricultural production of the following crops: barley, soybeans, sunflower, oilseed rape, sugar beet, vineyards and orchards. Vukovar-Srijem County is the most significant county in agricultural area and production of soybeans.

Area (ha)	wheat	barley	corn	sunflower	rapeseed	soy	sugar beet	vineyards	orchards
Osijek-Baranja	43,550	16,053	57,548	19,968	13,357	17,186	5,605	2,147	5,351
Vukovar-Srijem	29,553	13,841	31,099	10,662	5,439	23,531	3,940	1,563	2,200
Brod-Posavina	11,710	5,976	14,264	1,394	3,756	8,875	298	138	2,766
Pozega-Slavonia	7,267	3,651	11,159	570	1,801	4,611	65	1,415	2,093
Virovitica-Podravina	13,424	4,147	23,746	3,112	4,713	10,992	234	376	2,268
<b>Total - 5 counties</b>	<b>105,505</b>	<b>43,669</b>	<b>137,815</b>	<b>35,707</b>	<b>29,065</b>	<b>65,195</b>	<b>10,144</b>	<b>5,639</b>	<b>14,677</b>
<b>Production (t)</b>	<b>590,830</b>	<b>209,610</b>	<b>1,085,984</b>	<b>103,549</b>	<b>81,383</b>	<b>182,545</b>	<b>636,417</b>	<b>32,704</b>	<b>205,483</b>
<b>Yields (t/ha)</b>	<b>5.60</b>	<b>4.80</b>	<b>7.88</b>	<b>2.90</b>	<b>2.80</b>	<b>2.80</b>	<b>62.74</b>	<b>5.80</b>	<b>14.00*</b>

Table 1: Plant production intensity in Eastern Croatia (agricultural area, yield, production)

\*yields of orchards are calculated according to the yield of apples

(Source: PAAFRD, 2022)

	cattle	horses	donkeys	pigs	sheep	goats	total
Osijek-Baranja	79,513	1,648	100	374,627	42,408	1,926	500,222
Vukovar-Srijem	25,657	1,019	31	219,218	20,694	1,346	267,965
Brod-Posavina	15,700	1,703	101	127,897	44,343	772	190,516
Pozega-Slavonia	9,046	589	41	36,884	22,784	1,160	83,992
Virovitica-Podravina	18,143	522	67	38,942	24,700	1,618	70,504
<b>Total</b>	<b>148,059</b>	<b>5,481</b>	<b>340</b>	<b>797,568</b>	<b>154,929</b>	<b>6,822</b>	<b>1,113,199</b>

Table 2: Number of livestock heads in Eastern Croatia

(Source: PAAFRD, 2022)

In Eastern Croatia, the most important livestock production according to livestock numbers is the production of pigs, followed by sheep, cattle, horses, goats and donkeys as the least important livestock production. According to the importance of livestock production in a particular county, the most intensive livestock production is in Osijek-Baranja (500,222), followed by Vukovar-Srijem (267,965) and Brod-Posavina (190,516) – Table 2. Similar situation is present when we take into account livestock units. The most important county is again Osijek-Baranja, followed by Vukovar-Srijem and Brod-Posavina, and the most important livestock production is the production of pigs (199,392 LU) and cattle production (148,059 LU) – Table 3.

	cattle	horses	donkeys	pigs	sheep	goats	total
Osijek-Baranja	79,513	1,648	80	93,657	4,241	193	179,332
Vukovar-Srijem	25,657	1,019	25	54,804	2,069	135	83,709
Brod-Posavina	15,700	1,703	81	31,974	4,434	77	53,969
Pozega-Slavonia	9,046	589	33	9,221	2,278	116	21,283
Virovitica-Podravina	18,143	522	54	9,736	2,470	162	31,087
<b>Total</b>	<b>148,059</b>	<b>5,481</b>	<b>272</b>	<b>199,392</b>	<b>15,492</b>	<b>683</b>	<b>369,380</b>

Table 3: Livestock units (LU) per Eastern Croatia counties

(Source: PAAFRD, 2022)

County/type of production organization	AC*	TA*	SSF*	TC*	FF*	Other	Total	Share in Croatia (%)
Brod-Posavina	11	111	1,320	144	5,603	10	7,199	4.21
Osijek-Baranja	42	367	1,732	375	9,683	45	12,244	7.16
Pozega-Slavonia	3	66	1,671	98	2,799	5	4,642	2.71
Virovitica-Podravina	14	141	498	115	5,438	21	6,227	3.64
Vukovar-Srijem	32	164	992	313	5,906	13	7,420	4.34
<b>Total 5 counties</b>	<b>102</b>	<b>849</b>	<b>6,213</b>	<b>1,045</b>	<b>29,429</b>	<b>94</b>	<b>37,732</b>	<b>22.09</b>
<b>Total Croatia</b>	<b>355</b>	<b>3,039</b>	<b>10,250</b>	<b>2,299</b>	<b>154,697</b>	<b>215</b>	<b>170,837</b>	<b>100</b>

\*AC = agricultural cooperatives, TA = trade associations, SSF = self-supply farms, TC = trading crafts, FF = family farms

Table 4: Legal form of agricultural entities in the Eastern Croatia and the Republic of Croatia

(Source: PAAFRD, 2022)

Legal form of agricultural entity is also an important criterion when talking about the intensity of agricultural production because not every form of entity is equally binding in terms of finances, property and tax. In Croatian agriculture, the most important forms of agricultural entities are the following: agricultural cooperative, trade association, self-supply farm, trading craft and family farm. According to Table 4, the most important organizational forms in Croatia are family farms (154,697), self-supply farms (10,250), trade associations (3,039), trading crafts (2,299) and agricultural cooperatives (355). In Eastern Croatia, the situation is similar, with family farms and self-supply farms being the most common forms, although trading crafts are more common than the trading associations. Agricultural cooperatives are the least common forms.

### **3.3. Advisory (extension) services in Croatian agriculture**

Agricultural advisory (extension) services have long been recognized as an important factor in promoting agricultural development (historical perspectives are set out by e.g., Birkhaeuser, Evenson and Feder, 1991 and Anderson and Feder, 2007). The terms agricultural advisory services and agricultural extension refer to the entire set of organizations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills and technologies to improve their livelihoods (Anderson, 2007). There are diverse options that exist for financing and providing agricultural advisory services. Since all options have advantages and disadvantages, it is an important task for the development of extension policies to identify the mix of options that is best suited to support a country's agricultural development strategy in a cost-effective way, while taking the country-specific conditions into account. Over time, as an increasing number of farmers become aware of a specific technological thrust, the impact of such extension diminishes, until the opportunity and need for more information-intensive technologies arise. According to Wegrzyn (2010), the service sector became considered as a sort of development index for economy, society and general civilization level. The development level of service sector affects not only the economic growth rate and the competitive edge of national economies, but also secures a high standard of living and social security for nations. Agricultural counselling is one of the tools to support agricultural development. The main provision of the agricultural policy is the consultation for farmers. Farmer counselling is a professional service provided to farmers in terms of rural development issues. According to Tamaliene et al. (2017), a professional consultant has mastered the theoretical knowledge of law, agricultural technology, IT management, logistics, marketing, and economics and has practical work skills. Farmer counselling is dependent on several aspects: lack of relevant information, complexity of the problem and the way to find the solution to be used (one of which is the purchase of counselling care). According to Dockes et al. (2019), advisory actions can be classified according to their purpose, the main method applied and the role or 'postures' of advisors. Extension organizations have gradually developed a range of tools and approaches, with various aims, although they do not involve all types of farmers equally. Broadly speaking, advisory actions can be classified around four groups of objectives: technical control, economy or strategy, work organization and responses to social expectations. Advice with a technical purpose can relate to various aspects of the operation of a unit (outputs, optimization of inputs, feed, fertility, quality of products, buildings, etc.). It involves providing a variety of elements that enable interested farmers to progress in their technical control of an activity. Economic approaches aim to help farmers optimize the economic performance of their farms within sectors and the territory. Advice on work and organization can be embedded in technical advice when it deals with ergonomic or implementation issues. This advice includes some decisions about the way farmers organize their time or hire and manage paid workers.



Taking the expectations of society into account requires changes in practices, but it also involves adapting the way both farmers and advisors think about their respective professions. The advisors are often found to be divided between the collective logic of ‘the public good’ and the short-term economic interest of the farmers they support (Compagnone and Lémery 2009). The various reasons for seeking advice are translated into a variety of intervention methods, mobilized according to the means available and the motivations of the farmers and their advisors (Dockès et al. 1999, Laurent et al. 2006) – Figure 2.

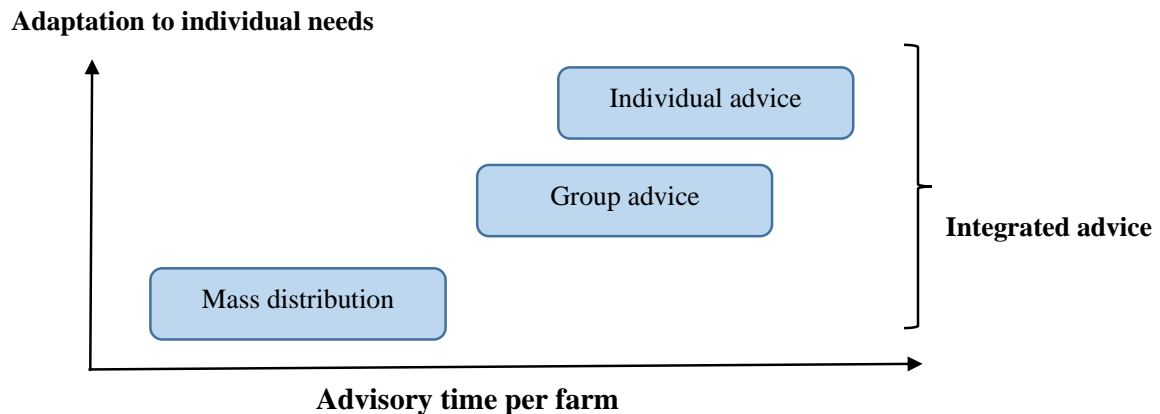


Figure 2: The main advisory methods  
(Source: Dockès, 2019)

Individual advice is a direct type of communication between the producers and one or more advisors, so it is possible to include specific constraints and assets of each farm to be taken into account. It is also beneficial because it enables the farmer to become closely involved in the definition of their project, while providing them with aid for decision-making and tools to analyze their situation. In general, this advice is all the more relevant and effective because it takes into account the points of view, knowledge, know-how and objectives of each farmer. On the other hand, the advisors must have appropriate technical or economic skills, mastery of teaching techniques and ‘active listening’ as well as willingness to take into account different expectations of farmers. Group advice represents a dialogue between an advisor and a group of farmers, and is a way to build points of view, practices and organizational methods that are adaptable to each farmer’s own specific situation. This approach, which enables discussions between peers and dialogue with one or more advisors, can be enriching for the participants, but requires real involvement from the farmers. Vedel (2008) described an approach like this because it was among the first ones to be mobilized by agricultural extension services in France in the 1950s and 1960s. During the 1990s and 2000s, these groups lost their significance, but now seem to be well attended in all countries as a way to break through the isolation in which farmers sometimes work and encourage discussion and dialogue within their professional group. Targeted more towards farmers who are spontaneously open to changes and innovation, these approaches require a high level of skill on the part of the group facilitators, with structured programs providing information and raising the awareness of farmers. Mass distribution primarily consists of informing farmers of results or technical information through the general media (e.g., press, bulletins, websites). This form of advising has the advantage of reaching a wide audience at a low cost and preserving individual autonomy in decision-making. However, it does not enable debate or allow for specific characteristics of each farm, and it requires an active approach when seeking information. Integrated advice (Dockès et al. 1999) is a combination of the aforementioned three methods. It includes a large audience (e.g., several hundreds or thousands of farmers) and brings together different forms and tools of advice.

The expectations of the targeted audience are taken into account by conducting preliminary studies and evaluations. Participatory meetings or focus groups are generally a key element of such actions; they allow the points of view of all of the participants to be expressed and discussions to take place between farmers as well as between advisors and farmers. A special type of counseling emerges from the process of digitalization of agriculture as the online counseling service. This form is convenient in many ways because it simultaneously enables individual active access for one or several clients. In doing so, the client can ask for a solution to a current problem or instructions on new technologies by studying the available online knowledge database, searching the former online conversations or seeking answers to a direct question from an advisor or a group that includes all interested stakeholders. It also enables correspondence and mutual exchange of experience and solutions between multiple users, i.e., all stakeholders (even at large distances), without the need to organize a meeting in advance. Furthermore, the user of the online advisory service from only one client or several clients at the same time does not always need to additionally burden the consultant. According to Lončarić et al. (2023), readiness for education and training in the form of an online service was expressed by 15% of farmers. In Croatia, after the Homeland War, the Agricultural Advisory Service (AAS) was established in 1991. Since that time, in the last 32 years, the Service has gone through several organizational and status changes. In 1994, the Department of Agricultural Advisory Services at the Ministry of Agriculture and Forestry was established by decision of the Government of the Republic of Croatia, and it represented a significant positive step forward in terms of the organization of employees. In 1997, the Croatian Institute for Agricultural Advisory Service (CIAAS) was founded. For a total of 87 employees of the Service throughout Croatia, that was a big challenge due to the process of creating a new institution, passing the necessary regulations (ordinance, statute, rules), as well as registering and organizing the system. In 2010, CIAAS joined the Croatian Chamber of Agriculture. In 2012, the Agricultural Advisory Service was separated from the Croatian Chamber of Agriculture and became an independent institution once again. This re-independence of the Agricultural Advisory Service was defined by the Law on the Agricultural Advisory Service from 2012. In 2013, the AAS changed its name to Advisory Service as a specialized public institution for the performance of advisory activities in agriculture, rural development, fisheries and forestry, and it was merged with the Forestry Advisory Service. In 2018, the Croatian Parliament passed the Law on the Croatian Agricultural and Forestry Advisory Service (CAFAS). The Croatian Agricultural and Forestry Advisory Service, in accordance with Article 12 paragraph 1 of Regulation (EU) No. 1306/2013 governs the user consultation system on land management and agricultural management. And finally, in 2019, CAFAS returned to the Ministry of Agriculture and became the Directorate for Professional Support for the Development of Agriculture and Fisheries – DPSAF (<https://www.savjetodavna.hr/>). DPSAF organizes various consultations and courses for Croatian farmers (related to product-related payments, IACS measures, consultations related to security in livestock production, sustainable use of pesticides), consultations for advisors, individual consultations, provides support related to the issuance of various certificates and forms prescribed by the Ministry and the European funds, and provides numerous other forms of support concerning publications, weather forecast, news etc.

### **3.4. Advising concerning agricultural intensity and form of agricultural entity**

The type of advisory method also depends on the form of the agricultural entity. Some forms of agricultural entities imply a higher or lower level of resources involved, and are more or less oriented towards the market and intensification of agricultural production. At the same time, the type of advising depends on the intensity of agricultural production. Intensity in plant production can be measured by the amount of arable land or land under the most important crops as it is presented in Table 1 on the example of 5 counties in Eastern Croatia.

It can also be done at the level of a single farm. On the other hand, intensity in livestock production can be measured by the number of livestock (Table 2), as well as livestock units (Table 3), because not all types of livestock require the same amount of work and resources. The main advisory methods when taking into account the combination of producers' organizational form and the level of agricultural production intensity are proposed in Table 5.

Business entity form	Intensification level	Main advisory method				
		Individual advice	Group advice	Mass distribution	Online service	Integrated advice
self-supply farm	low	-	+	+	+	+
family farm, trading craft	low	-	+	+	+	+
	medium	+/-	+/-	+	+	+
cooperative	medium	+/-	+/-	+	+	+
trading association	high	+	-	+	+	+

*Table 5: Advisory method concerning the level of intensification and business entity form*

According to the proposed model it is visible that all forms of entities regardless of the level of intensification will use means of mass distribution, online service and integrated advice method. The less intensive organizations (self-supply farm, family farms and trading crafts of low intensity) more likely will use group advices, because it is more economic effective for advisors. Individual advice method is proposed only for trading associations, as the organizations of the higher level of organization because it is presumed that because of their size and business complexity, individual advising is a more proper advisory method. For organizations with medium level of intensification (cooperatives and some family farms and trading crafts) it is proposed conditionally yes or no for individual and group advice because it depends are those entities closer to low intensification or high intensification level.

#### 4. CONCLUSION

Advisory services today play a very significant role in agricultural development due to the development of technology, digitalization, education, application in the projects funded by the European Union funds with its financial and digital literacy requirements and, in general, they assist and support the producers in the online environment. In this paper, we proposed several advisory methods while taking into account two factors: the intensity of agricultural production and the legal form of agricultural entity on the example of 5 counties in Eastern Croatia – Croatian granary. Based on the presented results, Osijek-Baranja County has the most intense agricultural production, followed by Vukovar-Srijem County and Brod-Posavina County, when considering the area and total production of the most important agricultural crops. The same level of intensity is seen in the issue of livestock production based on the number of livestock and on the basis of livestock units. The farm level intensity can be calculated in the same manner. There are also certain differences regarding the number and structure of certain legal forms of agricultural entities in Eastern Croatia, where some forms assume simpler operations in terms of the amount of annual income and financial, legal and tax responsibilities – for example self-supply farm, while some forms are more complex – family farm, trading crafts and agricultural cooperatives. There are also the largest and most complex organizations – trade associations, and sometimes agricultural cooperatives. The main advisory method is proposed from a group of integrated advisory methods – individual, group, online service and mass distribution – depending on the business entity form and level of intensification. Means of mass distribution and online services are suitable for all cases.

Selecting the individual or group advice as the most proper advisory method depends on the entity complexity and level of intensification. We suppose that individual advising is more suitable for large business organizations or medium to large organizations with high intensity of agricultural production. Because of their size and complexity, one-to-one approach is more suitable for them since it requires more time and adaptation to individual needs, specific constraints, assets, points of view, knowledge, know-how and objectives of the entity. For simpler organizations, we suppose group advice, or sometimes individual advice are more suitable, especially in case of medium to large organizations with medium intensity. Group advice is also a more rational way of advising when taking into account the benefits for clients (connecting with other producers, breaking through the isolation of farmers, encouraging discussion and dialogue) and for the consultants, but it requires a high level of skill with structured programs aimed at providing information and raising awareness of farmers.

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## PLUVIOMETRIC TRAGEDIES IN BRAZIL AND LOCAL ECONOMIC IMPACTS – AN ANALYSIS OF LOCAL TOURISM

**Antonio Elias Amil Lisboa**

*Universidade Federal Fluminense, Niterói, Rio de Janeiro, Brazil  
antonioamil@id.uff.br*

**Renata Goncalves Faisca**

*Universidade Federal Fluminense, Niterói, Rio de Janeiro, Brazil  
renatafaisca@id.uff.br*

**Marcelo Jasmim Meirino**

*Universidade Federal Fluminense, Niterói, Rio de Janeiro, Brazil  
marcelojm@id.uff.br*

### **ABSTRACT**

*Brazilian tourism is closely linked to natural and environmental conditions. This is evidenced by the exploration of coastal regions and the vertiginous growth of ecotourism, both responsible for most national tourist destinations. Therefore, tourism is an economic sector highly sensitive to climate change and its natural consequences. This research evaluates the economic impacts generated in the tourist sector of Brazilian locations affected by climatic disasters associated with intense rainfalls, floods, and landslides. Notorious recent cases of rainfall disasters were analyzed involving the mountainous regions of Rio de Janeiro state, São Paulo northern coast state, and south Bahia state. All these regions are notorious for their tourist vocation and sought-after destinations for leisure travelers. We also analyze tourist losses in infrastructure terms and the affectability of possible interest destinations. Based on bibliographical and documentary research, it was possible to perceive that psychological trauma also emerges as a potentiator for the subsequent tragedy of economic damages among the structural impacts and financial losses. The tourist management of locations susceptible to such phenomena must pay double attention to these risks of possible financial losses and humans. Tourism is negatively impacted by such weather events, which for certain locations, highly dependent on this sector, can result in a higher local social-financial aggravation. A partial solution or mitigation for this issue involves joint action by public and private management, investments, and effective policies to contain damage and prior preparation for possible disasters.*

**Keywords:** *climatic pluvial tragedies, economic impacts, management, prevention, tourism*

### **1. INTRODUCTION**

Tourism is one of the sectors with the highest financial turnover in Brazil. According to data from the World Travel and Tourism Council, the sector is responsible for R\$752.3 billion, equivalent to 7.8% of the national gross domestic product. (WTTC, 2023). The Brazilian tourism sector has a strong link with the country's landscapes and natural resources. Beach tourism and ecotourism are the national tourism sector's main drivers. According to data from the Geography and Statistics Brazilian Institute (IBGE), ecotourism represents 25% of tourist trips made in the country. Beaches are responsible for 50% of these (IBGE, 2021). This connection between the Brazilian tourism sector and local natural characteristics makes it a potential target for climate and environmental disaster consequences and impacts. This has been reflected in the local and regional economic aspects of tourist locations susceptible to such events.

Like considerable other sectors, actions, and discussions related to national tourism and the incidence of climate disasters only occur after such events. Little or almost, nothing exists in terms of prevention. Compounding this, numerous Brazilian tourist locations are strongly associated with regions with high disaster occurrences and extreme weather events. Furthermore, these regions have tourism as their main subsistence economic activity.

## **2. CONTEXTUALIZATION**

### **2.1. Brazil's climate disasters and their characteristics**

Climate disasters in Brazil are mainly represented by floods and landslides, both consequences of large volumes of rain. In recent Brazilian history, there have been a lot of major rain tragedies examples, with large numbers of victims, sumptuous costs, and physical intensity. Anthropogenic climate changes, those caused by human action, contributed to the occurrence of these events. The scientific understanding ratified today is that there will be a prospect of increasing these events throughout the Brazilian territory, especially in regions where this characteristic is already recurrent. (De Lima, et al. 2021; Castellanos, et al. 2022). The Brazilian coastal region is generally marked by a low-altitude zone immediately close to the sea. As you go deeper into the continental territory, you encounter mountainous and sierra regions, at high altitudes, forming a true geological wall to the low-altitude coast. Brazil's geomorphology is one of the factors that concentrate the urban population and the large city development in the country's coastal region. However, it is also a factor that explains the high incidence of precipitation in this region (Ab'Saber, 2010). The so-called orographic rains are large cloud accumulations that form in the maritime region and enter the continental territory. When they found physical resistance to their advance – mountainous regions – these rain accumulations fell, making a part of the Brazilian coastal region territory highly susceptible to the occurrence of this kind of precipitation. This process is the formation origins of many rains that fall on Brazilian coastal regions, such as the states of Rio de Janeiro, São Paulo, Santa Catarina, Rio Grande do Sul, Espírito Santo, and Bahia, among others. Other factors explain the precipitation incidence in various parts of the national territory. After all, Brazil has numerous distinct climatological characteristics due to its continental proportions. However, for the tourist regions mentioned, the orography process is in the main current climatic event origins (Forgiarini, Vendrusculo, and Rizzi, 2014; Rodrigues and Ynoue, 2015).

### **2.2. Tourism and disasters**

Tourism deals with natural disasters in different ways, depending on the characteristics of the intended tourist network. Climate change has a direct impact on tourism, since both the supply and demand for tourist services are independent of the quality and management of environmental attributes susceptible to the climate change impacts. (Arabadzhyan et al., 2021) For Scott and Gössling (2022), the literature about tourism and climate change over the last three decades has been unable to prepare the tourism sector for the climate changes that are to come. Analyzes on adaptation to these changes still require greater depth and auxiliary tools for action and management in facing new scenarios (Scott, Gössling, and Hall, 2012). In the Brazilian situation, disasters mostly involve damage caused by rain, and this affects the entire local urban infrastructure, as well as the natural environmental composition of regions with very high tourist travel, taking into the intimate relationship between Brazilian tourism and its territorial environmental composition. Landslides and floods shape local geomorphology, affecting numerous locations of public interest. Compounding this is the fact that many Brazilian tourist destinations are strongly associated with locations with high rainfall and susceptibility to disaster occurrences. These regions occur massively in this coastal zone, highly susceptible to orographic rains and storms formed at sea.

### **3. RECENT IMPACTS**

In Brazil's recent history, numerous climate disasters have occurred in regions with too many tourist characteristics, with severe impacts on this sector. In Brazil, there are economically strong regions with a strong tourist bias that are also marked by climatic and geomorphological characteristics that make them highly susceptible to inclement weather. This duality creates potentially tragic scenarios and transforms these municipalities into constant victims of these disasters. The tourist dependence of these regions worsens the disaster impacts since their main economic activity is also the most affected threat and susceptible to irregular weather conditions. In this way, these locations need public policies and great response and management capacity to mitigate the impacts and damages that occur due to the incidence of possible climate disasters and quickly normalize their activities after those events (Rocha and Mattedi, 2017).

#### **3.1. Fluminense Mountain Region**

In January 2011, the mountainous region of Rio de Janeiro state was hit by the greatest climate tragedy in Brazilian history. Hitting seven cities and totaling more than 900 deaths. This location is recognized for its strong tourism capacity and the sector's revenues, which have suffered strong impacts. According to a World Bank report, the local press at the time estimated losses of around R\$59.4 million, just for the months following the disaster. (World Bank, 2016) Petrópolis, in Rio de Janeiro's mountainous region, was again affected by rain disasters in March 2022. Tourist attractions and historical heritage were highly damaged in this episode. According to Costa et al. (2022), the local hotel chain was 90% full in the months before the tragedy and had this occupancy reduced to just 25% in the month immediately after the event. The climate disaster balance in 2022 for Petrópolis was 233 victims, R\$665 million in losses, and a loss of 2% of the local gross domestic product in that year. Even today, the Rio de Janeiro mountainous region has a low expectation of visitors in the rainy months, mainly due to the remaining feeling regarding the 2011 episode. Ecotourism, the main driver of the tourism sector in this region, is mainly based on the exploration of natural landscapes and waterfalls, both highly affected by floods and landslides. Furthermore, Petrópolis receives many tourists in its historic center, which is crossed by the three main rivers - Quitandinha, Palatino, and Piabanha - with recurring flood events during the rainy season. Moreover, at this same time, there were many landslides, as it was a region surrounded by mountains.

#### **3.2. South Bahia**

The southern coast of Bahia state is internationally recognized for major tourist destinations such as Porto Seguro, Ilhéus, Caraíva, Arraial D'Ajuda, Trancoso, and Morro de São Paulo. This region was the scenario of serious precipitation events in 2021 ends and 2022 beginning. More than 165 municipalities declared an emergency state and 850,000 individuals were affected, which was recognized as the region's major natural disaster. (Marengo et al., 2023). Data from the National Confederation of Municipalities (CNM, 2022) estimated total losses of around R\$15.4 billion for this occurrence. Extreme rain events reoccurred in the region in a short time. In December 2022, 37 municipalities were affected, more than 50 thousand individuals were affected, of which 3.6 thousand were homeless. Again, in extreme events in April 2023, there were 27 municipalities with 9.3 thousand individuals affected and 7.5 thousand homeless. Some coastal cities, with a greater tourist vocation, were even less affected than others located in the Bahia state interior, however, the feeling provoked by the episode in the media and the population's imagination was translated by Andrade (2021) as "frustrated tourism" for generating fear among tourists. Therefore, credibility and local tourist demand were affected. This demonstrates that the visitor's psychological factor is also important and must be considered in the management of these disasters.



The emotional factor is also observed when events arising in one location end up affecting tourist demand in another region that is not necessarily nearby, simply due to fear among the public and consumers.

### **3.3. North São Paulo Coast and South Fluminense Coast**

The coastal region between the São Paulo north state and the Rio de Janeiro south state is recognized as a potential tourist destination by local and foreign visitors. The axis between Ilha Bela and Angra dos Reis cities encompasses highly sought-after and visited coastal locations. However, the region is also recognized for high local rainfall, being the scenario of numerous extreme precipitation events and a high hydrological disaster risk (Farias and Alves, 2019). In April 2022, Angra dos Reis recorded the highest occurrence in its history with 655 millimeters of rain in 48 hours, resulting in 11 deaths and with a local beach completely buried by landslides. In 2010, in the same region, a hotel was buried after a huge landslide caused by intense rainfall, resulting in 53 deaths. A similar event occurred in 2002, with considerable penetration and 40 deaths. In February 2023, four cities on São Paulo state's north coast were severely affected by major rain events - Ilhabela, Caraguatatuba, Ubatuba, and São Sebastião. According to Alberto and Damin (2023), the rains were responsible for 36 thousand reservations canceled in hotels and inns in the region of the city of São Sebastião. Heavy rains affected the entire city, causing the main local beaches to be closed for up to three months due to the large amount of mud and landslides that reached them. Local government authorities have asked tourists to avoid going to the site and its surroundings. This decision was necessary to protect the capacity to serve and help local residents and generated contradiction between representatives of the local hotel and commercial network. Seven months after the incident, the hotel sector fell from 80% to 45% occupancy. Damage to local road infrastructure also prevented access to several locations, affecting the flow of commerce and tourists for a period much longer than the event's duration (Zylberkan, 2023).

## **4. CONCLUSION**

On the Brazilian coast, numerous cities have tourism as their main economic sector. This tourism is generally associated with the environmental and natural characteristics of these locations. Coastal cities that depend almost entirely on tourism may have difficulty recovering from a natural disaster that affects this sector directly or indirectly. Whether due to the compromise of the urban and tourist structure or even the damage to local natural attractions. The high vulnerability and recurrence of climatic events in regions with heavy tourist travel is additional complexity in managing and containing the damage caused by these disasters, which is already very difficult in the face of worsening climate changes. Cities that are highly susceptible to extreme rain events and with their economies heavily dependent on the tourism sector may suffer from a spiral of damage from those events, affecting the tourism sector and the financial and structural recovery of these locations, depending exclusively on the economic recovery of this same sector (Marengo et al., 2016). Tavares and Machado (2020) indicate that disaster management in tourism is not a widely discussed topic in Brazil. The existing discussion on the topic is recent, even for broader sectors and generic situations. Too little is discussed about external prevention, containment, and recovery measures for the tourism sector, despite the tourist location's high incidence and susceptibility to those events. The extreme weather events' ascendance highlights the urgency of more effective measures on the topic. Constant incidents can occur exclusively in tourist locations. Grimm (2019) demonstrated that climate adaptations force a remodeling in the tourism sector, potentially extinguishing the tourist capacity of certain locations because they are highly susceptible to disasters. Similarly, other regions may emerge as potential tourism due to their non-susceptibility to disasters. This would be a reconfiguration of tourist destinations due to the extreme climatic characteristics.

In managing these occurrences, relationship networks between tourism stakeholders and local government bodies are vital for the recovery of local tourism. Efficient communication with the population and possible public can interrupt and mitigate a negative reaction on the part of tourism consumers. Not only the recovery capacity, but the public perception of this capacity is an essential factor in mitigating financial impacts on the tourism sector after climate events, mainly in maintaining potential consumer confidence. Consequently, the disastrous episodes persistence and the inability to resume normal tourist activities after climate events are extremely damaging to the image and local tourism recovery (Jiang and Ritchie, 2017). The incorporation of the discussion on mitigation, prevention, and response to climate disasters is still incipient, but very necessary in tourist locations that are more susceptible to these events. Such regions must adopt this discourse in their local politics to identify their realities and needs, thus being able to plan their actions. City's master plans must pay attention to the disaster incidence within their local particularities, to avoid not only human and structural damage, but the prolonged inoperability of vital economic sectors for their respective regions.

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## WHERE IS THE THEORETICAL BASIS FOR THE PROPOSAL OF BLOCKCHAIN TECHNOLOGY IN SUSTAINABLE SUPPLY CHAIN MANAGEMENT? A SYSTEMATIC REVIEW

**Victor Andrade da Silveira**

*Universidade Federal Fluminense,  
Rua Miguel de Frias, 9, Niterói – RJ, Brazil  
victorsilveira@id.uff.br*

**Stella Regina Reis da Costa**

*Universit of Aveiro - GOVCOOP,  
Universidade Federal Fluminense,  
Rua Miguel de Frias, 9, Niterói – RJ, Brazil  
stella@ufrj.br*

**David Resende**

*University of Aveiro - ESTGA/GOVCOOP/PICTIS,  
Aveiro, Portugal  
david@ua.pt*

**Gilson Brito Alves Lima**

*Universidade Federal Fluminense,  
Rua Miguel de Frias, 9, Niterói – RJ, Brazil  
glima@id.uff.br*

### ABSTRACT

*The advancement of studies and practices on the impact of blockchain technology on the supply chain has been increasing scientific interest. The global push for better sustainability management conditions in the supply chain, ESG, life cycle, and competitive advantage has also been investigated. Just like other technologies in industry 5.0, AI, IoT, and Big Data, among others, Blockchain also aroused the interest of researchers, largely due to its promise in solving challenges posed to the supply chain, such as traceability, transparency, auditability, security, greater efficiency, among other objectives focused on sustainability. This context made the literature expand, increasing the discussion about causal relationships between these objects of investigation. However, this nexus, built between blockchain and the supply chain, has been gaining relevance in the scientific discussion, due to the way in which the existence of this causality emerged and because the research is based on practical motivations, with different lines of thought and with no consistent theoretical basis. The purpose of this work aims, through a systematic literature review, to comprehensively investigate how the research on blockchain applied to the sustainable supply chain has been constructed. The originality of this proposal lies in its results, which present the state-of-the-art theories developed for this field of research and how the lack of a consistent theoretical basis has hampered the advancement of studies on blockchain in the supply chain. The main points between the causal relationships, characteristics, and determinations of these objects of study are discussed, which, in some cases, concluded the possibility of more efficient sustainable management. We finish by highlighting contributions to the literature by surveying existing theories and lines of thought, and also by suggesting future work on blockchain governance applied to the supply chain.*

**Keywords:** *Blockchain Technology, Supply Chain, Sustainability, Industry 5.0*

## 1. INTRODUCTION

Globalization of supply chains makes their management and control more difficult (Saber et al., 2019). Blockchain technology has recently gained significant attention and hype as a disruptive technology (Kouhizadeh et al., 2021), and is showing promise for easing some global supply chain management problems (Saber et al., 2019). Also for this reason (Nasir et al., 2022), the adoption of blockchain technology in supply chain management has gained significant interest in recent years (Naseem et al., 2023). The use of Blockchain technology can lead to transparency, controllability, security, flexibility, visibility, reduction of costs, efficient processes, and achieving sustainable development goals in the supply chain network (Dehshiri and Amiri, 2023; Saber et al., 2019; Aich et al., 2021). For Mohamed et al.(2023) the Blockchain technology can be adopted as an innovative tool to enhance the sustainability and resilience of supply chains, especially in uncertain environments. As technological advancements and sustainability continue to merge, blockchain technology is poised to revolutionize how sustainable supply chains are managed in the future (Wang et al., 2023). It is within this context that researchers have started investigating various managerial, economic, sustainability, technology, and development concerns (Bai and Sarkis, 2022). The promising features of blockchain technology might be a panacea for such complexity in the triple-bottom-line of sustainability, thus, capturing and identifying examples applied in a sustainable supply chain can demonstrate the breadth of blockchain technology application (Saber et al., 2019). Although the literature has sought to understand these concerns through various empirical practices, field, existing empirical and case studies tend to focus on the qualitative analysis aspects of this field (Bai and Sarkis, 2020). Considering the benefits of implementing Blockchain for improving the sustainability of the supply chain, the amount of cases of using this technology is limited and the investment in blockchain doesn't have fast growth (Dehshiri and Amiri, 2023), limited while companies continue to struggle with the more holistic aspects of sustainability (Kouhizadeh et al., 2021). There is a need for a more impactful role and more robust empirical studies that can help tackle the new challenges of the current digital era (Mohamed et al., 2023). Investigations are needed to evaluate the case studies and pilot programs and provide valuable practical information to enhance blockchain implementation (Saber et al., 2019). The few applied ongoing use cases including blockchain for food, healthcare, and logistics supply chains have emphasized blockchain's untapped potential (Kouhizadeh et al., 2021). However, despite this growing interest, the literature on the obstacles to its adoption remains limited (Naseem et al., 2023). (Naseem et al., 2023). These obstacles will be important in scholarly literature discourse for several years (Saber et al., 2019). Blockchain technology has various functions and capabilities including decentralization, security, anonymity, transparency, and traceability which can support a multitude of supply chain processes or functions and can include transaction, finance, cooperation, and coordination requirements (Bai and Sarkis, 2022). This effort, to adapt this technology to the supply chain, was possible due to the association between these functions and capabilities of Blockchain with the challenges and opportunities of building a sustainable supply chain. Furthermore, a number of platforms such as Ethereum, Multichain and Hyperledger have been developed to facilitate the adoption of technology beyond cryptocurrencies and have had significant impact in achieving its widespread adoption (Nasir et al., 2022). Therefore, the objective of this study is to understand the state of the art on blockchain research applied to solutions for a supply chain. For that, we identified 549 research journal papers, in the English language, published between 2018 and 2023 using the Scopus database. This study is divided as follows: Section 2, a presentation of a theoretical basis on blockchain technology for sustainability in supply chains; Section 3, a presentation of the research methodology used; Section 4, presentation and discussion of the results found; and Section 5 conclusions obtained.

## **2. LITERATURE REVIEW**

An initial theoretical basis for the themes studied in this work is presented below, considering the existing literature of the works that preceded this one.

### **2.1. The blockchain technology**

Study about Blockchain technology was first started in 1991 as a digital document of data, which at its early stage, less attention was paid (Naseem et al., 2023). In 2009, Satoshi Nakamoto outlined a new protocol for a point-to-point system using a cryptocurrency called Bitcoin, called blockchain. The Blockchain can be explained as an electronic ledger, or a list of blocks connected by cryptography, that holds data constituting a block header and the block itself (Naseem et al., 2023). A major difference between the standard design of the Internet and Blockchain technology is that the Internet was designed to move information (not value) and to move copies of things (not original information) (Sabeti et al., 2019). Blockchain is a decentralized, distributed ledger technology for recording and verifying transactions which ensures the security and integrity of transaction data through cryptography and distributed consensus algorithms (Chen et al., 2023). This is an important property of Blockchain technology and is a check on any adulteration of information, thus increasing information validity (Sabeti et al., 2019). Blockchain is one element of the extended ecosystem of distributed ledger innovations and has been used in various innovative solutions in digital currencies (Dehshiri and Amiri, 2023). Figuratively, every transaction recorded on the blockchain at a given point in time is stored in a single block. Each block comprises a digital fingerprint of the user that implants the data, and this is known as a hash. Thus, the cryptographic identifier creator of the previous block is added (Mohamed et al., 2023). A record of that transaction is saved in several distributed nodes for security, meanwhile, the smart contract, as a critical feature of blockchain technology allows the performance of credible transactions without third parties' involvement (Sabeti et al., 2019). The development process is growing rapidly due to the range of benefits of Blockchain (Dehshiri and Amiri, 2023). This technology is unique in that it ensures transparency and security of transactions, as the record of transactions cannot be tampered with or deleted (Chen et al., 2023);

### **2.2. Blockchain technology in sustainable supply chains**

Industry 5.0 has introduced a novel interpretation of sustainable supply chains that emphasizes the importance of building a transparent and trustworthy network that can be continuously monitored and controlled through stakeholder collaboration as well as the use of advanced (Wang et al., 2023). Recently, the usage of new technologies to improve cooperation and coordination in the supply chains is necessary due to increasing competition, globalization, and creating a network of business partners, achieving a competitive advantage, and improving management and visibility (Dehshiri and Amiri, 2023). However, due to the involvement of multiple stakeholders in the supply chain, it is easy to encounter difficulties in information tracing, information falsification, and trust crises during the various lifecycle stages of production (Chen et al., 2023). According to Quayson et al. (2023), companies need to apply blockchain characteristics to improve information sharing, coordination, and visibility capabilities in their supply chain. For Sabeti et al. (2019) inefficient transactions, fraud, pilferage, and poorly performing supply chains, lead to greater trust shortage, and therefore, a need for better information sharing, and verifiability. Blockchain is one of the emerging technologies that can be used in multiple fields, especially in supply chain networks, where it is considered a sustainable concept technology (Chen et al., 2023). This technology can have disruptive and revolutionary implications for these processes (Kouhizadeh et al., 2022). More specifically, blockchain technology enables companies to trace returned goods in real-time, enabling them to manage returns effectively and assisting in the products' proper disposal to

achieve sustainability (Naseem et al., 2023). Every product may have a digital blockchain presence so that all relevant actors can have direct product profile access, thus, security measures may be set in place to limit access, where only the parties with the correct digital keys have access to a product (Saber et al., 2019). This means that it is possible to trace the origin of every component, raw material, or finished product through the supply chain (Mohamed et al., 2023). Before a product is transferred (or sold) to another actor both parties may sign a digital contract, or meet a smart contract requirement, to authenticate the exchange (Saber et al., 2019). In other words, supply chain partners can collaborate and interact with one another to create any type of record, such as product data, and warranty information (Naseem et al., 2023). In this way, the blockchain removes the need for a trusted central organization that operates and maintains this system and allows customers to inspect the uninterrupted chain of custody and transactions from the raw materials to the end sale (Saber et al., 2019). Many supply chain industries are moving away from the linear model in which large numbers of raw materials are extracted and turned into products that are not reused or recycled, and are gradually moving toward manufacturing with sustainability in mind (Chen et al., 2023). Smart contracts may be especially capable of rules of tracking and controlling sustainable terms and regulatory policy autonomously and enforcing or governing appropriate corrections (Saber et al., 2019). When blockchain technology is effectively utilized, it can revolutionize a company's supply chain and corporate operations and offer enormous advantages (Naseem et al., 2023). The idea of sustainability includes the consideration of social-economic-environmental dimensions in supply chain decisions and has become the main driver of customer demand and loyalty, thus the use of new technologies can help implement sustainability in this process. (Dehshiri and Amiri, 2023). The implementation of blockchain technology can significantly improve the reliability, efficiency, and security of the information exchanged among stakeholders in sustainable supply chains (Wang et al., 2023). Not only are business dimensions of the supply chain important for sustainable supply chains, but expanding the focus to environmental and social dimensions has made for a more generalizable and holistic perspective on the supply chain (Saber et al., 2019). The use of Blockchain leads to transparency, controllability, security, flexibility, visibility, and reduction of costs (Dehshiri and Amiri, 2023). The successful application of this technology can achieve supply chain sustainability in terms of social, environmental, and economic aspects (Naseem et al., 2023; Wang et al., 2023).

### **3. METHODOLOGY**

This study is based on a systematic literature review in order to obtain an initial view of the state-of-the-art research into blockchain technology applied in sustainable supply chains. To this end, we divided this work into two stages, (1) the preparation of metadata for searching for articles and (2) capturing the articles and classifying the data, for subsequent analysis and discussion, which will be discussed in section 4.

#### **3.1. Definition of search criteria**

The first step in carrying out the literature review was to define the article selection criteria. The Scopus database was selected to search for articles. According to the results presented by Silveira et al. (2022) and Bai and Sarkis (2022), the majority and most significant articles that related “blockchain technology” with “supply chain” and “sustainability” were in this database. Only complete articles in English were selected. Three levels of keywords were then determined to search for articles, as shown in Table 1. First, the selection keywords were defined for “blockchain technology” and a second level for “supply chains”, following what was carried out by Bai and Sarkis (2022), and a third level related to “sustainability”.

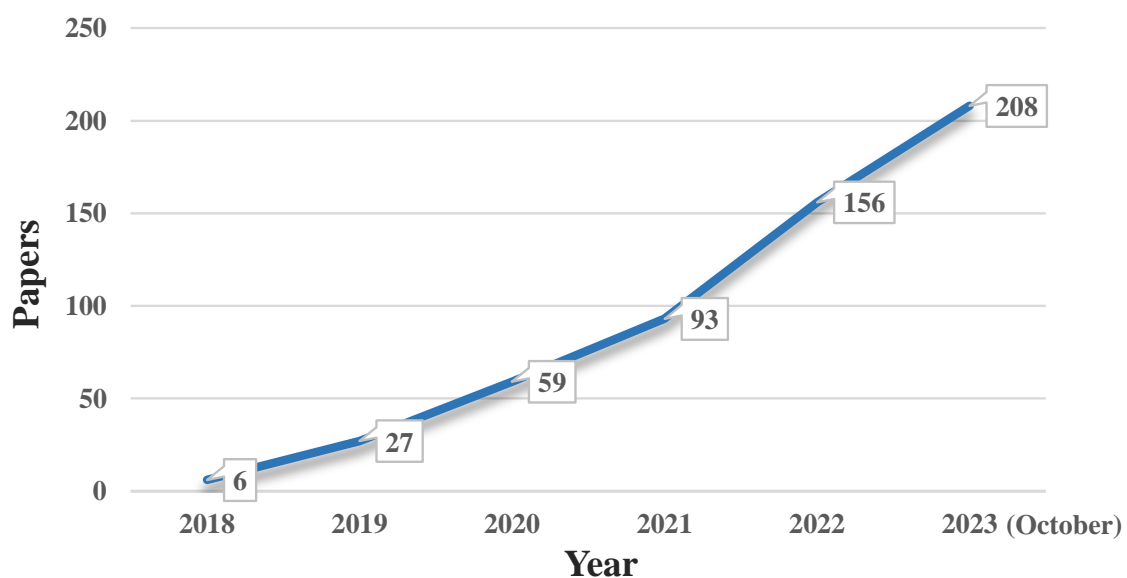
Level	Description	Structured keywords
1	Blockchain related keywords	"blockchain" OR "distributed ledger" OR "cryptocurrency" AND
2	Supply chains related keywords	"supply chain" OR "transport" OR "logistics" OR "manufacturing" AND
3	Sustainability related keywords	"sustainable" OR "sustainability"

*Table 1: The three levels of keywords.  
(Source: Research data)*

Considering the structuring of keyword levels, as demonstrated above, the search for articles was carried out, in this initial stage, using “title, abstract, keywords”, in magazine articles, published in the last five years, 2018 to 2023. The search period was concentrated between August and October 2023, search in the Scopus database. A total of 549 articles were found and stored, the statistical data of which will be presented in section 4. According to the criteria selected to search for articles in the database, the following query was obtained: TITLE-ABS-KEY ( ( " blockchain" OR "distributed ledger" OR "cryptocurrency" ) AND ( "supply chain" OR "transport" OR "logistics" OR "manufacturing" ) AND ( "sustainable" OR "sustainability" ) ) AND PUBYEAR > 2017 AND PUBYEAR < 2024 AND ( LIMIT-TO ( SRCTYPE , "j" ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) ).

#### 4. ANALYSIS AND DISCUSSION OF RESULTS

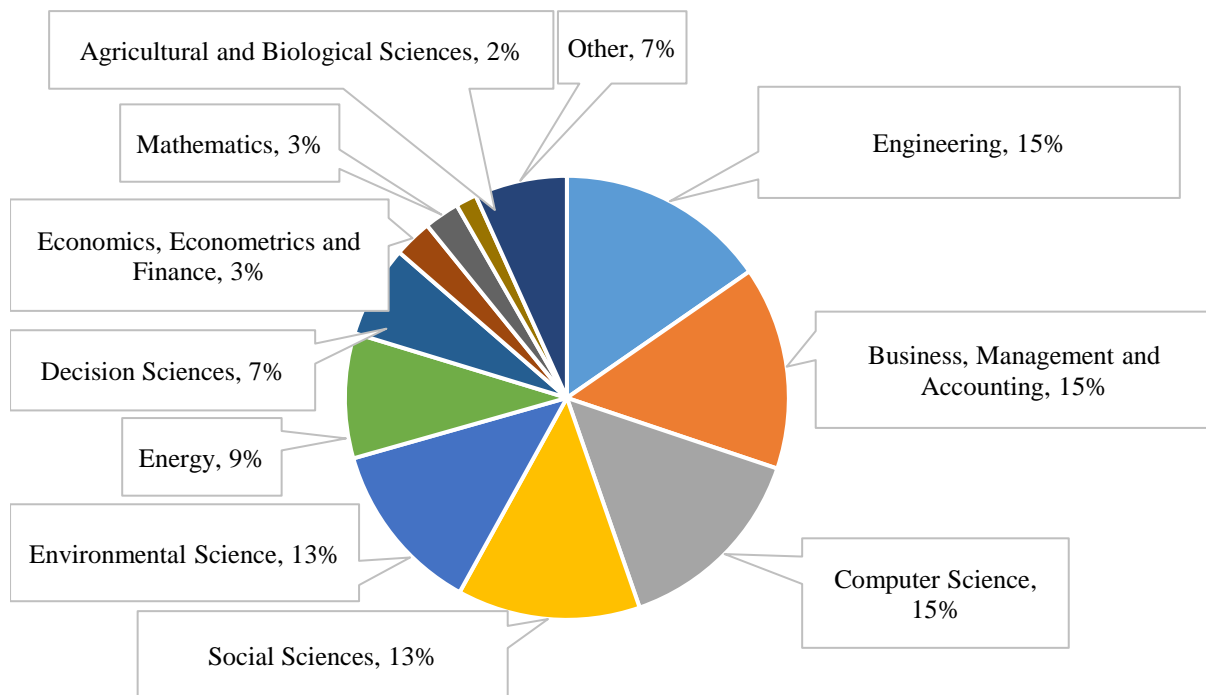
With the search criteria presented in section 3, it was possible to select the 549 articles in the Scopus database that relate blockchain technology to the supply chain and sustainability. Initially, the behavior of these publications was evaluated over the years from 2018 to October 2023. The first publications, which list these three levels of keywords, took place in 2018, ten years after the publication of Nakamoto's paper (2009) that gave rise to Bitcoin and corroborated the results found in studies by Silveira et al. (2022). Figure 1 shows a growth in publications in this studied period of approximately 60% per year on average.



*Figure 1: Trend of publications on blockchain, sustainable supply chain.  
(Source: Research data)*



With these numbers, it is possible to reach more than 230 publications by December 2023, and more than 360 articles in 2024, if this trend continues. Although the cryptocurrency Bitcoin represents the most popular application of Blockchain, the use of this technology has generated significant attention in diverse application domains, including healthcare, finance, government, and supply chain management (Nasir et al., 2022). This technology has gained more and more attention, as it guarantees transparency, trust, privacy, and security (Aich et al., 2021). Regarding the thematic areas, Figure 2 presents the ten main areas that focus studies on sustainable management applied in the supply chain with blockchain technology. Of the areas presented in Figure 2, three of them concentrate 15% of the studies each, being Engineering (221 articles), Business, Management and Accounting (213 articles) and Computer Science (209 articles). These three main areas were also found in the study by Bai and Sarkis (2022), which also related the supply chain to blockchain technology, which reinforces the multidisciplinary nature of research on the topics. These results also confirm the final discussions presented by Zysking et al. (2015). It is worth noting that the 7% of Others represent fourteen thematic areas, totaling twenty-four areas where the 549 articles selected in this work are distributed.



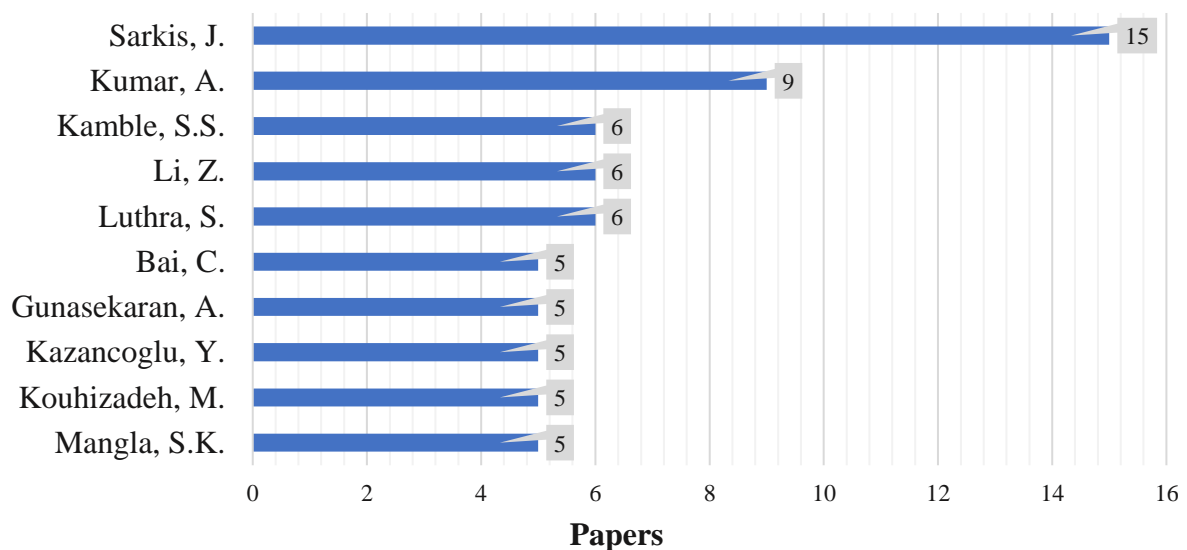
*Figure 2: Subject areas of studies on blockchain, sustainable supply chain.  
(Source: Research data)*

Table 2 presents the top ten contributions of articles found in the Scopus database with the three levels of keywords, which associate blockchain technology with the supply chain and sustainability. It is noted that the article by authors Saberi et al. (2019) reached a number of 1,585 citations on these topics, until October 2023. In a second observation, it can be identified that among the ten articles with the highest number of citations, the author Sarkis, J. appears in five articles and Kouhizadeh, M. in three of them.

Authors (year)	Journal	Citation
Saberi, S., Kouhizadeh, M., Sarkis, J., Shen, L. (2019)	International Journal of Production Research	1.585
Kouhizadeh, M., Saberi, S., Sarkis, J. (2021)	International Journal of Production Economics	484
Kamble, S.S., Gunasekaran, A., Sharma, R. (2020)	International Journal of Information Management	463
Cole, R., Stevenson, M., Aitken, J. (2019)	Supply Chain Management	429
Zhao, G., Liu, S., Lopez, C., Chen, H., Boshkoska, B.M. (2019)	Computers in Industry	362
Hastig, G.M., Sodhi, M.S. (2020)	Production and Operations Management	359
Kouhizadeh, M., Sarkis, J. (2018)	Sustainability (Switzerland)	339
Esmailian, B., Sarkis, J., Lewis, K., Behdad, S. (2020)	Resources, Conservation and Recycling	332
Wong, L.-W., Leong, L.-Y., Hew, J.-J., Tan, G.W.-H., Ooi, K.-B. (2020)	International Journal of Information Management	326
Bai, C., Sarkis, J. (2020)	International Journal of Production Research	305

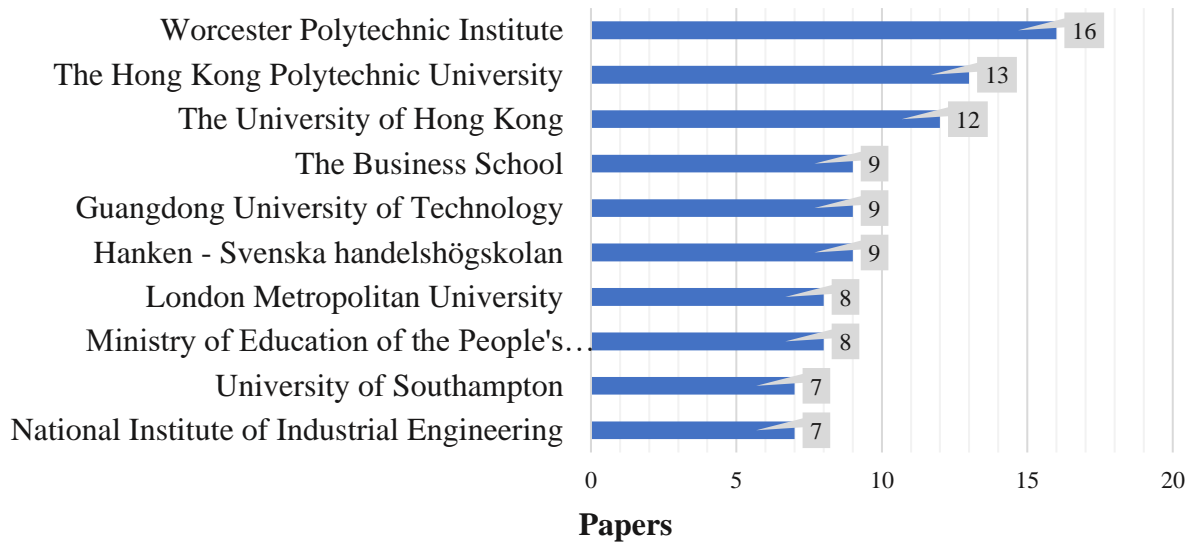
*Table 2: The top ten articles in terms of number of citations in the Scopus database.  
(Source: Research data)*

Figure 3 presents the ten authors who contributed in the last five years to the study of the themes studied in this work. Confirming the second observation made in the previous paragraph, it can be identified that the author Sarkis, J. stands out in his contributions, participating in the publication of 15 articles, in a group of a total of 160 authors. In a descriptive statistical analysis, it can be observed that in this total distribution of the number of articles by authors, the median is equal to two and the mode is also equal to two. This makes it possible to analyze that there is a great contribution effort by the ten authors presented in the figure.



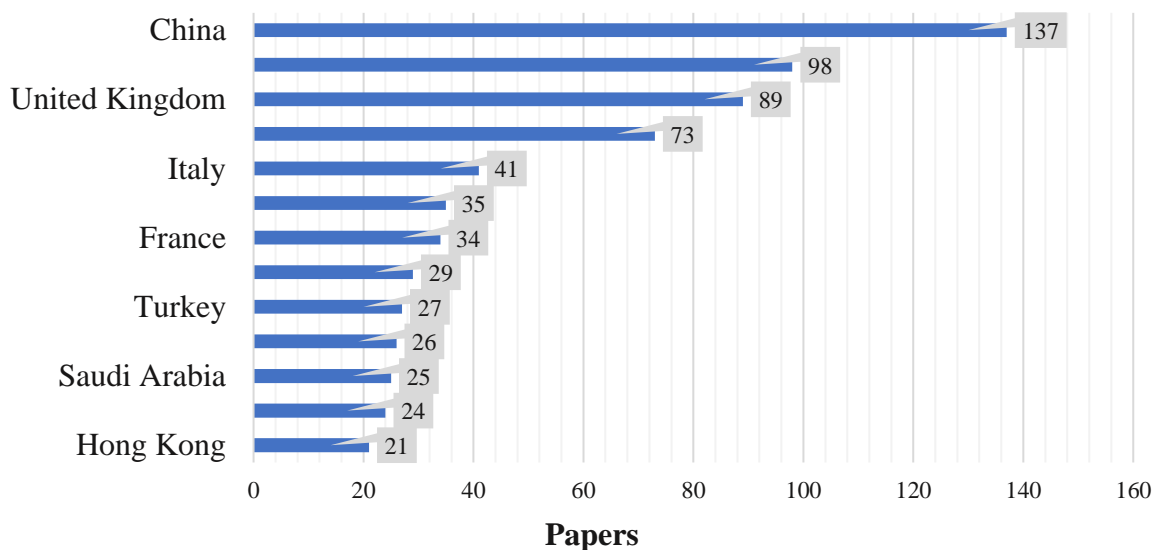
*Figure 3: The ten authors with the highest number of publications.  
(Source: Research data)*

Complementing the previous analysis, Figure 4 presents the ten largest organizations that have contributed to research on blockchain technology and sustainable supply chain management. It can be highlighted in this figure the presence of the home organizations of the ten authors with the highest number of publications and also of four Chinese organizations, The Hong Kong Polytechnic University, The University of Hong Kong, Guangdong University of Technology, and Ministry of Education of the People's Republic of China.



*Figure 4: The ten organizations with the highest contribution of publications.  
(Source: Research data)*

Likewise, Figure 5 presents the countries with the greatest contribution to publications on the relationship between blockchain technology and the supply chain and sustainability. It can be observed that the first five countries are related to the nation of origin of the organizations presented in Figure 4 or to the authors presented in Figure 3: China, India, United Kingdom and United States.



*Figure 5: Countries with the highest contribution to publications.  
(Source: Research data)*

As seen in Figure 4 and Figure 5, there is a relevance of research, mainly on the Asian continent. This result shows that in the context of blockchain technology and supply chain and operations management, emerging countries are paying more attention to research in this disruptive technology perhaps to help leapfrog developed countries (Bai and Sarkis, 2022). Table 3 shows the concentration of the ten largest Journals that contribute publications to the research themes presented.

Nº	Journals	Total of articles	Percentage of articles
1	Sustainability Switzerland	90	19%
2	Journal Of Cleaner Production	19	4%
3	Computers And Industrial Engineering	17	4%
4	Business Strategy And The Environment	17	4%
5	Technological Forecasting And Social Change	14	3%
6	International Journal Of Production Research	14	3%
7	Annals Of Operations Research	14	3%
8	Transportation Research Part E Logistics And Transportation Review	11	2%
9	Operations Management Research	9	2%
10	IEEE Access	9	2%

*Table 3: The top ten journals in terms of number of citations.  
(Source: Research data)*

Of a total of one hundred and sixty magazines where the 549 articles found were published, the ten journals in the table below carried out 44% of the publications. The significant number of contributions from the Sustainability Switzerland magazine can be highlighted in comparison to the total number of articles found.

## 5. CONCLUSION

The research that associates the use of blockchain technology applied to the supply chain, with a focus on achieving sustainability, has grown in recent years. With this, we can understand that there is a real interest in this technology's ability to make management more sustainable. However, relevant studies in this area are still concentrated in a few regions and organizations. There is a vast and complex field to be followed, considering the relevance of the three areas of study that are being associated and the interdisciplinarity that involves them. Blockchain technology has a range of determinations to be worked on, including smart contracts, autonomous processing, and tokenization, which require in-depth research for a better understanding. Despite the advancement of blockchain technology applications in cryptocurrencies, this same popularity is not observed in other practical uses. The research has been evolving towards understanding the challenges and benefits that this technology can bring, but still in a theoretical way and with few practical studies. It is necessary that further research advances in the discovery of case and empirical studies which, through their results, can substantiate the theory raised regarding its use in the supply chain.

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# DIGITAL TRANSFORMATION OF CINEMA IN THE 21ST CENTURY AND ITS IMPACT

**Zlatko Vidackovic**

University North, Croatia  
zlatko.vidackovic@unin.hr

**Iva Rosanda Zigo**

University North, Croatia  
iva.rosanda.zigo@unin.hr

**Filip Naglic**

Catholic University of Croatia, Croatia  
fnaglic@unicath.hr

## ABSTRACT

*Digital technology in the 21st century changed the cinema in every aspect, from filming with digital cameras, digital distribution and screenings in cinemas, platforms for home screenings to digital marketing via social networks. In this paper we try to determine the impact of digitalization on cinema, from economical, ecological and social perspective. Cheap HD digital cameras enabled the democratization of filmmaking, while drones helped independent filmmakers to film spectacular scenery without enormous budgets. However, the cost of digital cinema is not necessarily less than the 35mm film; indeed, it is sometimes greater in many aspects. The Academy of Motion Picture Arts and Sciences found the cost of long-term storage of 4K digital masters to be higher up to 11 times that of the cost of storing 35mm film masters. Also, digital storage media are not completely reliable and stored media can be lost. The digitalization of cinemas was a costly process that favored multiplexes over traditional one-screen cinemas, especially the smaller and art ones, as multiplex cinemas use only one operator for a large number of cinema halls. Streaming platforms brought a much wider choice of films to users, but only for a limited time, and the Blu-Rays still remain the most reliable way to collect movies. From the ecological point of view, streaming media's carbon footprint, were estimated in 2019 to be 1 percent of global greenhouse gas emissions, and this figure is rising at a high rate as more people around the world stream more media at higher bandwidth, especially during and after the COVID-19 pandemic. This paper will present not only the history of this processes, but also collect, summarize, analyze and comment the latest research data from various reliable sources.*

**Keywords:** Cinema, Digital technology, Film

## 1. INTRODUCTION

Digital technology in the 21st century changed the cinema in every aspect, from filming with digital cameras, digital distribution and screenings in cinemas, platforms for home screenings to digital marketing via social networks. In this paper we try to determine the impact of digitalization on cinema, from economical, ecological and social perspective. We analyze the democratization of filmmaking, the cost of digital cinema, the effects of digitalization of cinemas and the advantages and disadvantages of streaming platforms. This paper will present not only the history of this processes, but also collect, summarize, analyze and comment the latest research data from various reliable sources.

## 2. HISTORICAL CONTEXT

### 2.1. The Advent of Digital Cinema

The digital transformation of cinema started in the second half of the 20th century, but it reached a major point by the end of the century when digital cameras and computer-generated imagery (CGI) made a revolutionary change in film production. From the use of anti-aircraft targeting computer for the opening scene and the spiral sequence of Alfred Hitchcock's *Vertigo* (1958.), usage of the digital image processing in Michael Crichton's *Westworld* (1973.) with Yul Brynner as android, to groundbreaking George Lucas's *Star Wars* (1977), the early digital technology started to show its potential and in a few decades developed to new levels. The first feature-length CGI film was *Toy Story* (1995) and after that movie George Lucas realized that computer-generated imagery had advanced to the level he wanted to start a new era of realistic and complex visual effects that would be impossible with the old technology. His film *The Phantom Menace* (1999) fully demonstrated the potential of CGI, starting the digital revolution in live-action films. CGI started replacing the practical effects, with all of its advantages and disadvantages. Convincing CGI can be enough to impress a casual movie viewer, but a low quality effects are likely to have an opposite effect.

### 2.2. Transition from Celluloid to Digital

Celluloid film dominated the industry for more than a century, from the early days of cinema at end of the 19<sup>th</sup> to the end of 20<sup>th</sup> century. The big change from analog to digital filmmaking took place in the beginning of the 21<sup>st</sup> century. As the digital cameras and equipment for digital editing became affordable, filmmakers and studios gradually transitioned from shooting on traditional 35mm film to digital cameras. The digital transition not only reduced production costs but also offered great fiction filmmaking potentials and enabled a major creative flexibility. However, even in the 21<sup>st</sup> century some prominent directors (Christopher Nolan, J.J. Abrams, Quentin Tarantino, Martin Scorsese) use film and lobby for the support of the celluloid film, as they like the natural film grain that creates a unique effect and atmosphere. After their *Keep Kodak Open* campaign, five major film studios (Disney, NBC Universal, Paramount, Sony, and Warner Bros.) agreed to buy large quantities of celluloid from Kodak to help saving the company's production. Also, the cost of digital cinema is not necessarily less than the 35mm film; indeed, it is sometimes greater in many aspects. The Academy of Motion Picture Arts and Sciences found the cost of long-term storage of 4K digital masters to be higher up to 11 times that of the cost of storing 35mm film masters (<https://www.oscars.org/science-technology/sci-tech-projects/digital-dilemma>).

## 3. TECHNOLOGICAL ADVANCEMENTS

### 3.1. Digital Production

#### 3.1.1. High-Resolution Cameras

High-resolution digital cameras, like RED and ARRI, has revolutionized modern cinematography. These cameras provide excellent image quality, allowing filmmakers to capture remarkable visuals with supreme clarity. This can be particularly useful while filming real life images used in documentaries. The list of shows highlighted on the RED official pages include: wildlife documentaries such as *The Green Planet* (2022), *Our Great National Parks* (2022), *Tiny World* (2020); TV shows like *Queens Gambit* (2020), *Mr. Robot* (2015-2019), *House of Cards* (2013-2018) and popular films: *The Social Network* (2010), *The Great Gatsby* (2013), *The Martian* (2015), *Jurassic World* (2015), *Captain Marvel* (2019) (<https://www.red.com/shot-on-red>).



### 3.1.2. CGI and Visual Effects

The integration of CGI and visual effects into filmmaking process has expanded the possibilities for storytelling. The number of remakes, we are witnessing in recent decades provide a solid indicator in support of this thesis. Contemporary adaptations of iconic monster films like *Godzilla* (1998) and *King Kong* (2005) demonstrated how the main characters can be turned into a much more convincing, epic and visually impressive version of themselves. Disney decided to recreate a number of classical animated films. This time they made a live action versions assisted by a massive usage of CGI. It is getting harder to differentiate live action and CGI parts. After watching movies like *The Lion King* (2019) and *The Call of the Wild* (2020), the viewer is left wondering how to categorize these films. Should they be listed as a live action films or animated feature films? Films like *Avatar* (2009) and *The Jungle Book* (2016) demonstrate the power of digital technology in creating immersive and fantastical worlds. According to Screen Rants Craig Elvy, director James Cameron started developing the idea for the film in 1994. and further explains “The primary reason for *Avatar*’s 15-year development is that the technology of the late 1990s simply wasn’t good enough to cope with the demands of Cameron’s concept” (<https://screenrant.com/avatar-movie-development-long-reason/>). Financial potential of the CGI animated films was shortly noticed by the big studios. A quick look at the list of the highest grossing animated movies is enough to realize why the classical theatrically released animated feature films have become rare and not as profitable as the computer animated films (<https://www.the-numbers.com/box-office-records/worldwide/all-movies/cumulative/all-time-animated>).

Rank	Title	Year	Type of animation
1	<i>Frozen 2</i>	2019	Computer animation
2	<i>The Super Mario Bros. Movie</i>	2023	Computer animation
3	<i>Frozen</i>	2013	Computer animation
4	<i>Incredibles 2</i>	2018	Computer animation
5	<i>Minions</i>	2015	Computer animation
6	<i>Toy Story 4</i>	2019	Computer animation
7	<i>Toy Story 3</i>	2010	Computer animation
8	<i>Despicable Me 3</i>	2017	Computer animation
9	<i>Finding Dory</i>	2016	Computer animation
10	<i>Zootopia</i>	2016	Computer animation

Table1: Top 10 Highest Grossing Animated Movies (All Time Worldwide Box Office) and a Type of Animation Used

(Source: <https://www.the-numbers.com/box-office-records/worldwide/all-movies/cumulative/all-time-animated>)

Graphic novel film adaptations like *Sin City* (2005) and *300* (2006) have shown a highly distinctive visual design. Visual effects also made certain genres much more popular than ever before. The Superhero genre has flourished with the Marvel studio as best example. Digital de-aging process have been applied to Michael Douglas in *Antman* (2015), Michelle Pfeiffer in *Antman and the Wasp* (2018), and Harrison Ford in *Indiana Jones and the Dial of Destiny* (2023). They gave the audience another chance to see a glimpse of these actors in their prime. On the other hand, Andy Serkis created a name for himself after playing a motion capture role of Gollum in Peter Jackson’s *Lord of the Rings* trilogy and having a lead role as Caesar in the *Planet of the Apes* trilogy.

### 3.2. Digital Post-Production

#### 3.2.1. Non-linear Editing

The transition to digital post-production has made editing more efficient and accessible. Jasinchi and Moura talk about the main difference between digital and analogue video editing “Computerized video editing provides random access which represents a remarkable improvement over the current analogue tape editing technologies. These are said to be linear editors. (Jasinchi, Moura, 1996: 1220). Non-linear editing software, such as Adobe Premiere and Final Cut Pro, has become industry standards, enabling editors to manipulate footage with precision. Felicity Meakins names the main positive and negative sides of using Final Cut Pro: *“Pros: The ability to create an accessible language resource; the ability to include dual language subtitling and to overlay the original footage with additional associated materials such as voiceovers. Cons: The time to learn to use and the time to use; the cost of the software; the reliance on proprietary formats* (Meakins, 2009: 131).

#### 3.2.2. Sound Design and Mixing

Advancements in digital sound technology have transformed the auditory experience of cinema. Dolby Atmos and DTS:X have redefined sound design and mixing, immersing audiences in three-dimensional audio environments. Zovko states that a substantial portion of any film budget is dedicated to the music and sound and further adds “Sound designers and Foley artists spend countless hours replacing dialogue and re-creating diegetic sounds to craft a pristine and immersive sonic landscape (Zovko, 2021: 59,60). This aspect of technological advancement was valuable when it comes to music related films such as: *Whiplash* (2014), *Bohemian Rhapsody* (2018) and *Sound of Metal* (2020). New sequels of old franchises like *Mad Max: Fury Road* (2015) and *Top Gun: Maverick* (2022) are also upgraded with the contemporary sound effects and brought back to life after decades of waiting.

## 4. DIGITAL DISTRIBUTION

### 4.1. Streaming Platforms

The rise of streaming platforms like Netflix, Amazon Prime, and Disney+ has changed traditional film distribution models. Audiences can now access a large library of films and series on-demand, challenging the dominance of theatrical releases. Karolína Vodičková mentions the key characteristic of the streaming platforms: “The interactivity of the new media supports the differentiation between watching broadcast television as a traditional medium on the one hand, and using digital tools on the other” (Vodičková, 2022: 28). Streaming is now available on different platforms. It is not limited only to personal computers and laptops. Smart TV offers a possibility of internet connection, and installing the most popular applications we usually associate with personal computers. According to the official Netflix site, their content can be consumed on a phone, tablet, laptop, TV, PlayStation, Xbox, Chromecast, Apple TV, Blu-ray players and more (<https://www.netflix.com/hr-en/>). Turkish author Burcu Türkmen, mentions another advantage of this type of platforms “The reason why the audiences prefer such platforms can be predicted as the submission of the content in many languages with subtitles (Türkmen, 2020: 460). Hennig-Thurau, Ravid, and Sorenson point out the following “As of December 2020, only one Hollywood studio (Sony) has yet to launch its own streaming service Hollywood studios and their parent conglomerates have even begun to premiere their movies on streaming platforms” (Hennig-Thurau, Ravid, and Sorenson, 2021: 157,158).

### 4.2. Global Reach

Digital distribution has enabled films to reach global audiences instantaneously. Independent filmmakers and international cinema have benefited from this newfound accessibility,

expanding their reach beyond traditional boundaries. Hasan Gürkan explains why is this important: “

*Cinema can change people's attitudes, behaviours, and thoughts; the public is influenced by cinema, and cinema itself can create trends. Thus, cinema is not only a medium that carries the portrayal of power, but it is also is a medium that allows people with opposing views to express their thoughts. Cinema has three basic functions – economic, ideological, and aesthetic – that determine the structures of mainstream and alternative cinema (Gürkan, 2017: 42)*

VHS and DVD, are now considered to be dated means of distribution.

## **5. DIGITAL EXHIBITION**

### **5.1. Digital Screens**

The proliferation of digital screens in cinemas has transformed the exhibition experience. Digital projectors offer higher image quality and flexibility in scheduling, allowing theaters to screen a wider variety of content. Aljoša Zovko argues that the screen is a vital part of the cinema viewing experience because it is the most dominant and by far the largest element in the theatre (Zovko, 2021: 59).

### **5.2. Virtual Reality (VR) and Augmented Reality (AR)**

The integration of VR and AR technologies in cinema has the potential to revolutionize the way audiences interact with films. Steven Feiner describes this technology “Augmented reality (AR) refers to computer displays that add virtual information to a user's sensory perceptions. Most AR re-search focuses on “see-through” devices, usually worn on the head, that overlay graphics and text on the user's view of his or her surroundings” (Feiner, 2002: 50). Immersive experiences like “Sensory Cinema” and location-based VR installations are pushing the boundaries of storytelling. Eleftheria Astrinaki points out that the filmmakers goal is no longer just to represent reality, but also to construct it:

*“Artists, taking advantage of the technology that governs IMAX screens, simulation rides, and video games, struggle to represent a world that feels real, as being here and now. They aim at a reproduction not only before the audience's eyes but also before their ears, their noses, and their bodies. They want to capture consciousness and absorb the spectator into constructed worlds (Astrinaki, 2012: 2)”*

## **6. IMPACT ON FILMMAKING**

### **6.1. Democratization of Filmmaking**

Digital technology has opened the doors for many aspiring filmmakers. Affordable digital cameras, editing software, and distribution platforms have empowered independent creators, creating a wide range of voices and stories. Sherry Ortner talks about the importance of independent films “I do not mean to suggest that Hollywood has never produced a movie with complex characters, or progressive politics, or challenging subject matter. But these movies have always been in the minority within the total Hollywood output, whereas they tend to constitute the majority of independent films.” (Ortner, 2012: 2). She further explains:

*“What then makes independent films different from, and ideally better than, your stereotypical Hollywood movie? If one listens to the discourse in conjunction with watching the films, the short answer is something like this: Independent films seek to tell the truth about contemporary society. Where Hollywood films seek to provide escape and fantasy, independent films seek to tell realist or hyper(bolic)- realist stories about the world as it really is, in all its ugliness and cruelty, or all its weirdness and strangeness, and if this makes audiences uncomfortable, so be it” (Ortner, 2012: 11-12).*

Ortner also names Sundance Film Festival and Independent Spirit Awards as the independent film main representatives (Ortner, 2012: 2). If you take a look at the number of Oscar winning movies, you could argue that independent films are getting a lot of recognition in recent years. This was not the case a couple of decades earlier.

Year	Sundance Film Festival	Independent Spirit Awards
2011	<i>Like Crazy</i>	<i>Black Swan</i>
2012	<i>Beasts of the Southern Wild</i>	<i>The Artist</i>
2013	<i>Fruitvale Station</i>	<i>Silver Linings Playbook</i>
2014	<i>Whiplash</i>	<i>12 Years a Slave</i>
2015	<i>Me and Earl and the Dying Girl</i>	<i>Birdman or (The Unexpected Virtue of Ignorance)</i>
2016	<i>The Birth of a Nation</i>	<i>Spotlight</i>
2017	<i>I Don't Feel at Home in this World Anymore</i>	<i>Moonlight</i>
2018	<i>The Miseducation of Cameron Post</i>	<i>Get Out</i>
2019	<i>Clemency</i>	<i>If Beale Street Could Talk</i>
2020	<i>Minari</i>	<i>The Farewell</i>
2021	<i>CODA</i>	<i>Nomadland</i>
2022	<i>Nanny</i>	<i>The Lost Daughter</i>
2023	<i>A Thousand and One</i>	<i>Everything Everywhere All At Once</i>

Table 2: Sundance Film Festival and Independent Spirit Awards winners 2011-2023

(Source: <https://www.sundance.org/>

<https://www.filmindependent.org/spirit-awards/>)

## 6.2. Changes in Filmmaking Techniques

Filmmakers have embraced digital tools to experiment with new storytelling techniques. Films like "Birdman" (2014) and "1917" (2019) have pushed the boundaries of long takes and real-time storytelling.

## 7. IMPACT ON THE FILM INDUSTRY

### 7.1. Economic Changes

The digital revolution has had significant economic implications for the film industry. While production costs have decreased in some aspects, the rise of streaming platforms has changed revenue models, challenging the classic box office-driven system. Thorsten Hennig-Thurau, Abraham Ravid and Olav Sorenson explain this aspect in more detail:

*"Box office sales have traditionally been an important leading indicator of value. These sales have therefore helped set prices for subsequent channels, such as international markets and home video. Everyone had access to the same information; they agreed on its validity. But in streaming, performance data remain proprietary, introducing information asymmetry into any negotiations with other parties"* (Henning-Thurau, Ravid, Sorenson, 2021: 165).

Technological advancement also created new ways of creating a budget. Weilun Huang mentions a newly developed way of financing a film:

*With the rapid development of the Internet and Big Data, an innovative marketing mode focusing on loyal consumers of films (i.e., film fans) has gained its popularity. Accordingly, an increasing number of film crowdfunding (FC) projects have been initiated and operated. FC refers to a film financing alternative where the donors are mostly film fans who are active in the online crowdfunding platform* (Huang, 2020: 804).

## 7.2. Shift in Marketing and Promotion

Digital marketing and social media have become essential tools for promoting films. Studios and filmmakers can engage directly with audiences, creating new avenues for fan interaction and feedback. Blerta Rugova and Burim Prenaj describe the way in which the social media changed a digital communication: “But before the social media existed it was necessary to have a direct contact, by phone or by mail. So these have been the only opportunities to inform the customers with the existence of our product or our business in general” (Rugova, Prenaj, 2016: 90). They further name the most frequently used advertising channels: Facebook, Twitter Google Plus, YouTube and Blogs (Rugova, Prenaj, 2016: 88). Kerynne Tejada explains his perspective on this topic “Overall, the cost compared to traditional print or digital media marketing is lower. Four social networks that production studios have used to promote their films are Facebook, Twitter, YouTube, and Snapchat” (Tejada, 2015: 9,10). Famous actors and actresses can have millions of followers on social networks. It is normal to promote a new film with the help of the official social network profiles, because their reach can impact a lot of people. Most popular actors have more Instagram followers than certain countries total population. Dwayne “the Rock” Johnson has 392 millions Instagram followers while Kevin Hart has 179 millions (<https://www.scoopwhoop.com/entertainment/actors-with-highest-instagram-following-in-the-world/>). Those numbers are bigger than the population of United States and Russia combined. Melody Nouri explains the power of social media influencers “This is elucidated by their ability to create communities where users feel more connected to the influencer through higher levels of engagement, authenticity, and relatability” (Nouri, 2018: 3). Teyada points out:

*“The biggest impact that social media has is that it allows for people to connect with others in sharing and communicating ideas. When print media was only used, people were limited to taking what they saw and process it in their own way. With the usage of social media, people are allowed to not only share different marketing campaigns but can create an environment where they can discuss with others what they think and how they feel about the movies”* (Tejada, 2015: 5,6).

## 8. IMPACT ON AUDIENCE

### 8.1. Accessibility

Audiences now have unparalleled access to a huge library of films of various genres from different countries. This accessibility has enriched the cinematic experience, allowing viewers to explore diverse perspectives. The viewer doesn’t have to sit in front of television, and wait for another episode of his favorite show. If an episode ends with a cliffhanger, the viewer doesn’t have to wait at all, he can just watch another episode right away.

### 8.2. Changing Viewing Habits

Streaming has led to changes in viewing habits, with binge-watching and at-home movie nights becoming very popular. Vesna Karuza Podgorelec further describes binge-watching “An increasingly popular way of watching a television series is to stream it from video-on-demand (VoD) services and to watch multiple episodes of the same series consecutively” (Karuza Podgorelec, 2020: 4). In her research she explains the main motives for this activity “The results suggest that binge-watching has become a habit that primarily gratifies the expectations for relaxation, fun and the escape from everyday routine by viewing of long-form series that are thrilling and with intricate storylines, and that people also appreciate character engagement and empathic sadness (Karuza Podgorelec, 2020: 15). The communal experience of going to a theater has faced challenges in the digital age.

## **9. CHALLENGES AND CONCERNS**

### **9.1. Digital Piracy**

The ease of digital distribution has also facilitated piracy, creating a significant challenge to the industry. Ruud Jacobs explains this problem:

*“The current state of the internet allows for users to download full movies in less than the time it takes to watch them, making file sharing quickly accessible to anyone with an internet connection. Because of this, the continuous rise in the number of users, and their right to privacy, it is difficult for anyone to oversee what files are being shared (Jacobs 1)”*

Studios and platforms started anti-piracy measures to protect their movies. Different countries have taken different measures. Jacobs point out that in the countries like the United Kingdom and United States movie downloading is forbidden, while in the Netherlands only uploading is not allowed (Jacobs, 2010: 3).

### **9.2. Loss of Cinematic Craft**

Critics argue that the digitization of cinema has led to a loss of the artistic craftsmanship associated with celluloid filmmaking. The debate over the "film vs. digital" aesthetic continues to divide filmmakers and cinephiles. Certain filmmakers heavily rely on digital effects. This doesn't have to be something negative if a filmmaker is crafty enough. To please the high standards of many film critics, filmmaker needs to tell a convincing story. Impressive digital effect by itself are not enough. Morris Halbrook and Michela Addi argue that certain films are not even trying to reach high artistic value “For example, big-budget wide-release films with elevated levels of marketing clout tend to promote strong critical and popular buzz along the commerce-oriented path but to detract from evaluations of excellence by reviewers and consumers along the art-related path” (Halbrook, Addi, 2008: 102).

### **9.3. Ecology**

From the ecological point of view, streaming media's carbon footprint, were estimated in 2019 to be 1 percent of global greenhouse gas emissions, and this figure is rising at a high rate as more people around the world stream more media at higher bandwidth, especially during and after the COVID-19 pandemic (Marks, 2020).

## **10. CONCLUSION**

Although cheap HD digital cameras enabled the democratization of filmmaking, while drones helped independent filmmakers to film spectacular scenery without enormous budgets, the cost of digital cinema is not necessarily less than the 35mm film; indeed, it is sometimes greater in many aspects. The cost of long-term storage of 4K digital masters is still higher up to 11 times that of the cost of storing 35mm film masters. Also, digital storage media are not completely reliable and stored media can be lost. The digitalization of cinemas was a costly process that favored multiplexes over traditional one-screen cinemas, especially the smaller and art ones. Streaming platforms brought a much wider choice of films to users, but only for a limited time, and the Blu-Rays still remain the most reliable way to collect movies. Streaming media's carbon footprint, estimated in 2019 to be 1 percent of global greenhouse gas emissions, is rising at a high rate as more people around the world stream more media at higher bandwidth, therefore the ecological impact of digitalization causes concern.

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## **SUSTAINABLE DEVELOPMENT STRATEGY OF HEALTH TOURISM: THE CASE OF VRNJACKA BANJA**

**Ljiljana Kontic**

*University MB, Faculty of Business and Law, Belgrade, Serbia*

*ljiljana.kontic@yahoo.com; ljiljana.kontic@ppf.edu.rs*

### **ABSTRACT**

*This study focused on sustainable health tourism of Vrnjacka banja in order to identify potential problems and resources to improve its strategic position. Analysis of case study consisted of evaluation of factors defined by UNWTO methodology, content analysis of meta data as well as Development Strategy of Vrnjacka banja Municipality. The results showed that main problems are infrastructure, ecology, and privatization. In this paper, author provided guidelines for strategic development of Vrnjacka banja.*

**Keywords:** *Strategy, sustainable development, health tourism, Vrnjacka banja, Serbia*

### **1. INTRODUCTION**

This study is focused on health tourism, which together represent a case study of Vrnjacka banja-famous health center in Serbia. Health tourism is a type of tourism activity focusing on the professional and controlled use of natural healing elements, physical medicine procedures and programmed physical activities for the purpose of maintaining and improving the physical, mental and/or spiritual health of tourists, with the aim of improving their quality of life. Well-preserved nature is one of the fundamental and competitive advantages of tourism development in Serbia, while the diversity of natural and health-tourism resources becomes an additional reason for the development of health and eco-tourism as an important means of sustainable tourism development. Due to the large number of attractive natural and anthropogenic tourism resources, the Republic of Serbia has a strong foundation for faster health and wellness tourism development, and thus for more comprehensive economic development as a whole. The main objective of this paper is to emphasise the main potentials and challenges in domain of health tourism in Serbia. The case study of Vrnjacka banja will be analyzed in order to present state and guidelines for development of these tourism branches. This paper is structured as follows. The first part is devoted to the theoretical background of health and wellness tourism. In second part, the research context is presented. The third part outlines the research methodology. The next part presents the results and discussion. The final part gives the conclusions, including the main recommendations, limitations and directions for future research.

### **2. HEALTH TOURISM**

There is strong connection between to tourism, health and health culture, which can be analyzed regarding followed two basic aspects (Geic et al., 2010). The first, impact of health culture in the domain of tourist initiative about policy of the tourist migration and the quality of living. The second, the influence of health on tourists wellbeeing and social culture. Although the general public perceives health and medical tourism as synonyms, there are significant differences between them (Kesar & Rimac, 2011), but given the complementarity in the literature, they are often studied in parallel (Wang 2012). Health tourism means organized trips outside one's own local environment with the aim of maintaining, improvement and renewal of the psycho-physical condition of a person, while medical tourism implies organized trips outside one's own health competence with the aim of improving human health through medical interventions (Carrera and Bridges 2006). Kushen (2011) states that there is a clear difference between health and medical tourism.

Health tourism through holistic approach includes health care, beauty treatments, diet, detoxification, talsotherapy and kinetic therapy, or various wellness treatments while medical tourism focused on specific medical procedures and therapies, with the inclusion of elements of health tourism as accompanying treatments (Madzar et al., 2016). Until 2015, The Tourism Development Strategy of the Republic of Serbia envisages the formation of tourism cluster for the purpose of more successful positioning of Serbia as a relevant destination on the international tourism market. Products that require large investments or long-term successful tourism products include: Health tourism ("Spa & Wellness"); Mountains and Lakes ("Mountain and Lake Holidays"); Nautics; and Rural tourism. One study revealed the following facts:

- The ratio of strengths and weaknesses is almost the same, which indicates that it is still insufficiently divided tourism industry,
- Opportunities are greater than hazards, indicating a positive trend, and
- Tourism policy should be designed to maximize the forces of opportunity, and minimize weaknesses and dangers.

### 3. RESEARCH CONTEXT

Serbia is a case in point with tradition more than 160 years in health tourism. Concrete, Vrnjacka banja. According the official records (see <https://vrnjackabanja.co.rs/>), the history of using mineral waters of Vrnjačka Spa goes back far into the past, in the time when this region was inhabited by the Celtic tribe Scordiscs. After the Roman conquest of the Balkans, in the last centuries BC and in the first few centuries AD, mineral waters were used for drinking and bathing as testified by a Roman spring that was discovered during the impoundment of hot mineral water in 1924, and by a great number of coins with images of Roman emperors engraved on them. It is very likely that the newly settled Slavs in the Middle Ages were aware of the healing properties of the Vrnjci waters. There is almost no evidence that the mineral waters were used after the Turkish conquest of the Balkans, with the exception of several unreliable legends saying that the Turks, however, towards the end of their reign, were familiar with the healing properties of the waters and that they were using them as such. After the liberation from the Turks, in the beginning of 19th century, Prince Milos hired a Saxon geologist baron Herder to examine mineral springs in Serbia, thus hot mineral water of Vrnjci was also examined. There are reliable data that the local residents of the village Vrnjci and its surroundings, were using hot mineral water for cure in the middle of 19th century; Janja, the Bishop of Zica, also used it for drinking and bathing. However, the history of modern spa in Vrnjci is related to the year 1868, when Krusevac prefect Pavle Mutavdzic together with a few benefactors and prominent people from Kruševac, Karanovac (Kraljevo) and Trstenik founded the Founding Endowment Association of Hot Mineral Water in Vrnjci. In the same year two hot mineral springs were impounded and building of spa facilities started, the baths first of all. The first season, in the following year 1869, justified the establishing of such an association and showed the perspectives of a new spa. After several years of stagnation, due to the lack of funds for building a sanatorium, and partly because of the negligence of the state, in the 1880s, when the Spa in Vrnjci became state run, and especially after construction of the General Jovan Belimarkovic's villa, a regent of King Aleksandar Obrenovic, Vrnjacka Spa began to develop into a modern health resort. In 1885 the National Inn owned by Kosta Petrovic – Rakica started to work as a real catering facility. Enterprising people from surrounding towns were having their villas and boarding houses built, the central spa area was being landscaped, and in mid 90s the first regulation plan of Vrnjacka Banja Spa was drawn up. The number of visitors was increasing year after year. Spectacular rise of the Spa was experienced in the years preceding the Balkan wars. In that time Vrnjacka Spa got a great number of modern boarding houses, new baths were built, one cinema was in operation, and the construction of another one was in a

preparatory stage. Just before the wars, the railway Stalac - Pozega was constructed and passed near Vrnjacka Spa, so the Spa became very well connected with most big towns in Serbia. Stagnation affected Vrnjacka Spa during the wars from 1912 to 1918. In 1915 several allied hospitals were housed in the Spa boarding houses and resorts. After the First World War a meteoric rise was recorded, whose climax was reached towards the end of the 1930s. Zest was not even fading in the years of economic crisis: modern villas were built, so were sanatoriums (St George, Zivadinovic), in 1924/1925 a great impoundment of a hot mineral water was performed, modern baths were constructed, regulation of the Vrnjacka river was done, the spa parks were extended and landscaped, traffic routes were built, waterworks and sewage systems were extended. According to the 1933 census there were 133 handcraft and commercial shops. Cultural life was flourishing as well, with kermises being organized, classic music concerts held, renowned theatre groups performed as guests. The Tourism Society "Goc" was established and after the Bill on Spas had been enacted, all villas and boarding houses, which numbered up to 257 according to the inventory of 1935, were strictly categorized. That year 28 080 guests were recorded, which vastly outnumbered the recorded visits of all other tourist resorts in Serbia. After the Second World War the profile of visitors changed: now the civil services started sending patients for treatments, the level of provided services declined, a large number of exclusive spa facilities was not used any more. Another upswing Vrnjacka Spa experienced in the 1950s and 1960s owing to the increased number of visitors and construction of new facilities. The greatest visit to the Spa was in the 1980s – almost 200 000 tourists and two million overnight stays. Development of health services in Vrnjačka Banja has a tradition of over 140 years. The first spa physician who was recommending his patients a treatment in Vrnjacka Spa was Joseph Pancic, and the first patient to be treated here on his recommendation was Pavle Mutavdzic, Krusevac prefect. That was in 1860. Since that time, the natural and balneoclimatic factor, which Vrnjacka Banja spa abounds in, has been used to treat diabetes, digestive tract diseases, liver disease, diseases of the urinary organs, diseases of skin, eyes, nervous system, as well as for the patients' health improvement and prevention. Since the 1920s when Vrnjačka Banja spa got its first real sanatorium, "Sveti Đorđe", up to the present days in addition to the use of mineral waters for medical purposes, there have been developed important centers for hospitalization of patients, laboratory and diagnostic centers with the state-of-the-art equipment in the fields of medical services they are used in. Moreover, there is also a long tradition of spa doctors who graduated from prestigious European Universities of Vienna, Graz, Nancy, Moscow. Nowadays professors from the Faculty of Medicine, urologists, gastroenterologists, endocrinologists, cardiologists, radiologists, physiatrists come to Vrnjacka Banja and offer medical service to the patients. Nowadays spa treatments are performed at the Special Hospital for treatment and rehabilitation of patients suffering from digestive organs diseases and diabetes, "Merkur." In this medical institution are implemented scientifically established methods of diagnosing, treatment and rehabilitation, professionally methodological and doctrinal criteria and preventives, diagnostic, therapeutic and rehabilitative medical services in ambulatory, polyclinic and stationary conditions. By applying the methods of modern balneotherapy, physical medicine and rehabilitation, in this institution for prevention, treatment and rehabilitation, the patients are cured from: gastrointestinal, endocrinology and metabolic diseases, urology diseases, respiratory tract, as well as some cardiovascular, gynecological and rheumatic diseases, children diseases indicated for treatment in Vrnjačka Spa and diseases in the field of sports medicine. Vrnjacka Banja has accommodation capacities of over 15,000 beds, of which about 4,500 located in hotels, boarding houses and apartment complexes, 850 beds are in health centers and about 10,000 at home. In Vrnjacka Banja there are hotels of high category in their facilities have covered swimming pools, congress halls and sports facilities. The company is Fontana the largest hotel organization that has 1,500 beds and which includes the famous hotels "Fontana", "Zvezda", "Park", "Sloboda", "Beli Izvor" on Goc

and several comfortable boarding houses in the very seat of the Spa. In terms of the quality of services and capacity utilization, the hotel "Breza" is unrivaled, and "Partizanka", "Slavija", "ŽTP", "Slatina", etc. do not lag behind. The backbone of the economic life of Vrnjacka The spa is undoubtedly a tourist activity, but "thanks" to it, some other economic branches.

### 3.1. Review of past research about Vrnjacka banja

In previous study primary data have been collected about the attitudes of tourists regarding the quality of the existing one tourist offers of Vrnjacka Banja and opportunities for improvement the same (Podovac&Toncev, 2015). Based on the average values of individual elements tourist offers, which were evaluated by tourists, it can be concluded that tourists visiting Vrnjacka Banja are satisfied existing tourist offer. 97.4% of respondents said they would visit Vrnjacka again. Although, this spa is one of the most visited destination in Serbia, there are problems that may have negative effect on future development. Small number of foreign tourists caused low influx of foreign exchange, on one side. On other, the results showed that main factors for this have been the followed: unrecognizable brand of Vrnjci Spa at international market, lack of international promotion, lack of investments, unskilled employees etc. (Podovac&Toncev, 2015). Further development of this spa as competitive tourism destination depends on managers abilities to create innovative products. Based on these results, the great potentials and holistic approach would brought many tourist to Vrnjci Spa (Podovac&Toncev, 2015). One author stated that the key factor of development strategy of Serbian tourism sector is the health tourism, more specifically the health treatments in Vrnjci Spa (Djurovic, 2011). The services in domain health tourism are balneotherapy, sources of mineral water, peloid, and oxygen. To improve health and wellness tourism, in aforementioned study a special hospital Merkur as a dominant facility in the Vrnjci Spa. Also, the key problems have been identified as followed (Djurovic, 2011):

- Infrastructure is in bad condition,
- Water supply in Vrnjacka banja Municipality is very problematic,
- Waste management,
- Problem during the privatization process.

The Vrnjci Spa has a great potentials from development various forms of tourism such as health tourism, wellness, congress, cultural tourism, picnick and sport tourism (Pecic, 2012).

In one empirical research, aimed to determinate key elements of the tourism product, the following 14 elements were calculated (Milicevic et al., 2020):

- 1) Natural beauty,
- 2) Hospitality,
- 3) Health related offer,
- 4) Cultural-entertainment offer,
- 5) Accommodation,
- 6) Spa and wellness offer,
- 7) Clean facilities,
- 8) Diversity and quality offer,
- 9) Sports offer,
- 10) Activities for children,
- 11) Prices,
- 12) Transportation,
- 13) Local informations, and
- 14) Other elements.

Also, there is a statistically important difference between domestic and foreign tourists' ratings of key elements of the tourism product of Vrnjci Spa (Milicevic et al., 2020). Foreign tourists gave higher scores to aforementioned elements of Vrnjci Spa than domestic tourists. It is worth to notice that there were a small number of foreign tourists that participated in the study. The results of the one study revealed the transformation process in health tourism, from only spa for heal illness to wellness (Gligorijevic&Novovic, 2014). To do this, it is necessary to enrich tourism offer, i.e. Davos, Switzerland was expand its offer with prevention program, rehabilitation, wellness etc. In 2015, the USAID thought project has been supported the municipalities such as Kraljevo, Cacak, Vrnjacka Spa, Raska, and Gornji Milanovac to integrate their tourism products (VBM, 2005). At this region, there are two famous tourism destinations Kopaonik and Vrnjci Spa. The results have been showed that local authorities in Vrnjci Spa, in domain of health tourism, needed to improve service quality and marketing activities. Also, the development of following products have been recommended (VBM, 2005):

- Destination Spa with main task to provide clients improvement of life quality, health condition through fitness, education programmes and accommodations. Also, spa menu should be a specific offer.
- Medical Spa with main role to provide complete health and wellness services (i.e. conventional, special treatments and therapies). In the next ten year, the fastest grow will be in the holistic medical treatments and therapies.
- Mineral Springs Spa as a typical European spa/wellness center.
- Resort / hotel Spa which includes large investments.

The main strengths of Vrnjci Spa are (VBM, 2005): human potentials, current capacities and services for health treatments, ISO standards, developed commercial network, complete offer for animation, education etc., high hospitality level, health food, and infrastructure. Key clients would be (USAID, 2015): single (up to 50 years), couple without children, small groups from Serbia as well as Serbian citizens from Germany, Italy, Austria, Russia, Netherlands, Scandinavia. In order to do these, it is necessary to develop informational system, so called "joint venture marketing", and loyalty program for potential clients. The analysis of aforementioned operational plan developed by USAID (2015) has been showed that the main guidelines is to build Resort Spa, but is it only strategy for Vrnjci Spa? Specifically, can this be a model for development of sustainable health and wellness tourism in Serbia? In next section, the research methodology will be explained to assess potentials of Vrnjacka banja.

#### 4. METHODOLOGY

In the study, the authors have been used quantitative criteria (tourist turnover, total number realized overnight stays, average tourist retention, etc.) represent relevant position indicators concrete destinations in the tourism market. After the inventory of tourist resources, the value of the elements of tourism was assessed potential (individually and collectively), ie to determine their use and market value, by UNWTO methodology. The World Tourism Organization classifies the factors of tourist valorization into two large groups internal and external factors (<https://www.unwto.org>). Internal factors refer to the specifics of the quality and value of the object, phenomenon and process can serve in tourism, and in terms of their degree of utilization, namely:

- Urbanization - assessment of the type, quality and degree of equipment of resources
- Infrastructure - characteristics of urban and transport infrastructure
- Tourist equipment and services - accommodation facilities, tourist offer, tourist services
- Inherent characteristics of tourist resources - type of natural or anthropogenic resource.

External factors (external factors that enable the manifestation of tourist value) tourist valorizations enable those elements that are important for their use in the sense that they facilitate accessibility, emphasize attendance, emphasize certain specifics and their recognizability in the tourist market:

- Accessibility of resources - appropriate transport infrastructure
- Proximity of emitting centers - mark concentric zones
- Specificity of the tourist resource - comparison with other resources of the same type
- Significance of resources - market image, volume of tourist demand.

The evaluation was performed from 0-3 points. In this study, content analysis conducted on official data and Development strategy of Vrnjacka banja Municipality (2013 to 2023) as follows.

## 5. RESULTS AND DISCUSSION

According to National Statistical Office, in Vrnjacka banja tourist arrivals and overnight stays has been failed in 2020 as a consequence of COVID 19 pandemic.

The possibility of further development of medical tourism in Vrnjačka Banja by introducing the Schroth therapy has been introduced by Savic&Manic (2023).

Year	Total	Domestic	Foreign	Overnights stays	Domestic	Foreign
2018	247,709	200,343	47,366	818,045	695,171	122,874
2019	283,491	230,887	52,604	907,892	774,206	133,686
2020	211,496	200,879	10,617	698,238	668,635	29,603
2021	267,672	231,112	36,560	852,297	745,118	107,179
2022	207,559	183,522	24,037	756,142	676,052	80,090
I-VI 2023	66,826	56,144	10,682	206,740	174,667	32,073

*Table 1: Tourist turnover in Vrnjacka Banja  
(Source: Statistical Office of the Republic of Serbia)*

Analysis conducted by UNWTO methodology, showed that all factors except Proximity of emitting centers and Specificity of the tourist resource (value 2 of 3) gained maximum value (3 of 3). In this study, following factors are identify:

- Infrastructure,
- Ecology, and
- Privatization of state property in Vrnjacka banja Municipality.

The National Sustainable Tourism Development Strategy is key for positioning Serbia as an international destination. Health tourism can be essential parts of this strategy (Kontic et al., 2019). Development Strategy of Vrnjacka banja Municipality 2013 to 2023, embodies vision, mission, strategic goals defined by priority.

### 1) Vision

Vrnjacka banja as center of health tourism with wellness and spa capacities for active rest in sustainability environment.

### 2) Mission

3) Realized synergy in all strategic sector in Vrnjacka banja in period 2013 to 2023

### 4) Priorites:

- Economic development
- Infrastructure
- Human resource development

- Knowledge, culture and sport
- Development of local authorities
- Ecological issues.

Regarding the time frame of the proposed Development Strategy, it can be concluded that defined goal would not be realized by the end of 2023. It is also consequence of Covid 19 pandemic which block the process of decision making as well financing the projects proposed by Development Strategy of Vrnjacka Banja Municipality (2013-2023).

## 6. CONCLUSION

Due to the numerous attractive natural and anthropogenic tourism resources, the Republic of Serbia has a strong foundation for faster development of sustainable health and wellness tourism. The strategic choice, and implementation of development strategy depend on European and national strategies for sustainable tourism. The main objective of this study was to emphasise the main potentials and challenges in domain of sustainable development of health and wellness tourism in Serbia. The case study of Vrnjci Spa has been analyzed, as representative example for development of other spas, the health and wellness tourism branches at Serbian market. Over 140 years, the health tourism in Vrnjci Spa has existed. According to Tourism Organization of Vrnjci Spa, the accommodation capacities are over 15,000 beds, of which about 4,500 located in hotels, boarding houses and apartment complexes, 850 beds are in health centers and about 10,000 at home. In Vrnjci Spa, there are hotels of high category in which facilities have covered swimming pools, congress halls as well as sports facilities. The review of past research showed that from several studies about Vrnjci Spa, only few has been analyzed primary data about the attitudes of domestic and foreign visitors about service quality. Also, in some studies, the authors were using official meta data from National Statistical Office of Republic of Serbia. In past years, factors which limit further development have been: unrecognizable Vrnjci Spa as a brand on the international tourist market, lack of promotional activities at the international level, lack of investment, unskilled labor and etc. In this study, the mix methods have been used. The author has calculated tourism turnover, and compared by years (i.e. 2019/2020), based on meta data from official sources. Also, UNWTO methodology has been revealed that the main problems of Vrnjci Spa, as attractive tourism destination in Serbia, were infrastructure problems, ecological issues and privatization of state property. The content analysis of the National Sustainable Tourism Development Strategy showed that the health tourism could be essential parts of this strategy. The results for Development Strategy of Vrnjacka Banja Municipality revealed the fact that proposed projects started, but it is unreal to finish them by the end of 2023. Although Vrnjci Spa has been one the most visited domestic destination, it is inevitable that there are problems, which limit further development, such as Covid 19 pandemic which resulted in low arrivals of tourists, especially foreign as well as delays in starting and implementation of projects proposed by Development Strategy of Vrnjacka Banja Municipality (2013-2023). Sustainable development of Vrnjci Spa as competitive tourism destination at national and international market depends on the ability of national and local policy-makers as well as destination management of Vrnjci to create innovative tourism products. It is necessary to create new Development Strategy of Vrnjci Spa for period 2022 to 2032. Based on research results, it can be concluded that there are great potentials for enriching existing tourism products. Innovation strategy will include attractive design of products in domain of health and wellness tourism, continuous innovation of infrastructure, marketing activities at international level, continuous education of staff along with public-private partnership. The development of Vrnjci Spa can provide guidelines for development of some spas in Serbia which have potentials for sustainable development of health and wellness tourism.

Although, Vrnjci Spa can be view as representative example, one of the limitation of this study is that focused on one spa center in Serbia. Serbia has few characteristics that emphasis only in transition environment. Also, Serbia is in process of implementation European Union legaslative therefore, National Sustainable Development Strategy partly includes all specific of health and wellness tourism in Serbia.

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## **KAIZEN COSTING: A CASE STUDY IN A CONSTRUCTION COMPANY**

**Clara Rafaela das Dores da Silva Barbosa**

*University of Minho, School of Economics and Management, Braga, Portugal  
pg36407@alunos.uminho.pt; clararsbarbosa@gmail.com*

**Anabela Martins Silva**

*University of Minho, School of Economics and Management, Braga, Portugal  
anabela@eeg.uminho.pt*

**Amelia Cristina Ferreira da Silva**

*Polytechnic of Porto, CEOS.PP, OSEAN; Porto, Portugal  
acfs@iscap.ipp.pt*

**Eduardo Leite**

*University of Madeira Higher School Technology and Management, OSEAN, Portugal  
eduardo.leite@staff.uma.pt*

### **ABSTRACT**

*This research is conducted with the primary objective of assessing the effectiveness of implementing Kaizen Costing to achieve cost reduction within a civil construction company across four distinct projects. The methodology employed encompasses an exploratory approach based on in-depth case study analysis. The application of Kaizen Costing has been found to make significant contributions to cost-saving efforts. Notably, the approach has resulted in a remarkable reduction of up to 10% in expenses within one of the construction projects. As such, this research objective plays a crucial role in enhancing the overall performance of the company under investigation. Moreover, it serves as a valuable reference for similar cases, ultimately promoting increased productivity and improved cost management.*

**Keywords:** *Kaizen Costing, Construction Company, Case study*

### **1. INTRODUCTION**

The globalization of the economy and rapid technological advancements, among other factors, have driven the pursuit of tools and strategies to enhance the competitiveness of companies across their entire value chain. Achieving this demands the active participation of all internal and external company stakeholders. The synergy between Kaizen and Lean methodologies offers companies the means to adopt novel approaches without necessitating additional resources, thereby fostering the creation of new processes that engage the entire organization and lead to cost reduction. Furthermore, Kaizen can stimulate the development of alternative products or more competitive offerings that might not otherwise be attainable. Considering these considerations, this research delves into the realm of Kaizen, explicitly focusing on Kaizen Costing. The principal aim of this study is to comprehend the motivations driving organizations to adopt the Kaizen methodology, especially Kaizen Costing, the procedural steps involved in its implementation, and its impact on cost allocation within organizations. Within this framework, the study encompasses a literature review section that delves into the Kaizen methodology, particularly emphasizing Kaizen Costing. Additionally, a dedicated section elucidates the research methodology and another that details the empirical case study, complete with analysis. Finally, the study concludes with its findings and implications.

## 2. LITERATURE REVIEW

The quest for enhanced competitiveness among companies in today's globalized economy, driven by technological advancements and other factors, has necessitated adopting tools that encompass the entire value chain. This transformation requires the active participation of both internal and external stakeholders. When coupled with the Lean methodology, a notable approach known as Kaizen equips companies to innovate and optimize processes without additional resources, facilitating organizational excellence and cost reduction. Kaizen helps eliminate waste, making it a foundational component of the Lean philosophy (Green, Lee, and Kozman, 2010; Imai, 2021). The continuous improvement inculcated by Kaizen necessitates the full engagement of the entire organization, starting with top management. Imai (1986; 2021) categorizes employees in an organization into two key roles: those responsible for implementing improvements and those tasked with maintaining standards. Management ensures that the standards are met, while teams are responsible for continuously enhancing processes and their execution. Imai (1986; 2021) further classifies improvement into innovation and Kaizen. While innovation often demands substantial investments in cutting-edge technology, resulting in radical changes, Kaizen focuses on making incremental, cost-effective improvements in everyday processes, which are usually straightforward and fundamental (Imai, 1997). Thomaz (2015) supports that significant investments or major transformations are not prerequisites for achieving these incremental improvements. To ensure the correct implementation of Kaizen, Imai (1997) emphasizes the importance of management adhering to specific principles, which include (i) aligning Kaizen with top management, (ii) emphasizing processes and results, and (iii) following the PDCA cycles (Plan, Do, Check, and Act). Successful implementation of Kaizen relies on five fundamental values: (i) creating value for the customer; (ii) involving the entire organization, (iii) eliminating waste; (iv) going to the Gemba (the place where work is done), and (v) promoting visual management (Guedes, 2008; Imai, 2010). Kaizen Costing, like Target Costing, extends beyond the production and development phases, integrating cost management during the production phase of a product's life cycle (Guilding, Craven, and Tayler, 2000; Lee and Monden, 1996). Target Costing strategically ensures that production costs align with predefined margins after establishing market prices (Yoshikawa, Innes, and Mitchell, 1994). It allows companies to adapt pricing strategies to gain market share or cater to niche markets. Monden (1995) contends that Target Costing seeks to develop cost-efficient products that maintain product quality and competitive pricing, thereby satisfying shareholder profitability expectations. In contrast, Kaizen Costing focuses on a continual, gradual reduction in production costs during the product's life cycle, primarily emphasizing cost savings during production. In practice, a company striving to maintain competitiveness cannot compromise on product value by using cost-cutting measures. Alternatively, reducing profit margins is discouraged by stakeholders who expect increased profitability. The ideal scenario is maintaining the product's price throughout its life cycle while achieving cost reductions that enhance company profitability. Management's responsibility in this context is to evaluate the price needed to meet market objectives while preserving desired margins (Monden, 1995). Correctly applied, Kaizen Costing can lead to annual production cost reductions of between 3% and 5%, even when many costs are fixed or non-negotiable. The benefits of cost reduction, achieved throughout the product's life cycle, impact the company's overall costs and the costs associated with processes and other products within the organization. Therefore, it is imperative to involve and sensitize all value chain members to capitalize on the advantages that Kaizen Costing brings to their activities (Cooper and Slagmulder, 1999, 2004). Cooper and Slagmulder (2004) and Yoshikawa et al. (1994) highlight cost control from various angles. Kaizen Costing can be applied at three levels: (i) specific timeframes, (ii) specific items, or (iii) indirect costs (Sani and Mahdi, 2012). Cooper and Slagmulder emphasize a multidisciplinary approach to controlling the product mix by top management.

Yoshikawa et al. focus on cost reduction for new products through Target Costing, while Kaizen Costing is dedicated to reducing the production costs of existing products. The advantages of Kaizen encompass measurable and non-measurable benefits. While it often goes unnoticed, the methodology can enhance the workforce's skills and facilitate workplace improvements. By implementing Kaizen, companies may require fewer human resources, as existing employees can improve their qualifications and streamline processes, leading to increased motivation, teamwork, and reduced workplace stress. Though challenging to quantify, these benefits significantly impact organizational performance (Manos, 2007). According to the founder of the Kaizen methodology (Imai, 1998), minor, continuous improvements enhance the work environment, efficiency, effectiveness, and safety, ultimately resulting in higher profits through cost reductions. Advantages of Kaizen, when correctly applied, include team involvement, increased training and development within the company, and active worker participation, fostering professional recognition (Imai, 1986). Continuous improvement initiatives lead to identifying and eliminating waste and problem-solving within the work environment (Imai, 1986). However, there are several potential disadvantages to consider, as noted by Imai (1986), New (2003), and Brunet (2003): (i) reversing implemented measures can be highly challenging; (ii) as a Japanese methodology, applying Kaizen in other cultural contexts may yield contradictory outcomes; (iii) it can lead to increased workload, as problem-solving activities are an integral part of Kaizen; and (iv) implementing technological changes may pose difficulties in continuous improvement processes, necessitating reorganization.

### **3. METHODOLOGY**

The research methodology adopted in this paper is exploratory, aiming to provide deeper insights into the subject of study due to the limited availability of information on the topic. It serves to clarify the situation under investigation and can lay the groundwork for formulating research questions or hypotheses for future studies. It is important to note that this methodology does not necessarily constitute a case study. Instead, it serves a descriptive function by comprehensively documenting events within their context, enhancing understanding of the subject matter. The defined objectives are structured and aimed at problem-solving or evaluating alternatives. The data sources for this study include documentation, records in archives, interviews, direct observation, and physical artifacts. The data analysis process involves the examination, categorization, classification, or recombination of evidence while remaining mindful of the initial positions of the case study. The intrinsic case study methodology adopted in this research focuses on a unit of analysis related to implementing Kaizen, specifically Kaizen Costing, within a construction company. The study aims to replicate the case study conducted by Robert and Granja in 2006, which was applied to a construction company designated as "Company A". In this case, we seek to determine whether the results obtained by Robert and Granja in 2006 remain consistent when applying the Kaizen methodology, with a specific emphasis on Kaizen Costing, to a Portuguese construction company. This particular construction company, labeled as "Company A", has been operating for 75 years in the northern region of Portugal.

### **4. CASE STUDY**

This study focuses on the activities of 'Company A,' specifically comparing the costs of four projects over a quarter. These projects are categorized by size, with Projects 1 and 2 covering areas under 500 square meters and Projects 3 and 4 exceeding 500 square meters. This division of time periods was made because the study primarily evaluates the construction phase, rather than the design phase, aligning with the focus on Kaizen Costing. It's worth noting that this study does not involve customer service since there have been no complaints, and all construction projects have met individual expectations (refer to Figure 1).

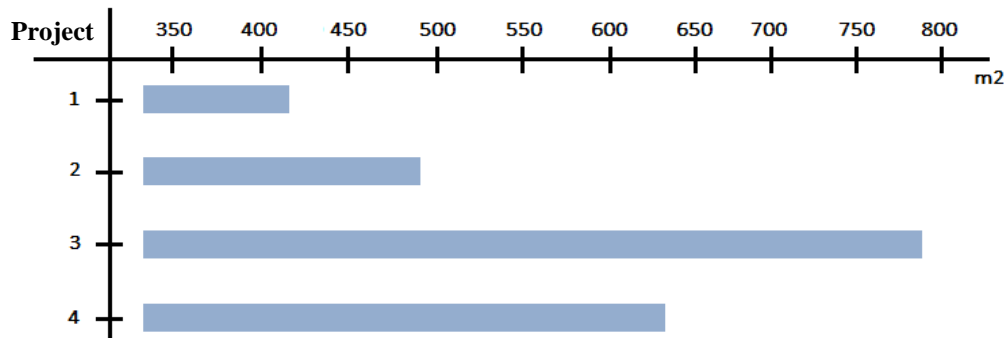


Figure 1: Scheme of works per m2  
(Source: Own elaboration)

As previously discussed in the literature review, the PDCA cycle (Plan, Do, Check, and Act) has been implemented and integrated into the routine, involving all stakeholders within the business. Following the analysis phase, new ideas and suggestions can emerge, providing opportunities to enhance the final product (see Figure 2).

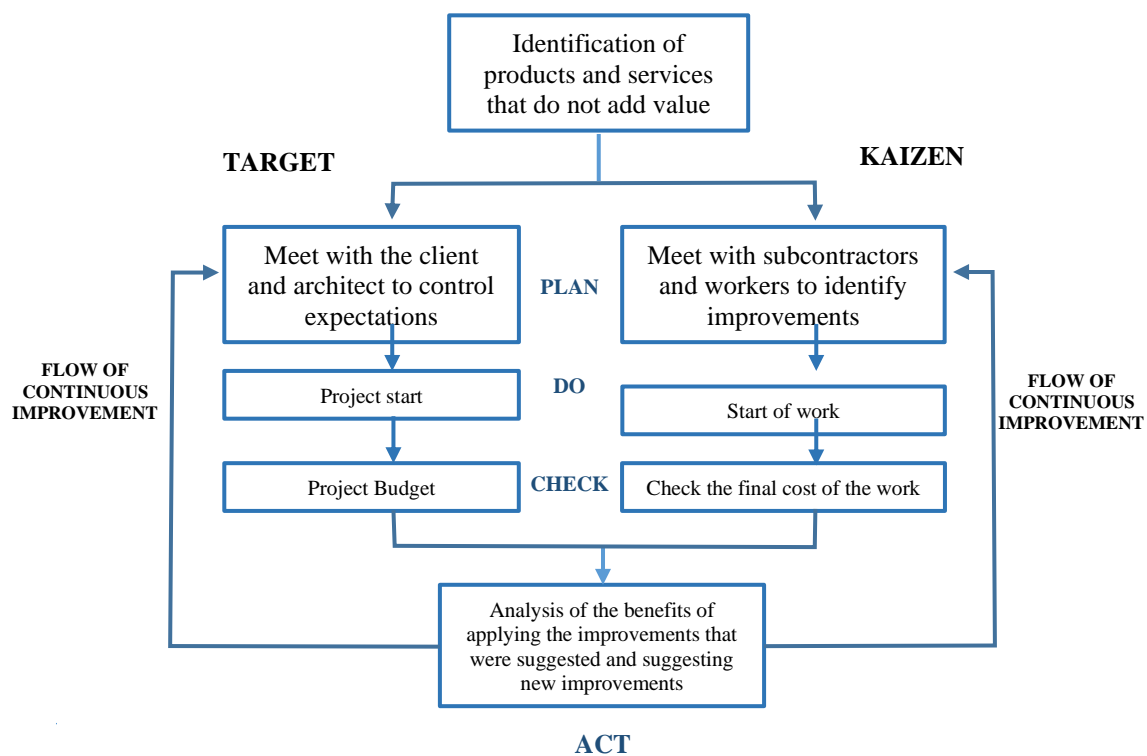


Figure 2: Schematic of the implementation methodology  
(Source: Own elaboration)

Over time, the relationships between contractors and subcontractors have strengthened, leading to collaborative efforts for continuous improvement. While it may seem that implementing Kaizen Costing could reduce the profit margin for suppliers, this is not the case. The study involved reaching out to a highly reliable supplier to explore the possibility of applying more competitive prices that would benefit the supplier and align with most of the subcontracts to be carried out.

To engage construction workers, they were asked to email their suggestions regarding how tasks should be performed, with a commitment to evaluate and implement these suggestions if they were beneficial. These ideas would then be shared with their colleagues.

#### 4.1. Office Staff Suggestions

An informal meeting was organized with the key departments in the office to gather suggestions for improvement. Each department was requested to provide four points for consideration, with the final point reserved for medium to long-term implementation due to requiring investment. The responses were unanimous, and discussions were held to explore cost-reduction opportunities (see Table 1).

Proposals	Suggestions for improvement
<b>Centralized banking</b>	Keep only the accounts with the greatest flow in order to reduce commissions and credit cards
<b>Reducing electricity consumption</b>	Changing light bulbs to more economical ones and applying home automation
<b>Reducing paper waste</b>	Sensitise employees to reducing waste, assign an average number of copies per department and understand why if this figure is exceeded.
<b>Reduced heating costs</b>	Installation of panels to help with air conditioning

*Table 1: Summary table of office improvement suggestions  
(Source: Own elaboration)*

This approach allows for a comprehensive evaluation and subsequent implementation of cost-saving measures, ensuring the active involvement of all relevant parties.

#### 4.2. Suggestions from site employees

While it's worth noting that not all employees were equally receptive to the idea of improvements, a significant portion provided valuable input, resulting in a total of 15 suggested improvements. After careful consideration, five of these suggestions were successfully implemented. The implemented ideas are listed below (see Table 2).

Proposals	Suggestions for improvement
<b>Few helpers on site</b>	Optimization of existing support machinery and possible purchase of some machines
<b>Disorganized construction site and lack of cover to protect materials (cement, sand, lime)</b>	Products organized by type/category to make them easier to find and a dry, sheltered place to put the material, leading to fewer breakages
<b>Low-skilled workers performing tasks</b>	Training to reduce errors and prevent accidents at work
<b>Lack of a waste disposal policy</b>	Recycling of waste, sale of leftovers, transformation into processed materials
<b>Lack of organization at work</b>	Initiating daily meetings to assign tasks, providing all the tools and accessories to carry out the work, optimizing it and avoiding unnecessary travel

*Table 2: Summary table of suggestions for improvement in the works  
(Source: Own elaboration)*

This collaborative approach reflects the engagement of site employees in the pursuit of improvements, with specific ideas successfully integrated into the construction processes.

#### 4.3. Analyzing costs

Following the implementation of the suggested improvements, an analysis of the costs related to Kaizen Costing was conducted. The results of the works, categorized into their respective areas, were also examined.

The costs under consideration are consistent across all four works and are documented within Class 6 accounts, specifically account 62, which pertains to external supplies and services. Cost figures from the previous quarter were scrutinized to assess the potential for cost reduction in the forthcoming quarter. This analysis identified decisions that needed to be made to achieve cost reductions. The primary means through which cost reduction was achieved involved negotiating contracts with subcontractors and more experienced suppliers. Reallocating resources to the works and reconsidering what was necessary versus what could be considered dispensable played a pivotal role in reducing costs across all four Projects. The results will be presented for Project 1 and 2, both of which are under 500 square meters in size, followed by Project 3 and 4. Detailed results can be found in Table 3 and Table 4. The data in these tables will provide insights into the outcomes of cost-reduction efforts across the different works and their respective areas, demonstrating the impact of the implemented changes.

ACCOUNT	HISTORICAL COST		KAIZEN COSTING	
	Project 1	Project 2	Project 1	Project 2
Subcontracts	19 916,63 €	24 853,20 €	17 589,43 €	22 698,36 €
Specialized services	1 586,32 €	3 452,88 €	1 425,88 €	2 998,25 €
Electricity	110,95 €	150,37 €	108,50 €	148,96 €
Water	657,12 €	1 020,39 €	578,94 €	953,42 €
Incomes and rents	26 861,25 €	25 876,25 €	24 358,21 €	25 506,32 €
Communications	50,37 €	22,30 €	49,97 €	18,58 €
Cleaning, hygiene, and comfort	250,00 €	250,00 €	200,00 €	200,00 €
<b>TOTAL</b>	<b>49 432,64 €</b>	<b>55 625,41 €</b>	<b>44 310,93 €</b>	<b>52 523,89 €</b>
Area of the unit (in m2)	420	498	420	498
<b>TOTAL €/m2</b>	<b>111,70 €</b>	<b>111,70 €</b>	<b>105,50 €</b>	<b>105,47 €</b>
<b>Cost reduction</b>			<b>-10,38%</b>	<b>-5,58%</b>

*Table 3: Results of Project 1 and 2*  
(Source: summary of data obtained from Company A)

ACCOUNT	HISTORICAL COST		KAIZEN COSTING	
	Project 3	Project 4	Project 3	Project 4
Subcontracts	70 183,03 €	31 065,99 €	68 215,80 €	30 002,36 €
Specialized services	4 960,25 €	2 587,96 €	4 253,75 €	1 453,98 €
Electricity	200,95 €	298,37 €	199,50 €	280,74 €
Water	1 092,30 €	930,51 €	1 020,30 €	889,57 €
Incomes and rents	28 630,00 €	29 475,20 €	27 400,00 €	27 400,00 €
Communications	109,85 €	92,60 €	100,28 €	85,87 €
Cleaning, hygiene and comfort	450,00 €	450,00 €	400,00 €	400,00 €
<b>TOTAL</b>	<b>105 626,38 €</b>	<b>64 900,63 €</b>	<b>101 589,63 €</b>	<b>60 512,52 €</b>
Area of the unit (in m2)	785	632	785	632
<b>TOTAL €/m2</b>	<b>134,56 €</b>	<b>102,69 €</b>	<b>129,41 €</b>	<b>95,75 €</b>
<b>Cost reduction</b>			<b>-3,82%</b>	<b>-6,76%</b>

*Table 4: Results of Project 3 and 4*  
(Source: summary of data obtained from Company A)

While the results obtained did not reach the same level of significance as those reported by the authors, they generally aligned with Company A's expectations. Consequently, there is a plan to re-evaluate Project 3, which experienced the lowest cost reduction. As a result of this study, Company A is considering replicating the suggestions and explanations that were implemented.

This demonstrates a proactive approach to incorporating the lessons learned from the investigation into the company's ongoing practices, with the potential for further refinements and improvements.

## 5. CONCLUSION

Kaizen methodology, and consequently Kaizen Costing, when applied effectively, can bring significant benefits to organizations committed to achieving their set objectives. The application of Kaizen Costing results in a cost reduction ranging between 3% and 5%, as indicated in the literature review. These values were corroborated by the case study works, with some even showing higher variations. In summary, the results met our expectations. However, since this is an exploratory study with an application limited to four sites, achieving better results would require applying this tool to more sites while maintaining the same team, companies, and methods. All parties involved should continue to actively participate and contribute suggestions. It may be of interest to replicate this study in other organizations within the same sector or across different sectors that have also implemented the Kaizen methodology. This would enable a more extensive analysis of the impacts and advantages of implementing this methodology. Furthermore, this study can contribute to providing clarity to companies in various sectors regarding the added value of adopting methodologies that enhance performance. The main limitations are associated with the case study methodology itself; for example, the results obtained cannot be generalized.

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# DIGITALIZATION, WOMEN ENTREPRENEURSHIP AND SUSTAINABLE DEVELOPMENT GOALS: THE BULGARIAN CASE

**Galina Zaharieva**

*D. A. Tsenov Academy of Economics, Svishtov, Bulgaria*  
*g.zaharieva@uni-svishtov.bg*

## ABSTRACT

*The focus of the paper is on the relationship between digitalization, female entrepreneurship and sustainable development. Its aim is to outline the role and contribution of female entrepreneurship, in particular digital female entrepreneurship in Bulgaria, to the implementation of the Sustainable Development Goals. It examines the specifics of digital entrepreneurship and how it contributes to the achievement of sustainable development goals. Special attention is paid to female entrepreneurship, including in Bulgaria. To achieve the goal of the research, a three-step technology is applied. It is based on a set of indicators such as the number of newly born enterprises, the number of closed enterprises, self-employed persons with and without employees, the level of Total early-stage Entrepreneurial Activity, description of characteristics of women entrepreneurship and a study of the profile of Bulgarian digital startups founded by women or by women and men. The results show that there is a difference in entrepreneurial activity between women and men, which is below the average for the European Union. The main characteristics of female entrepreneurs in Bulgaria are also presented. The share of female digital entrepreneurship is not large, but it contributes to the achievement of the goals for Sustainable Development. This is evidenced by the subject of their activity focused on areas such as education, health, sustainable and environmentally friendly production and consumption, providing work for vulnerable groups, digital marketing and online commerce. The main conclusion is that theoretical studies and empirical evidence clearly highlight the contribution of women (digital) entrepreneurship to achieving a more sustainable, more socially and environmentally oriented economy.*

**Keywords:** *Female entrepreneurship, Digital entrepreneurship, Sustainable development goals, Startups*

## 1. INTRODUCTION

The degree and the speed of development of individual countries in the world is not the same. Each of them has its own problems and faces different challenges to deal with. And despite differences in economic development, every country faces problems such as poverty and inequality in its various forms, the overcoming of which sometimes requires collective action. Similar actions are also required to protect the environment, because the quality of life of people at the given moment depends on it, as well as the protection of the resources necessary for the economy and for the future generations. The desire of the international community to achieve sustainable development was reflected in the UN program "Transforming the world: 2030 agenda for sustainable development" adopted in 2015. Its 17 goals aimed at eradicating poverty, protecting the planet, protecting human rights and ensuring prosperity for all. Their achievement requires new and innovative ways that do not rely only on the help of donors, but are rather based on the principle of communities helping themselves (Apostolopoulos, Al-Dajani, Hol, Jones, & Newbery, 20018) or on private initiative, aided by the creation of a suitable environment. This draws attention to the potential that entrepreneurship carries in this process, especially in the context of digital transformation. In this direction, women's entrepreneurship is of particular interest, due to its specificity and the role of women in society and the economy in a national and an international aspect.

In this context, the aim of the present study is to outline the role and contribution of female entrepreneurship, in particular digital female entrepreneurship in Bulgaria, to the implementation of the Sustainable Development Goals.

## **2. DIGITAL ENTREPRENEURSHIP AND SUSTAINABLE DEVELOPMENT GOALS**

Digitalization has affected all spheres of socio-economic life in a national and international aspect. It has become a factor of crucial importance that every company should consider in today's highly competitive world (Mihaylova, 2023). Digitalization has opened up new opportunities for access to markets and customers, but at the same time it has also created a number of threats (Zahariev, Zaharieva, Mihaylova, & Ivanova, 2022). Some companies have adapted their business models to take advantage of digitalization and meet the expectations of their customers. Others, thanks to it, were designed to be digital, which in most cases provides them with a fast track to internationalization. Traditional forms of entrepreneurship were supplemented by hybrid and digital forms.

### **2.1. The specifics of digital entrepreneurship**

Modern technological advancements and digitization have significantly changed the entrepreneurial environment and created an opportunity to do business differently from the traditional way. Communication with customers has changed, distribution channels have been modified, new market spaces and new products have been created. This did not go unnoticed by researchers whose attention was drawn to emerging new forms of entrepreneurship. Concepts such as internet entrepreneurship, cyber-entrepreneurship, e-entrepreneurship, web entrepreneurship, information entrepreneurship, online entrepreneurship and digital entrepreneurship have emerged (Paliwal, Chatradhi, Tripathy, & Jha, 2023), seen as different forms of entrepreneurship by some authors, or as a variation of digital entrepreneurship by other. In turn, digital entrepreneurship is considered by some authors as a subtype of entrepreneurship (Siva Vineela, 2018). Digital entrepreneurship is identified with "entrepreneurial opportunities that are created and pursued through the use of technological platforms and other information transmission equipment" (Antonizzi & Smuts, 2020). It differs from the traditional one in several directions. Digital entrepreneurship is characterized by easier market entry; easier production and storage; faster distribution of the digital market; digital workplace; digital product; digital service (Siva Vineela, 2018), harder organizational commitment (Paliwal, Chatradhi, Tripathy, & Jha, 2023), communication with computer and digital technologies and flexible and collaborative organizational structure (Ballı, 2020). According to Hull, Hung, Hair and Perotti (Hull, Hung, Hair, & Perotti, 2007), there are three types of digital entrepreneurship based on the degree of digitalization: mild digital entrepreneurship, which according to other definitions is a hybrid form between traditional and digital; moderate digital entrepreneurship, for which the digital infrastructure is of particular importance, since a large part of the activities are digitized (products, delivery or other components) and extreme digital entrepreneurship, in which the entire venture is digital.

### **2.2. The relation between digital entrepreneurship and the sustainable development goals**

The role of business in the economic development of the country is indisputable. Enterprises produce products, create jobs and stimulate economic growth. As for the achievement of sustainable development, the effects here are not always unambiguous (Camodeca & Amici, 2021). There are companies that apply controversial practices in relation to their employees, use technologies that harm the environment, use resources in an unscrupulous way for the needs of their production activity. According to a report by Deloitte and its authors (Deloitte, 2018), there are many ways in which companies can contribute to achieving the goals of sustainable development (Herman, 2022).

To overcome the problem of poverty (SDG1), companies can produce products with lower costs and use specific practices in the delivery of goods to poorer groups of consumers by implementing strategies of cooperation with local producers. Such collaboration also contributes to solving the problem of hunger (SDG2). In this direction, the efforts of companies for reducing food wastage (SDG2; SDG12) are important. Donating funds from digital entrepreneurs to support the United Nations' World Food Program is a good practice here. In order to achieve SDG3, the working conditions in enterprises, as well as investments and innovations in food technology, are essential. During the Covid-19 pandemic organizing remote work has played an important role, as well as the emergence of new digital entrepreneurs and the use of artificial intelligence to provide health services (Zahariev, Zaharieva, Mihaylova, & Nikolova, 2022). The partnership between business and educational institutions is of particular importance for building an educated and skilled workforce (SDG4). It should be mentioned here that the big technology companies have joined the educational process by providing the opportunity for free education. On the other hand, thanks to ICT, education has become possible and accessible, even for more remote and poorer regions. Gender equality (SDG5) is important for the economy. For its achievement, both the stimulation of female entrepreneurship and the creation of conditions for its development, as well as the policies applied by companies regarding the hierarchical growth and empowerment of women and the payment of their work, are important. Companies are largely responsible for providing clean water and sanitation to their employees (Zahariev, et al., 2023). Also, the way they use water depends on keeping this resource clean for future generations (SDG6; SDG14). An important role in achieving this goal is the introduction of smart water management and the use of innovations based on digital technologies such as the Internet of things (IoT), big data, artificial intelligence (AI), blockchain, and augmented reality (AR). In recent years, thanks to the investments made by entrepreneurs, the production of energy from renewable resources has grown significantly (SDG7). This, in combination with digital technologies, allows compensation of emitted harmful emissions and building of a sustainable economy (SDG13). Technology enables the creation of new businesses (some entirely digital in nature) and jobs, and drives economic development and growth (SDG8). It also contributes to building sustainable cities and communities (SDG11) and reducing inequalities (SDG10). The digital transformation of enterprises, innovation and the introduction of ICT infrastructure contribute to the construction of resilient and sustainable infrastructure (SDG9). It should be noted here that the goals of sustainable development are interrelated and interdependent. At the same time, the typology of entrepreneurship depending on the degree of digitalization is important for the analysis of its contribution to the SDGs.

### **2.3. The women entrepreneurship role**

When it comes to the Sustainable Development Goals, women have a dual role. On the one hand, they are beneficiaries, and on the other hand, they play an active role in achieving them. Specific to female entrepreneurship at this stage is that it is generally less developed. Female-owned micro, small and medium-sized enterprises (MSMEs) are smaller, which also determines the smaller number of employees in them, compared to those owned by men (Bruhn, et al., 2021). According to some studies, women-owned businesses are less profitable, grow more slowly, have higher closure rates and use less external finance. The indicated differences "can be explained by the choice of sectors women tend to operate in, which are predominantly service, retail, and hospitality. These sectors are more crowded and register lower profits" (Carranza, Dhakal, & Love, 2018). Another difference between female and male entrepreneurship is found in motivation and goals. Women in general are not only driven by economic goals, but also by non-economic ones such as flexibility, service to society, etc., and in general their entrepreneurship has the characteristics of a more sustainable and

environmentally friendly enterprise. There are a number of publications dedicated to women's entrepreneurship and sustainable development, and they are aimed at different aspects. A more complex bibliographic study (Raman, et al., 2022) concluded that the most frequently studied SDGs are SDG 8, decent work and economic growth, SDG 10, reducing inequalities and SDG 5, gender equality.

### **3. WOMEN ENTREPRENEURSHIP IN BULGARIA**

#### **3.1. Methodology and data**

To research the contribution of women digital entrepreneurship to the implementation of the Sustainable Development Goals, we will apply a three-step technology. First, we will analyze the general state of entrepreneurship in Bulgaria using indicators such as the number of newly born enterprises, the number of closed enterprises, self-employed persons and the level of Total early-stage Entrepreneurial Activity (TEA). TEA is one of the important indicators for analyzing entrepreneurship developed by The Global Entrepreneurship Monitor (GEM). It measures the proportion of the adult population who are starting or running a new business. According to GEM a start-up is a new business, which has paid wages or salaries, including to the owners, for no more than 42 months. In the opposite case it is defined as an Established Business Ownership (EBO) (Hill & Sahasranamam, 2023). Unfortunately, the data for Bulgaria is available for the period 2015 - 2018. Second, we will characterize women entrepreneurs in Bulgaria. Third, we will analyze the profile of digital startups founded by women or those founded by women and men. For the first two steps, we will rely on statistics and data from previous research, and for the third, we will study the profile of the startups registered in EU-Startups by visiting the web page of each registered startup (most of them already EBO at the present time) and examining the profile of their activity. Based on the collected information, we will draw conclusions about their contribution to the achievement of sustainable development goals.

#### **3.2. Data and results**

##### *3.2.1. General state of entrepreneurship*

The state of entrepreneurship and entrepreneurial activity can be analyzed based on various indicators. It is related to the number of newly created and closed companies within the year and different criteria can be used for the analysis. Table 1 shows the dynamics of newly created and closed private enterprises by year, from which it is clear that from 2017 the number of newly registered enterprises started to decline and the number of deregistered enterprises to increase (See Table 1). At the same time, according to data from the National Statistical Institute of Bulgaria, the share of ICT is growing both in terms of the share in active enterprises and the share in newly born ones. This can be perceived as a kind of indication of the digitization of the economy and growth of digital entrepreneurship. According to Eurostat data, it is established that the number of self-employed women in Bulgaria for 2021 was 196.45 thousand, compared to 200.95 thousand men, which in terms of percentage constitutes about 49% and 51% of all self-employed in the country, respectively.

*Table following on the next page*

Years	Number of NEW Limited Liability Companies	New business density rate*	Number of CLOSED Limited Liability Companies	Closed business density rate
2009	8199	1,6	370	0,1
2010	6903	1,4	539	0,1
2011	8267	1,7	922	0,2
2012	8558	1,7	1098	0,2
2013	8168	1,7	905	0,2
2014	7751	1,6	971	0,2
2015	8720	1,8	1035	0,2
2016	9423	2,0	967	0,2
2017	9022	2,0	1081	0,2
2018	8855	2,0	1092	0,2
2019	7872	1,8	1047	0,2
2020	6220	1,4	980	0,2

\* New business density rate: The number of newly registered firms with limited liability per 1,000 working-age people (ages 15-64) per calendar year. Closed business density rate is determined on a similar principle

*Table 1: Dynamics of private enterprises in Bulgaria)  
(Source: World Bank, Entrepreneurship Database)*

On average for the EU, these percentages are calculated at around 46% for women and 53% for men. The data show that the number of registered employers with employees predominates among women, while the share of self-employed persons without employees is greater among men (See Table 2).

	Self-employed persons with employees (employers)	Self-employed persons without employees (own-account workers)	Self-employed persons with employees (employers)	Self-employed persons without employees (own-account workers)	Total
	Females		Males		
<b>Bulgaria</b>	127	69	76	125	397
	32%	17%	19%	31%	
<b>EU</b>	8722	6091	5820	11134	31767
	27%	19%	18%	35%	

*Table 2: Self-employed persons with and without employees in 2021 (in thousands persons and % in total self-employed)  
(Source: Eurostat and own calculations)*

However, the share of self-employed in total employment in Bulgaria amounts to 10.2% for 2021, compared to 13.1% for the EU. The percentage of self-employed women amounts to 7%, which is below the EU average (9%), and that of men to 13%, compared to 16% for the EU according to the data from Eurostat (CEDEFOP, 2023). Historically, the TEA in Bulgaria is rising as in 2018 it amounts to 6% (See Table 3). However, it can be seen that the entrepreneurial activity of women decreases for the period 2015-2018 when Female/Male TEA becomes 0.88. Female/Male Opportunity-Driven TEA Ratio changes over the years showing that in 2018 there is not a very big difference in the motivation of women and men to start a business.

	2015	2016	2017	2018
Total early-stage Entrepreneurial Activity (TEA)	3,46	4,84	3,7	6
Female/Male TEA	1,06	1,05	0,93	0,88
Female/Male Opportunity-Driven TEA	0,72	0,8	0,7	0,87

*Table 3: Percent of startup groups in all registered startups  
(Source: <https://www.gemconsortium.org/data>)*

### *3.2.2. The profile of female entrepreneurs in Bulgaria*

According to studies of Bulgarian researchers, women entrepreneurs are mainly over 40 years old, with higher education, mostly economic, followed by technical (Georgieva, 2021). They operate in areas such as trade, manufacturing, professional activities and scientific research. Women entrepreneurs rely on their communication skills, the skills to build good relationships in the workplace, the ability to adapt to change and do not undertake high-risk business ventures. A large number of them need adequate financial support, training and mentoring. Their motives for starting a business are both economic and to achieve personal satisfaction, realize a dream or realize a business idea.

### *3.2.3. Women's digital entrepreneurship and the Sustainable Development Goals*

Based on the characteristics of female entrepreneurs and the conclusions from the specifics of female entrepreneurship, we will try to analyze digital female entrepreneurship from point of view of its contribution to achieving the SDGs. According to the data of EU-Startups, a leading online publication with focus on startups in Europe, there are more than 20 thousand startups from all EU countries registered (EU-Startups, 2023). Since we want to highlight digital startups, we use three key words - digital, AI and IT to identify them. The processed data shows that of all startups in the EU, 14% fall into the digital category, 48% into AI and 85% into IT, with some falling into more than one category. The distribution of Bulgarian start-ups is similar, as from the total number (233) 18% fall into the digital category, slightly more than half into the artificial intelligence category and the largest number of those in the IT group (See Table 4).

	<b>Digital</b>	<b>AI</b>	<b>IT</b>
<b>EU_27</b>	14	48	85
<b>BG</b>	18	51	82

*Table 4: Percent of startup groups in all registered startups  
(Source: Own calculations based on information from EU-Startups)*

Of the considered sample of startups, about 20% were created by women or by men and women. The profiles of the established companies show that some of them are involved in production such as healthy foods, organic products or the production of biodegradable products. Another part is oriented towards sustainable consumption and the fight against food waste. Some startups are focused on the physical and mental health of people and their personal development, using artificial intelligence or modern means of communication for the purposes of their activity. There are also those who have dedicated their activities to the education of children and adults or the creation of work for people in need (e.g. Humans in the Loop, which is an award-winning social enterprise founded in 2017 with the vision to connect conflict-affected communities to digital work). Some of the startups operate in the field of business consulting, digital marketing or online trade.

It seems that few of the women's startups are purely technologically oriented. Refracted through the lens of the SDGs, we can confirm that women's digital entrepreneurship is driven by both economic and social and environmental motivations.

#### 4. CONCLUSION

The digitalization of the economy brings a new perspective and new potential to the achievement of sustainable development goals. It also finds its manifestation in entrepreneurship, helping it to develop in new forms and directions. It is through these new forms that it contributes with new strength to the achievement of socially significant problems, such as those laid down in the goals for sustainable development. Women's entrepreneurship, including that in Bulgaria, is not an exception. Theoretical studies and empirical evidence clearly highlight its contribution to achieving a more sustainable, more socially and environmentally oriented economy.

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## **A MODEL OF CHANGE MANAGEMENT FOR THE FILM INDUSTRY IN THE CONTEXT OF CONTINGENCIES**

**Brigita Beniusyte**

*Film producer; University of Madeira, Funchal, Portugal  
brigita@m-films.lt*

**Eduardo Manuel de Almeida Leite**

*OSEAN, CiTUR, ESTG, University of Madeira, Funchal, Portugal  
eduardo.leite@staff.uma.pt*

**Humberto Nuno Rito Ribeiro**

*GOVCOPP; ESTGA, University of Aveiro, OSEAN, Portugal  
hnr@ua.pt*

**Carmen Freitas**

*OSEAN, ESTG, University of Madeira, Funchal, Portugal  
carmenf@staff.uma.pt*

**Rafael L. Pedrosa**

*Polytechnic of Porto; CEG, Open University, Lisbon, Portugal  
rafael.pedrosa@sc.ipp.pt*

### **ABSTRACT**

*The purpose of this paper is to offer a model for change management for the film industry in the context of contingency. The model was developed based on theoretical analysis and discussion of most referenced models in change management, as well as the literature on contingency. Subsequent discussion of its applicability to the film industry is presented and resulted in a proposed model for this industry composed by four key steps: Situational awareness, Decision-making, Communication, and Monitoring.*

**Keywords:** *Change management, Film industry, Contingency, Communication, Monitoring*

### **1. INTRODUCTION**

Change is an ongoing process in every area, and organizational leaders who anticipate and respond to those changes ultimately make the right decisions and succeed (Hemant and Kumar 2014). Today, in the aftershock of the COVID pandemic, all organizations need to plan for change and implement the needed adaptations, always adjusting to the changing circumstances. There are many models that can be used to prepare for the implementation of change in organizations, so it is very important to adapt and use the models that are appropriate for the specific situation. However, the COVID pandemic clearly showed that it is extremely useful to be able to react quickly and to adapt the change models used in simple conditions to the needs of the organization. Change management is an integral part of the activities of all organizations, and company managers must properly prepare for these changes. Therefore, they will need to spend a lot of time introducing employees to future changes and their benefits, preparing a vision and strategy, providing a specific action plan, among other activities. As it is perceived, change management is a long and painstaking process that requires a lot of attention and time (Saetren and Laumann 2017). In 2020 the pandemic caused by Covid-19 led to inevitable changes that the industry was not prepared for. Different sectors have dealt with the challenges posed by the pandemic in different ways.

The creative industries sector, which was forced to react quickly and radically, changed all operational processes due to the restrictions caused by the pandemic. This situation has put into evidence the sector's need to manage change smarter and faster. The pandemic, and the forced operational and organizational changes associated with it, happened in the beginning of 2020; however, it still has impact on many industries nowadays; The creative industries is still struggling with this process, which reflects the fact that management of change in these industries is not common or subject to an in-depth analysis. Out of all the sub-sectors of the creative industries, the film industry and the main film exhibitor, cinemas, make this problem even more apparent, which emphasises the need for more knowledge on change management in the context of contingencies. Therefore, it is important to investigate if there is enough knowledge about the management of changes in the cinema sub-sector of the creative industries in the context of contingencies. The main goal of this study is to explore the use of change management models during a pandemic and provide a draft conceptual model for change management, in the context of contingencies, for the film industry. To conduct this research, a theoretical research method was used, through a comparative analysis of scientific literature. First, based on the scientific literature, the main elements of the selected change management models are defined. Then, literature on the application of change management methods in the context of contingencies is analysed. Finally, an assessment of the literature on the management of changes in the cinema sub-sector of the creative industries in the context of the pandemic is conducted.

## **2. CHANGE MANAGEMENT THEORIES**

In the scientific literature, the concept of “change” and “change management” is presented in various ways. Usually, the change is perceived as a shift in some area. Vanagas (2007) emphasises the concept of alteration, which correlates with the concept of change and can be used as a synonym. Change is the most constant phenomenon, during which the past is analysed to clarify the present situation and identify the important factors for the future. It is also established that change management means planning, change initiation, perception management, and stabilization of the change process in both personal and organizational fields (Anyieni et al. 2016). So basically, change is altering an existing situation to a desired situation; change management itself is the way and method used to achieve that result. Change management is an integral element of every organization's success and development, which is implemented using most well-tested models, modifying them for the specificities of the situation. One of those models is Kurt Lewin's change management model, which has three principles that can be used to successfully implement change in an organization. They are very similar to the steps in the action research model — moving out of the present to achieve change; implementing the change; freezing the existing new situation. This last step is necessary for long-term results so that the change remains in the altered stage and does not return to the starting point. Doing so requires the destruction of the current situation, moving from the current to the future situation, and finally employing people and systems to ensure the longevity of the change (Burnes 2020). The first step in Lewin's change process plan must be action-oriented because the main goal of the entire process is to implement change. The second part focuses on the practical implementation of actions to see if the chosen strategy works and is suitable for implementing the change in question. Using this model, the need for change is first determined (unfreezing), then the implementation of actions is started (moving), and finally, the entire process is evaluated, and the change is stabilised (refreezing). The best way to integrate this model into organizational changes is to test them in practice; the action performed in this way can become a habit, so the integration of changes will take place successfully. However, using Lewin's model, the speed of implementation of changes is quite high and requires responsible advance preparation.

For this reason, it is not suitable for managing change in the context of contingencies (Hemant Yadav 2014). Another well-known model is John Kotter's change management model, who developed a model that should be used at the strategic level to change the vision of the organization and then transform the organization itself in various aspects. This model is composed of eight steps, which take different amounts of time depending on its complexity. Also, the author highlights/points out that the omission of one step or its improper performance can lead to the failure of the entire change process. Table 1 presents Kotter's eight-step change model.

Step	Activities
<b>1) Identifying the importance of changes</b>	Often, people like the existing situation and do not want to change it — it is comfortable, well-known, does not raise doubts, so the staff often opposes the introduction of innovations. For this reason, it is first of all very important to clearly broadcast that the changes are important and why they need to be implemented right now.
<b>2) Intervention</b>	The goal of this stage is to change the opinion of the most resistant employees by proving to them the necessity and benefits of change. There are many ways to do this, but one possible way is to build a strong leadership team that can dedicate their time to dealing with recalcitrant employees.
<b>3) Creating a vision and strategy</b>	To start moving towards the implementation of change, a concrete action plan needs to be created. Creating a vision and strategy would make employees feel more secure because it would be clear how the organization will change in the context of change.
<b>4) Communication</b>	It is not enough to know the action plan for the highest management bodies within the organization. For the successful initiation of changes, it is important to properly communicate the changes to the employees; only this way will they feel sufficiently involved and important, which will ensure their humility and motivation for the implementation of the changes.
<b>5) Initiating change</b>	Considering the fact that the current situation is the most comfortable for people, it is very important to properly prepare employees for the changes. This can be done practically or theoretically by training the staff about the future job specifics after the changes. This step empowers employees to act on the vision and inspires them to adopt risky and creative ways to implement change.
<b>6) Reward for effort</b>	Employees who have worked hard to implement change must be properly rewarded. In this step, subordinates should be rewarded for short-term achievements that lead to the realization of the new vision.
<b>7) Consolidation of the change</b>	In this step, when the resistance forces are reduced, the process of change should be monitored and, if necessary, adjusted accordingly.
<b>8) Demonstrating the benefits of change</b>	If employees do not understand the meaning of the new changes, they will eventually revert to their old habits, thus undoing the progress made. Therefore, it is important to communicate the benefits of the changes to all members of the organization.

*Table 1: The eight steps in Kotter's change model  
(Source: Adapted from Hemant and Kumar, 2014)*

William Bridges' change management mode, created in 1991, emphasises the process of change itself, that is, the process of internalizing psychological changes, more than the result. This model focuses on employees, their feelings, and emotions. Based on human psychology, the scientist distinguished 3 stages of the transition period, which are usually experienced by employees during the implementation of changes (Miller 2017). Stage 1 (completion, loss, letting go) is about letting go of old habits or the old identity that the company/people had. This stage is a transitional period when it comes to helping people cope with their losses. Stage 2, neutrality, is an intermediate time when the old way of life no longer exists, but the new one cannot yet be understood and implemented. Critical psychological rearrangements and changes take place in this step. The final stage is the new beginning, which aims to leave the neutral zone and start a new beginning, it occurs when a new identity is created, a new energy is experienced, a new purpose is discovered, which initiates change. Although this model can be considered not a change management model, but a management model of employee transformation and adaptation to change (Marques, 2020), the emotional state of employees and ability to adapt to change can be an important reason for the success of change implementation. Another important model is the McKinsey 7-S change management model, which consists of 7 essential steps that can be used to implement organizational change. In McKinsey 7-S model, these 7 elements are divided into hard (strategy, structure, systems) and soft (shared values, skills, style, staff). Hard elements are usually easier to identify, while soft elements are more difficult to describe due to their imprecision. The application and implementation of this model is usually done in order of elements (Setianingrum et al. 2021): 1) Strategy, a step-by-step plan for implementing change management; 2) Structure, the structure of the organization's operation, the distribution of duties, and responsibilities; 3) Systems, organizational systems for daily implementation of functions (information technology, financial, and control processes); 4) Style, method of change implementation, different methods used; 5) Staff, selection, and socialization of employees; 6) Skills, development of strengths and their optimal use; and 7) Shared values, the general agreement of employees and the organization on a common goal and how that goal is achieved. The last is the ADKAR change management model consists of 5 words corresponding to each letter of the model's name: Awareness that changes are necessary; Desire for change, the benefits of implementing change are clearly perceived; Knowledge of how to implement changes, what steps to take; Ability needed to implement change; and Reinforcement, monitoring, maintaining, and striving to maintain the existing situation (Bekmukhambetova 2021). To date, the theory of organizational change offers many different models of change management that allow for the development of a common ideology and concept of change. Each model helps you understand the fundamental concept of change management, which starts with the current state, recognises the need for change, moves to the change stage, implements the change, and achieves the desired state. Table 2 highlights the strengths and weaknesses of the models presented.

*Table following on the next page*

Model	Strengths	Weaknesses
<b>Lewin</b>	It is considered the simplest model because it consists of 3 essential steps for implementing changes.	Requires a lot of time for preparation and detailed analysis, so it is not suitable for the implementation of rapid changes; major changes can cause chaos among staff.
<b>Kotter</b>	Clearly implemented steps; great attention is paid to the preparation of employees or changes.	Most suitable for the implementation of changes in large organizations; difficult to adapt to smaller companies; the least welfare-oriented model.
<b>Bridges</b>	Focused on the well-being of the staff, their feelings and needs.	The model cannot be implemented in a short period of time, as it requires considerable attention to evaluate each element of the organization.
<b>McKinsey 7-S</b>	The model covers all the necessary aspects of the implementation of changes in the company.	A complex execution scheme, requiring detailed analysis and benchmarking, which accordingly takes time; is not suitable for rapid change implementation.
<b>ADKAR</b>	Balance between employee training and business-oriented changes	The model is limited to implement big-minded changes; possible failure to realise the need for change.

*Table 2: Comparison of change management models*

### 3. CHANGE MANAGEMENT IN THE CONTEXT OF CONTINGENCIES

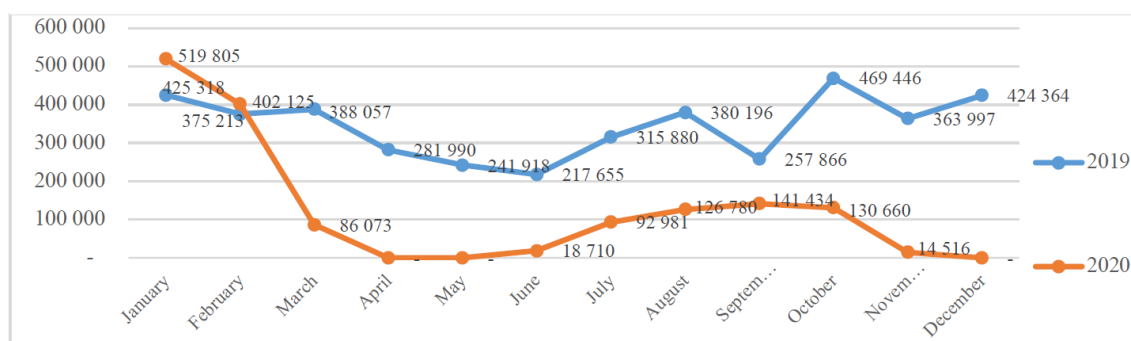
While not all change leads to improvement, change is necessary for improvement (Langley et al. 2009). The Covid-19 pandemic brought unwanted changes incredibly quickly. Responding to the consequences of the pandemic and finding solutions is an unprecedented process. Experiencing change under normal circumstances is one thing, but when a crisis emerges and operational functions change, extraordinary determination and leadership are required (Burton and O'Neill 2020). Change affects people and organizations become confused and fragmented at a time when resilience and collaboration are vital to implementing change at a high level. Chima and Gutman (2020) note that there is a growing body of literature that discusses psychological safety, shared purpose, and group resilience as important, powerful drivers of leadership, team, and organizational performance in rapidly changing environments such as pandemic crises. In this transitional period of change, knowing how to protect yourself from the pandemic will be a challenge for both businesses and individuals. Managing change should not be tied to a specific model, as situations in every organization are different. This is supported by new analyses related to Covid-19 and other change management studies that do not single out one specific change management model for pandemic change management, such as Lewin, Kotter or McKinsey (Kiosi et al. 2020).

Thus, in the absence of one universal approach, the company needs to decide which change management method or parts of it are applicable to a specific situation. The pandemic situation complicates the problems of organizational change, because for most organizations these change problems are transformational, requiring a complete organizational restructuring. Literature review shows that popular change management models, such as Lewin or Kotter, cannot always be applied in the context of unforeseen cases. It is necessary to emphasise that in the face of a pandemic, organizations can react to changes in different ways, so it is obvious that they can start preparing, adopting, and implementing different change plans.

#### **4. THE FILM INDUSTRY**

The global upheaval caused by the 2020 pandemic has shown that all sectors must be flexible and adapt to the changed situation around the world. Some businesses were more affected by the pandemic, others less so. The creative industries sector has become one of the most affected sectors, so implementing changes was an inevitable part of overcoming the pandemic in this sector. The film industry, as a market directly affected by the pandemic due to the closure of cinemas and the cessation of film production, is still facing endless changes daily (Hanzlík and Mazierska 2021). The pandemic affected all markets operating in the world and forced them to adapt to the inevitable changes. The creative industries sector, including television, film, radio, music, publishing, video games, performing and visual arts, and others, were no exception. Europe's creative industries sector has been hit harder by the Covid-19 crisis than any other industry except aviation, according to a study that calls for major public and private investment to prevent potentially irreversible long-term damage (Lhermitte et al., 2021). According to the report, revenues from this sector, including television, film, radio, music, publishing, video games, and the performing and visual arts, decreased by 31.2% in 2020 compared to 2019. This sector was hit harder than tourism, with revenues down 27%. As with every sector of the economy that involves people, the creative industries will adapt, but it would be unrealistic to suggest that the sector's ability to think creatively will help the sector become more resilient to the effects of Covid-19. When those sub-sectors of the creative industries that rely on audiences, entertainment, and experiences where people are inseparable from physical contact are listed, it is clear that the pandemic is having a big impact and inevitable changes for many (Harper, 2020). The question of what strengths can emerge in this sector will be relevant, as it is this sector that will recover and most likely develop after the pandemic (Comunian and England 2020). According to Harper (2020), the sector's strengths are: 1) significant investments in technologies that enable and support remote delivery of creative industries products and services; 2) a workforce that ranges from "artisan" workers to solo developers to large corporations, while being adaptable, inspired to do so, and trying to integrate change into their personal lives; and 3) integration into consumers' lifestyles. The creative industries sector is becoming more and more popular today because it has the ability to take the user away from their everyday life, engaging them in intellectual or relaxing leisure activities, or simply engaging in the user's "emotional life". It can be observed that the common values of the creative industries sector are related to the emotional life of the consumer, innovations, technological tools, and evolutionary changes, so the necessity of the sector is unquestionable. However, in order to adapt to the changing situation and successfully implement changes, it is necessary to react quickly and adapt existing change management models or create new ones. After the rise of World War II and the subsequent expansion of the motion picture industry, the motion picture industry faced a new threat: colour cable television. Cinema theatres have been forced to innovate to stay competitive (Vitálišová et al. 2021). They have been upgraded to today's multiplex model with large screens and comfortable seating areas and increased numbers of film screenings per day.

Currently, cinemas are once again under threat from outside competition and inevitable innovation with the rapid rise of streaming platforms (further on VOD, video-on-demand), such as Netflix, HBO, or Disney (Ayanbadejo 2020). These platforms not only provide the viewer with a lower price but also access to thousands of audio-visual works that can be viewed at any time from any location. The pandemic caused by Covid-19 contributed significantly to their popularity, due to which the functioning of cinemas around the world was limited or stopped. Thus, the essential film distributor, the cinema, was the most economically affected by the pandemic. Physical attendance of customers in cinema theatres around the world has been banned for a long time. An example of this are the cinemas in Lithuania which did not work for 12 months, between 2020 and 2021, and the time when working does not generate enough income (see Figure 1), which happened for several reasons. First, consumers were intimidated by the threat of the virus, so after the cinemas were open again, they started to come back slowly. Another reason is that during the long period of quarantine, users got used to watching films at home (high-resolution TVs, projectors, computers, and even phones). Additionally, film producers have decided to postpone the release of their films for the coming year due to a decrease in attendance, so cinemas can no longer offer new films to consumers. Finally, government restrictions also had a significant impact on the market. First, 50% occupancy of the cinema hall ensures a maximum of only 50% of the income compared to the older operation of cinemas. Second, the prohibition of food and drink sales led to consumer indifference, since most people go to the cinema for entertainment, not to watch cinema art, so the absence of popcorn and soft drinks could be one of the main reasons for not visiting cinemas.



*Figure 1: Cinema attendance statistics in 2019–2020*

*(Source: Compiled by the authors, based on data from the Lithuanian Cinema Centre)*

Figure 1 shows the statistics of Lithuanian cinemas in 2019 and 2020; a sharp decrease in attendance can be clearly observed. In 2019, 4,141,900 people went to cinemas, while in 2020 only 1,533,084 did. The income is correspondingly lower by more than 2.5 times. In 2019 the income was 22,495,264 euros, however, in 2020, it was only 8,475,003 euros. The pandemic will affect the film industry for at least another 4 to 5 years. The structural changes that had started before the pandemic have accelerated. However, even in the rapidly changing processes of film distribution, the film industry remains strong. While the experience of the 2020s has revealed the industry's dependence on the macroeconomic, social, and environmental context, a systemic approach to managing operations across the value chain can increase industry resilience and efficiency (Koljonen 2021). It is predictable that the operating model of cinemas will not be the same as it was before the pandemic. Film distributors are currently beginning to change the release scheme, creating new and modifying old release models. Before the pandemic, the release of films was planned according to the windows model — when the film is first shown in cinemas, after a certain period another window is opened — VOD platforms, then television, and others.

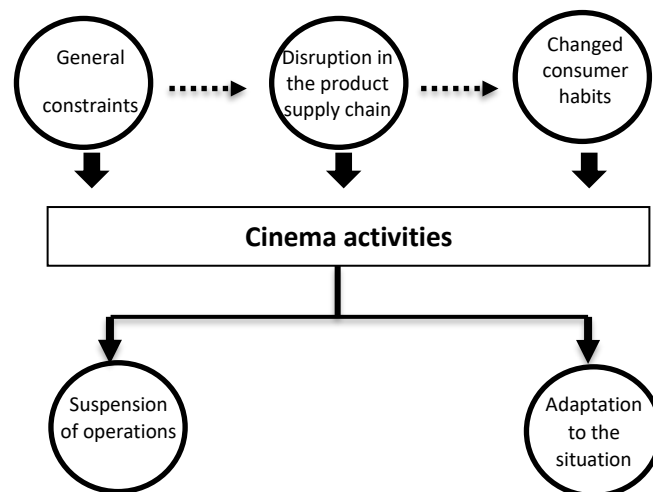
Currently, film distributors have begun to modify this model by combining several windows into one, for example, releasing films day-to-day, where the film is released simultaneously in the cinema and on VOD platforms (Sadłowska, Karlsson, and Brown 2019). This change was necessitated by the pandemic itself, as consumers now tend to watch films at home.

## **5. PROPOSED CHANGE MANAGEMENT MODEL FOR CINEMA (OR THE FILM INDUSTRY)**

Considering the literature analysis, it is perceived that change management in the cinema sub-sector, in the context of contingencies, is not a thoroughly analysed field, change management is a vague and undefined field. For this reason, after analysing the insights of scientists in the context of both change management models and the pandemic activity of the film industry, a principled change management model for the cinema sub-sector in the context of contingencies is presented. First, it is necessary to pay attention to the strengths and weaknesses of the analysed change management models (Table 2). Contingencies and change management in their context are a complex process simply because it is impossible to prepare for it in advance due to their unexpected appearance. Looking at the weaknesses of the models, all models require detailed and time-consuming preparation, and therefore, in principle, they are not suitable for change management in the context of contingencies, since such change management requires a quick reaction and can be achieved in a short time. However, when constructing a principled model of change management for the cinema sub-sector, one should not distance oneself from the models developed by scientists and tested and modified over many years. Lewin's 3-step model (identification of the need for change > implementation > stabilization of the process) is effective in the way that it covers a very wide field of organizational change, and is also abstract, which creates an opportunity for interpretations. Bridges' model also consists of 3 stages: the stage of completion, neutrality, and a new beginning, which is basically very similar to the Lewin model, but here the focus is on the process of internalizing psychological changes. W. Bridges offers a model that focuses on employees' emotions, feelings, and ability to adapt to change. Kotter's 8-stage model seems to frame it in a strict structure but distinguishes clear steps for the implementation of changes: identification of the importance of changes, intervention, creation of vision and strategy, communication, initiation of changes, reward for efforts, consolidation of change, demonstration of the benefits of changes. Although Kotter's original model was supposed to be implemented sequentially, without missing a single step, the construction of a new change management model can theoretically be done on an as-needed basis. McKinsey's 7-S model also consists of many stages that help create a clear plan for implementing change: strategy, structure, systems, style, staff, skills, shared values. This model requires extensive and detailed analysis — the hard elements of the change management model (strategy, structure, systems) are easier to identify due to their clear structure, but the soft ones (style, staff, skills, shared values) are more difficult to identify. Adequate time is required for detailed analysis to properly characterise each step, so implementing McKinsey's 7-S model in a contingency context would be potentially inefficient. However, attention can be paid to aspects of strategy and capabilities that could be essential for the cinema sub-sector in the context of contingencies. Finally, the ADKAR model seems to summarise the essence of all discussed models, which consists of 5 steps: awareness that changes are needed; understanding the benefits of change; knowledge; skills; strengthening/monitoring of the situation. To develop a principled change management model for the cinema sub-sector in the context of contingencies, it is important to review events/situations in the cinema sub-sector in the context of contingencies. One of them, perhaps the first crisis that hit the film industry, was the emergence of television. The first five decades of the 20th century can be called the golden age of the film industry (Usai 2001). Black-and-white films by legendary directors such as Charlie Chaplin, Greta Garbo or Rudolph Valentino gathered thousands of film fans.



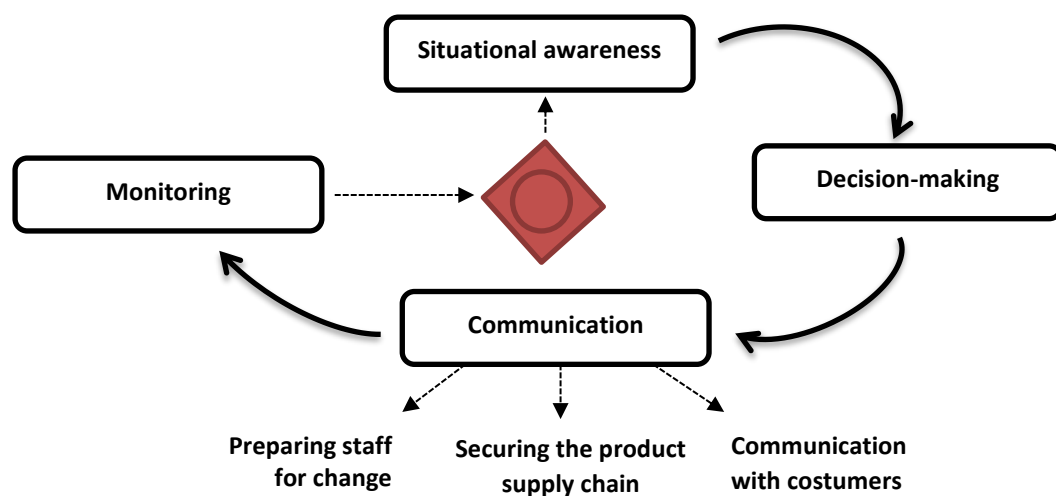
The only competitor to cinemas was the theatre, but it was more difficult to access and less modern. Without any serious competitors, the film industry expanded, the number of production companies grew, the audience grew rapidly, and the quality of scripts and special effects improved significantly. However, the unexpected start of television in the 1830s radically changed the situation in the film industry: viewers began to prioritise television over cinemas, because of comfort — there is no need to go to another location, it is possible to switch the channel if the show or film is not interesting, and, most importantly, TV was free (Farber and McClellan 2020). This industry-wide crisis led to inevitable changes, with cinema theatres developing ways to adapt to the situation, looking for ways to compete with television and differentiate themselves. One of the most significant innovations, in 1952, introduced and used the Cinerama motion picture process for the first time, which was a sensation that brought many consumers back to the cinema theatres. This period saw the greatest evolution of cinemas, during which decisions to implement change and recovery were made quickly enough to manage an unforeseen industrial crisis. Looking at more recent times, the economic crisis of 2008 is a case in point. Although this crisis has had a negative impact on most sectors around the world, the cinema sub-sector is an exception. With rising prices and falling consumer wages, most people tried to optimise their spending, but it was not psychologically possible to close in their homes completely (Briguglio et al. 2020). Cinemas, which could have increased ticket prices in line with other creative industries, decided to keep ticket prices relatively low, which attracted consumers. Finally, the cinema sub-sector of the creative industries had to cope with a pandemic crisis to implement change, which meant that cinemas were unstable and had to change rapidly during the pandemic. In response to direct security directives from the Government, cinemas had to cope with a few external constraints directly affecting their operations: restrictions on the availability of auditorium seats, food and beverage bans, lack of new films, consumer fears about the possible spread of the virus, and others. Against this changed environmental background, cinemas have had to react to the situation and implement changes (Figure 2).



*Figure 2: External influences on change caused by the pandemic and the stages of change management in cinemas*

The generalised restrictions of the Government of the Republic of Lithuania have led to mandatory changes in cinemas — the suspension of operations. This was compounded by disruptions in the product (film) supply chain, with film producers postponing premieres and reducing film production due to the closure of cinemas.

With the resumption of government restrictions and the opportunity to reopen, cinemas have restarted; however, changes in consumer habits, such as a shift to VOD platforms and other online content, have led to a significant drop in attendance. In response to these factors, cinemas are going through a period of adaptation where innovative solutions are more important than ever. The external factors that led to the changes brought about by the pandemic and the steps of change that have been implemented are essential and interlinked elements. The above-mentioned factors behind the industrial, economic, and pandemic crises, as well as the feedback and decisions taken by cinemas, could be the basis for the construction of a principled change management model. Considering existing change management models and the management of change in the cinema sub-sector in the context of contingencies, it is possible to theoretically construct a model that would make the process of change management clearer and more coherent. Figure 3 presents our proposed model, which consists of 4 key steps: 1) situational awareness; 2) decision-making; 3) communication; 4) monitoring.



*Figure 3: Proposed model for change management in a contingency context for the film industry*

Due to its coherence and inevitable renewal, the model is designed in a circular structure, so that the decisions taken can be continuously updated and modified as and when required. Unforeseen events or crisis situations are unprecedented and change management models that have been carefully prepared in advance will not be relevant to the current situation and will be ineffective. In this contingency model, change is implemented in a circular way, a crisis or any unforeseen and sudden factor forces the initiation of change. The first step is the situational awareness; the aim is to find out the real situation: the potential damage, the consequences of the contingency. Additionally, the objective of the change is perceived as the desired outcome or situation to be achieved. The possible consequences and mistakes of crisis management are discussed. The second step is decision-making. Initiating this step requires first identifying the nature of the changes to be implemented. Depending on this, decision-making at different levels is undertaken: 1) if the planned changes directly affect employees, such as improving their emotional well-being, skills development, social security, etc., employees should be involved in the decision-making process; 2) if strategic, large-scale changes are to be made, for example in the event of an industrial (the emergence of TV or VOD and a fairly significant takeover of consumers) or economic crisis, cinemas should take decisions at the highest level, possibly in consultation with experts; 3) if technical changes are planned, such as replacing equipment or installing systems, management should not necessarily be involved in the change process;

appropriate specialists or specialised staff should be called upon; and 4) in the event of a crisis requiring a rapid response, such as a pandemic, for which there is insufficient time to test and analyse solutions, a decision should be taken at the highest level. The third step is communication; it is one of the most important elements for change success as it is necessary between all levels of the organisation. In this model adapted to the cinema sub-sector, the communication step consists of 3 more components. The first component is preparing staff for change. At this phase, the changes should be adequately and clearly explained and communicated to employees — why they are needed in the first place, what new technologies will be used (if there is a need for them, employees will be trained to use them), how activities will be carried out in the context of the employees, what new operating principles will be introduced in the organisation as a whole, and any other aspects related to employee information. The point of this step is not to create additional stress for employees, but rather to prepare them so that they are clear about the actions to be taken when making and implementing changes. The second component is securing the product supply chain. If applying this model to any other sector, the product supply process could be classified as the next stage, but in the film industry, the products are the films that are shown in cinemas. For a cinema to operate, communication with film distributors is essential, who, due to the crisis, may reschedule the release dates of the films, which would mean that the cinema would be in danger of not having anything to show to the public. The final component is communication with consumers, which is essential to persuade them to come to cinemas and use their services. The last step of the model is monitoring. To ensure that the crisis is contained, constant monitoring of the situation is necessary and should be carried out daily, monitoring visitor numbers, food and drink sales, etc. If the results remain stable or change negatively, a second round of change management is initiated, and the process is repeated in a sequential manner: the situation is re-examined again, only this time focusing on the new data already available. The timeframe in which the change management process is re-initiated depends on the situation: in the event of a terrorist attack, change decisions can be updated every few hours; in the event of an economic crisis, the process can be repeated every 1 month; in a pandemic period, every week; and so forth. Such a model would allow cinemas to react quickly, take additional decisions and stabilise the situation. The analysis of the contingency performance of the cinema sub-sector suggests that a key element of managing change in a contingency context should be responsiveness and flexibility. If properly interpreted, the principled model of change management that has been developed can be useful in structuring possible change management plans for the cinema sub-sector in the context of contingencies.

## 6. CONCLUSION

The academic literature on the concept of change and management models is comprehensive and structured. Theorists on the subject provide a wide range of insights and reasoned analyses of change management models and their use in different organisations. Traditional change management models cannot always be adapted to a specific situation, in this case the management of an unforeseen crisis. Theorists do not stick to one model or another when discussing change management in the context of contingencies but encourage a flexible approach to change management. However, a comparison of change management models suggests that they are not generally suited to managing change in a contingency context, as they require a high degree of advance preparation and a long period of time for implementing and monitoring change. The construction of a principled change management model for the contingency of the cinema sub-sector is based on 4 steps, which, depending on the situation, are iterated as many times as the situation requires: situational awareness, decision-making, communication, monitoring. This would allow cinemas to manage change according to a model that is freely interpretable but clearly structured.

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## FOSTERING ORGANISATIONAL EXCELLENCE: ANALYZING THE INTERPLAY BETWEEN INVOLVEMENT IN CONTINUOUS IMPROVEMENT AND ORGANIZATIONAL SOCIAL CAPITAL

**Elisabeth Brito**

*School of Technology and Management of Águeda, University of Aveiro, Aveiro, Portugal;  
Research Unit on Governance, Competitiveness and Public Policies, (GOVCOPP),  
University of Aveiro, Aveiro, Portugal  
ebrito@ua.pt*

**Isabel Souto**

*Department of Education and Psychology, University of Aveiro, Aveiro, Portugal  
isabel.souto@ua.pt*

**Anabela Pereira**

*University of Évora, Évora, Portugal; Center for Research in Education and Psychology  
(CIEP), University of Évora, Évora, Portugal; WJCR/UA, Portugal  
anabela.pereira@uevora.pt*

### ABSTRACT

*Organisational culture plays a crucial role in active participation in continuous improvement and innovation. A culture that values the active involvement of professionals in these areas, fosters an environment that encourages them to acquire new skills and knowledge, as well as to promote innovation in processes and working methods. It also has a significant impact on the way they perceive their roles, interact with each other and approach their work. This topic becomes particularly relevant in the context of teaching and education. In this context, the use of information and communication technologies is inevitable, culminating in the need to use innovative training and learning methods. This reorganisation of education systems implies a shared commitment to continuous improvement of teaching and learning, requiring a collective effort from all those involved. This study focuses on the work context of education (n=233 professionals from public and private schools), exploring the relationship between the culture of involvement in continuous improvement (at process and/or individual level), with the organization's social capital, leadership relations, as well as the individual-work interface (assessed using COPSQ III). The results show a symbiotic relationship between the organisational culture of involvement and the dimensions assessed, particularly social capital. In conclusion, social capital is an organizational strength that is highly mediated by the culture of employee involvement in continuous improvement at multiple levels. Understanding its synergy provides valuable information for organizations that want to focus on innovation and continuous improvement.*

**Keywords:** *Organizational Social Capital, Continuous improvement, Quality, Innovation, Education professionals*

### 1. INTRODUCTION

In today's rapidly evolving business environment, organizations are constantly striving to achieve excellence, to remain competitive and guarantee long-term success. Achieving organizational excellence involves the harmonious interaction of various elements, with a focus on continuous improvement in quality management. Continuous improvement, a concept rooted in various management philosophies, is fundamental to the pursuit of organizational excellence. It emphasizes the continuous identification and elimination of inefficiencies, waste, and errors in processes, with *Total Quality Management*, *Six Sigma* and *Lean* standing out as

well-established approaches to achieving continuous improvement. As regards quality, the vast majority of organizations are based on the principle of providing products and services that meet or exceed customer expectations, using structured guidelines as a reference for establishing and maintaining a solid quality management system (e.g. standards and frameworks, such as ISO 9001). Nevertheless, it is important to address that continuous improvement go beyond compliance with regulatory standards. An organization's commitment to continuous improvement as a culture is fundamental, as it promotes an environment of learning, adaptation, and innovation. Furthermore, the organizational culture of employee involvement in continuous improvement can play a significant role in the pursuit of excellence. An organizational culture that promotes collaboration, transparency and ethical behavior can improve employees' motivation, creativity, and overall job satisfaction. In turn, engaged employees are more likely to take ownership of continuous improvement efforts and improving the quality in their work. This comprehensive approach is key to increasing productivity, satisfaction, and overall performance, improves the organizational' social environment and, ultimately, leads to sustainable success. This issue is particularly relevant in education. First and foremost, in educational context, continuous improvement go beyond compliance with regulatory standards. In this field, continuous improvement is essential for the quality of learning, the result of which has an (in)direct impact not only on the overall success of educational institutions: we see education as the source of knowledge and skills essential for the jobs of the future and, therefore, the cornerstone of society's progress, development, and innovation. Furthermore, we are on the threshold of a new era (profoundly marked by the emergence of different generational groups, and rapid technological innovation), which bring unprecedented challenges and opportunities to the educational context (European Commission, 2016, 2014). This encompasses not only pedagogical and/or curricular innovations, but also the need to reorganize the entire education system, which implies a shared commitment to continuous improvement, in a collective effort from all stakeholders. Involving teachers in continuous improvement initiatives can result in improved teaching methods, greater student engagement and better academic results. However, the pursuit of excellence should not be limited to the classroom *novel tasks* but extends to the wider activities, processes, and procedures (personal, professional, and scientific development, pedagogical innovations, curriculum development, administrative processes and much more). From this perspective, we are dealing with a double-barreled issue: while all these processes are crucial to continuous improvement, it is essential to recognize that they can create a burden for the (already overburdened) teachers (Skaalvik and Skaalvik, 2017; Souto et al., 2019, 2018; Yuan and Zhang, 2017). It is therefore important to understand how the interaction between involvement in continuous improvement and the organizational social environment has special significance in the daily work of teachers. This study explores the intricate relationships between engagement in continuous improvement, and organizational social factors in the context of education. By examining the synergy between these elements, we can gain a deeper understanding of how organizations can excel in a dynamic business environment. Scientific research and empirical evidence will guide our exploration of the impact of these interconnected elements on organizational performance as well as employee satisfaction and well-being.

## **2. METHODOLOGY**

This study is part of a larger project that aims to study work-related stress, integrated into a wide range of factors (individual, organizational and contextual), including the culture of involvement in continuous improvement as a factor in the organizational domain. This paper presents for the first-time data of the culture of involvement (in continuous improvement), in the work context of education.

## 2.1. Participants

The study relied on participation of 232 teachers of Portuguese formal education context. The sample comprised 30 males (12.9%), and 201 females (n= 86.6%), aged between 26 and 69 years old (M= 48.02, SD= 10.119). Teaching activities were carried out in public (n= 113, 48.7%), private (n= 38, 16.4%), and public-private partnership (n= 81, 34.9%) sectors, including regular (n= 162, 69.8%), vocational education and training (VET, n=52, 22.4%), or both modalities (n= 18, 7.8%), at different educational levels, namely: Up to early childhood education (ISCED<sup>1</sup> 0; n= 112, 48.3%), Primary education (ISCED 1; n= 31, 13.4%), Lower secondary education (ISCED 2; n=13, 5.6%), Upper secondary education/ Post-secondary non-tertiary education (ISCED 3 or 4; n=31, 13.4%), or More than one level (n=45, 19.4% ).

## 2.2. Data Collection and Procedures

A sociodemographic questionnaire was developed by researchers, in in which (beside sociodemographic and professional characteristics), participants were asked about the organizational culture in terms of continuous improvement processes [*Does your work have an organizational culture/ system that involve employees in continuous improvement and quality?*], as well asked to characterize in which of the dimensions/type does involvement occur: (i) in terms of processes (processes/procedures/products/services), (ii) individual (individual/training and/or specialization/career progression), or (iii) both (processes/procedures and individual level). The Portuguese version Copenhagen Psychosocial Questionnaire (COPSOQ III, Cotrim et al., 2022), was also employed, aiming to assess psychosocial dimensions/ factors (PRFs), of work context. COPSOQ III is composed by 85 items distributed in 31 factors (grouped in seven dimensions). In the present work we will results related to five dimensions, namely, organization's social capital, leadership relations, individual-work interface, work organization and job content, as well as work demands at work (we exclude the personality, and Health and well-being dimension). Data was collected between december, 2022 and May, 2023. Participants were invited to complete an online questionnaire on a voluntary, anonymous, and confidential basis. All participants were informed of the objectives and voluntary nature of participation, as well as subsequent use of the data collected through informed consent. All data collection and procedures respect the ethical and deontological principles inherent in the development of an investigation, being performed according to the project criteria, approved by the Ethics Committee of the University Aveiro (60-CED/2022).

## 2.3. Data Analysis

Statistical analysis was carried out using *Statistical Package for the Social Sciences* software (IBM SPSS Statistics®, version 29). After the descriptive statistics, comparisons between groups (type of involvement) were performed using the one-way *ANOVA test*, whose effect magnitudes were measured using the Omega-squared fixed-effect ( $\omega^2$ , considering that values of .01, .06 and .14 represent small, medium, and large effects, respectively) (Field, 2009).

## 3. RESULTS

When asked about the organizational culture (in terms of employee involvement in continuous improvement), the majority of respondents say Yes (n= 142, 61.2%), i.e. the employer adopts a culture/systems that involve employees in continuous improvement. The remaining participants deny this involvement or are unaware of the associated information (n= 90, 38.8%).

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<sup>1</sup> ISCED: International Standard Classification of Education, according to (Eurostat, 2023).



The involvement of employees can cover both processes (or procedures/products/services;  $n=45$ , 19.4%) and individuals (training and/or specialization/career progression;  $n=57$ , 24.6%), or both (processes and individuals;  $n=40$ , 17.2%), with the majority of respondents included in the improvement, referring to the individual level (Figure 1).

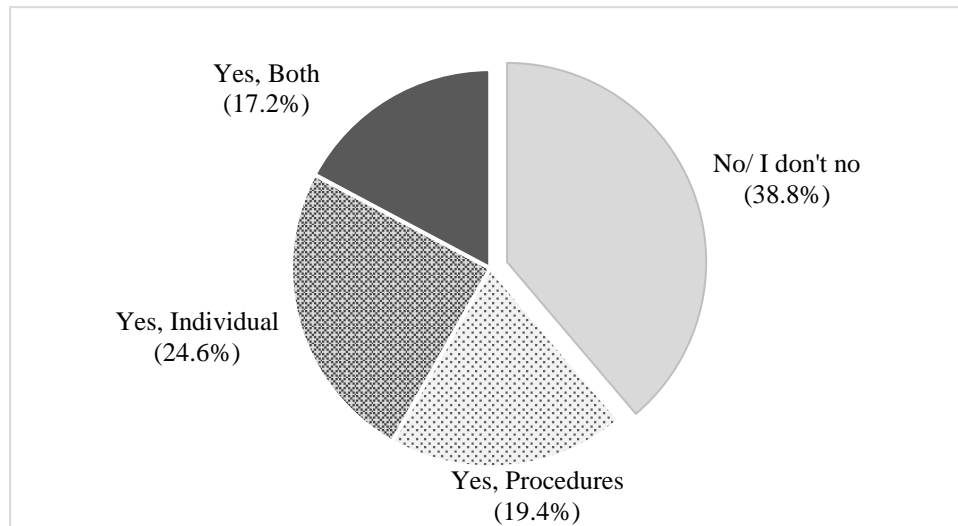


Figure 1: Involvement of employees in continuous improvement.

When comparing involvement groups in the Social Capital dimension, the average value is higher in the individual involvement type, or both, when compared to the absence of involvement. These differences are statistically significant, with high effect sizes in all the factors included, namely Horizontal trust [ $F(3, 228)= 8.027, p \leq .001, \omega^2 = .083$ ], Vertical trust [ $F(3, 228)= 12.530, p \leq .001, \omega^2 = .130$ ], and Organizational justice [ $F(3, 228)= 14.300, p \leq .001, \omega^2 = .147$ ] (Table 1). On the other hand, when comparing the type of involvement only at the level of processes, with the absence of involvement, no statistical differences were found (Table 1).

Dimension: social capital		M	DP	<p>Comparaing groups <sup>(a)</sup></p>
Horizontal trust	No	3,11	0,769	
	Processes	3,44	0,844	
	Individual	3,56	0,601	
	Both	<b>3,70</b>	0,666	
Vertical trust	No	3,20	0,815	
	Processes	3,74	0,813	
	Individual	3,82	0,612	
	Both	<b>3,87</b>	0,666	
Organizacional Justice	No	2,76	0,840	
	Processes	3,31	0,761	
	Individual	3,42	0,648	
	Both	<b>3,57</b>	0,791	

Table 1: Relationship between the type of involvement in continuous improvement and the organization's Social Capital (Assessed with COPSOQ III).

(a) Statistically significant differences are marked with the black arrow (directed from the highest to the lowest average). Dashed lines indicate that no statistical difference was found.

On the other hand, in the social relations and leadership dimension, the average value is also higher when there is involvement (either in processes, individually, or both), when compared to the absence of involvement.

These differences are statistically significant in most of the factors included, namely Previsability [ $F(3, 228)= 12.595, p \leq .001, \omega^2 = .130$ ], Recognition [ $F(3, 228)= 10.777, p \leq .001, \omega^2 = .112$ ], Quality of leadership [ $F(3, 228)= 17.689, p \leq .001, \omega^2 = .178$ ], Superiors' social support [ $F(3, 228)= 8.371, p \leq .001, \omega^2 = .087$ ], and Sense of community belonging [ $F(3, 228)= 8.531, p \leq .001, \omega^2 = .089$ ] (Tabela 2). In the Colleagues' social support factor, the statistical difference [ $F(3, 228)= 6.282, p \leq .001, \omega^2 = .064$ ] is only found when comparing the mean values of the individual types of involvement, or both, with the absence of involvement. On the other hand, in the Work role transparency factor, the statistical difference [ $F(3, 228)= 4.230, p \leq .001, \omega^2 = .040$ ], is only found when comparing the individual type of involvement with the absence of involvement (Table 2). No statistical differences were found when comparing the groups with regard to the Conflict of work roles factor, with the understanding that involvement in improvement processes (of any kind) has no impact at this level.

Dimension: social relations and leadership		M	DP	Comparing groups <sup>(a)</sup>
Previsability	No	2,87	0,877	
	Processes	3,37	0,875	
	Individual	<b>3,67</b>	0,670	
	Both	3,50	0,884	
Recognition	No	3,00	1,063	
	Processes	3,56	0,888	
	Individual	3,70	0,798	
	Both	<b>3,84</b>	0,897	
Work role transparency	No	4,05	0,874	
	Processes	4,27	0,744	
	Individual	<b>4,49</b>	0,505	
	Both	4,26	0,647	
Quality of leadership	No	2,73	0,993	
	Processes	3,39	0,918	
	Individual	<b>3,67</b>	0,562	
	Both	3,59	0,871	
Colleagues' social support	No	3,34	0,807	
	Processes	3,60	0,787	
	Individual	3,81	0,777	
	Both	<b>3,88</b>	0,754	
Superiors' social support	No	2,48	0,955	
	Processes	3,04	0,937	
	Individual	3,04	0,817	
	Both	<b>3,20</b>	0,948	
Sense of community belonging	No	3,59	0,913	
	Processes	4,04	0,680	
	Individual	<b>4,15</b>	0,577	
	Both	4,14	0,820	

Table 2: Relationship between the type of involvement in continuous improvement and factors from the social relations and leadership dimension (Assessed with COPSOQ III).

(a) Statistically significant differences are marked with a black arrow (directed from the highest to the lowest mean). The dashed lines indicate that no statistical difference was found.

In the work-individual interface dimension, statistically significant differences were only found in the Commitment to work factor [ $F(3, 228)= 4.232, p \leq .01, \omega^2 = .040$ ], with the difference occurring exclusively in the comparison between involvement of the individual type, when compared to the absence of involvement (Table 3).

In the domains of Job insecurity, Insecurity with working conditions, Quality of work, Work-family conflict and Satisfaction with work, no statistical differences were found when comparing the groups, with the understanding that involvement in improvement processes (of any kind) has no impact at this level.

Dimension: Work-Individual Interface		M	DP	Comparing groups <sup>(a)</sup>
Commitment to work	No	3,49	0,805	
	Processes	3,73	0,727	
	Individual	<b>3,91</b>	0,541	
	Both	3,78	0,815	

*Table 3: Relationship between the type of involvement in continuous improvement and the factors of the Work-Individual Interface dimension (Assessed with COPSOQ III).*

(a) Statistically significant differences are marked with a black arrow (directed from the highest to the lowest mean). Dashed lines indicate that no statistical difference was found.

In the Work organisation and content dimension, statistically significant differences were only found in the Influence at work factor [ $F(3, 228) = 4.232, p \leq .01, \omega^2 = .040$ ], when comparing the group with individual involvement with the group with no involvement. In the Possibilities for development, Control over working time and meaning of work domains, no statistical differences were found when comparing the groups. Similarly, in the dimension Labour demands (quantitative, cognitive, emotional and rhythm), no statistical differences were found, with the understanding that involvement in improvement processes (of any kind) has no impact at this level.

Dimension: Work organisation and contents		M	DP	Comparing groups <sup>(a)</sup>
Influence at work	No	3.44	0.822	
	Processes	3.76	0.694	
	Individual	<b>3.84</b>	0.570	
	Both	3.69	0.856	

*Table 4: Relationship between the type of involvement and work organisation and contents dimension (Assessed with COPSOQ III).*

(a) Statistically significant differences are marked with a black arrow (directed from the highest to the lowest mean). Dashed lines indicate that no statistical difference was found.

#### 4. CONCLUSION

The aim of this study was to investigate the relationship between engagement in continuous improvement and organisational social factors in the context of education. With regard to the relationship between teacher engagement in continuous improvement and Organisational Factors (assessed with COPSOQ III), there are statistical differences between the groups in which there is no engagement, when compared with the groups of types of engagement in (i) processes (processes/procedures and individual level), (ii) at the individual level (individual/training and/or specialisation/career progression), (iii) or both (processes and individual), particularly when considering all the factors included in the Social Capital, Social Relations and Leadership dimensions. The same is not true of the dimensions Work-individual interface, Work organisation and content and Work demands, since no differences were found across all the domains assessed. It should be noted that scientific research supports the notion that organisational social capital is closely related to continuous improvement in organisations.

In this document we have also demonstrated this relationship in the context of teaching, offering an insight into how educational institutions can take advantage of this relationship effectively: we highlight the intrinsic relationship between organisational cultures of involvement in continuous improvement, with a focus on individual training, specialisation and career progression, and their link to organisational social capital in the context of the Teaching profession. In this way, attention is being focused on individual involvement as a priority in the context of professional development and career progression opportunities for teachers. For the organisation, this includes providing access to continuous training, supporting specialisation in areas of expertise and creating a clear path for career progression. At the same time, fostering a culture of social capital through collaboration platforms, mentoring programmes and open communication channels between teachers can increase their collective effectiveness (Edinger and Edinger, 2018; Hargreaves, 2019; Tantawy, 2020). In turn, the commitment of educational institutions to promoting a culture of continuous improvement is essential to ensuring that teachers can provide the best possible learning experiences for students. When organisations invest in training, specialisation and career progression opportunities for their teaching staff, they not only increase teachers' knowledge and skills, but also send a clear message that the institution values their growth and development (Edinger and Edinger, 2018). This is a simultaneous investment in the development of organisational social capital, which is crucial within the educational community. It facilitates collaboration, the sharing of best practice and the mutual support that enables outstanding teachers to perform their tasks. Strong social capital in educational institutions creates an environment where teachers can work cooperatively, share innovative teaching methods and collectively address challenges, all of which ultimately improves the quality of education (Hargreaves, 2019). In the continually evolving landscape of education, the harmonious link between organisational cultures of involvement in continuous improvement, individual training and career progression, along with concern for organisational social capital, is fundamental to the success of teachers and the quality of the learning provided to students. By recognising and fostering this dynamic, educational institutions can empower their teachers to fulfil their potential, and ultimately achieve a more effective and more impacting teaching profession. In conclusion, exploring the relationship between teacher involvement in continuous improvement and its link to organisational social capital in the context of education reveals that there is a central dynamic that has long-range implications for the quality of teaching and the overall efficacy of academic institutions, in a process similar to that found in other contexts (Ganguly et al., 2019).

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## **COST-EFFECTIVENESS OF APPLICATION OF MICROBIAL BIOAGENTS AS A SUBSTITUTE FOR MINERAL P FERTILIZERS ON ACID SOILS**

**Zdenko Loncaric**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
zdenko.loncaric@fazos.hr*

**Suzana Kristek**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
skristek@fazos.hr*

**Jurica Jovic**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
jjovic@fazos.hr*

**Vladimir Zebec**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
vzebec@fazos.hr*

**Vladimir Ivezic**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
vivezic@fazos.hr*

**Sanja Jelic Milkovic**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
sajelic@fazos.hr*

**Iva Nikolin**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
inikolin@fazos.hr*

**Josipa Jantos**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
josipa.jantos@fazos.hr*

**Ruzica Loncaric**

*Faculty of Agrobiotechnical Sciences Osijek, Vladimira Preloga 1, Osijek, Croatia  
rloncaric@fazos.hr*

### **ABSTRACT**

*The importance of soil fertility and its elasticity is increasingly highlighted in view of the significant limitations of crop cultivation due to climate change and soil degradation. Unfortunately, in the last few years in the Republic of Croatia, the share of acidic arable soils and soils with a low content of SOM and plant-available phosphorus is worrying, but the use of microbial bioagents with the aim of increasing the availability of P in agricultural soils is very promising. The aim of this paper was to determine the profitability of using microbial bioagents on acidic soils with different levels of available P in order to determine the possibility of reducing mineral fertilization without reducing yields and without increasing production costs. For that purpose, a model was created for calculating the costs of mineral fertilizers and*

*microbial bioagents (MB) in the cultivation of corn and wheat. The required fertilization was calculated for 14,646 soil samples with a total of 44,604 ha of arable land based on the results of agrochemical soil analyses. Three models were used: a basic model with an analysis of the required P mobilization without including the potential benefit of N fixation, a model with an assumed reduction of the N fertilization of 5%, and a model with an assumed reduction of N fertilization of 10%. Models show that the application of MB in corn and wheat cultivation can be already profitable with N fixation which reduces N fertilization by 10-20% without affecting P mobilization. With the expected effect on P mobilization and reducing the need for P fertilization, the 5% reduction of N fertilization is already profitable with mobilization of 5–15 kg P, as well as 10% reduction in N fertilization with mobilization of 0–10 kg P ha<sup>-1</sup>. Including the expected effect on potassium and micronutrients, the model could prove the cost-effectiveness of using MB with an even smaller effect on N fixation and P mobilization.*

**Keywords:** acid soils, available phosphorus, fertilization, microbial bioagents, poor soils

## 1. INTRODUCTION

Soil fertility is an extremely important factor in the profitability of agricultural production. The importance of soil fertility and its elasticity is increasingly emphasized in view of the significant limitations of crop cultivation due to climate change and soil degradation. At the same time, the most important soil properties that influence the necessary measures of soil conditioning and fertilization are soil acidity, SOM content, texture and the content of plant-available nutrients, especially nitrogen, phosphorus and potassium. Unfortunately, in the last few years in the Republic of Croatia, a worrying proportion of acidic arable soils and soils with low SOM content (Lončarić et al., 2023b) and plant-available phosphorus (Lončarić et al., 2023a) has been determined. Nevertheless, problems and limitations lead to new technological solutions, and one of them is the increasing use of microbial bioagents with the aim of reducing the use of mineral fertilizers. Microbial bioagents, including beneficial bacteria, fungi, and other microorganisms, are able to increase plant growth, speed up seed germination, improve seedling emergence, responses to external stress factors, protect plants from disease and root growth pattern (Egamberdiyeva, 2007). It has been known for decades that treating seeds with bacterial bioagents increases the symbiotic nitrogen fixation, and non-symbiotic bacteria have recently been frequently used with the aim of increasing N fixation in the cultivation of most field crops. In this manner, the use of mineral N fertilizers is reduced, thereby reducing the risk of environmental contamination and additional soil acidification. Furthermore, excessive P fertilization harms soil and aquatic ecosystems (Panagos et al., 2022). Because of this and due to diminishing global resources of phosphorus minerals, the use of microbial bioagents with the aim of increasing the availability, i.e. mobilizing P in agricultural soils, is very promising. Therefore, the aim of this paper is to determine the profitability of using microbial bioagents on acidic soils with different levels of available phosphorus in order to determine the possibility of reducing mineral fertilization without reducing yields and without increasing production costs.

## 2. MATERIAL AND METHODS

For the purposes of this paper, a model was created for the analysis and forecasting the costs of fertilization with mineral fertilizers and the costs of using microbial bioagents (MB) in the cultivation of corn and wheat. In the model, the lowest prices of mineral fertilizers (urea, calcium ammonium nitrate, potassium chloride, monoammonium phosphate and complex fertilizer 7-20-30) in the Republic of Croatia in November 2023 were used to calculate the costs of mineral fertilizers. Based on the prices of the above-mentioned fertilizers, the costs of fertilization and the price of one kilogram of the mineral form of phosphorus were calculated.

Therefore, the price of 2.26 EUR kg<sup>-1</sup> P (or 0.985 EUR kg<sup>-1</sup> P<sub>2</sub>O<sub>5</sub>) was determined and used in the model. Furthermore, the price of the microbial bioagents suitable for acidic soils used in the model was 26 EUR kg<sup>-1</sup>, which was determined by the market analysis in Croatia. In the model, the actual needs of fertilization with mineral fertilizers in the cultivation of corn and wheat on acidic soils were used. For the purposes of this research, the results of analyses of 14,646 soil samples from a total of 44,604 ha of arable land were used. The required fertilizations were calculated, in accordance with the production practice in the continental part of Croatia, using previous research results (Bertić et al., 2007, 2006, Lončarić et al., 2023a, 2023b, Lončarić et al., 2009, Lončarić et al., 2006, Rastija et al., 2008, 2007) and a combination of different decision support systems (Lončarić et al., 2020., Lončarić and Lončarić, 2006, Lončarić et al., 2004., Teklić et al., 2002) based on the results of mandatory analyses within the soil fertility control system in Croatia. The analyzed acidic soils were divided into 5 classes according to available phosphorus (Lončarić and Karalić, 2015) and the recommended amounts of fertilizers (MAP, potassium chloride, urea and calcium ammonium nitrate) for growing wheat (target yield 8 t ha<sup>-1</sup>) and corn (target yield 12 t ha<sup>-1</sup>) were used in the model. Consequently, the average results for fertilizing acidic soils with different phosphorus supply are shown: very poor soils (average for 7,599.3 ha), poor soils (16,812.3 ha), moderately supplied soils (10,838.4 ha), rich soils (5,742.9 ha) and very rich soils (average for 3,608.2 ha). All results (in EUR or kg) are presented for ha as a unit of arable land.

The required efficiency of MB is shown as the amount of P that needs to be mobilized in the soil as a result of the application of MB in order for the savings in fertilization to be equal to the costs of buying MB.

Three models were used to calculate the required efficiency of MB:

- 1) basic model with calculation of required mobilization of P without including the potential benefit of N fixation due to the application of MB;
- 2) model with the assumption of a reduction of the required N fertilization by 5% (assumed increase of N fixation due to application of MB on average 8.2 or 9.8 kg ha<sup>-1</sup> for wheat or corn - 5\_N model);
- 3) model with the assumption of a reduction of the required N fertilization by 10% (assumed increase of N fixation on average 16.4 or 19.7 kg ha<sup>-1</sup> for wheat or corn - 10\_N model).

The required efficiency of MB to be profitable is also shown as the required amount of increase in N fixation due to MB addition in the case of no effect on P mobilization.

### 3. RESULTS WITH DISCUSSION

#### 3.1. Classes of phosphorus availability in acid soils in Croatia

Acidic soils (highly acidic soils with exchangeable acidity <4.5 and acidic soils with exchangeable acidity 4.5–5.5) make up more than 46% of analyzed arable land in 2022 in Croatia. A similar proportion of acidic soils was determined in the analyses for the previous three years, 49.9% in 2021 (Hefer et al., 2023), 46.0% in 2020 (Hefer et al., 2022) and 44.5% in 2019 (Hefer et al., 2021). In addition to harmful excessive acidity, acidic soils are also characterized by a lower level of soil organic matter (SOM) and available phosphorus (Figure 1). The percentage of soil with a low SOM content (<2%) in the topsoil layer in all analyzed soils in Croatia in 2022 (13,312 samples from 96,712 ha) was as much as 41.4%, while a significantly higher percentage was found in acidic soils, as much as 52%. Very similarly, taking into account all analyzed soils regardless of their pH, 52.6% of soils with low availability of phosphorus were determined (19% of soils of class A, i.e. very low availability and 33.6% of soils of class B, i.e. low availability), while in acidic soils the share of phosphorus-poor soils is as high as 61.6% (22.0% of class A and 39.6% of class B).



In acidic soils with very low availability of phosphorus (class A that make up 22% of the samples), an average of 1.41 mg P per 100 g of soil (3.23 mg expressed as P<sub>2</sub>O<sub>5</sub>) was determined. In acidic soils with low availability of phosphorus (class B, 39.6% of samples) 3.57 mg P per 100 g of soil (8.17 mg as P<sub>2</sub>O<sub>5</sub>) was determined, in soils with moderate availability (class C, 21% of samples) 6.76 mg P (15.49 mg P<sub>2</sub>O<sub>5</sub>), with high availability (class D, 9.8% of samples) 10.58 mg P (24.22 mg P<sub>2</sub>O<sub>5</sub>) and in soils with very high availability (class E, 7.6% of samples) 19.05 mg P (43.63 mg P<sub>2</sub>O<sub>5</sub>).

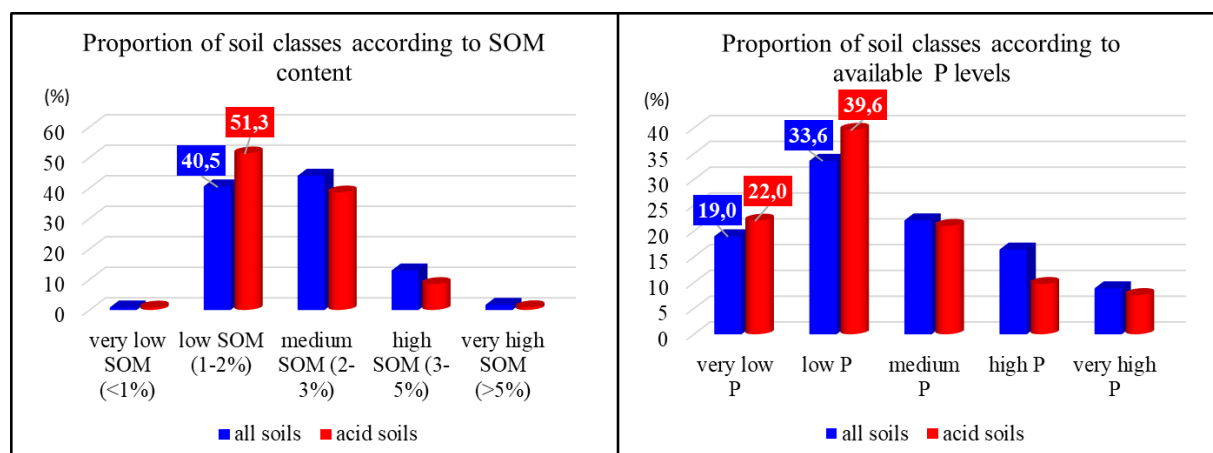


Figure 1: Proportion of soil classes according to SOM or available P in all and in acid soils

When analyzing data presented in Figure 1, it is evident that on all soils the balance is shifted towards soils with low levels of SOM and available phosphorus (blue boxes), and the same is even more pronounced in acidic soils (red cylinders). The management of available phosphorus in acidic soils is difficult, not only due to the chemical fixation of phosphorus by acidic cations, but additionally due to the lower content of SOM in acidic soils (Figure 1).

### 3.2. Effectiveness of microbial bioagents as a cost-effectiveness factor in corn cultivation

In corn cultivation on analyzed acidic soils, the average needs in fertilization with mineral P fertilizers (without organic fertilizer or microbial bioagents) would be 26.9 kg P ha<sup>-1</sup> (61.6 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>), starting from 39.4 kg P ha<sup>-1</sup> (90.2 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>) on very poor soils (Table 1) up to very rich soils where phosphorus fertilization is not required.

Soil supply class according to available P	Average needs in corn fertilization with mineral P in kg P ha <sup>-1</sup> (as kg P <sub>2</sub> O <sub>5</sub> ha <sup>-1</sup> )	Total cost of mineral P (EUR ha <sup>-1</sup> )	Share of mineral P cost in total fertilizer costs (%)
(A) Very low	39.40 (90.23)	88.88	17.56
(B) Low	31.78 (72.78)	71.69	15.12
(C) Moderate	23.49 (53.79)	52.98	12.73
(D) High	7.24 (16.59)	16.34	4.52
(E) Very high	0.00 (0.00)	0.00	0.00

Table 1: Average needs and costs of mineral P fertilizer in corn cultivation depending of available P in soils

The price of the required mineral phosphorus ranges from 88.88 EUR ha<sup>-1</sup> on acidic soils very poor in phosphorus, decreases to 52.98 EUR on moderately supplied soils, while on very rich soils no P fertilizers are needed (Table 1).

By using microbial bioagents (MB) with the aim of increasing the mobility and availability of phosphorus already present in the soil, it is assumed that there is a lower need for fertilizing with mineral P. In this model, the amount and price of MB and the effect that needs to be achieved only in the direct reduction of the need for phosphorus fertilization are analyzed. In doing so, the other expected beneficial effects of the same MB were not taken into account, such as the expected reduction in the need for nitrogen and potassium fertilization, and the indirect effect on reducing the need for fertilization by increasing the efficiency of added nutrients and the general increase in yield due to the increase in soil fertility. In such a basic model, the price of MB ranges from 33.8 to 46.8 EUR ha<sup>-1</sup> on soils with medium and low phosphorus availability, which accounts for 52.8–65.2% of the price of the required P fertilization. These values mean that MB would need to mobilize 15.0–20.8 kg P ha<sup>-1</sup> (34.3–47.5 kg P<sub>2</sub>O<sub>5</sub>) to fully justify the cost of buying MB (Table 2).

Soil supply class according to available P	Needed amount of MB (kg ha <sup>-1</sup> )	Cost of MB (EUR ha <sup>-1</sup> )	Share of MB in total fertilizer costs (%)	Needed mobilized kg P ha <sup>-1</sup> by MB (kg P <sub>2</sub> O <sub>5</sub> ha <sup>-1</sup> ) in basic model
(A) Very low	1.80	46.8	9.25	20.75 (47.51)
(B) Low	1.50	39.0	8.26	17.29 (39.59)
(C) Moderate	1.30	33.8	8.18	14.98 (34.31)
(D) High	1.20	31.2	9.15	13.83 (31.68)
(E) Very high	1.10	28.6	9.47	-

Table 2: Needed amount and costs of MB, share in total fertilizer costs in corn growing and needed amount of P mobilized by MB

Assuming that MB will also result in a reduced need for fertilization with mineral forms of N by only 5% (5\_N model), the total price of the needed mineral fertilization is reduced, and the share of the cost of purchasing MB increases from 8.18–9.47% (Table 2) to 8.44–9.92%. However, in this case, analyzed by 5\_N model, a significantly lower effect of MB on P mobilization would be required to cover the remaining part of the cost of purchasing MB (Table 3), since part of the costs is already covered by the assumed 5% reduction in N fertilization.

Soil supply class according to available P	Needed mobilized kg P ha <sup>-1</sup> by MB (kg P <sub>2</sub> O <sub>5</sub> ha <sup>-1</sup> ) in 5_N model	Needed mobilized kg P ha <sup>-1</sup> by MB (kg P <sub>2</sub> O <sub>5</sub> ha <sup>-1</sup> ) in 10_N model
(A) Very low	15.48 (35.46)	10.22 (23.40)
(B) Low	11.79 (26.99)	6.28 (14.38)
(C) Moderate	9.37 (21.45)	3.75 (8.59)
(D) High	8.00 (18.31)	2.16 (4.95)
(E) Very high	-	-

Table 3: Needed amount of P mobilized by MB in 5\_N model and 10\_N model in corn growing

Presuming the reduction in N fertilization by 5% in corn growing as an expected benefit of MB application, for the purchase of MB to be profitable, the effect on P mobilization is sufficient in the amount of 15.48 kg P ha<sup>-1</sup> (or 39.3% of the total P requirement) on soils with very low P availability (Figure 2), on soils with low P availability 11.79 kg P (or 37.1%), moderate availability 9.37 kg P (or 39.9%), and high availability 8.00 kg P ha<sup>-1</sup> (Figure 2). If the efficiency of MB was at the level of 10% reduction of N fertilization (10\_N model) in corn growing, in order to cover the remaining amount of MB price, an even smaller P-mobilizing effect of MB would be sufficient (Table 3, Figure 2), from 2.16 to 10.22 kg P ha<sup>-1</sup>.

The minimum P-mobilizing effect required for the cost-effectiveness of MB application in these models depends on the level of available P in the soil and the assumed efficiency of MB in reducing N fertilization. Thus, for soils with very low availability of P (class A), without a positive effect of MB on the reduction of N fertilization, a phosphorus mobilizing effect of 20.7 kg P ha<sup>-1</sup> (47.5 kg P<sub>2</sub>O<sub>5</sub>) is required, which is in average 52.7% of the total need in corn fertilization using phosphorus. But with the MB effect on the 5% reduction in N fertilization, the P-mobilizing effect of 15.5 kg P ha<sup>-1</sup> (39.3% of the total need for P fertilization) is sufficient, and with the 10% reduction 10.2 kg P ha<sup>-1</sup> (25.9% of required P) is sufficient. Using the same model, it was determined that on very poor P soils (class A soils), for a positive financial effect without any P-mobilizing effect, an MB effect of 19.7% reduction in N fertilization would be required. Furthermore, for soils with low availability of P (class B) without a positive effect of MB on the reduction of N fertilization, a P-mobilizing effect of 17.30 kg P ha<sup>-1</sup> (39.6 kg P<sub>2</sub>O<sub>5</sub>) is required, which is in average 54.4% of the total need in corn fertilization using phosphorus. On poor P soils (class B soils), for a positive financial effect without any P-mobilizing effect, an MB effect of 15.7% reduction in N fertilization would be required.

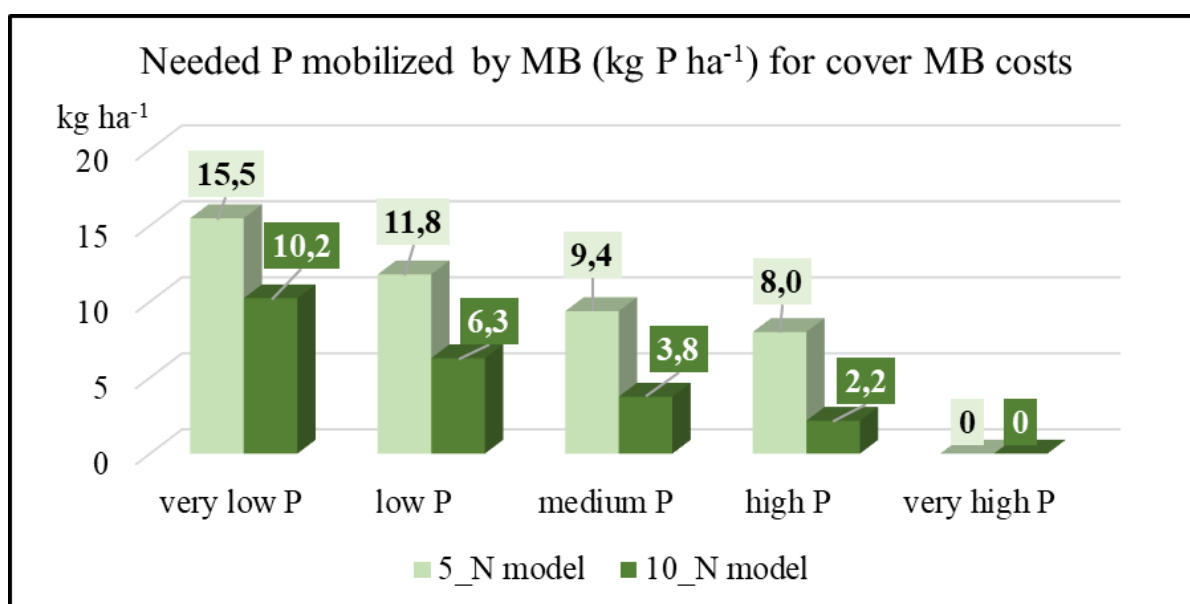


Figure 2: Sufficient P mobilized by MB (kg P ha<sup>-1</sup>) from the aspect of profitability of buying MB in corn growing

Finally, for soils with medium availability of P (class C) without a positive effect of MB on the reduction of N fertilization, a P-mobilizing effect of 15.0 kg P ha<sup>-1</sup> (34.3 kg P<sub>2</sub>O<sub>5</sub>) is required, which is in average 63.8% of the total need in corn fertilization using phosphorus. On medium P soils (class C soils), for a positive financial effect without any P-mobilizing effect, an MB effect of 13.3% reduction in N fertilization would be required, and on class D soils (high P availability), an MB effect of 12.0% reduction in N fertilization would be enough.

### 3.3. Effectiveness of microbial bioagents as a cost-effectiveness factor in wheat cultivation

In winter wheat cultivation on analyzed acidic soils, the average needs in fertilization with mineral P fertilizers (without organic fertilizer or microbial bioagents) would be 32.4 kg P ha<sup>-1</sup> (74.21 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>), starting from 47.2 kg P ha<sup>-1</sup> (108,1 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>) on very poor soils (Table 4), up to very rich soils where phosphorus fertilization is not required.

Soil supply class according to available P	Average needs in wheat fertilization with mineral P in kg P ha <sup>-1</sup> (as kg P <sub>2</sub> O <sub>5</sub> ha <sup>-1</sup> )	Total cost of mineral P (EUR ha <sup>-1</sup> )	Share of mineral P cost in total fertilizers costs (%)
(A) Very low	47.21 (108.1)	106.49	22.94
(B) Low	38.31 (87.72)	86.41	19.93
(C) Moderate	28.00 (64.13)	63.16	16.53
(D) High	9.73 (22.28)	21.94	6.67
(E) Very high	0.00 (0.00)	0.00	0.00

Table 4: Average needs and costs of P fertilizer in wheat cultivation depending of available P

The price of the required mineral phosphorus ranges from 106.49 EUR ha<sup>-1</sup> on acidic soils very poor in phosphorus, it decreases to 86.41 EUR on acidic soils poor in phosphorus, 63.16 EUR on moderately supplied soils, and 21.94 EUR on soils rich in P, while on very rich soils no P fertilizers are needed (Table 4). The share of mineral P costs in total fertilizer costs is higher (6.67–22.94%, table 4) in winter wheat growing than in corn growing (4.52–17.56%, table 1). The reasons are lower total N fertilization and higher total P fertilization in wheat than in corn growing due to the fact that in wheat cultivation, harvest residues and a significant part of P are removed from the fields, while corn residues are usually incorporated into the soil after harvesting corn. The price of MB for winter wheat cultivation ranges from 26 to 31.2 EUR ha<sup>-1</sup> (Table 5) on soils with medium and very low phosphorus availability, which accounts for 29.4–42.0% of the price of the required P fertilization. These values mean that in winter wheat growing MB would need to mobilize from 11.5 kg P ha<sup>-1</sup> on soils moderately supplied with P up to 13.8 kg P ha<sup>-1</sup> on very poor soils (26.4–31.7 kg P<sub>2</sub>O<sub>5</sub>) in order to fully cover the price of the purchased MB (Table 5).

Soil supply class according to available P	Needed amount of MB (kg ha <sup>-1</sup> )	Cost of MB (EUR ha <sup>-1</sup> )	Share of MB in total fertilizers costs (%)	Needed mobilized kg P ha <sup>-1</sup> by MB (kg P <sub>2</sub> O <sub>5</sub> ha <sup>-1</sup> ) in basic model
(A) Very low	1.2	31.2	6.73	13.83 (31.68)
(B) Low	1.1	28.6	6.62	12.68 (29.04)
(C) Moderate	1.0	26.0	6.85	11.53 (26.40)
(D) High	0.9	23.4	7.53	10.37 (23.76)
(E) Very high	0.8	20.8	7.70	-

Table 5: Needed amount and costs of MB, share in total fertilizer costs in winter wheat growing and the needed amount of P mobilized by MB

Using the 5\_N model, the total price of the needed mineral fertilization is reduced, and the share of the cost of purchasing MB increases from 6.6–7.7% (Table 5) to 6.8–8.1%. In case analyzed by 5\_N model, a significantly lower effect of MB on P mobilization would be required to cover the remaining part of the cost of purchasing MB (Table 6), since part of the costs is already covered by the assumed 5% reduction of N fertilization.

Soil supply class according to available P	Needed mobilized kg P ha <sup>-1</sup> by MB (kg P <sub>2</sub> O <sub>5</sub> ha <sup>-1</sup> ) in 5_N model	Needed mobilized kg P ha <sup>-1</sup> by MB (kg P <sub>2</sub> O <sub>5</sub> ha <sup>-1</sup> ) in 10_N model
(A) Very low	9.12 (20.88)	4.40 (10.1)
(B) Low	7.73 (17.70)	2.78 (6.37)
© Moderate	6.43 (14.72)	1.33 (3.03)
(D) High	5.03 (11.52)	-
(E) Very high	-	-

Table 6: Needed amount of P mobilized by MB using 5\_N and 10\_N model in wheat growing

Presuming the reduction in N fertilization by 5% in wheat growing as an expected result of MB application, for the purchase of MB to be profitable, the effect on P mobilization is sufficient in the amount of 9.12 kg P ha<sup>-1</sup> or 19.3% of the total P requirement on soils with very low P availability (Figure 3), on soils with low P availability 7.73 kg P or 20.2%, with moderate availability 6.43 kg P or 22.9%, and with high availability 5.03 kg P or 51.7% of the total P requirement. If the efficiency of MB was at the level of 10% reduction of N fertilization (10\_N model) in wheat growing, in order to cover the remaining amount of MB price, an even smaller P-mobilizing effect of MB would be sufficient, from 1.33 to 4.40 kg P ha<sup>-1</sup> (Table 6), i.e. 4.7 to 9.3% (Figure 3) of the total need for P in fertilization.

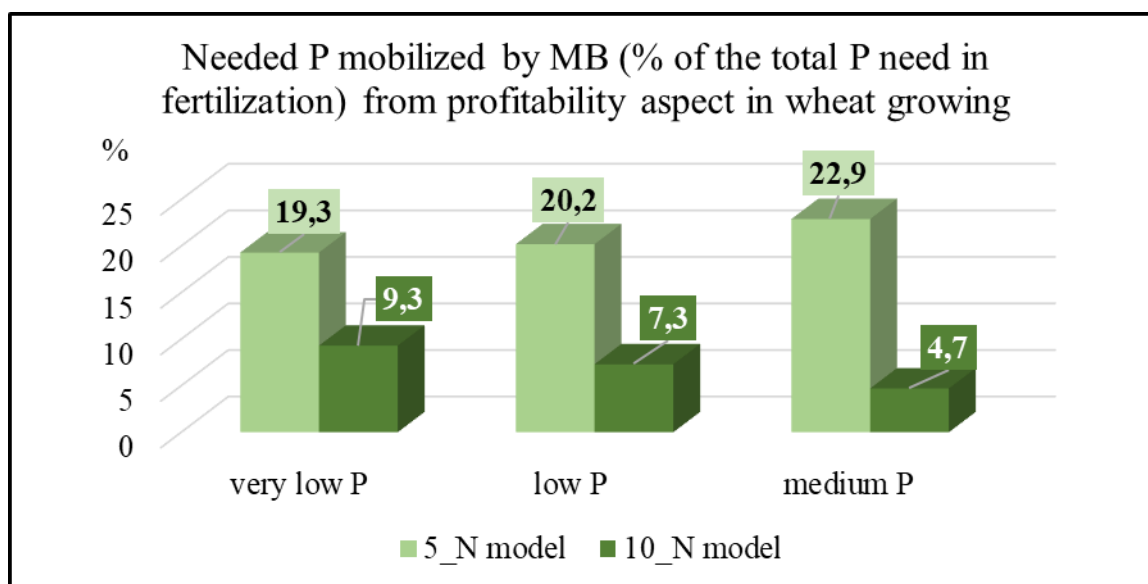


Figure 3: Sufficient P mobilized by MB (kg P ha<sup>-1</sup>) from the aspect of profitability of buying MB in winter wheat growing

On very poor soils with very low availability of P (class A), if there is no effect of MB on the reduction of N fertilization, a P-mobilizing effect of 13.83 kg P ha<sup>-1</sup> (31.68 kg P<sub>2</sub>O<sub>5</sub>) is required, which is in average 29.3% of the total need in wheat fertilization using phosphorus. But with the MB effect on the 5% reduction in N fertilization, the P-mobilizing effect of 9.1 kg P ha<sup>-1</sup> (19.3% of the total need for P fertilization) is sufficient, and with a 10% reduction 4.4 kg P ha<sup>-1</sup> (9.3% of required P). It was determined that on very poor P soils (class A soils), for a positive financial effect in wheat growing without any P-mobilizing effect, an MB effect of 14.7% reduction in N fertilization would be required. On poor P soils (class B soils), for a positive financial effect without any P-mobilizing effect, an MB effect of 12.8% reduction in N fertilization would be required, on soils with medium availability of P (class C), an MB effect of 11.3% reduction in N fertilization, and on class D soils (high P availability), an MB effect of 9.7% reduction in N fertilization would be enough.

#### 4. CONCLUSION

On acidic soils in the Republic of Croatia, which are predominantly poor in available phosphorus and SOM, the use of MB for treating wheat and corn seeds can reduce the costs of the necessary fertilization with mineral fertilizers. The level of MB use efficiency required to reduce the costs depends on soil fertility, i.e. the soil pH, level of SOM and available P in the soil, which most significantly affect the total need for N and P in fertilization.

The total price of the required phosphorus fertilization on very poor soils is on average 88.9 and 106.5 EUR ha<sup>-1</sup> in the cultivation of corn and wheat, on poor soils 71.7 and 86.4, on medium-supplied soils 53.0 and 63.2, on phosphorus-rich soils 16.3 and 21.9 EUR ha<sup>-1</sup>, while on very rich soils, phosphorus fertilization is not required. The share of the cost of the needed P fertilization in the total cost of fertilization in corn cultivation increases from 4.5% on phosphorus-rich soils to 17.6% on very poor soils, as well as from 6.7 to 22.9% in wheat cultivation. The price of the required amounts of MB in corn cultivation ranges from 28.6 to 46.8, and in wheat cultivation from 20.8 to 31.2 EUR ha<sup>-1</sup> from very rich to very poor soils. In modeling the profitability of using MB only based on the mobilization of P in the soil, without affecting the N fixation, the poorer the soil is in available phosphorus, the greater the mobilization of phosphorus is needed for a positive financial effect, and it amounts on average from 13.8 to 20.8 kg P ha<sup>-1</sup> in corn cultivation and 10.4 to 13.8 kg P ha<sup>-1</sup> in wheat cultivation on soils with high (class D soil) to very low availability of phosphorus (class A soil). However, it is more accurate to show the combined effect of MB on reducing the need for fertilization with mineral forms of N and P, which significantly reduces the minimum required mobilization of P for a positive financial effect. Thus, by modeling with the assumption of a 5% reduction in N fertilization of corn, the minimum required mobilization of P by using MB was reduced by about 5.3–5.8 kg P ha<sup>-1</sup>, i.e. to 8–15.5 kg P ha<sup>-1</sup>, and by 10% reduction of N fertilization by 10.5–11.7 kg, i.e. up to 2.2–10.2 kg P ha<sup>-1</sup> for P-rich to P-very poor soils. In wheat fertilization, there is a similar reduction of the minimum required mobilization of P to 5–9.1 kg P ha<sup>-1</sup> and 0–4.4 kg P ha<sup>-1</sup> with a 5 and 10% reduction in N fertilization for P-rich to P-very poor soils, respectively. Modeling also determined that the use of MB can be financially profitable even without a positive effect on P mobilization, but for this an effect on N fixation is necessary, which enables a reduction of N fertilization by a minimum of 19.7 or 14.7% on very poor soils, a minimum of 15.7 or 12.8% on poor soils, on medium-supplied soils a minimum of 13.3 or 11.3%, and on phosphorus-rich soils a minimum of 12 or 9.7% in the cultivation of corn or wheat, respectively. Final conclusion is that the use of MB in the cultivation of corn and wheat can be already financially profitable with N fixation, which reduces N fertilization by 10–20% without any effect on P mobilization, and with the expected effect on P mobilization and reducing the need for P fertilization, a 5% reduction in N fertilization with the mobilization of 5–15 kg P is already profitable, as well as a 10% reduction in N fertilization with the mobilization of 0–10 kg P ha<sup>-1</sup>. Additionally, by including the expected effect on reducing the need for potassium and microelement fertilization in the model, the model will be significantly more complex, but it could prove the profitability of using MB with less effect on N fixation and P mobilization.

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