



**Contemporary Research in the Field
of Entrepreneurship, Management,
and Innovation: Regular Issue**

Edited by

Anna Ujwary-Gil

Anna Florek-Paszowska

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The JOURNAL OF ENTREPRENEURSHIP, MANAGEMENT AND INNOVATION

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Table of Contents

Transnational water resource management in the Karawanken/Karavanke UNESCO Global Geopark	7
Lilia Schmalzl, Gerald Hartmann, Michael Jungmeier, Darja Komar, Rahel M. Schomaker	
From transition management towards just transition and place-based governance. The case of Western Macedonia in Greece	37
Lefteris Topaloglou, Lefteris Ioannidis	
University students' entrepreneurial intentions during COVID-19: The perspective of social cognitive career theory	75
Suwaluck Uansa-ard, Wisuwat Wannamakok	
An innovative approach to support interests' alignment in the context of transport management using semantic differential	107
Nestor Shpak, Zoriana Dvulit, Liana Maznyk, Włodzimierz Sroka, Olha Podra, Nataliia Petryshyn	
Technological innovation and the labor market: The two-way non-reciprocal relationships with a focus on the confectionery industry in Poland	135
Katarzyna Piwowar-Sulej, Krzysztof Podsiadły	

Transnational water resource management in the Karawanken/Karavanke UNESCO Global Geopark

Lilia Schmalzl¹ , Gerald Hartmann² ,
Michael Jungmeier³ , Darja Komar⁴ ,
Rahel M. Schomaker⁵ 

Abstract

PURPOSE: The management of cross-border natural resources has been the focus of research in different disciplines. Nonetheless, beyond theoretical insights, empirical evidence of successful cross-border management or governance of natural resources is still limited, even in the European Union (EU), where a range of instruments are provided to foster cross-border cooperation between its Member States. This is where our paper departs, providing evidence from an example of cross-border cooperation between two Member States of the EU, Austria, and Slovenia, adding to the analytical framework to identify the drivers of successful cross-border cooperation. **METHODOLOGY:** Drawing from the example of the European Grouping of Territorial Cooperation (EGTC) Geopark Karawanken we evaluate the success factors and limits for transboundary cooperation encompassing different forms of cooperation. Furthermore, based on empirical evidence of workshops with local, regional, and national stakeholders, we investigate the potential of the EGTC organizational framework to provide for the successful cross-border management of water resources within the Geopark area. **FINDINGS:** Our analysis of project bundles, joint ventures/consortia, and EGTCs as possible forms of transboundary cooperation indicates that EGTCs have various advantages over looser forms of cooperation. Higher operational costs for the organization are contrasted by enhanced governance of transboundary

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activities, in accordance with legal frameworks and representation on both sides of the border. This increases acceptance and facilitates decision-making. Furthermore, it increases the potential for receiving funds in accordance with planned activities and regional requirements, while decreasing the individual financial risk for partners. The genesis of the Karawanken/Karavanke UNESCO Global Geopark (Geopark Karawanken) indicates that looser forms of organization, for instance, project bundles, enable stakeholders to get to know each other without great institutional effort. In the course of increasing integration, the organizational form can be more complex. The experience in developing transboundary, water management instruments shows that even in a more sophisticated form of cooperation like an EGTC, there are remaining obstacles in managing transboundary natural resources. Obstacles result from e.g., national laws and regulations, data standards, monitoring techniques, and soft factors such as language barriers. **IMPLICATIONS:** The example of the Geopark Karawanken shows that cross-border public authorities can be significantly supported with the introduction of an EGTC. Still, an EGTC tends to exclude private companies or societal actors because they cannot be active members of the Board. Exploring further options for closer integration of the private sector in Public-Private-Partnership (PPP) models may be useful to maintain the opportunity to include much-needed private skills and resources. The experience of the Geopark Karawanken suggests that EGTCs can and will be a significant form of organization in Europe for a number of activities, for example, in the field of cross-border resources, cross-border protected areas, or cross-border predicate regions. This will support the achievement of the goals of EU programs to face the climate and biodiversity crises through transnational agreements, e.g., the Green Deal or the Biodiversity Strategy. **ORIGINALITY AND VALUE:** This article provides a concise overview on transnational water resource management in the European Union in the context of an EGTC, and raises points for practitioners about potential challenges for the successful introduction of an EGTC. While the analysis of common experiences of various EGTCs could lead to the development of a European standard and guideline for the successful foundation of this territorial cohesion tool, this paper provides the first step, paving the road for future research.

Keywords: European Grouping of Territorial Cooperation, Karawanken/Karavanke UNESCO Global Geopark, transnational cooperation, European Union, water resources management

INTRODUCTION

The management of cross-border natural resources, particularly water, has been studied in economics and political science, but first and foremost in geography. Economic implications resulting from the nature of water as a common good and prerequisite of human life, but also its institutional implications, constitute a major share of published literature (e.g., Beck, 2017; Noferini et al., 2020). For the European Union (EU), a couple of studies

exist on river management and water governance (e.g., Lindemann, 2006; Renner et al., 2018; Renner & Meijerink, 2018). While the majority of existing literature focuses on the governance of major transboundary river basins (e.g., Bernauer, 2002; Wiering et al., 2010), less attention has been paid to regional river basins that are shared between countries and represent a large share of the world's cross-border water resources. Empirical evidence of successful cross-border management or governance of water resources is still limited for the EU. Examples show that even though cross-border cooperation is mostly sanctioned at national level it is mostly shaped and organized at a regional and local level (Renner et al., 2018).

The EU provides a range of instruments to foster border-spanning cooperation in resource management between its Member States (MS) (Noferini et al., 2020). Still, the question of how cooperation can be developed and institutionalized on a sub-national level is hardly addressed. The issue is even more acute when it comes to the inclusion of non-public actors and citizens. This is where our paper departs, providing evidence from an example of cross-border cooperation between the local level of two MS of the EU, Austria, and Slovenia. We provide the example of the European Grouping of Territorial Cooperation (EGTC) Geopark Karawanken, which is the management organization of the Karawanken/Karavanke UNESCO Global Geopark (hereafter referred to as Geopark Karawanken). This geopark has at least 11 years of different cross-border cooperation experiences that can be analyzed and discussed in the context of their particular challenges.

The Geopark Karawanken is a cross-border region connected and divided by the mountain range of the same name. It is located along the border of Austria and Slovenia and is marked by the wide geological variety between the Alps and Dinarides. It was established in 2011, and in 2013 it became a member of the European and the Global Geopark Network (EGN and GGN, respectively). It covers an area of 1,067 km² and includes nine Austrian and five Slovenian municipalities (Štrucl et al., 2014). On the 27th of November 2019, the management organization of the geopark, the EGTC Geopark Karawanken, was officially founded (Geopark Karawanken, 2019a). It is the first EGTC on the Austrian-Slovenian border as well as the first EGTC with its official seat in Austria. With the new organizational structure, the Geopark Karawanken became an area where voluntary cooperation of municipalities was upgraded into an obligatory action. This new organizational structure of the Geopark Karawanken has several advantages over its previous forms of cooperation. For example, the advantages lie in the increased potential for gaining strategic projects to develop the cross-border region in a transboundary effort and maintaining the status of the best example of cross-border cooperation between municipalities on the border between

Austria and Slovenia. Enhanced cross-border cooperation between municipalities of the Geopark Karawanken in other areas (e.g., transport and mobility, protection of natural resources and protection against natural disasters, building up monitoring and early warning systems) is expected in upcoming years.

Cross-border cooperation between institutions is important for the development of peripheral border regions – such as the area of the Geopark Karawanken – to tackle socio-economic problems and thus improve the quality of life for residents on both sides of the border (Gruber, 2013). From the long-term experiences of the EGTC Geopark Karawanken we evaluate the success factors and limits for transboundary cooperation in different organizational forms. Furthermore, we investigate the potential that the organizational framework provides for the successful cross-border management of water resources within the geopark area, including remaining obstacles such as different national laws and regulations, data standards, monitoring techniques and soft factors like language barriers. These questions are framed in the context of the INTERREG SI-AT project KaraWAT (2021-2022). Regarding these objectives, in this paper we work on the following research questions (RQ):

- RQ1) What are the success factors and limits for transboundary cooperation for project bundles, joint ventures/consortia and EGTCs?*
- RQ2) How can the EGTC framework support successful cross-border water resource management decisions in the cross-border Karawanken UNESCO Global Geopark and what are the remaining obstacles?*

The paper proceeds as follows: Firstly, we discuss the relevant literature concerning cross-border management of natural resources and transboundary cooperation. We describe the genesis of the EGTC Geopark Karawanken and give insights into water resources within the Geopark area. In the methods section we explain the attributes that we used to rate the practicality of different cross-border organizational forms and the workshops that were carried out within the frame of the project KaraWAT. The results demonstrate the potentials and limitations of different cross-border organizational forms and the experiences on cross-border water management decisions within the EGTC Geopark Karawanken. The discussion highlights research gaps and limitations of transboundary cooperation. The article concludes with a recommendation of measures that were elaborated upon within the workshops.

LITERATURE REVIEW

Cross-border management of natural resources

Natural resources like water or forests play an essential role in modern societies, being relevant for economic development as well as ecological sustainability. Thus, the nature and related scarcity of many of these resources – and the associated problems of efficient management or pricing – represent a particular challenge that is discussed in the literature, especially regarding natural resources that stretch over national borders (Fullerton, 2003; Guo, 2021). The underlying assumption is that water – as with many natural resources – can be understood as both a private marketable good and a public good. In economic theory, rivalry and excludability are taken as indicators to differentiate between public and private goods. Rivalry defines the question of whether a good can be used by more than one user without a decrease in utility. Excludability stands for the question if non-paying users can be excluded from using the good (Randall, 1983). If rivalry and excludability are given, a good can be classified as being “private,” if there is no rivalry and no excludability at affordable costs, the good can be classified as a “public good.” Following these analytical dimensions, many natural resources can be understood as public goods or at least so-called “commons.” These common pool resources are similar to public goods in that they do not offer themselves simply to the exclusion of non-paying users, but their consumption is open to overuse – a fact that is apparent in cases of exhaustive natural resources. Hence, in these cases, as long as the total demand does not exceed the productive capacity of the resource, the consumer can use the respective good without threatening other consumers’ needs. However, once the demand exceeds availability, common pool resources can be overused due to a lack of ownership and control. To prevent overuse, consumers often develop rules about the protection and sustainable use of the resource (Ostrom, 2008).

Traditionally, public goods (including services) are provided by national governments in the interest of the public; the potential users of the good pay indirectly for the good via taxation. The geographic scope of natural resources is of great importance in this context, as the outlined concept is implicitly characterized by a national view. Thus, in the case of transboundary public goods the question emerges how such “cross-border” or even “global public goods” can be governed (Schomaker, 2017). Water resources, such as groundwater basins or rivers, have their own geographic boundaries that often do not match with administrative borders. Moreover, administrative boundaries often run along ecosystems, such as rivers or mountain ranges.

Mountain ridges and water features very often represent borders between administrative units or states (UNECE, 2015). Hence, holistic management of these ecosystems must often take place across borders. Therefore, the management of these ecosystems intrinsically requires transboundary measures and management (Petrova et al., 2019).

Beyond sheer economic and territorial analyses of natural resources, like water resources, there is a wide range of literature related to cross-border cooperation, especially in protected areas. Institutions such as IUCN (Vasilijevic et al., 2015), UNESCO (2013), the Ramsar Convention (2016), or Europarc (EUROPARC, n.d.) develop guidelines, toolkits or recommendations for the challenging activities of transboundary cooperation.

Furthermore, much literature focuses on institutional and regime-based water basin management (e.g., Bressers & Kuks, 2013) and international river management (e.g., Bernauer, 2002; Marty, 2001). Less attention has been paid to regional water basins shared between countries, representing a large share of the world's cross-border water resources. Renner et al. (2018) argue that cross-border cooperation is mostly shaped and organized by actors at regional and local levels. The EU's cohesion policy includes a variety of instruments to facilitate regional cross-border cooperation between MS, as outlined below.

Transboundary cooperation in the EU

Against the backdrop of cross-border public goods, in particular with a view on the sustainable and efficient use of natural resources and the management of biodiversity and ecosystems, a suitable legal and organizational framework for cross-border cooperation is necessary. At the European level, different initiatives or arenas exist that provide such a framework, including a variety of single measures or concrete cooperation (e.g., Böhm, 2014). The European Territorial Cooperation (ETC), better known as "Interreg," is part of the EU's cohesion policy and provides a framework for the implementation of joint programs and actions between different MS. It is built around three pillars of cooperation: Interreg A, the so-called "European cross-border cooperation," supports cooperation between regions at the NUTS-III-level of two or more MS that are located directly on or adjacent to the borders (EC, 2021a). The second initiative, Interreg B, fosters transnational cooperation. It aims to form bigger areas, involving a number of regions from several countries of the EU (EC, 2021b). Interreg C focuses on interregional cooperation and works at the pan-European level.

To support these (project-oriented) approaches of ETC with a European cooperation structure that has legal force, the EU provides the following transboundary forms of cooperation to strengthen its economic, social, and territorial cohesion (Zapletal, 2010): European Economic Interest Grouping (EEIG) and EGTCs. An EEIG is a legal entity that was created by the Council of the European Communities in 1985. An EEIG agreement can be formed by companies and other public or private law entities under the national law of an EU country. The EEIG has no legal personality, but according to EU law it has (limited) contractual capacity (EC, 1985). An “EGTC is a European legal instrument designed to facilitate and promote cross-border, transnational and interregional cooperation” (EC, 2021c). This organizational form was established in 2006. It enables cooperation between regional and local authorities, associations and other public bodies from different MS (EC, 2006; Zapletal, 2010). While the purpose of the EEIG mainly lies in maximizing economic results through cross-border cooperation, the EGTC adds instruments to facilitate territorial cooperation between local and regional authorities (Zapletal, 2010).

Currently, there are 79 EGTCs in Europe, operating in various fields of activities ranging from tourism to transport topics. Examples include territorial and transnational cooperation in the field of ceramic art and craft, water management programs for border areas, enhanced cross-border waste management, management and valorization of mycological resources, and even management of a hospital (CoR, 2022a). Most EGTCs are driven by the motivation to facilitate the coordination of cross-border cooperation and to increase the binding nature of their political function (Beck, 2017). This motivation for increased liabilities and facilitated cross-border cooperation was experienced by the EGTC Geopark Karawanken. On its genesis it experienced a number of different organizational forms that will be outlined below.

Genesis of the EGTC Geopark Karawanken

The Karawanks are a mountain chain in the southern Alps that form the border between two EU-member states, Slovenia and Austria. In their formation, caused by the collision of the African and Eurasian tectonic plates, they built out a dense number of natural features. These include (hydro-)geological phenomena like a high variety of different rock types and the formation of natural caves, a high number of springs that are fed by transboundary water bodies, characteristic alpine landscapes and valuable as well as sensitive ecosystems (Skoberne et al., 2013; Štrucl et al., 2014; Bedjanič, 2021a, 2021b).

The administrative borders of the region have shifted in the past. They once formed a common historical region that belonged to the Austrian part

of the Austro-Hungarian monarchy. After the peace treaty of Saint-Germain-en-Laye in 1919 and with the plebiscite in Kärnten/Koroška on the 10th of October 1920, today's border between the former Kingdom of Yugoslavia and Austria was fixed (Pohl, 2020). Ore mining has had a significant impact on the landscape and people's lives in the past (Modrej et al., 2018).

When the mining activities in the Mežica mine in Slovenia came to its end, the mines were reused for touristic purposes and the Podzemlje Pece museum was established. At approximately the same time, the Obir dripstone caves were opened for touristic purposes in the municipality of Eisenkappel-Vellach, Austria. Strong initiatives for the conservation of geological phenomena and their promotion for touristic and educational purposes first arose around 1980. Later, the feasibility and practicality of different forms of protected area designation were investigated (Jungmeier et al., 2003). In 2004, when Slovenia became a member of the EU, the cross-border working group (WG) "Dežela pod Peco – Petzenland" was established to promote the cross-border area jointly. The cooperation was supported by local communities, regional authorities and expert institutions (Štrucl et al., 2014).

The formation of the cross-border geopark was established between the Peca/Petzen and Koschuta/Košuta within a project in the period 2007–2013. The loose form of project-based cooperation enabled local authorities to build trust and get to know each other. In 2013, an ARGE (in German, Arbeitsgemeinschaft, or "working group") was established to increase the visibility and the commitment of its members, as well as to get it officially recognized as a member of the European geopark network (Štrucl et al., 2014). Under Austrian law, an ARGE is defined as an association of individuals, groups or institutions for the purpose of exchanging experiences, representing interests or dealing with issues and problems of common interest. The basis of collaboration is built upon a memorandum or an agreement on measures that have no legal binding (Pfefferkorn & Thamm, 2015). Within a follow-up project, several good practices and possible forms of cross-border cooperation were examined to increase the binding nature of collaboration and facilitate cooperation. Within the project EUfutuR (2016-2019), the application for the establishment of an EGTC was created.

In 2019, the EGTC Geopark Karawanken was officially founded to facilitate mutual decision-making between nine Austrian and five Slovenian municipalities. It has one and the same legal personality on the Austrian and Slovenian sides. Legally, the association is considered a community association, which, like a municipality, is authorized to make decisions on behalf of all 14 partner municipalities of the region (Geopark Karawanken, 2019a). This removes bureaucratic obstacles, as the local councils of municipalities do not need to be involved in the decision-making.

The main objective of the EGTC Geopark Karawanken is the conservation of its geological, natural and cultural heritage in the cross-border territory of its 14 member municipalities (Zillmer et al., 2020). Of equal importance are awareness-raising activities, information and education about the geological, natural and cultural heritage of the area within the geopark, and its promotion in the EGN and GGN (Geopark Karawanken, 2019b). The economic development of the peripheral cross-border region is being supported through local political coordination and general cross-border cooperation involving the tourism sector and the representation of sustainable regional policy interests of the entire region (CoR, 2022b).

The EGTC Geopark Karawanken thus experienced a number of different forms of cooperation through its development (Figure 1). The advantages and disadvantages on the levels of governance and suitability facilitated transboundary cooperation, and costs will be outlined in the results of this paper.



Figure 1: Genesis of the EGTC Geopark Karawanken

Water in the context of the Karawanken UNESCO Global Geopark

The mission of the UNESCO Global Geopark network is to “promote the links between geological heritage and all other aspects of the area’s natural and cultural heritage, clearly demonstrating that geodiversity is the foundation of all ecosystems and the basis of human interaction with the landscape” (GGN, 2022). Geodiversity is defined as the variety of geological, geomorphological, pedological, and hydrogeological phenomena (IUCN, 2022). Water is directly related to the geology of the area and is responsible for the formation of geological features, including river incisions, tufa deposits, and caves. The geological composition influences the type of water aquifers, the temperature, mineralization and carbonization of waters as well as water run-off and filtration behavior. Water features are of essential importance as they sustain unique ecosystems that require conservation on the one hand and add aesthetic value to landscapes, which attract visitors and facilitate tourism, on the other hand. Therefore, management

of water resources is of emerging importance in UNESCO Global Geoparks (Ruban, 2019).

All EU member states are obliged to manage their water resources according to the principles of the Water Framework Directive (WFD 2000/60/EC). This includes the joint cross-border management of water resources. To address these water management questions within the EGTC Geopark Karawanken, a sustainable cross-border water management strategy for the protection and sustainable use of ground- and surface water resources is being developed in the frame of the INTERREG V-A SI-AT project KaraWAT (2021-2022).

Mountain ridges and water features very often represent borders between administrative units or states (UNECE, 2015). The Karawanks are one example of a mountain range connecting and dividing two MS of the EU. They form the border between Austria and Slovenia, incorporating a transboundary karstic groundwater body (Figure 2). They are an essential basis of living in both neighboring countries, as they provide excellent quality drinking water to neighboring areas.

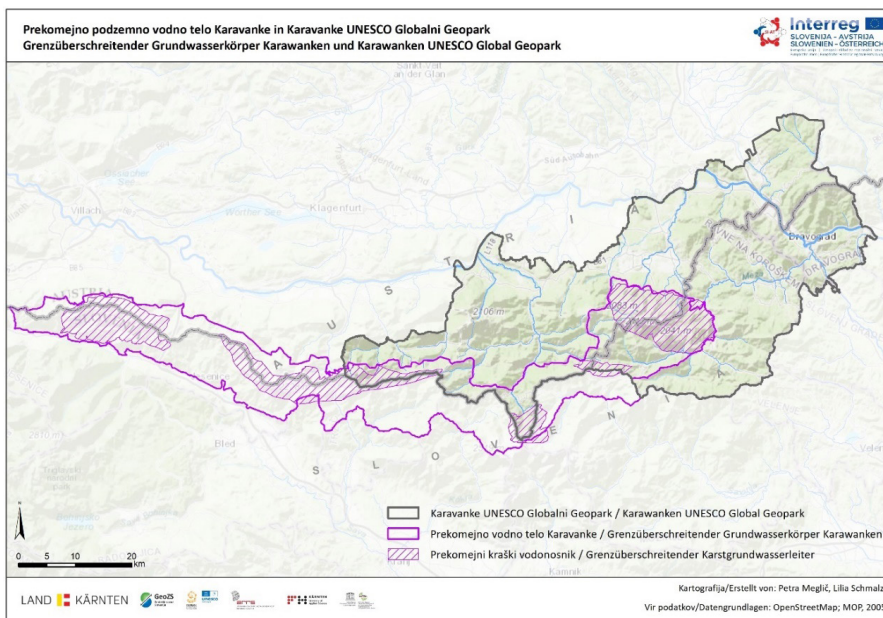


Figure 2. Transboundary water body of the Karawanks and karstic aquifers

Karstic water aquifers are particularly sensitive to pollution due to the poor filtration capacity of limestone. Precipitation infiltrates underground

quickly, and the water finds its way through the mountains, discharging at springs that are found at the transition zones between limestone and other water-impermeable geological layers. The water does not respect borders on its way through the mountains, so in the case of the Karawanks some amount of precipitation that falls on the Slovenian side runs off through springs on the Austrian side and vice versa (Brenčič & Poltnig, 2008; Brenčič & Poltnig, 2009). Investigations on karstic water springs discharging from the Karawanks started in the early 1980s (e.g., Brandt & von Hütschler, 1980). To protect these water resources on a long-term basis, transboundary water bodies and risk areas were defined. It was not possible to designate transboundary, water protection zones across the border officially, due to differences in national laws and regulations. Still, both countries agreed to designate necessary areas to support water quality on both sides (Brenčič & Schlamberger, 2013).

Apart from karstic water aquifers, there are other transboundary water-related phenomena, like mineral water springs, within the geopark area. The question for the EGTC Geopark Karawanken is how those valuable natural assets can be protected and valorized for touristic and educational purposes. There are numerous highly mineralized and carbonated springs in the area alongside the Periadriatic fault system, which crosses the territory of the geopark, building the fault zone of the European and the Adriatic continental plates. The springs are mineralized due to the dissolution processes of water and rocks. Some of them have high concentrations of CO₂ from gases rising from the earth's crust (Brenčič et al., 2004; Štrucl et al., 2014).

Furthermore, climate change drastically influences the water balance of the geopark, similar to the rest of the Alps (Reszler et al., 2011). Frequent storms in recent years struck the whole area and flooding due to high precipitation caused a high amount of damage to streets, buildings, and other infrastructure. Forest landcover loss due to wind throws and bark beetles (Schmalzl & Weiß, 2020) increases the pressure on regulated streams and rivers (Calder, 2007). It also influences the quality of drinking water (Kreye et al., 2014). An increase in extreme weather events affects both sides of the border and demands transboundary efforts in risk management. Bracken et al. (2016) review different approaches to cross-border flood risk management. Integrated land use practices and nature-based forest management can reduce the risks of natural disaster and pollution of drinking water (BMLRT, 2021; Kreye et al., 2016). A close-meshed network of monitoring stations at springs and streams can help to understand changing flow regimes. In combination with early-warning systems, local authorities and inhabitants can be supported in disaster control management (Tadrist et al., 2022).

METHODOLOGY

The aim of our approach is twofold. Firstly, we carve out the success factors and limits of vertical, horizontal and cross-border cooperation between local, regional and national stakeholders acting in different forms of cooperation. Following a comparison of different forms of cross-border cooperation, we investigate the potential that the EGTC organizational framework provides for the sustainable management of transboundary water resources within the Geopark Karawanken and remaining obstacles resulting from different national laws and regulations, data standards and monitoring techniques, including soft factors such as language barriers between countries. Beyond a literature screening, empirical insights are generated in different formats; here, we try to draw on the particular experiences of the project team. Based on a similar way of presentation (Jungmeier, 2014) the diagrams (Figure 3, 4, and 5) were conceptualized and put under debate within the project team. Based on that, two national and two cross-border stakeholder workshops on the identification of water resources and risks in the Karawanken UNESCO Global Geopark were organized as part of the INTERREG V-A SI-AT project KaraWAT.

We evaluate the suitability of three transboundary cooperation forms that the EGTC Geopark Karawanken experienced from its genesis, namely “project bundle,” “joint venture/consortium” and “EGTC”:

- 1) Project bundle: Cross-border cooperation organized on the basis of individual projects that are prepared and implemented on a case-by-case basis.
- 2) Joint venture/consortium (i.e., ARGE): Cross-border cooperation based on an institution, e.g., a formalized WG, an NGO or a (non-profit) company.
- 3) EGTC: Cross-border cooperation based on the cross-border association of public bodies, e.g., municipalities

The forms of cooperation are rated on four criteria: ‘Governance,’ ‘Suitability,’ ‘Transboundary’ and ‘Costs.’ The selection of the criteria and designated attribute levels give reference to the literature on different aspects of transboundary governance (Beck, 2018; Böhm, 2014; Borrini-Feyerabend et al., 2013; Crofts et al., 2020; Vasilijevic et al., 2015; Zapletal, 2010). For each level, we associate different attribute levels that are rated from 1-3, where 1 is not suitable, and 3 is very suitable (Table 1). The selected criteria are defined as follows:

- 1) **Governance:** Governance is an essential element of transboundary cooperation and can be seen as the autonomy of local political action in cross-border regions. Local actors use different forms of cooperation to achieve their goals in the area. We analyze the success of the governance criteria regarding the effectiveness and legitimacy of decision-making, the transparency of decision-making and the liability of action, concerning responsibilities and functions within the cooperation.
- 2) **Suitability:** The functional role of cooperation is dependent on the ability to generate income or funding. EU funding has substantial influence on the shape of cross-border cooperation and their possibilities to fulfill regional requirements. Another factor influencing the suitability of different cross-border cooperation forms and their coherence with regional requirements is their ability to achieve planned activities.
- 3) **Transboundary:** Concerning transboundary aspects, the formation of cross-border forms of cooperation can be seen as emerging new political communities. The question of visibility and acceptance of activities of cross-border forms of cooperation is essential considering transboundary aspects. Often, people living within the cross-border area are unaware of the existence of cooperation and lack a sense of involvement.
- 4) The cost criterion is of great importance as well. The more sophisticated the organization of cross-border cooperation is set up, the higher the cost will be for setting up and for operating the institution. The financial risks on the other hand can be minimized for local actors, like municipalities or other partners, when there are limited liabilities for them.

Table 1. Description of criteria and associated attribute levels

Levels	Description
Governance	
A1 – Decision-making	Effective and legitimate decisions in the long-term
A2 – Transparency	Traceability of decisions and processes
A3 – Liability	Clarity of responsibilities and functions
Suitability	
B1 – Accordance with financial instruments	Suitability to generate funding or income
B2 – Accordance with regional requirements	Liaison with regional institutions and policies
B3 – Accordance with planned activities	Coherence with the objectives of the cooperation
Transboundary	
C1 – Acceptance on both sides	Correspondence to social and cultural requirements
C2 – Legal frame on both sides	Correspondence to legal and administrative requirements
C3 – Representation of both sides	Well-balanced depiction of interests

Levels	Description
Costs	
D1 – Investment required	Costs for setting up the institution
D2 – Operational cost	Costs for running the institution
D3 – Financial risks	Limited liabilities for individuals and partners

After comparing the potentials and limitations of different cross-border forms of cooperation, we next investigated the opportunities and obstacles of EGTCs for the sustainable cross-border management of water resources in the Geopark Karawanken. The results are based on four stakeholder workshops in the frame of the KaraWAT project. In May 2021, two national stakeholder workshops were staged. In the Austrian national workshop (n = 16 participants), local and regional stakeholders as well as experts in water management and sanitation, drinking water protection and hydrogeology discussed issues in water management, impacts of climate change on water resources, measures to protect the quality and amount of drinking water, land-use and land planning questions, and activities or processes necessary to improve collaboration between local, national and cross-border stakeholders. The same topics were discussed in the Slovenian national workshop (n = 10 participants). The aims of the two cross-border workshops were to carve out possibilities for a coordinated collaboration across borders. The first one was organized in November 2021 with experts in hydrogeology and natural sciences as well as regional and national authorities from Austria and Slovenia (n = 20). The second one was organized in December 2021 and was made up of local authorities and experts in water management (n (SLO) = 11 participants, n (AT) = 13 participants).

RESULTS

Potentials and limitations of different cross-border forms of cooperation

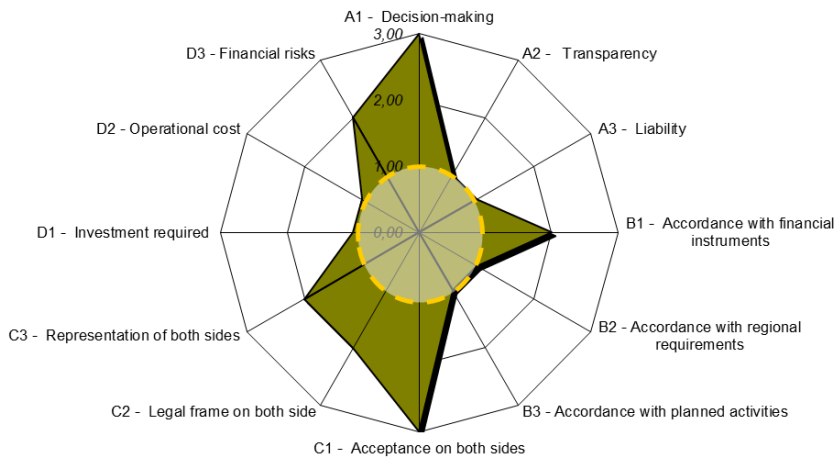
Project bundles

Project-based cooperation shows strengths in the criterion of decision-making (Figure 3). Decision-making is not time-consuming because it is by definition “lean” and only relates to the specific project. Acceptance for the project is high; otherwise it would not exist. However, acceptance can vary greatly from project to project. More complex initiatives and possible

conflict issues can hardly be addressed in project-based cooperation. Apart from the preparation costs, there are neither investments nor significant operational costs for project-related cooperation. Still, the financial risks for individual participants can be high. In the other criteria, purely project-related cooperation shows significant weaknesses, which are particularly obstructive in a longer-term perspective. This accounts for the low liability of projects. A lack of long-term responsibilities on project outputs after the project period can lead to problems in maintenance and service of infrastructure. Furthermore, project outputs do not necessarily have a direct relationship with planned activities and regional requirements of the cross-border regions, as they depend strongly on funding programs and individual interests. This leads to low transparency of project outputs because of resulting gaps between local needs and project outputs, generating open questions concerning the embedded and long-term responsibilities.

D: Costs

A: Governance



C: Transboundary

B: Suitability

Figure 3. Spider chart of project bundles

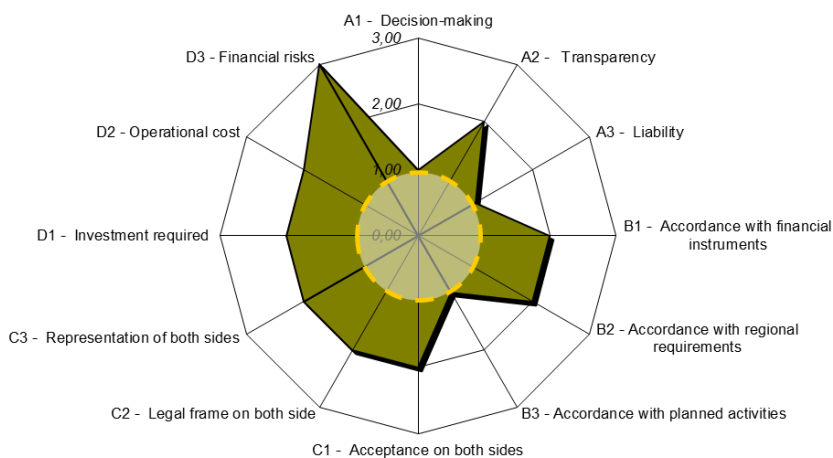
Joint venture/consortium

The joint venture/consortium (Figure 4) has the advantage of reducing the financial risk of individuals or partners. This is particularly advantageous in view of difficult funding “landscapes.” However, increased security entails higher operational costs (e.g., for annual financial statements, audits, consulting, etc.). This form of cooperation still has clear advantages over the project bundle with regard to other criteria, such as the accordance with regional

requirements and improved transparency. The basis of collaboration is agreed upon in a non-binding memorandum of understanding or agreement between partners. This leads to a partner structure of local and regional actors and explains the aims of cooperation. Still, the non-binding nature of agreement may lead to low liabilities concerning responsibilities and functions. In the area of governance, it is evident that decision-making is a weak point, which has an impact on the long-term quality of the cooperation. Restraints in decision-making directly relate to the legal capacity of consortia. The purely national legal capacity sometimes entails complicated and lengthy procedures.

D: Costs

A: Governance



C: Transboundary

B: Suitability

Figure 4. Spider chart of joint ventures/consortia

EGTC – European Grouping of Territorial Cooperation

The evaluation shows that the advantages of the EGTC over other forms of organization lie mainly in the criteria of governance, suitability, and transboundary (Figure 5). This inevitably leads to higher costs for investment and operational costs. The evaluation in accordance with regional requirements assumes that antagonistic, unpredictable, and diverse demands from the respective regions can never be fully satisfied. Nonetheless, the concept of EGTC does not come without restrictions. Firstly, the operationalization of EGTCs is a critical factor. Secondly, EGTCs involve cooperation of public entities only, excluding private companies or societal actors from this institution. This may lead to a loss of private entrepreneurial resources in the management of cross-border issues.

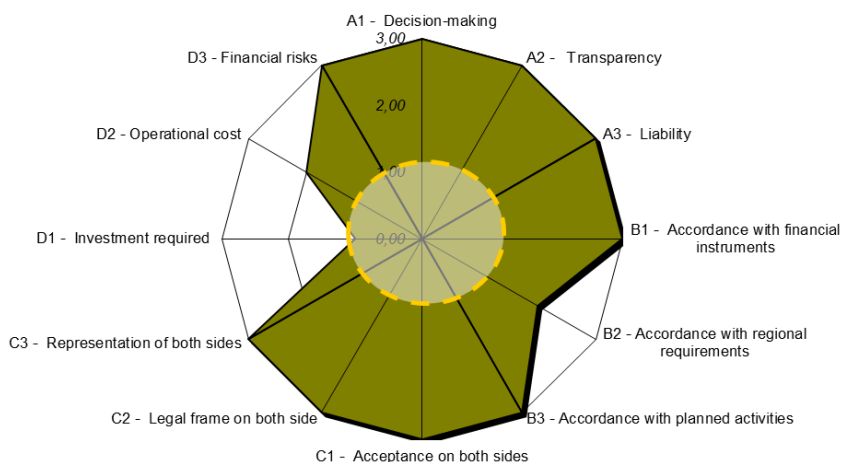
D: CostsA: GovernanceC: TransboundaryB: Suitability

Figure 5. Spider chart of EGTCs

Opportunities and challenges in the management of water resources in the cross-border EGTC Geopark Karawanken

The opportunities and obstacles of the EGTC Geopark Karawanken to manage water resources sustainably across borders proved to be diverse. Within expert talks and four workshops on the identification of water resources and associated risks in the area, possible cooperation between stakeholders was identified for the protection and sustainable use of cross-border water resources within the EGTC. In the agreement of members of the EGTC Geopark Karawanken, the common goal is the conservation and touristic valorization of cultural heritage as well as geological and natural assets (Geopark Karawanken, 2019b). Concerning water resources, the form of cooperation offers the opportunity for a coordinated collaboration between its members across borders. Still, there are remaining obstacles in data standards, laws, regulations, political functions as well as language that challenge this cross-border cooperation.

One example that was already outlined in the literature review is offered by the designation of water protection zones (Brenčič & Schlamberger, 2013). Even though the principles for drinking water protection in Austria and Slovenia are similar, the countries differ in their practical implementation. In Austria, groundwater belongs to the landowner, who is also responsible for its protection. In Slovenia, groundwater is a public good, and groundwater

protection is the responsibility of the state. Groundwater protection in both countries is regulated by water laws, but in Austria protection zones are delimited on the basis of the Austrian Water and Waste Management Association guidelines, whereas in Slovenia delimitation is regulated by law (Brenčič & Poltnig, 2008). This leads to differences in the effectiveness of designated protection zones. In Austria, 95 percent of necessary water sanctuaries for the karstic aquifer on Peca Mountain have been implemented. In the workshops, Austrian regional authorities stated that the remaining five percent are currently under discussion. On Slovenian side, water protection procedures can take a very long time due to the different political situation and thus remaining risk areas can be found with insufficient protection against microbiological contamination. The WG of the Drava Commission is responsible for coordination of protection zones across borders but currently there is no active political will to proceed with the joint mission of water protection. In the workshops, the stakeholders suggested that the municipalities inside the Geopark Karawanken could induce positive pressure at higher levels that the WG continues with the necessary procedures for protection.

Concerning the valorization of water resources for touristic and educational purposes, the EGTC Geopark Karawanken offers similar water-related phenomena on both sides of the border, such as the occurrence of mineral waters springs alongside the Periadriatic fault system. Even though those waters offer a high potential for their valorization, they are hardly used today, with the exception of the Carinthia-Lithion spring, which offers therapeutic treatment within a health center in the municipality of Eisenkappel. For the remaining springs, efforts were taken in previous projects to develop touristic infrastructure around them, including pathways, attractive catchments, and information signs (Brenčič et al., 2004). This infrastructure was developed and placed within the project but no provisions were assigned to the individuals who would be responsible for the maintenance work at the conclusion of the project period. This lack of responsibility and investment in the maintenance of existing infrastructure led to neglect at the sites. Revitalization of existing infrastructure and assignment of future responsibility for maintenance is being worked out within the KaraWAT project. With the joint promotion of sites on both sides of the border, the tourism sectors of Austria and Slovenia can profit equally from valorization efforts. In the workshops, stakeholders proposed that within the EGTC Geopark Karawanken, clear common goals for the valorization of springs need to be defined. Additionally, the question of how to protect the springs from tourist activities when putting them into the programs must be addressed. Clear rules and a plan for the revitalization, maintenance and development of infrastructure need to be defined prior to implementation. The main goal within the EGTC is to connect offers on both

sides of the border and to find common levels for internal protection as well as common levels for the interpretation and valorization of the springs.

On the level of risk management, municipalities play a central role concerning forward-looking land use planning and effective disaster management. The effects of climate change and an expected increase in the frequency of extreme weather events has struck the geopark area in recent years. This indicates the pressing requirement for effective disaster management. In the workshops, continuous and harmonized area-wide monitoring of smaller streams and rivers in Austria and Slovenia, the installation of common early warning systems, effective land-use and forest management within the municipalities, data exchange and joint interpretation of data, were named as important elements to be addressed at the transboundary level (Schmalzl et al., 2021). The methodologies for monitoring and interpretation of water-related data between Austria and Slovenia currently differ. Efforts to harmonize methodologies could improve the cross-border collaboration.

From the process perspective, the language factor proved to be a possible barrier for cross-border cooperation within the EGTC Geopark Karawanken. The workshops with local stakeholders had to be moderated bilingually, as many of the local authorities felt more comfortable speaking in their national language. Still, with experienced moderation, bilingual workshops can offer a fruitful exchange. In the workshops with regional or national stakeholders and experts on water management, no language barrier was experienced. Language also proved to be an obstacle in the review of literature and materials. Official national websites mainly provide information, (geo)data and literature in their national language. Local hydrogeological studies, land use laws and regulations, and planning instruments are available only in national languages, making exchange of knowledge more difficult.

DISCUSSION

UNESCO Global Geoparks aim to promote geodiversity as the foundation of all ecosystems and the basis of human interaction with the landscape (GGN, 2022). We have outlined the importance of water resources in the context of protection within the Karawanken UNESCO Global Geopark. Geoparks, as conservation areas, may contribute to effectively manage and promote water resources in their area across local, regional, and national borders. Thereby, geoparks can foster collaboration between members and stakeholders and promote water resources through awareness-raising activities for visitors, inhabitants, and relevant actors.

The genesis of the EGTC Geopark Karawanken suggests that the suitable form of cooperation for cross-border management of natural resources is developed in a chronological sequence. Accordingly, initial attempts at project-based cooperation for the conservation of cultural and natural heritage are possible without great institutional effort. In this way, getting to know each other, building trust and gaining common transcultural experience can be facilitated from the bottom-up. In the course of increasing integration, the organizational form of long-term cooperation can be more complex. A more sophisticated form of cooperation, like an EGTC, increases the liabilities and facilitates transboundary cooperation, giving it a clear legal framework and representation on both sides and increasing acceptance. In terms of governance, these sophisticated forms facilitate decision-making, improve transparency of activities and assign clear responsibilities to partners (Beck, 2017; Böhm, 2014). It increases the potential for gaining funds for strategic projects in accordance with planned activities and regional requirements. The suggested levels and attributes that were developed to rate the potentials and limits for transboundary cooperation were tested for the Geopark Karawanken.

Overall, the fingerprint of the EGTC showed that the concept does not come without restrictions. Even though EGTCs enable the cooperation between public authorities across borders, they still tend to exclude private companies or societal actors because these stakeholders cannot be active members of the Board. Still, private actors can be integrated in the expert council or within project WGs, but the concept does not imply a real “public-private partnership.” This may lead to a loss of private entrepreneurial resources in the management of cross-border natural resources and also restricts the option to include private financial resources to a larger extent. Given the difference between public and private values, this limitation may ease the use of EGTCs in a way. Nonetheless, exploring further options for closer integration of the private sector may be useful so as not to miss the opportunity to include much-needed private skills and resources.

In terms of water management, there are still a number of restrictions that cannot be addressed within the cross-border cooperation of the EGTC Geopark Karawanken due to differences in responsibilities, laws, and regulations of both countries. This concerns, for example, the designation of transboundary, water protection zones. The partner structure of the EGTC Geopark Karawanken is built by communal partners so they can implement communal tasks. Traditionally, the protection and supply of drinking water are provided by national, regional, and local governments (Schomaker, 2017). Still, as outlined above, natural resources, like water bodies, often do not match with administrative borders and transboundary

cooperation is necessary to manage these resources effectively. These issues of transboundary governance and decision-making will need to be elaborated further and national laws and regulations should be developed to facilitate the cross-border management (Petrova et al., 2019).

Recommendations

Even though the Geopark Karawanken cannot formally designate water protection zones, it can nonetheless encourage designations by revealing their necessity and creating a platform of exchange for responsible stakeholders. It can proactively engage the protection of transboundary karstic aquifers by fostering communication between responsible authorities. Furthermore, the Geopark can educate visitors about karstic water bodies and possible impacts of use.

From a strategic point of view, and to address the mission of the GGN (GGN, 2022), the EGTC Geopark Karawanken needs to develop common educational, economic, and environmental approaches, like information material, touristic activities, and integrated protection measures around water resources. The promotion of mineral waters can improve economic development and foster cooperation between local actors like small- and medium-sized companies, tourist offices, and local authorities across borders. The valorization and development of touristic activities can create jobs and counteract emigration from the area (Forcher et al., 2021). Visitor activities to explore mineral waters in the Geopark Karawanken give the park another unique selling point. This broadens the appeal of the whole area and increases its attractiveness. In this way, the larger peripheral cross-border mountain region can benefit from an increase in visitor numbers based on its natural assets. Nonetheless, it is essential to define future responsibilities for maintenance of developed infrastructure after project periods. An institutional framework, such as an EGTC, enables longer-lasting responsibilities on project outputs, as it provides a legal body that can take over the responsibilities of maintenance.

Early warning systems enable immediate reaction to natural disasters and are therefore of central importance for municipalities. One of the geopark municipalities on the Austrian side is currently testing an innovative microclimate monitoring and early warning system (LoRaWan). The pilot project is being carried out in cooperation with the Graz University of Technology, the province of Carinthia, and a subsidiary of the Carinthian electricity company Kelag. Real-time monitoring and data transmission can simplify communication in the area of flood protection, enabling a quick response in disaster management. The system can be extended to the

neighboring municipalities, or even to the entire geopark area. The joint development and implementation of a close-meshed monitoring network of smaller catchment areas and the data exchange between municipalities guarantees a harmonized risk management program, including representative and comparable monitoring and interpretation of climate impacts within the Geopark Karawanken. The EGTC Geopark Karawanken will eagerly and actively continue its work in this area and push efforts to establish a rollout of the warning system to interested municipalities.

Finally, the establishment of a cross-border WG on water issues within the geopark structure enables public authorities to regularly meet and exchange best practices. While the two countries have different legislative rules, the local authorities in both countries still have the same mission to supply the public with high-quality drinking water and to protect their inhabitants from natural disasters. Regarding laws and regulations, the differences in national implementation cannot be overcome through the establishment of an EGTC. Nonetheless, a WG on water-related issues within the EGTC Geopark Karawanken can push joint efforts to facilitate communication across borders, to work on harmonization of interfaces and data standards and to improve cross-border monitoring and early warning systems.

CONCLUSION

The cross-border management and valorization of water resources within the EGTC Geopark Karawanken was demonstrated to be of great importance due to transboundary water bodies, cross-border occurrences of mineral waters and parallel challenges in risk management. The outcome of the project indicated that a cross-border collaboration of stakeholders in Austria and Slovenia can be facilitated within the framework of the EGTC Geopark Karawanken, even though obstacles remain, including different laws and regulations, data standards, and the language factor that proves challenging to overcome.

The management of transnational resources constitutes a challenge for countries in the EU and beyond. At the European level, the EGTC provides an instrument that helps public authorities to form cross-border cooperation. The first experiences with the EGTC, as presented in this article, suggest that this form of organization can and will be transferrable for a number of other tasks, for example, in the field of cross-border resources, cross-border protected areas or cross-border predicate regions. In view of the climate and biodiversity crises, transboundary management schemes are more important now than ever before. From a scientific perspective, a Europe-

wide comparative study of EGTCs would be of interest. The visualization method used in this paper could allow the first approximation. However, more in-depth insights involving comprehensive studies would be required in a transdisciplinary research design.

The current case study of the Geopark Karawanken provides empirical evidence and theoretical approaches for the analysis of the instrument of EGTC. The experience of the EGTC Geopark Karawanken should be consolidated with an analysis of other transboundary cooperation forms for the management of natural resources in Europe. Further research may focus on deriving common potentials and limitations experienced along the emergence of cross-border cooperation of different EGTCs in Europe. Identifying these common experiences could lead to the development of a European standard and guidelines for the successful foundation of this territorial cohesion tool. This seems to be even more important with a view on the wide range of potential EGTCs in the EU, but also the diversity of cultural backgrounds of the (potential) actors involved, and the very different societal needs in different MS.

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Abstrakt

CEL: Zarządzanie transgranicznymi zasobami naturalnymi było przedmiotem badań w różnych dyscyplinach. Niemniej jednak, poza spostrzeżeniami teoretycznymi, dowody empiryczne skutecznego zarządzania transgranicznego lub zarządzania zasobami naturalnymi są nadal ograniczone, nawet w Unii Europejskiej (UE), gdzie zapewnia się szereg instrumentów w celu wspierania współpracy transgranicznej między jej państwami członkowskimi. Nasz artykuł, dostarcza dowodów na przykładzie współpracy transgranicznej między dwoma państwami członkowskimi UE, Austrią i Sło-

wenią, uzupełniając ramy analityczne w celu zidentyfikowania czynników stymulujących pomyślną współpracę transgraniczną. **METODYKA:** Na przykładzie Geoparku Karawanken Europejskiego Ugrupowania Współpracy Terytorialnej (EUWT) oceniamy czynniki sukcesu i granice współpracy transgranicznej obejmującej różne formy współpracy. Ponadto, w oparciu o dowody empiryczne z warsztatów z lokalnymi, regionalnymi i krajowymi interesariuszami, badamy potencjał ram organizacyjnych EUWT w zakresie skutecznego zarządzania zasobami wodnymi w wymiarze transgranicznym na obszarze Geoparku. **WYNIKI:** Przeprowadzona przez nas analiza pakietów projektów, wspólnych przedsięwzięć/konsorcjów oraz EUWT jako możliwych form współpracy transgranicznej wskazuje, że EUWT mają różne zalety w porównaniu z luźniejszymi formami współpracy. Wyższe koszty operacyjne ponoszone przez organizację kontrastują z lepszym zarządzaniem działalnością transgraniczną, zgodnie z ramami prawnymi i reprezentacją po obu stronach granicy. Zwiększa to akceptację i ułatwia podejmowanie decyzji. Ponadto zwiększa możliwość uzyskania środków finansowych zgodnie z planowanymi działaniami i wymogami regionalnymi, jednocześnie zmniejszając indywidualne ryzyko finansowe dla partnerów. Geneza Globalnego Geoparku UNESCO Karawanken/Karavanke (Geopark Karawanken) wskazuje, że luźniejsze formy organizacji, np. pakiety projektów, pozwalają interesariuszom na wzajemne poznanie się bez większego wysiłku instytucjonalnego. W miarę postępującej integracji forma organizacyjna może być bardziej złożona. Doświadczenie w opracowywaniu transgranicznych instrumentów gospodarki wodnej pokazuje, że nawet w bardziej wyrafinowanej formie współpracy, takiej jak EUWT, nadal istnieją przeszkody w zarządzaniu transgranicznymi zasobami naturalnymi. Przeszkody wynikają np. z krajowych przepisów ustawowych i wykonawczych, standardów danych, technik monitorowania i czynników miękkich, takich jak bariery językowe. **IMPLIKACJE:** Przykład Geoparku Karawanken pokazuje, że wprowadzenie EUWT może uzyskać znaczące wsparcie transgranicznych władz publicznych. Mimo to EUWT ma tendencję do wykluczania prywatnych przedsiębiorstw lub podmiotów społecznych, ponieważ nie mogą one być aktywnymi członkami zarządu. Zbadanie dalszych opcji ściślejszej integracji sektora prywatnego w modelach partnerstwa publiczno-prywatnego (PPP) może być przydatne, aby zachować możliwość włączenia bardzo potrzebnych prywatnych umiejętności i zasobów. Doświadczenie Geoparku Karawanken sugeruje, że EUWT mogą i będą znaczącą formą organizacji w Europie dla szeregu działań, na przykład w dziedzinie zasobów transgranicznych, transgranicznych obszarów chronionych lub transgranicznych regionów. Pomoże to w osiągnięciu celów programów UE w zakresie przeciwdziałania kryzysom klimatycznym i bioróżnorodności poprzez umowy ponadnarodowe, np. Zielony Ład czy Strategia Bioróżnorodności. **ORYGINALNOŚĆ I WARTOŚĆ:** Artykuł ten zawiera zwięzły przegląd transnarodowej gospodarki zasobami wodnymi w Unii Europejskiej w kontekście EUWT i przedstawia praktykom uwagi dotyczące potencjalnych wyzwań związanych z pomyślnym wprowadzeniem EUWT. Chociaż analiza wspólnych doświadczeń różnych EUWT może doprowadzić do opracowania europejskiego standardu i wytycznych dla pomyślnego stworzenia tego narzędzia spójności terytorialnej, niniejszy artykuł stanowi pierwszy krok, torując drogę przyszłym badaniom.

Słowa kluczowe: Europejskie Ugrupowanie Współpracy Terytorialnej, Karawanken/Karavanke UNESCO Global Geopark, współpraca transnarodowa, Unia Europejska, zarządzanie zasobami wodnymi, zasoby wodne

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Conflicts of interest

The authors declare no conflict of interest.

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From transition management towards just transition and place-based governance. The case of Western Macedonia in Greece

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Abstract

PURPOSE: This paper examines to what extent the governance modes of transition in the region of Western Macedonia (Greece) are effective and just, and whether they embed transition management, spatial justice, and place-based elements. To this end, the hypothesis tested in this paper is that spatial justice and place-based policy can make a positive contribution to just and well-managed transition. In this framework, the question examined is not about ‘who is in charge for designing and implementing transition policies?’ but about ‘what is the balance and mix of transition policies at the central, regional, and local levels of administration?’. **METHODOLOGY:** The article critically discussed the concept of transition as a fundamental societal change through the lens of efficiency and justice. Thus, the notions of transition management and spatial justice are thoroughly explored. It also embeds the concept of ‘place’ in this discussion. Therefore, the challenges, opportunities, and shortcomings of the place-based approach in the course of transition are examined. The empirical section contains a mix of quantitative and qualitative methods, such as the use of questionnaires and focus group meetings, preceded by background research, comprising mainly desk research. The above different cases of empirical work are not entirely irrelevant to each other. The validity of the research findings is strengthened by using multiple sources of evidence and data triangulation. The analysis at the empirical research level focuses on Western Macedonia in Greece. This region has all the characteristics of a coal-dependent locality, under an urgent need to design and implement a post-lignite, just, transition strategy. **FINDINGS:** Given that transition implies a profound and long-lasting societal, economic, and environmental

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transformation, new and pioneering modes of governance are necessary to tackle such a multifaceted challenge. The discourse about place, policies, and governance, reveals the need for focusing on a balance and mix of inclusive and multi-scalar policies instead of defining governance structures and bodies in charge for implementing transition policies. The launched transition governance model in Greece considerably deviates from the EU policy context. In fact, substantial shortcomings in terms of legitimacy, inclusiveness, and public engagement and overall effectiveness have been recorded. The empirical evidence reveals a rather clear top-down model than a hybrid one. The findings show that the governance model employed in the case of Western Macedonia, neither embeds spatial justice nor incorporates a place-based approach. **IMPLICATIONS:** Viewing the long-term process of transition through the lens of governance and policymaking, this paper challenges the assertion that the traditional top-down governance model is the most effective and fair approach. In this setting, the notions of transition management and spatial justice are thoroughly explored. The concept of 'place' is also embedded in this discussion. To this end, the challenges, opportunities and shortcomings of the place-based approach are analysed. Given that transition is by nature a multifaceted, multi-level and multi-actor process, an effective and just transition governance should reflect the views of different actors. In this sense, it seems that multi-level governance models for regions in transition need to harness existing interactions among different levels and actors. **ORIGINALITY AND VALUE:** After having touched upon the process of transition regarding the notions of 'management' and 'justice,' we embed the concepts of spatial justice and the place-based approach into governance transition practices. In this respect, the gap between efficiency and equity, redistributive logic (needs, results), and development policy (inclusive development) can be bridged through the so-called 'spatial-territorial capital' and spatially just, multi-level governance. **Keywords:** just transition, place-based approach, spatial/social justice, governance, Green Deal, climate change

INTRODUCTION

Over the last decade, a frequent claim that has been made is that the traditional economic models need to be drastically reformed in order to address the challenges of the climate crisis, and the necessary transition to a green and sustainable economy, through technological innovations. Within this context, the concept of transition as fundamental changes within a given societal system has become a center of scientific and policy debates, interconnected with environmental, economic, social and government dimensions of sustainability (EEA, 2021; Loorbach, 2007). As a result, transition is seen as a means to tackle persistent problems related to transformative, and cross-cutting changes, encompassing major shifts in society's goals, practices, norms, and governance approaches (Jansen, 2003; Meadowcroft, 2000; Scott & Gough, 2004). Likewise, Lund Declarations in 2009 and 2015, called upon

Member States and European Institutions to focus research on the grand challenges of our times by moving beyond rigid thematic approaches and shifting the focus to society's major needs.

The fact that persistent challenges are resistant to traditional policies, have raised the questions of systemic, integrated, and coherent policy responses which involve a just and efficient governance of the transition process (Loorbach, 2007; Petrakos, Topaloglou, Anagnostou, & Cupcea, 2021; Topaloglou, 2020, 2021). In particular, a research gap is identified in the interplay between environmental pressure, technological novelties, societal structure, administrative setting, and economic resilience of a given region, which defines, to a certain extent, the intensity of transformations (Kemp, Loorbach, & Rotmans, 2007; Loorbach, 2007; Rotmans, Kemp, & Asselt, 2001; Voss, Smith, & Grin, 2009). In this setting of multiple challenges and systemic changes in conjunction with the uncertain, co-evolutionary, and unpredictable nature of the transition, the policy interventions and governance configurations in open market economies, may generate winners and losers in space and society, thus challenging spatial and social justice (EEA, 2021; Madanipour, Shucksmith, Talbot, & Crawford, 2017).

Viewing the long-term process of transition through the lens of governance, it is uncontroversial to state that the traditional top-down model is currently challenged as the most effective and fair approach. Given that transition is by nature a multifaceted, multi-level and multi-actor process, an effective and just transition mechanism should reflect the views of different actors, emphasize the engagement of stakeholders, promote social dialogue as well as the active involvement of civil society, and be based on a solid communication strategy (EC, 2020a; Loorbach, 2007). Citing Börzel and Risse (2010), governance is considered as 'the various institutionalized modes of social coordination to produce and implement collectively binding rules or to provide collective goods. From the functionalist point of view, multilevel governance describes the diffusion of authority away from the central state, in which coordination takes place at discrete levels across vast reaches of scale (Hooghe & Marks, 2001; Hooghe & Marks, 2020). In this sense, it seems that multi-level governance models for regions in transition need to harness existing interactions among different levels and actors, as well as acknowledge that boundaries between levels and competences can sometimes be 'fuzzy' (EC, 2020b). The compelling research question addressed in this work, relates to the mix of just transition policy making and governance configuration that is able to serve spatial and social justice as well as the implementation of a place-based governance framework.

This paper attempts to examine to what extent the governance modes of transition implemented so far in the case of the region of Western

Macedonia in Greece, are effective and just and whether they embed transition management, spatial justice, and place-based elements. Based on Edward Soja's work (2010), we conceptualize spatial justice as the fair and equitable distribution in space of socially valued resources and the opportunities to be used. In this framework, we critically discuss the concept of transition as a fundamental societal change through the lens of justice and efficiency. Thus, the notions of transition management and spatial justice are thoroughly explored. We also attempt to embed the concept of 'place' in this discussion as a socially constructed concept (Hassink, 2020), thus, the challenges, opportunities, and shortcomings of the place-based approach are examined. The empirical section involves a survey of the governance mechanism implemented in the case of Western Macedonia among experts on transition issues in Greece. The case of Western Macedonia has been selected, as the region has all the characteristics of a coal-dependent locality, under an urgent need to design and implement a post-lignite, just transition strategy within the EU Green Deal context.

The paper proceeds as follows. The next section provides a theoretical discussion and a synthesis of existing bodies of literature on transition, spatial justice, place-based approach, and governance. The following section outlines the transition governance frameworks in EU and Greece in relation to the European Green Deal and especially the Just Transition Fund Regulation. Then, we present the empirical elements and results of the fieldwork research, while the last section provides conclusions and policy recommendations for improving the efficacy and the fairness of the current governance mechanism.

LITERATURE REVIEW

The notion of transition is theorized as a process of fundamental change within the structure of a given societal system (Frantzeskaki & de Haan, 2009), in which 'degradation' and 'breakdown' co-exist for a certain period with 'build up' and 'innovation' (Gunderson & Holling, 2002). Historical evidence indicates that before the transition phase occurs, societal systems have experienced long periods of relative stability and optimization that are followed by relatively short periods of radical change. Within this context, governance of transformations of such a critical magnitude, emerges as a crucial issue. Existing literature provides ample insights into the dynamics of transitions in the endeavor of establishing an alternative paradigm (Kemp et al., 2007; Voss et al., 2009). However, the question of how the transition could be effectively and fairly governed remain ambiguous.

The transition management approach

Loorbach (2010) invokes the notion of transition management as a governance concept, based upon complex systems theory on the one hand and practical experimental approach on the other. In conceptual terms, this approach offers a framework that can simultaneously analyze and manage long-term changes and ongoing governance practices in society, economy, and the environment. From this pioneering point of view, the concept of transition management reflects a normative model by embedding the long-term objective of sustainability, while at the same time suggesting a prescriptive governance approach at the operational level. In fact, the transition management approach goes a step further in comparison to process management approaches, through focusing on sustainability narratives and lessons learned from experiments (Frantzeskaki, Loorbach, & Meadowcroft, 2012). Despite this promising perspective of transition management, in which theory and practice-oriented research co-exist and are fed to each other, this hybrid approach is still in early stages of development, and there is plenty of room for amplification (Rotmans et al., 2001; Voss, Bauknecht, & Kemp, 2006).

Current developments in the spheres of economy, technology, demography, and climate change have brought to the fore the society whose social structure is made up of networks (Castells 2009; Teisman 1992; Voss et al., 2006) and an increasing societal complexity (Loorbach, 2010). From the evolutionary perspective, system theories use the concepts of transition and transition management as a means to provide a useful analytical framework from the organizational point of view (Senge, 1990), governance and political sciences (Kemp et al., 2007; Rotmans et al., 2001). Within this context, government, business, academia, civil society organizations and individuals, create formal and informal networks in which each actor's views may either diverge or converge. From the democratic legitimacy point of view, however, such types of loose and informal policymaking may lead to deficits in transparency, thus creating a policy vacuum that needs to be addressed (Loorbach, 2010). The strengthening of the local governance could potentially help bridge the democratic deficit, but it needs a sound coordination and collaboration with all other actors, as well as cross cutting procedures and forces (Madanipour et al., 2017). In other words, policymaking should introduce novel approaches to learning, interaction, integration, and experimentation at the level of society instead of policy alone (Loorbach, 2010).

Fairness and spatial (in)justice perspective

While the transition management approach focuses on a well-managed transition, the concept of just transition is mainly based on social and environmental considerations, seeking to ensure the substantial benefits of a green economy transition which contribute to the goals of decent work for all, social inclusion and the eradication of poverty (EC, 2020a). Based on the EU Governance of Transitions Toolkit issued by the European Commission in May 2020, just transition can be defined as a *[Transition which captures the opportunities of the transition to sustainable, climate neutral systems, whilst minimising the social hardships and costs]*. According to ILO's vision, just transition is a bridge from where we are today to a future where all jobs are green and decent, poverty is eradicated, and communities are thriving and resilient. In this regard, the required massive development efforts to reach a zero-carbon economy will create millions of new jobs. ILO also emphasizes the need to secure the livelihoods of those who may be negatively affected by the green transition (ILO, 2015).

After having touched upon the process of transition in relation to the notions of 'management' and 'justice,' we will introduce in this critical theoretical review, the concepts of spatial justice and place-based approach. Given the discussions over the years around justice, equity and inequalities, several scholars became aware of the geographic aspects of injustices (Heynen, Aiello, Keegan, & Luke, 2018; Jones et al., 2019). Ample evidence indicates that spatial inequalities have been increasing over time, favoring the metropolitan centers to the detriment of the less advanced regions (Iammarino, Rodriguez, & Storper, 2019; Rodriguez-Pose, 2018). Likewise, several papers show that agglomeration economies, integration dynamics, geographic coordinates and the EU Cohesion Policy, represent the major drivers that shape the pattern of regional disparities in Europe (Psycharis, Tselios, & Pantazis, 2020; Rodriguez-Pose, 2018; Petrakos, Kallioras, & Anagnostou, 2011). Smith (1994) describes justice as an answer to the question "*who gets what, where, when and how.*" The normative concept of '*spatial justice*' with its holistic approach, places emphasis on the spatial or geographical aspects of justice and injustice. From this point of view, the social and the spatial processes are correlated since social processes are spatially reflected while spatial processes influence the social processes. Hence, spatial justice is the spatial dimension of social justice (Soja, 2010). Seen in this respect, the distribution of resources is considered a key factor in identifying (in)justice, with social justice focusing more on the distribution between social groups and spatial justice, than on the geography of the distribution (Madanipour et al., 2017).

According to Morange and Quentin (2018), social and spatial justices are multifaceted and overlapping notions, with a strong normative character and a broad variety of understandings. Many efforts in the literature have been exploring the extent to which economic growth benefits and risks vary among social groups and are affected by the power settings (Florida & Mellander, 2016). Envisioning spatial justice from the perspective of social justice, it requires devising rules that equally allocate urban resources to all social actors (Friendly, 2013). It also endows the combination of community engagement, active participation, and consultation among all major stakeholders (Rawls, 1999), reflecting potentially various “*modes of governance*” (Hooghe & Marks, 2001) and configurations of power (Topaloglou, 2020). Spatial justice is a component of social justice providing all people with equal rights to access and/or use spatial resources to meet their basic needs (Miller, 1999). In this logic, social justice can contribute to reducing or preventing economic inequalities and deprivation of resources (Soja, 2009) which may give rise to political discontent and populism (Rodriguez-Pose, 2018). In that sense, spatial justice literature deals with spatial imbalances by drawing policies and governance settings that will allow for a better allocation and utilization of existing resources, aiming to meet both the equity and efficiency goals (Petraikos, Topaloglou, Anagnostou, & Cupcea, 2021). Thus, the concept of spatial justice is one of the most fascinating topics in the recent bibliography of spatial studies (Topaloglou, 2020).

Spatial justice brings together two important forms of justice, distributive and procedural. Distributive justice is focused on identifying the forms of exclusion and injustice, while procedural justice places emphasis on actions and institutional arrangements that can reduce spatial injustice (Madanipour, Cars, & Allen, 2003). Just procedures are necessary, but not sufficient for the fairness of the outcome, while attention to the outcome may hide the injustices of the process within a particular locale (Soja, 2010). As indicated by Loorbach (2007), an exclusive focus on the outcome of the process may resemble a Machiavellian approach. To conclude, in light of the procedural paradigm, what matters are just institutions and procedures that are necessary to have a just society (Madanipour, Shucksmith, & Brooks, 2021; Soja, 2010). Interestingly, this discussion highlights strong links between the theoretical debate on spatial justice and the concept of a just transition which feed each other towards a governance perspective.

According to Madanipour et al. (2021), spatial justice also has a clear temporal dimension reflecting social relations that are not static in the course of time. This echoes the concept of sustainability which requires justice within and across generations (Brundtland, 1987). At the same time, just transition has been linked in this discussion to the pressures of climate

change and the goals for a green zero-emission economy. Hence, adaptation to global environmental requirements due to the climate crisis should be pursued by employing the place-based logic, which in turn, should take into account spatial justice and territorial cohesion (Madanipour et al., 2017). To this end, the concepts of social and spatial justice cannot be separated from environmental justice. This approach brings to the fore the need to seek place-based approaches that challenge the “one size fits all” and space-neutral logic (Topaloglou, 2021).

To conclude, our hypothesis is that spatial justice and place-based policy are essential components of a just and well-managed transition. Thus, an interesting question to be explored in terms of policymaking and governance, is whether the efficacy and justice of the transition can be associated with spatial justice and place-bound policy.

Transition governance and the place-based approach

It should be stressed that despite common elements, spatial justice and place-based approaches, do not stem from a common theoretical standpoint (Petrakos et al., 2021). Place-based strategies reflect the ‘endogenous development’ focusing on locally available resources, such as local knowledge, innovation and learning, local clustering of activities, global networking, in which local institutions play a critical role (Asheim, 1996; Pike, Rodriguez-Pose, & Tomaney, 2016). Since the 1990s, a tendency to weaken the dominance of the top-down model (exogenous-oriented) is identified. At the same time, a focus on promoting endogenous potential (Vázquez-Barquero, 2003) and ‘development from below’ (Stöhr, 1990) started to emerge.

Based on this background, the place-based approach has provided a challenge to re-think spatially ‘blind’ policies. In this regard, the gap between efficiency and equity, redistributive logic (needs, results), and development policy (inclusive development) can be bridged through the so-called ‘spatial-territorial capital’ (Barca, McCann, & Rodríguez-Pose, 2012; Barca, 2019; Sarmiento-Mirwaldt, 2015). According to Petrakos et al. (2021), top-down and bottom-up policies need to find a working balance between efficiency and the territorial perspective. In this framework, the real question should not be about ‘who is in charge of designing and implementing development policies?’, but about ‘what is the balance and mix of policies at the central, regional, and local levels of administration?’ (Petrakos et al., 2021)

The concept of ‘place’ in the place-based approach, is detected, defined, and interpreted, through a relational perspective. Seen in this respect, the ‘place’ is not encapsulated, but porous as part of broader relationships, which can be horizontal, vertical, or transversal, reflecting a multilevel

governance model (Madanipour et al., 2021). From this perspective, the idea of the place-based approach is of particular importance in this discussion. The place-based approach advocated mainly by the Barca Report, is 'a long-term strategy aimed at making full use of the potential of a place and reducing inequalities and social exclusion in specific places by providing integrated services thorough multilevel governance (Barca, 2009). This approach relies on local knowledge-based assets and includes utilizing place-specific endogenous territorial capital and fostering institutional reforms. In this framework, a place-based approach reflects the regional ecosystem, where market, social, institutional and governance settings are intertwined, generating critical scale and cumulative effects (Giuliani, 2007). It is also argued that, by placing emphasis on local assets and capacities, this type of strategy can stimulate economic development through smart specialization (McCann, 2015).

At the same time, many concerns and critique have been raised about the fairness and efficiency of the place-based approach. Several scholars pointed out that place-based at inter-local level is not always fair, since it focuses on social inclusion and balanced development within regions, rather than equity across regions (Madanipour et al., 2021). In addition, this shift towards place-based approaches undermines the redistributive top-down logic of policy interventions aimed to increase spatial justice (Weck, Madanipour, & Schmitt, 2021). It has also been claimed that place-based solutions are not sufficient to tackle global-wide problems, such as environmental degradation and climate change (Rees, 2015; 2017). Moreover, it has been argued that the territory-based approach focusing on policy at the local level, ignores the wider perspective of uneven development at the national and international levels, inter-regional flows, and globalization (Hadjimichalis, 2019).

In an attempt to amalgamate the above discussion into a governance perspective, it is worth noting first, an unambiguous shift over the last decades from the centralized government-based State toward new modes of governance that place emphasis on networks and multilevel governance (Pike et al., 2016). In the same vein, OECD (2020), in its recent policy report, stresses the need for further autonomy through transfer of authority and responsibility for public functions from central government towards decentralized policymaking structures, associated with fiscal and administrative arrangements (Petraikos et al., 2021). Hooghe and Marks (2001) accentuate that the well-established top-down governance model began to be questioned by market-based drivers and multilevel modes of governance stratified across subnational, national, and supranational levels of government.

In the context of a long-term structural change, such as the drastic societal transition occurring in coal regions, new governance practices and effective transitional management mechanisms are necessary in order to tackle multifaceted social, economic and environmental transformations (Loorbach, 2007). At the same time, however, it is true that the central State and the liberalized market continue to play a decisive role as major societal changes are impossible to be effectively governed without these key players (Jessop, 1997; Meadowcroft 2007; Pierre, 2000; Scharpf, 1999). In fact, this requires a new balance between the state, the market, and the society, in which alternative agendas and perspectives will be intertwined with formal and informal networks fueling regular policymaking processes with new solutions, ideas, and practices (Heritier, 1999). From the spatial justice point of view, the decision-making setting reflects the abovementioned balance either through the distribution of resources (distributive justice) or through the fairness and transparency of decision-making (procedural justice) (Davoudi & Brooks, 2014; Israel & Frenkel, 2018; Madanipour, et al., 2021).

Petrakos et al. (2021) argue that the endeavor of transition requires a multi-level governance environment that gives room for some local control over the decision-making process, the financial means, and interventions. In other words, a higher degree of regional autonomy is essential, aiming to enhance the scope of place-based actions and innovation elements in the transition strategy (Baier & Zenker, 2020). In the same vein, Ladner, Keuffer, and Baldersheim (2016) claim that local autonomy is a highly considered feature of good governance. In this outline, multi-level governance should also make use of local territorial assets, ensure wide participation and consensus of local stakeholders, transfer responsibility at lower levels, as well as invest on capacity building and local knowledge (Hooghe & Marks, 2020). Only then will local and regional actors be able to deliver results that match the scale and intensity of the problems confronted. Transitions imposed by the climate crisis threat should be governed through novel forms of government–society interactions across different levels, which take into account the complexity of the interrelated problems (Prins & Rayner, 2007; Rabe, 2007).

Remarkably, in two recent Toolkits for Transition Strategies (EC, 2020a) and Transition Governance (EC, 2020b), the European Commission highlights that the governance of the transition process must be set-up in a participatory manner in order to correspond to the problems identified. Thus, participatory processes not only help to improve the quality of strategies but also ensure ownership and strengthen the legitimacy of the transition. To this end, transitions require multiple stakeholders to participate in the effort. For coal regions however, this is particularly difficult since these areas often do not have clear administrative boundaries. The Green Tank, an established think

tank on energy issues in Greece, in its recent report, carried out a critical assessment and recommendations for the improvement of the governance mechanism of the Just Transition in Greece, drawing on best governance practices from other lignite regions in Europe (The Green Tank, 2021). The report concludes with a series of recommendations for the construction of a just and effective governance mechanism, which among others includes transparency and open access platforms, co-creative consultations, active participation of local governments and civil society and decentralized policy-making structures.

The European framework for governing transition

The European Green Deal constitutes the overarching EU policy framework aiming to ensure a just transition towards climate neutrality by 2050. Given that transition is associated with drastic economic and social transformations, it is widely agreed that the component of governance plays a critical role in the outcome of this transition endeavor. Governance mechanisms, however, in terms of laws, official and unofficial norms, practices and power settings, largely vary in each country reflecting different institutional frameworks and political perspectives.

As far as the EU policy context regarding governance of transition regions is concerned, three major relevant policy documents may be identified. First, the Just Transition Fund Regulation (EC, 2021a), which includes a strong governance framework, focuses on the Territorial Just Transition Plans. Specifically, the Regulation requires that the Territorial Just Transition Plans should encompass well-structured governance, involving inclusive partnerships, monitoring and assessment mechanisms, and a clear description of the role of each entity engaged in governance mechanisms.

Second, the Common Provisions Regulation (EC, 2021b) sets the governance mechanism context for governing the Territorial Just Transition Plans. In fact, this document incorporates a multilevel mode of governance as a prerequisite for access in relative EU funds. In particular, each Member State must establish an inclusive partnership consisted at least of public authorities, economic and social partners, and relevant bodies representing civil society organizations. Remarkably, these partnerships shall consult at least once a year.

The third document concerns the Governance of Transitions Toolkit (EC, 2020b) which provides guidelines for the design of governance structures and stakeholders engagement processes for coal regions in transition. It addresses the design of governance models, the part of stakeholder engagement and partnership, the role of social dialogue, and the role of civil

society. It also defines the concept of “good” governance, which is based on six core principles: transparency, participation, rule of law, equity and inclusiveness, efficiency, and accountability.

The toolkit also highlights the risks arising from insufficient stakeholder engagement, such as increased uncertainty, rejection of outcome, loss of confidence – also associated with the inefficient use of resources, as well as the development of resistance related to ethical issues, such as the lack of participation in decision-making. Furthermore, it puts forward three levels of increasing stakeholder engagement: information, consultation, and cooperation. Finally, the toolbox recommends the implementation of the following seven Golden Rules for open and inclusive planning of a just transition at the regional level, as a means to enable a rapid and socially just transition of coal-dependent regions: Open invitations, Inclusion, Equality, Access to information, Feedback, Disclosure, and Engagement and participation.

The Greek transition governance mechanism

In September 2019, the Greek Prime Minister pledged from the UN podium to phase out all coal-powered electricity production by 2028. This commitment is enshrined in the National Energy and Climate Plan (NECP) submitted by the Greek government to the European Commission in December of 2019. Three months after the announcement of the decision to phase out lignite, the first governance structure came to the fore, under the title Government Committee for Just Development Transition in the context of a Ministerial Council Act. The Committee comprised of representatives of competent Ministries, empowered to politically oversee the overall transformation in lignite regions and coordinate the utilization of the available funding resources. It is worth noting that there was the possibility of choosing other bodies, such as local authorities, public organizations, agencies, environmental NGOs, and even any other person considered capable to assist on a case-by-case basis (without the right to vote). Notably, the Committee does not have an expiration date implying that it will operate throughout the entire course of the transition.

In parallel with the Government Committee, a Steering Committee was established with the mandate of preparing and implementing a Just Development Transition Program and the corresponding Territorial Just Transition Plans required for accessing funds from the EU Just Transition Fund. The members of the Steering Committee are Secretary Generals of several ministries relative to transition, the Governors of the lignite regions, the CEO of the Public Power Corporation (PPC), and the Director of the Greek

manpower employment organization (OAED). The appointed Chairman of the Steering Committee was a person of recognized status, whereas the Steering Committee operates within the context of the Regulations or the European Structural and Investment Funds and reports to the Government Committee. On top of all that, a Technical Secretariat was set up to provide technical support to the Steering Committee in the planning, drafting and monitoring of the implementation of the Just Development Transition Program and the Territorial Just Transition Plans. The Technical Secretariat is also authorized to provide scientific, technical, and legal support.

An initial formal reference to a governance mechanism for the lignite regions of Greece can be found in the Just Development Transition Plan, also known as the “Master Plan,” in August 2020. The Territorial Just Transition Plans that followed, in compliance with the rules of the Just Transition Fund Regulation, established a partnership of various categories of local partners, aiming to strengthen social dialogue and inclusive participation. The adopted governance setting, however, as illustrated in Figure 1 below, reflects a labyrinthine mechanism with several ambiguities in duties and roles of the eleven (11) different structures (Green Tank, 2021).

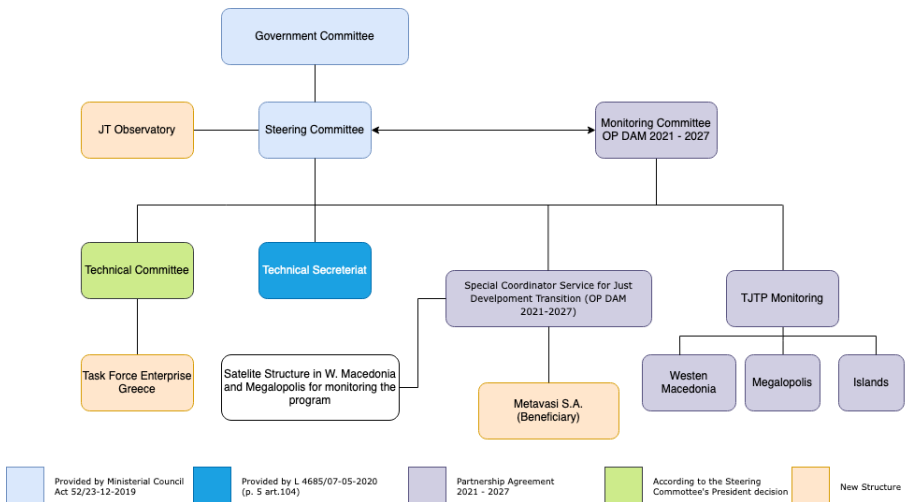


Figure 1. Organizational structure of the just development transition in Greece

Source: Just Transition Development Plan (2020).

Apart from the managerial intricacy of the above governance mechanism, it is obvious that this governance mode is clearly applying a top-down

approach. It is worth mentioning, for instance, that decision-making does not even include the mayors of the transition regions, ignoring their decisive role as advocates of the lignite areas' transition issues. In addition, several key stakeholders, representatives of local communities, and NGOs are missing from the proposed structures, thus reflecting inadequate inclusiveness and representation (The Green Tank, 2021).

The main elements of the abovementioned centralized model of planning and governance of the transition was transposed into Law only very recently (4872/10-12-2021). According to the law, the Ministry of Development and Investment establishes a “Special Body for the Coordination of Just Development Transition” as an independent Unit, which reports directly to the Minister. This Special Body oversees the implementation of the Just Development Transition Program 2021-2027, the Territorial Just Transition Plans, as well as the utilization of all the available national and European funding sources. The Director of the Special Body is appointed by a joint decision of the Prime Minister and the competent Minister. In addition, the ‘Hellenic Company for a Just Development Transition’ (Metavasi S.A.) was also established, based in Athens, and governed by a five-member Board appointed by the decision of the Minister, with the main purpose of restoring and managing the assets of the Public Power Corporation in transition regions. The following diagram illustrates the clear top-down mode of transition governance in Greece as described in the Law.

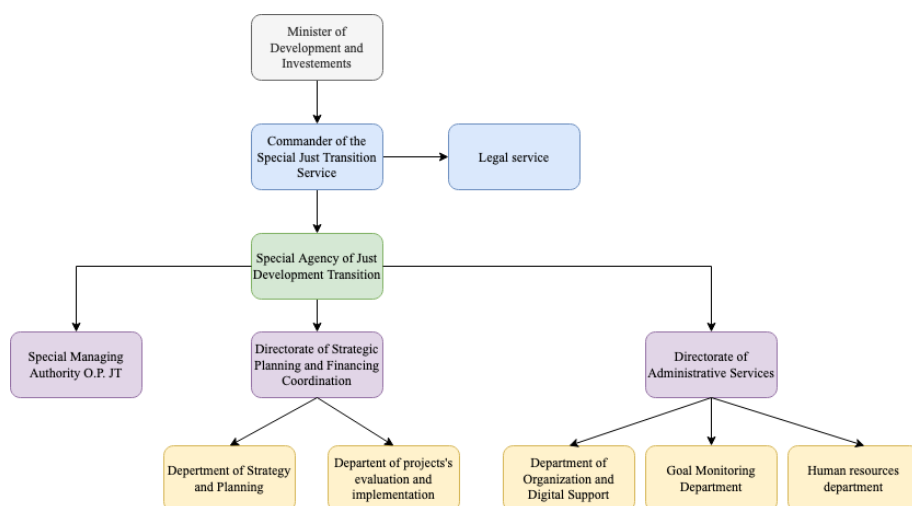


Figure 2. The structure of the Special Body for Coordination of Just Transition

Source: Law 4872/10-12-2021.

METHODOLOGY

The empirical research analysis focuses on the Western Macedonia region in Greece. Western Macedonia is the only land-locked region within the country, situated in the north-west and covering an area of 9.451 km². Its population of 271,500 inhabitants constitutes around 2.6% of the national total. Western Macedonia's economy is predominantly dependent on natural resource extraction. Since the mid-50s, the region has followed a coal-intensive development pathway, acting for several decades as the country's energy pillar, due to its significant lignite reserves. As a result, a mono-industry economic structure has been created, mainly due to the economic reliance on lignite mining (160 thousand acres) and associated power plants (20% of the national net installed capacity). The coal-based economy contributes to more than 34% of the Gross Added Value of the Region, while more than 22.500 direct and indirect jobs are in the coal value-chain, indicating a significant multiplier effect in the local labor market (Petraikos et al., 2021). However, the lignite industry in Western Macedonia is in decline, drastically shrinking its share in the energy mix due to environmental (high emissions) and cost (emission tariffs) related considerations. Given this background, the government's decision to phase out lignite completely by 2028, made the long-standing challenge of restructuring a very urgent one.

The empirical fieldwork employed a mix of quantitative and qualitative methods, such as the use of questionnaires and focus group meetings that were supported by background research, and comprised mainly desk research. Firstly, key documents at EU, national and regional levels have been assessed, referring to coal phase out policies, administrative settings, statistics, reports, studies, and relevant scientific articles. Specific focus has been given on the decision-making processes in the locality, by screening secondary data such as spatial planning and its articulation with development strategies at different levels of government. Aiming to obtain a holistic picture, exploratory field visits in the region of Western Macedonia have taken place, involving participative observations, informal talks, and discussions with local stakeholders. This approach aimed to explore narratives of stakeholders, and hidden interests and expectations of local elites (Yazan, 2015).

However, the most important sources of evidence were questionnaires involving experts with established status, academics, practitioners, executives at public local, regional, and national administrative level, and policy makers with in-depth knowledge on the transition framework in the region respectively. The fieldwork was conducted within the 2nd semester of 2021, both online and with physical presence. In this context, the questionnaire was sent to 48 individuals matching the aforementioned profile, out of which 41

responded, indicating an acceptable sample. That is so, considering the high level of expertise that post-coal transition requires along with the relatively small size of the population in Western Macedonia.

In addition to the above, a focus group meeting has been organized with local stakeholders, triggering responses that contribute to a greater understanding of the perceptions of participants (Hennink, Hutter, & Bailey, 2011). The above different instances of empirical work are not entirely irrelevant to each other. Using multiple sources of evidence, by applying data triangulation, increases confidence in the accuracy of the research findings.

The fundamental research question addressed, related to the extent to which the effective management of the transition at the level of governance, has the potential to acquire just and place-based characteristics. The questionnaire was divided into six sections involving: first, the six Core Principles of the EU Governance of transition toolkit, second, the seven Golden Rules for open and inclusive planning of a just transition at regional level, third, the risks arising from insufficient stakeholder engagement, fourth, the levels of stakeholder engagement, fifth, the dominant governance model in Western Macedonia, and sixth, the level of implementation of the place-based approach. Each respondent should answer closed-ended Likert-scale questions, ranging from 1 to 5, with 1 indicating 'not agree at all' and 5 'fully agree.' The answer to each question was mandatory. To this end, in order for a result to be considered positive, it must exceed the value of 3.

As a preliminary analysis of the data, indicative descriptive statistic indexes (mean, standard error, standard deviation, confidence level (95%, etc.) were calculated for all the variables (questions), to provide some basic insights. The analysis revealed that the standard deviation for all questions is very low and the confidence level is very high.

Additionally, a correlation analysis (Pearson correlation coefficient or Pearson Product Moment Correlation – PPMC) between all variables highlighted the potential relationships between them. Thus, for each pair of variables/questions, the linear relationship between them (ranging from -1 to 1) were calculated. An absolute value of precisely 1 indicates that a linear equation describes the relationship between two variables perfectly, with all data points lying on a straight line. On the contrary, a value of 0 indicates that there is no linear dependency between the tested variables. To this end, correlation is an effect size. We can verbally describe the strength of the correlation using the scale that Evans (1996) suggests for the absolute value of r as follows: 0.00-0.19 'very weak,' 0.20-0.39 'weak,' 0.40-0.59 'moderate,' 0.60-0.79 'strong,' 0.80-1.00 'very strong.' Typically, values above 0.5 are accepted as adequate correlations. The mathematical equation of PPMC is shown below:

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x}) (y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2} \sqrt{\sum_{i=1}^n (y_i - \bar{y})^2}} \quad (1)$$

RESULTS AND DISCUSSION

The first section of the empirical research addressed the concept of ‘good governance’ as defined by the six core principles of the EU Governance of Transition Toolkit (EC, 2020b). To this end, the level of implementing the principles of transparency, participation, rule of law, equity and inclusiveness, efficiency and accountability were examined. The empirical results, summarized in Table 1 and presented in Figure 3, reveal a low degree of satisfaction among the respondents, since all the obtained mean scores were below the value of 3, with the lowest scores recorded in the principles of participation and accountability. This evidence clearly indicates shortcomings in terms of legitimacy and effectiveness, which reflects a governance vacuum (Loorbach, 2010) and a lack of fairness in policy making (Madanipour, et al., 2021).

Table 1. Six Core Principles of the EU Governance of transition toolkit

	Transparency	Participation	Rule of law	Equity and inclusiveness	Efficiency	Accountability
Mean	2.76	2.20	2.68	2.39	2.44	2.24
Standard Error	0.2	0.1	0.1	0.2	0.1	0.2
Median	3.0	2.0	3.0	2.0	2.0	2.0
Standard Deviation	1.0	0.7	0.9	1.0	0.9	1.0
Count	41.0	41.0	41.0	41.0	41.0	41.0
Largest(1)	5.0	4.0	5.0	5.0	4.0	4.0
Smallest(1)	1.0	1.0	1.0	1.0	1.0	1.0
Confidence Level (95.0%)	0.3	0.2	0.3	0.3	0.3	0.3

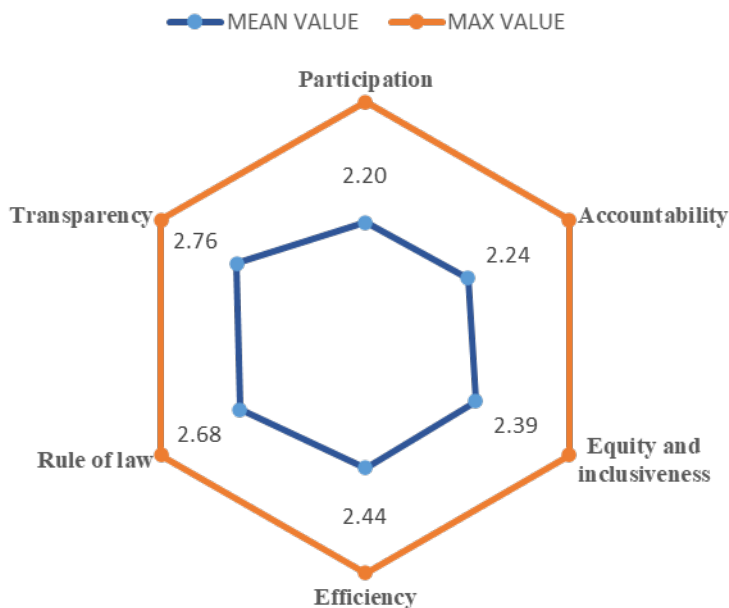
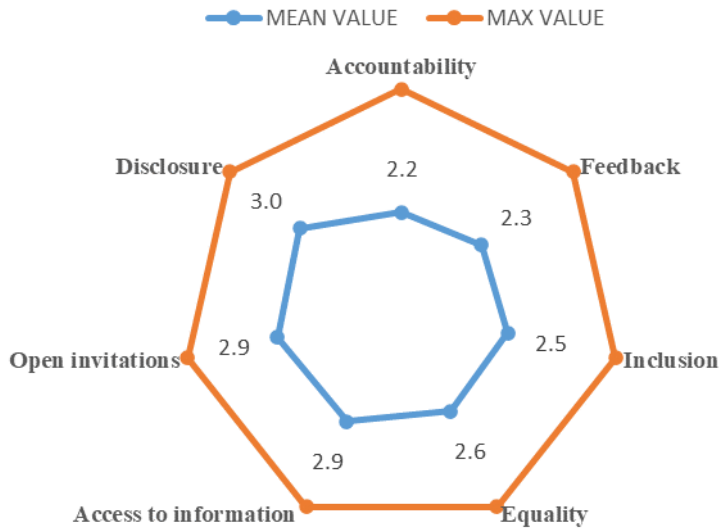


Figure 3. Six Core Principles of the EU Governance of transition toolkit

The next research section, explores the extent to which the seven golden rules for open and inclusive planning of a just transition (also included in the EU Governance of Transition Toolkit) are applied. These rules concern open invitations, inclusion, equality, access to information, feedback, disclosure, and engagement/participation. According to the results, summarized in Table 2 and illustrated in Figure 4, the respondents consider that none of these golden rules are applied at a satisfactory level, signaling a low anticipation of the major challenges for active social participation and engagement. We also underline that the rules of accountability, feedback and inclusion have the lowest scores, reflecting to a certain extent procedural governance injustices (Madanipour et al., 2003) and reduced trust within the society (The Green Tank, 2021).

Table 2. Seven Golden Rules for open and inclusive planning of a just transition

	Open invitations	Inclusion	Equality	Access to information	Feedback	Disclosure	Accountability
Mean	2.90	2.49	2.59	2.85	2.34	2.95	2.20
Standard Error	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Median	3.0	2.0	2.0	3.0	2.0	3.0	2.0
Standard Deviation	0.8	0.8	0.9	0.9	0.9	0.9	0.8
Count	41.0	41.0	41.0	41.0	41.0	41.0	41.0
Largest(1)	4.0	4.0	5.0	4.0	4.0	5.0	4.0
Smallest(1)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Confidence Level (95.0%)	0.3	0.3	0.3	0.3	0.3	0.3	0.3

**Figure 4.** Seven Golden Rules for open and inclusive planning of a just transition

The risks arising from insufficient stakeholder engagement were addressed in the third set of questions, in order to assess the possible threats from the low involvement of key societal actors in the transition endeavor. In this respect, the risks addressed were increased uncertainty, rejection of outcome, loss of confidence, lack of participation in decision-making and resistance related to ethical issues. The findings demonstrated in Table 3 and Figure 5 show that the role of stakeholder engagement in avoiding serious

risks in the course of transition is critical. It is worth noting that the highest values are found in the risks of increased uncertainty, lack of participation in decision-making and loss of confidence, suggesting the complexity, ambiguity, and uncertainty of such societal transformations occurring in lignite regions (Loorbach, 2010).

Table 3. Risks arising from insufficient stakeholder engagement

	Increased uncertainty	Rejection of outcome	Loss of confidence	Resistance related to ethical issues	Lack of participation in decision-making
Mean	4.44	4.05	4.32	3.85	4.37
Standard Error	0.1	0.1	0.1	0.1	0.1
Median	5.0	4.0	4.0	4.0	5.0
Standard Deviation	0.7	0.7	0.8	0.8	0.8
Count	41.0	41.0	41.0	41.0	41.0
Largest(1)	5.0	5.0	5.0	5.0	5.0
Smallest(1)	2.0	3.0	2.0	2.0	3.0
Confidence Level(95.0%)	0.2	0.2	0.2	0.2	0.2

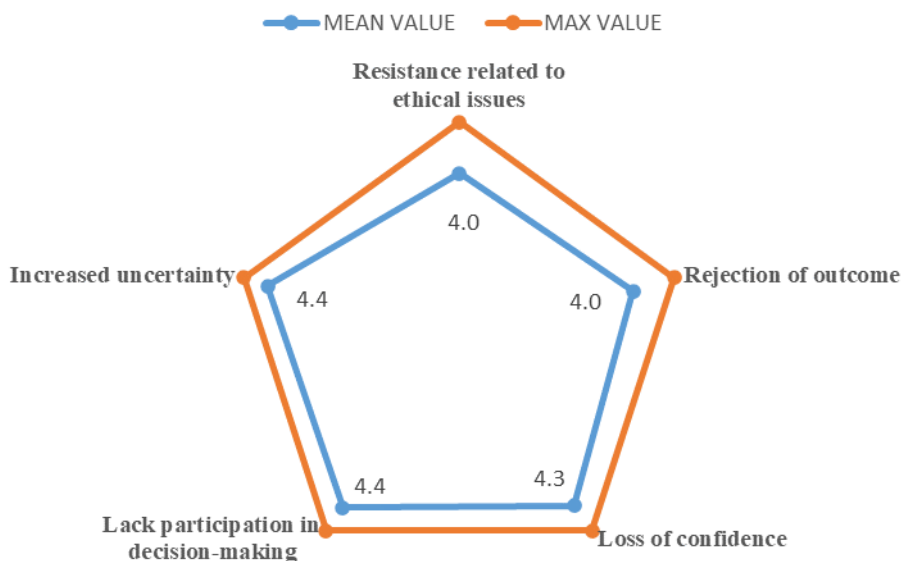


Figure 5. Risks arising from insufficient stakeholder engagement

The fourth set of questions focused on assessing the level of participation in the partnerships during the process of planning and monitoring of the Just Transition Program for Western Macedonia. To this end, three levels of participation were assessed: information, consultation, and cooperation, to reflect a gradual escalation in the dynamics of partnerships. The results shown in Table 4 and Figure 6, clearly imply that there is low performance in all the levels of participation. This practically means that first, the one-way flow of information is not adequately ensured, second, the stakeholders cannot easily express their views and recommend policies (consultation), and third, joint decision-making forms (cooperation) are absent from the governance setting (Green Tank, 2021).

Table 4. Levels of increasing stakeholder engagement in the Partnerships

	Information	Consultation	Involvement
Mean	2.72	2.49	2.49
Standard Error	0.1	0.1	0.1
Median	3.0	2.0	2.0
Standard Deviation	0.8	0.8	0.8
Count	41.0	41.0	41.0
Largest(1)	5.0	4.0	5.0
Smallest(1)	1.0	1.0	1.0
Confidence Level(95.0%)	0.3	0.3	0.3

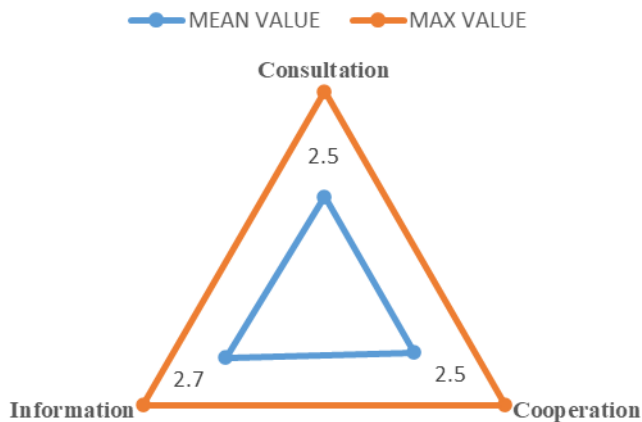


Figure 6. Levels of increasing stakeholder engagement in the Partnerships

The fifth set of questions was aimed at evaluating the type of governance model applied in Western Macedonia. From this point of view, three categories of governance models were considered. First, the top-down model, where decision-making is carried out predominately by the central government. Second, the bottom-up approach in which decision-making and process implementation originates from lower levels and proceeds upwards. The third model is the hybrid one, which combines elements from the above mentioned two approaches. Based on results summarized in Table 5 and depicted in Figure 7, most of the respondents characterized the governance model implemented in the case of the region of Western Macedonia as a clear top-down governance mechanism. Interestingly, this occurs contrary to the general tendency to weaken the dominance of top-down model (Vázquez-Barquero, 2003) and the shift towards place-based approaches over the last decades (Weck et al., 2021).

Table 5. Transition Governance Model in Western Macedonia

	Top-down	Bottom-up	Hybrid
Mean	4.02	1.71	2.54
Standard Error	0.2	0.1	0.1
Median	4.0	2.0	3.0
Standard Deviation	1.0	0.8	0.8
Count	41.0	41.0	41.0
Largest(1)	5.0	4.0	4.0
Smallest(1)	2.0	1.0	1.0
Confidence Level(95.0%)	0.3	0.2	0.2

The last set of questions focused on testing the major components of the place-based hypothesis based on Barca’s definition (Barca, 2009). In this theoretical framework, the existing governance mechanism was rated according to the extent by which it: (a) makes use of local territorial assets, (b) will be able to address economic inequalities and social exclusion, (c) transfers responsibility to lower levels, (d) employs place-based decision-making and multilevel governance, (e) applies vertical and horizontal links with poles of power, (f) delivers outcomes tailored to the local context and (h) encourages continuous monitoring through consultation.

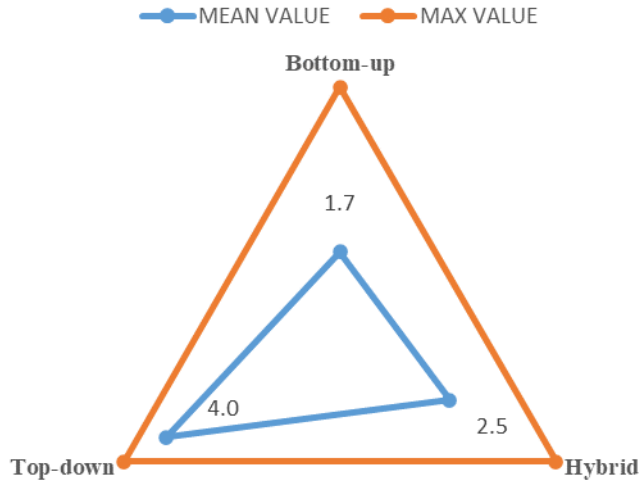


Figure 7. Transition Governance Model in Western Macedonia

Based on the results depicted in Table 6 and Figure 8, the majority of the respondents believe that the proposed transition governance mode, deviates substantially from the place-based approach. In particular, a considerable lack of decentralization was recorded in terms of transfer of responsibilities to the local level, which in turn is not able to activate the place-based decision-making logic. The findings also suggest that the proposed model for governing transition in Greece, favors neither multilevel governance, nor vertical or horizontal linkages among different power poles and places. As a result, this pattern promotes a purely centralized and vertical administrative setting that favors the core-periphery paradigm (Topaloglou, 2021). In addition, according to the prevailing perceptions, it seems that the governance model to be applied in the region is not able to address effectively economic inequalities and social exclusion. Furthermore, it does not take into consideration local peculiarities and local resources, nor does it generate outcomes adapted to the local context.

Table 6. Level of place-based approach

	Make use of local territorial assets	Address economic inequalities	Address social exclusion	Transfer responsibility at lower levels	Place-based decision-making model	Multilevel Governance	Vertical and horizontal linkages with poles of power	Outcomes tailored to local context	Continuous monitoring through consultation
Mean	2.93	2.76	2.76	2.02	2.41	2.44	2.59	2.80	2.61
Standard Error	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Median	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0
Standard Deviation	1.2	1.2	1.0	1.1	1.3	1.0	1.2	1.3	1.2
Count	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0
Largest(1)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	5.0
Smallest(1)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Confidence Level(95.0%)	0.4	0.4	0.3	0.3	0.4	0.3	0.4	0.4	0.4

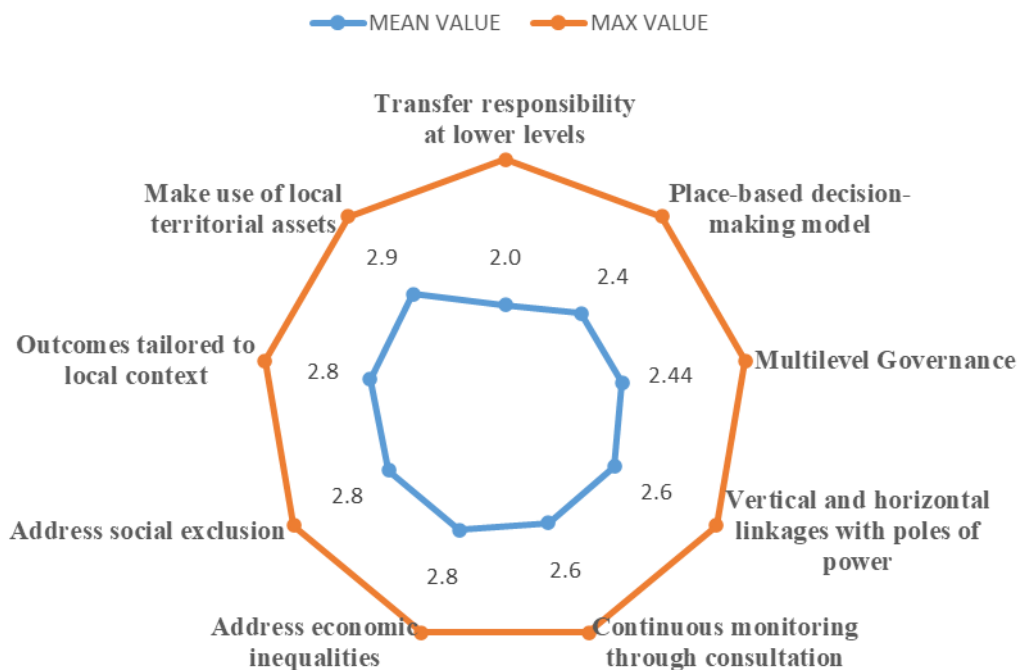






Figure 8. Level of place-based approach

In the next section, we employed a Pearson correlation coefficient aiming to explore the strength and the direction (positive or negative) of the linear relationship between two variables. All involved variables in the research were examined and all pairs were tested. Figure 9 shows the Pearson values of the variable pairs that demonstrate either a positive or a negative statistically significant correlation, excluding the insignificant statistical correlations.

Table 7. Pearson correlations

	Transparency	Effectiveness	Accountability	Inclusion	Access to information	Involvement & participation	Rejection of outcome	Loss of confidence
Inclusion	0.6							
Access to information		0.6	0.5					
Involvement & participation	0.5		0.6					
Loss of confidence	-0.5		-0.5	-0.5	-0.5	-0.6		
Resistance related to ethical issues	-0.5		-0.5	-0.6		-0.5		
Lack of participation in decision-making	-0.5		-0.6	-0.6				
Cooperation		0.5					-0.5	
Top-down						0.5		
Bottom-up	0.5					0.5		
Make use of local territorial assets					0.5			
Multilevel Governance			0.5	0.5		0.5	-0.5	-0.6
Vertical and horizontal linkages	0.5				0.5			
Continuous monitoring & consultation								0.5

Legend	
Positive/Strong Relationship	
Positive/Moderate Relationship	
Negative/Strong Relationship	
Negative/Moderate Relationship	

The significant values depicted in Figure 7 allow us to make a number of interesting observations. First, the findings illustrated in the first column show 'strong' and positive correlations between 'Transparency with inclusion' ($r=0.6$). 'Moderate' and positive correlations are recorded between 'Involvement & participation' ($r=0.5$), 'Bottom-up' model ($r=0.5$) and 'Vertical and horizontal linkages' with poles of power. On the other hand, 'moderate' and negative relationships are recorded between 'Transparency' and 'Loss of confidence' ($r=-0.5$), 'Resistance related to ethical issues' ($r=-0.5$) and 'Lack of participation in decision-making' ($r=-0.5$), respectively. These findings highlight the critical role that transparency plays in designing inclusive transition policies that can ensure active involvement and participation of the key stakeholders. It is also evident that transparency seems to be connected to a bottom-up perspective and vertical and horizontal linkages in relation to power setting. On the other hand, lack of transparency seems to discourage active participation, reduces the feeling of confidence, and challenges the transition proposed policies.

The next 'strong' and positive relationships between 'Effectiveness' and 'Access to information' and 'moderate' relationship with 'Cooperation' implies that effective policy making requires open access processes and an in-depth level of participation. Furthermore, 'Accountability' shows a positive/strong relationship with 'Involvement and participation' and positive/moderate relationship with 'Access to information,' and 'Multilevel Governance'. Respectively, negative/strong relationships are detected with 'Lack of participation in decision-making,' whilst negative/moderate relationships are recorded with 'Loss of confidence' and 'Resistance related to ethical issues.' This evidence suggests that accountability could be a key element in an engagement strategy of transition that incorporates multilevel governance modes and inclusive participation during the planning process.

Moreover, 'Inclusion' shows a positive/moderate relationship with 'Multilevel Governance' signifying the importance of interaction among distinct political levels and actors. To the contrary, negative/strong relationships are calculated with 'Resistance related to ethical issues' and 'Lack of participation in decision-making' and negative/moderate relationships with 'Loss of confidence.' It is inferred that inclusiveness of all the key categories of bodies, representing political makers, societal actors, economic agents, research institutions and distinct individuals, is a key precondition for obtaining the 'ownership' of the transition at the local level.

Next, 'Access to information' demonstrates a negative/moderate correlation with 'Loss of confidence' denoting the specific importance of the information diffusion within all parts and manifestations of the society, in the course of a trust building perspective. On the other hand, positive/moderate

relationships are displaying with the variables of 'Make use of local territorial assets' and 'Vertical and horizontal linkages.' From the policymaking point of view, this finding makes a lot of sense if one considers that the more access to information, the better the use of endogenous resources and better implementation of a place-based policy will be.

Likewise, positive/moderate correlations are revealed between 'Involvement and participation' with 'Bottom-up' governance model and 'Multilevel Governance.' To the contrary, negative/strong relationships are displayed between 'Involvement and participation' with 'Loss of confidence' and negative/moderate relationships with 'Top-down' and 'Resistance related to ethical issues.' At a macroscopic view, it is obvious that a bottom-up approach and multilevel mode of governance are favored within an environment of active involvement and participation of the key actors. Conversely, low performances in participation are usually associated with top-down model of governance that may harm trust in transition policies and trigger ethic-driven resistances.

Interestingly, the risk of 'Rejection of outcome' seems to exhibit negative/moderate correlation with 'Cooperation' and 'Multilevel Governance.' In other words, the likelihood of rejecting the transition strategy is considerably decreased whether solid partnerships and multi-level governance are employed. Similarly, the 'Loss of confidence' shows a negative/strong relationship with 'Multilevel Governance' and positive/moderate relationship with 'Continuous monitoring and consultation.' This result, seems to be in line with the latter finding, indicating that a governance setting that encourages a broad involvement of actors on a multi-layered basis, in combination with permanent monitoring and essential consultation, strengthens trust building in relation to transition policies.

DISCUSSION

In this section, we attempt to cast some light upon the various aspects of just transition policy making and governance, by linking up the theoretical considerations with the documents' analysis, and the empirical findings in Western Macedonia. The preceding analysis revealed that energy transition in coal regions concerns a fundamental change associated with major economic, societal, and environmental impacts. Given this background, our empirical findings suggest that the lower the local stakeholders' participation in decision-making, the higher the ambiguity, uncertainty, and loss of local societies' confidence towards central transition policies will be (Loorbach, 2010). On the other hand, however, our analysis showed that the no-

tion of just transition is not irrelevant to the goals of sustainability and neutral climate considerations at a national and global level (Frantzeskaki et al., 2012; Rees, 2015; 2017). That is so since the question that arises is whether such a global-wide challenge can effectively be tackled solely as a territory-based approach. Many scholars touch upon this question, pointing out the decisive role of the central State in confronting the regional disparities (Hadjimichalis, 2019) and effectively governed major societal transformations (Jessop, 1997; Meadowcroft 2007; Pierre, 2000; Scharpf, 1999), questioning the adequacy of place-based logic.

The exploration of the transition's governance model in Western Macedonia, revealed a clear top-down approach, rather than a bottom-up model or a hybrid one. It is worth pointing out that what is taking place in Western Macedonia does not reflect the prevailing governance approaches across the EU, where multilevel governance and place-based logics seem to dominate over the last years (Vázquez-Barquero, 2003; Weck et al., 2021). Concurrently, all modes of participation (information, consultation, cooperation) are evaluated as inadequate, whereas the factors of transparency, active involvement, participation, and inclusiveness, are clearly linked with bottom-up model, vertical and horizontal linkages, and multi-level governance. These findings constitute a major cause for alarm if one considers the fact of such deeply lignite-dependent economies, since the transition is a long-term and dynamic transformation that cannot be limited to the running programming period (2021-2027). To this end, decision-making and the implementation of resources should be placed in the geographic area where the transition activities are concentrating and, in order to have any realistic chance of success and obtain the true support of the local society, the governance model needs to become more inclusive.

Existing literature indicates a positive relationship between local autonomy and good governance, best use of local assets, and local knowledge (Ladner et al. 2016; Hooghe and Marks, 2020, Hooghe et al., 2020). Remarkably, the empirical evidence tends to confirm these assertions of literature, according to which 'accountability,' as a transfer of responsibility at a lower level, demonstrates a positive correlation with the perspective of multilevel governance and active involvement of local stakeholders. At a macroscopic level, such types of multifaceted participatory processes could cover the democratic deficit, governance vacuum and democratic legitimacy in policy making in countries with centralized administrative structure, such as Greece. This makes a lot of sense in coal regions in particular, if one examines the critical role of societal actors and their engagement in the form of 'ownership of the transition' that could be implemented within a multi-layered governance setting.

Based on the assumption that a place-based approach contributes to spatial and social justice, we examined to what extent policymaking in Western Macedonia makes use of local territorial assets and addresses economic disparities and social exclusion in a way that deliver outcomes tailored to locality. The empirical findings clearly suggest that Western Macedonia lags significantly behind the place-based logic. Concurrently, this evidence brings to the fore the critical role of local capacities and leadership. It is uncontroversial to state that governing such a demanding and long-term plan requires a well-managed transition and visionary leadership. To this end, a high-level leadership group would be of utmost importance for decision-making processes and for clarifying roles and assignments across a variety of actors at the national, regional, and local levels.

CONCLUSION

In the previous analysis, a critical theoretical review of the literature on transition management, spatial justice and the place-based approach was attempted, aiming to amalgamate this discussion into a just, transition governance perspective in Western Macedonia in particular. Given that transition in the case of Western Macedonia implies a profound and long-lasting societal, economic, and environmental transformation, new and pioneering modes of governance are necessary to tackle such a multifaceted challenge. Viewed in this respect, competing notions, such as efficiency and equity, effectiveness and legitimacy, market and society, exogenous and endogenous drivers of development, intra-generational and inter-generational environmental justice, should be manifested and reflected to a certain extent in transition governance mechanisms.

Given the intricacy and multi-layered nature of the transition, we may safely argue that any governance approach cannot easily overcome these competitive challenges without taking them into account. Policymaking from this point of view requires new balances among mainstream, alternative, and sometimes antagonistic agendas. Also, it should take into account new types of informal and formal networks, and new approaches of public engagement and civil society's involvement, that might reconcile the aforementioned tensions. To this end, a governance system, institutionally equipped to operate independently from political interventions and election cycles at national and local level, would contribute to the success of the transition. In this framework, the new discourse about place, policies, and governance, reveals the need for focusing on balancing and mixing inclusive and multi-

scalar policies, instead of merely defining governance structures and bodies in charge of implementing transition policies, as applied in Western Macedonia.

Within the sphere of responsibility of the EU, three policy documents with strong governance framework have been discussed, that of the Just Transition Fund Regulation, the Common Provisions Regulation, and the Governance of Transition Toolkit. At the national level, the major transition governance-context initiatives and documents have been critically discussed as well. Based on insights gained from the empirical research, there is abundant evidence to claim that the launched transition governance model in Greece and Western Macedonia considerably deviates from the EU policy context. In fact, substantial shortcomings in terms of legitimacy, effectiveness, inclusiveness, and public engagement have been recorded, associated with a lack of trust among local stakeholders. The findings also imply that these weaknesses are fueling several risks, such as uncertainty, rejection of outcome, and lack of participation due to resistance related to ethical issues.

It seems that resilient, sustainable, and inclusive transformations in coal-dependent regions, such as Western Macedonia, require minimizing social distress, placing emphasis on competitive advantages locally and the fast-growing sectors globally, and responding to climate neutral challenges. To this end, the elements of effectiveness, justice and 'place-bound' in a transition's governance, prove to be enabling factors to make transition pathway truly successful and tackling such multifaceted challenges and, sometimes, competing agendas. To sum up, a new operationalizing balanced perspective between the state, the market, and the society on the one hand, and the top-down and bottom-up policies on the other, seem to be crucial for a success and just governance transition pathway.

Finally, existing findings reveal that the governance model in Western Macedonia does not embed spatial justice, in terms of fairness and equitable distribution of power and socially valued resources in space, at a satisfactory level. To this end, the gap between efficiency and equity remains open, making it inadequate to design and implement an inclusive development policy. In addition, the proposed governance mechanism does not seem to incorporate a place-based approach in terms of harnessing the spatial territorial capital, local knowledge, multi-layered interactions among administrative structures, spatial levels, and actors. This policy framework does not favor either spatial-territorial capital, or just multi-level governance. Seen in this perspective, one could identify an interesting and promising interaction between the transition management, the spatial justice rationale, and the place-based approach in the governance of transition.

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Abstrakt

CEL: W niniejszym opracowaniu przeanalizowano w jakim stopniu sposoby zarządzania transformacją w regionie Macedonii Zachodniej (Grecja) są skuteczne i sprawiedliwe oraz czy uwzględniają zarządzanie transformacją, sprawiedliwość przestrzenną i elementy związane z miejscem. W tym celu hipoteza przetestowana w tym artykule jest taka, że sprawiedliwość przestrzenna i polityka ukierunkowana terytorialnie mogą wnieść pozytywny wkład w sprawiedliwą i dobrze zarządzaną transformację. W tym kontekście badane pytanie nie dotyczy „kto jest odpowiedzialny za projektowanie i wdrażanie polityki transformacji?“, ale „jaka jest równowaga i kombinacja polityk transformacji na szczeblu centralnym, regionalnym i lokalnym?“. **METODYKA:** W artykule krytycznie omówiono koncepcję przejścia jako fundamentalnej zmiany społecznej przez pryzmat efektywności i sprawiedliwości. W związku z tym dokładnie zbadano pojęcia zarządzania transformacją i sprawiedliwości przestrzennej. Wprowadzono również pojęcie „miejsca“ w tę dyskusję. W związku z tym badane są wyzwania, szanse i wady podejścia terytorialnego w trakcie transformacji. Część empiryczna zawiera mieszankę metod ilościowych i jakościowych, takich jak wykorzystanie kwestionariuszy i spotkań grup fokusowych, poprzedzonych badaniami tła, obejmującymi głównie badania typu desk research. Powyższe różne przypadki pracy empirycznej nie są dla siebie całkowicie nieistotne. Trafność wyników badań jest wzmocniana przez wykorzystanie wielu źródeł dowodów i triangulacji danych. Analiza na poziomie badań empirycznych koncentruje się na Macedonii Zachodniej w Grecji. Region ten ma wszelkie cechy miejscowości zależnej od węgla, w związku z pilną potrzebą zaprojektowania i wdrożenia post-węglowej, sprawiedliwej strategii transformacji. **WYNIKI:** Biorąc pod uwagę, że transformacja oznacza głęboką i długotrwałą transformację społeczną, gospodarczą i środowiskową, nowe i pionierskie sposoby zarządzania

są niezbędne, aby stawić czoła tak wieloaspektowemu wyzwaniu. Dyskurs na temat miejsca, polityki i zarządzania ujawnia potrzebę skupienia się na równowadze i połączeniu integracyjnych i wieloskalowych polityk zamiast definiowania struktur zarządzania i organów odpowiedzialnych za wdrażanie polityki transformacji. Rozpoczęty w Grecji model zarządzania transformacją znacznie odbiega od kontekstu polityki UE. W rzeczywistości odnotowano znaczne niedociągnięcia w zakresie legitymacji, inkluzywności, zaangażowania społecznego i ogólnej skuteczności. Dowody empiryczne wskazują na raczej wyraźny model odgórny niż hybrydowy. Wyniki pokazują, że model zarządzania zastosowany w przypadku Macedonii Zachodniej nie zawiera ani sprawiedliwości przestrzennej, ani podejścia terytorialnego. **IMPLIKACJE:** Patrząc na długoterminowy proces transformacji przez pryzmat zarządzania i kształtowania polityki, niniejszy artykuł kwestionuje twierdzenie, że tradycyjny model zarządzania odgórnego jest najbardziej skutecznym i sprawiedliwym podejściem. W tym kontekście dokładnie badane są pojęcia zarządzania tranzycją i sprawiedliwości przestrzennej. Pojęcie „miejsca” jest również osadzone w tej dyskusji. W tym celu analizowane są wyzwania, szanse i wady podejścia terytorialnego. Biorąc pod uwagę, że transformacja jest z natury procesem wieloaspektowym, wielopoziomowym i wielopodmiotowym, skuteczne i sprawiedliwe zarządzanie transformacją powinno odzwierciedlać poglądy różnych podmiotów. W tym sensie wydaje się, że modele wielopoziomowego zarządzania regionami w okresie przejściowym muszą wykorzystywać istniejącą interakcję między różnymi poziomami i podmiotami. **ORYGINALNOŚĆ I WARTOŚĆ:** Po omówieniu procesu transformacji w odniesieniu do pojęć „zarządzania” i „sprawiedliwości”, osadzamy koncepcje sprawiedliwości przestrzennej i podejście oparte na miejscu w praktykach transformacji zarządzania. Pod tym względem lukę między efektywnością a sprawiedliwością, logiką redystrybucji (potrzeby, rezultaty) i polityką rozwoju (rozwój sprzyjający włączeniu społecznemu) można wypełnić za pomocą tak zwanego „kapitału przestrzenno-terytorialnego” i przestrzennie sprawiedliwego, wielopoziomowego zarządzania.

Słowa kluczowe: sprawiedliwa transformacja, podejście terytorialne, sprawiedliwość przestrzenna/społeczna, zarządzanie, Zielony Ład, zmiana klimatu

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Conflicts of interest

The authors declare no conflict of interest.

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University students' entrepreneurial intentions during COVID-19: The perspective of social cognitive career theory

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Abstract

PURPOSE: Although the COVID-19 pandemic has had a catastrophic effect on economic activities worldwide, the paradoxical phenomenon of this black swan situation may be found to facilitate entrepreneurial intentions. This study aims to investigate Thai university students' perceptions of their entrepreneurial aspirations during the times of the COVID-19 pandemic. **METHODOLOGY:** Drawing upon social cognitive career theory, this research investigates the profound linkage of university students' COVID-19 perceptions and attitudes towards situations for self-believing in the adaptation for entrepreneurship. A valid sample of 798 collected from eight provinces, eight districts, and eight cities throughout Thailand was included for further analysis using Structural Equation Modelling (SEM) and Process Macro Model 6. **FINDINGS:** University students' COVID-19 pandemic perceptions influence their self-efficacy in situation adaptations and perceived desirability towards individual-level entrepreneurial intentions. Interestingly, self-efficacy and desirability towards entrepreneurship act as serial mediating factors, towards the mediated relationship between attitude towards the situation, COVID-19 perception, and university students' entrepreneurial intentions. **IMPLICATIONS:** The results of this research can add to entrepreneurship literature and additional model testing has also been proposed. Besides, practitioners and researchers could collaborate with governors to cultivate entrepreneurial trajectories based on research findings. **ORIGINALITY AND VALUE:** Social cognitive career theory (SCCT) can rationalize an academic student's career choice of entrepreneurship by considering their perception of the start-up processes during COVID-19. Future research can also test findings on a representative sample at the national level.

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Keywords: COVID-19, entrepreneurial intentions, self-efficacy, attitude, situation, desirability, social cognitive career theory

INTRODUCTION

In the past decades, the global business ecosystem and economic development have been challenged by periodic black swan events that later became familiar forms, such as SARS, Spanish flu, and even the mystery of Syphilis (Cartwright, 2014). Based on the work of Nassim Nicholas Taleb, a black swan event refers to an unpredictable situation that no one can foresee or prepare for. The black swan term can be more understood following the different deductive logic that all observed swans are white. This does not refer to that all of them are always white (Taleb, 2007). It can be implied by the emergence of COVID-19, which has been an exogenous shock to affect economies and society in unprecedented ways, and humans have not prepared for it. This global health disaster was initially discovered in late 2019 and caused a fully-fledged economic and social crisis (Wannamakok, Sissokho, & Gates, 2020). This humanitarian pandemic is a most serious catastrophe, affecting almost all parts of the globe (Hall, Scott, & Gössling, 2020). Although the COVID-19 crisis affects the economy at large, entrepreneurial spirits and activities could be the key drivers to mitigating the effects of disastrous crises, social instability, and unemployment rates (Zamrudi & Yuliantu, 2020). As a result, governments all over the world have been encouraging drastic measures and cultivating individuals' entrepreneurial mindsets to respond to unexpected crises innovatively (Ratten, 2021).

General speaking, although entrepreneurial intentions are recognized as having a central role in entrepreneurship studies (Linan & Fayolle, 2015), most current studies have widely investigated entrepreneurial activities and little is known in the context of individuals' states of mind in the entrepreneurial processes (e.g., Liñán & Jaén, 2020; Ratten, 2020). How individuals' entrepreneurial intentions could influence their perceptions of the COVID-19 pandemic should be further studied (Liñán & Jaén, 2020; Krichen & Chaabouni, 2021). Previous studies have postulated that entrepreneurial processes and trajectories could be affected by uncertain and risky circumstances (Amorós et al., 2019). Particularly, how an individual's entrepreneurial aspiration could be affected by their subjective perceptions during the COVID-19 pandemic are unexplored (Hernández-Sánchez, Cardella & Sánchez-García, 2020). Although this exogenous shock could cause entrepreneurial activities to teeter on the verge of a rapid decline, it

also allows individuals to cope with this crisis with resilience and innovative creation (Anker, 2021).

Drawing upon the social cognitive career theory proposed by Bandura (1978), self-efficacy in adaptation contingent on the situation is the germane premise of the theory especially when predicting individuals' entrepreneurial intentions. When individuals possess high self-efficacy, their level of self-confidence to perform a particular action is higher (Shahab, Chengang & Arbizu, 2019). It is also in line with Liñán and Chen's (2009) research work. They found and confirmed that self-efficacy arouses individuals to be more confident in their entrepreneurial decisions. Individuals may exercise stronger muscles of resilience and recognize new opportunities that emerge from today's pandemic-filled business ecosystem (Liguori & Pittz, 2020). In this line of thought, individuals may view the COVID-19 pandemic crisis as an opportunity in the pursuit of their entrepreneurial intentions, particularly those who are in educational institutions. This is because academic students considered the COVID-19 crisis as an opportunity for an enterprising career, particularly those who perceived risk situations as negative for their entrepreneurial propensity and consider entrepreneurship as a future career choice through the educational support in university (Krichen & Chaabouni, 2021).

In this sense, we explore how university students' COVID-19 perceptions and attitudes towards the current situation influence self-efficacy and perceived desirability to determine their entrepreneurial intentions. This research question is essential because it could help improve the existing education and entrepreneurship policies, boost academic students' intentions to engage in entrepreneurship during COVID-19, and bring about positive change to society at large. This paper could also contribute to the current literature on entrepreneurial intentions by exploring the concurrence effects of COVID-19 and the serial mediating roles of self-efficacy and perceived desirability towards entrepreneurial propensity on university students' entrepreneurial intentions. Our work could also broaden the abovementioned understanding and help future research in conceptualizing the underlying entrepreneurial intentions research area.

LITERATURE REVIEW

Social cognitive career theory

Based on the intention model theorists, Ajzen's (1991) Theory of Planned Behavior (TPB) and Shapero's (1982) model of how entrepreneurial events could enhance individuals' entrepreneurial intentions. TPB provides three

determinants of pre-enterprise intentions (attitude towards behavior, subjective norms, and perceived behavior control). Meanwhile, Shapero's (1982) model of the entrepreneurial event also provides three antecedents (perceived feasibility, perceived desirability, and propensity to act). These two theoretical models have been widely adopted to examine enterprising spirits in the entrepreneurial intention literature. Besides, both entrepreneurial intention models by Ajzen (1991) and Shapero (1982) also agree on the way perceived desirability and feasibility can influence entrepreneurial intentions. In this sense, perceived desirability is an individual's attitude that is influenced by personal expected values. Whereas, perceived feasibility, refers to the degree of individuals' self-confidence and capability of launching a business. This self-confidence perception is in line with the main premise of Bandura's (1978) social cognitive theory on perceived self-efficacy that could explain how individuals' inners on their self-belief to effectively perform a behavior. As a result, this study incorporates the above-mentioned two intentions models with Bandura's (1978) self-efficacy to further examine individuals' entrepreneurial intentions in the context of the COVID-19 situation accordingly. Based on this line of thought, individuals' entrepreneurial intentions could be explained by cognitive perceptions for business information evaluation to become entrepreneurs (Krueger, 1993).

In the present study, we, therefore, draw upon the social cognitive career theory (SCCT) to rationalize an individual's career choice of entrepreneurship by considering their perception of the start-up processes. SCCT is based on individuals' cognition awareness of their self-belief, which is crucial for tenacious goal pursuits and intentions. Thus, individuals are cognitively prone to shape their intentions based on the expectations of their efforts for future outcomes (Liguori, Bendickson, & McDowell, 2018). Caines, Earl, and Bordia (2019) suggested that self-efficacy has a positive influence on an individual's self-employment. Individuals would engage in entrepreneurial activities when they believe they are capable of handling the complicated and uncertain processes of founding a new venture (Lent, Brown & Hackett, 2000). However, the close connections between self-efficacy and entrepreneurial aspirations are still inconclusive in the COVID-19 context.

Looking at the wider picture of the connection between the industries and current situation, Seetharaman (2020) found that individuals in the industries who have agilely adapted to the current situation could seek business opportunities and foster businesses to have an altered or new business model for their future survival outcomes. Individuals will be more resilient to the COVID-19 pandemic situation and may be able to perceive new opportunities (Liguori & Pittz, 2020). Meanwhile, individuals' risk evaluation, attitude towards situations, and failure could be the main suppressors of

their career choices. This view is in line with the work of Lent et al. (2000), who postulated that starting a new business involves dealing with risks and uncertainties that may stifle an individual's passion for entrepreneurship. However, the premises of SCCT and other contributing factors could jointly reinforce individuals' commitment to their career choice through the lens of cognitive determinants (Lent, Brown & Hackett, 2002), particularly in the times of COVID-19 that may drive individuals to adapt and foster entrepreneurship (Krichen & Chaabouni, 2021).

These health-related behaviors and outcomes could affect personal assessments of a taxing situation, and thus, self-efficacy is the main trigger in predicting physical and psychological health (Bandura, 1978). Besides, self-efficacy has been associated with or included in entrepreneurship and psychological health studies. For example, self-efficacy has been found to have a profound effect on the relationship between personal representations and physical health (Knowles et al., 2020), psychological health (Karademas & Thomadakis, 2021), individual's quality of life (Banik et al., 2018), and entrepreneurial behavior in the times of COVID-19 (Doanh et al., 2021). This pandemic is a demanding condition that could affect their adaptive abilities (Karademas & Thomadakis, 2021), Bandura's (1978) theory thus reflected a personal self-efficacy perception for their adaptation to the COVID-19 pandemic. Therefore, this research clarifies how individuals' entrepreneurial intentions are driven by self-efficacy, attitude towards the situation, and COVID-19 perceptions including perceived desirability towards entrepreneurship that may jointly strengthen their motivation and serve as precursors of potential entrepreneurs.

Entrepreneurship in times of pandemic

Bandura's work (1978) has elucidated that self-efficacy dramatically led to personal opportunity, which is persuasive for future expected outcomes. In this sense, individuals who possess self-efficacy, resilience, and innovativeness are more likely to create a business opportunity that thrives within a short period. Brown, Beale, and White-Johnson (2011) confirmed that individuals' attitudes towards entrepreneurship are influenced by their self-efficacy, self-reliance, and risk-taking tendencies. Individuals could even create a new type of venture contingent upon opportunity/necessity entrepreneurial mindsets (Maritz, Perenyi, De Waal, & Buck, 2020). When the business environment is highly uncertain, individuals could be more proactive and perceive the advantages of the positive facets of this environment (Hernández-Sánchez et al., 2020). These emerging opportunities are formulated through an individual's perceived self-efficacy, intention, and desirability (Hostager, 1998). This

view is confirmed by the recent studies that an individual's self-efficacy and perceived desirability are the source of arousal of entrepreneurial intentions (e.g., Linan & Fayolle, 2015).

Compared to past epidemics, COVID-19 has spread rapidly worldwide and has caused unprecedented uncertainty on a global scale (Hernández-Sánchez et al., 2020). However, numerous firms may also adjust their business models or even close their businesses during this difficult time. Paradoxically, this brutal pandemic is also considered a for-opportunity accelerator for entrepreneurs in response to people's daily life activities, such as online education, digitalization, communication, entertainment, etc. In this sense, the work of Maritz et al. (2020) has revealed that the roles of entrepreneurial activities and mindsets could well be the unsung hero in the times of the COVID-19 pandemic. Based on the above-mentioned reasoning, our first hypothesis was formulated as follows:

H1: An individual's COVID-19 perception on entrepreneurship has a direct influence on their (a) self-efficacy in the current situation and (b) desirability towards entrepreneurship

A positive attitude towards the situation can play a role in predicting entrepreneurial intentions. In this sense, several studies have included and altered attitudes towards behavior in different contexts. For example, attitude towards social distancing (e.g., Gibson et al., 2021; Yu, Lau, & Lau, 2021), attitude towards the uptake of a COVID-19 vaccine (Fan et al., 2021), attitude towards fears and worries (Ammar et al., 2020), attitude towards intentions for pro-environmental behavior in the times of COVID-19 (Lucarelli, Mazzoli, & Severini, 2020), and attitude towards entrepreneurship (Vamvaka et al., 2020; Botsaris & Vamvaka, 2016). However, incorporating the attitude towards the COVID-19 situation into the entrepreneurial behavioral model is in its infancy and is inconclusive.

Based on the planned behavior theory, attitude towards a behavior is also a conceptual antecedent of individual intention (Ajzen, 1991), which could be the main motivator for entrepreneurial trajectories (Shapero, 1982). Attitude and behavior have also been found to have a profound effect on self-efficacy towards behavioral intention (e.g., de Vries, Dijkstra, & Kuhlman, 1988; Boyd & Vozikis, 1994), which could bolster individuals' career confidence in addressing barriers they confront when achieving their career goals (Savickas & Porfeli, 2012). Thus, career confidence and adaptability are considered a source of self-efficacy (Rossier, 2015). In perilous situations, self-efficacy has not been investigated as a predictor of entrepreneurial ambition

(Bullough, Renko, & Myatt, 2014). Attitude towards the situation in the times of COVID-19 may jointly influence individuals' self-efficacy and their desire to become eventual entrepreneurs.

H2: An individual's attitude towards the situation has a direct influence on their (a) self-efficacy in the current situation and (b) desirability towards entrepreneurship

The mediating role of self-efficacy and desirability towards entrepreneurship

As several studies have postulated that entrepreneurship and innovation play a pivotal role in improving and increasing the wealth and economy of a country (e.g., Hernández-Sánchez et al., 2020; Lee & Rodríguez-Pose, 2021), individuals' entrepreneurial mindsets and ecosystems should be fostered at such a critical time for wealth and growth. However, the factors that may have an impact on business processes and potential entrepreneurs' motivations during catastrophes have not yet been explored (e.g., Hernández-Sánchez et al., 2020; Maritz et al., 2020). In this direction, entrepreneurship as a career choice refers to individuals' perceived cognitions determined by their attitudes, intention, and action (Bandura, 1986). It is generally acknowledged that a profound understanding of how and what contributing factors could play a decisive role in predicting an individual's entrepreneurial aspiration requires further exploration.

Based on SCCT, the main point of the theory is the motivation driven by outcome expectation, self-efficacy, and goal-directed activity that could ultimately translate individuals' cognition to determine and make decisions on their career paths (Lent et al., 2002). Liguori et al. (2018) reaffirmed that applying the premise determinants of SCCT-informed propositions could significantly explain entrepreneurial intention. This echoes the intentionality-based model, which contends that entrepreneurial intention accrues when entrepreneurially motivated individuals perceive self-beliefs and desirability (Ajzen, 1991; Shapero, 1982). More critically, the work of Liguori et al. (2018) affirms that self-efficacy can mediate individuals' entrepreneurial intention relationships, which could be explained by the constructionist assumption that SCCT rests on the individuals' perceptions of their capacities to cope with their surroundings and their ability to self-reflect, be self-proactive, and self-organize to execute courses of actions over conditions that affect their life (Bandura, 1986). Zhao, Seibert, and Hills (2005) also confirmed that self-efficacy plays a mediating role in predicting entrepreneurial intentions, which are also related to an individual's perceived desirability towards

entrepreneurship. Especially in a traumatic situation, the social cognitive theory could contribute to explaining a person's perceived coping self-efficacy as the mediator towards personal contextual perceptions and traumatic adversity (Benight & Bandura, 2004). In the case of academic students, those who had higher risk-taking are more prone to pursue careers as entrepreneurs through their confidence perception (Zhao et al., 2005). These individuals' physiological state building could foster their desire to deal with difficult and risky situations more than those who are not (Sitkin & Weingart, 1995).

Several works have endorsed the close connections between perceived desirability and self-efficacy towards entrepreneurial aspirations (e.g., Linan & Fayolle, 2015). In this sense, Achchuthan and Nimalathasan (2012) found that perceived desirability has a major influence on entrepreneurial intentions. In the student sample, Zampetakis (2008) found that university students' perceived desirability could play a mediating role in promoting their entrepreneurial intentions. This view is confirmed by Yusoff, Ahmad, and Halim (2016), who reported that perceived desirability and entrepreneurship intention posit a positive effect between them.

During the COVID-19 pandemic, the disrupted environment could give rise to uncertainty and risk, which could weaken individuals' entrepreneurial intentions, especially those who are pessimistic (Bergenholtz, Klyver, & Vuculescu, 2021). However, the COVID-19 situation could be considered a double-edged sword that could facilitate an individual's entrepreneurial mindset with resilience and innovativeness in response to the concurrent situation, particularly, in sport entrepreneurship (Ratten, 2020), digital-supported entrepreneurship education (Secundo et al., 2021), and social entrepreneurship (Bacq & Lumpkin, 2020). An individual may perceive entrepreneurship as a desirable career option along with an individual's self-efficacy in adjusting to disturbing surroundings and related cognitive characteristics. Based on the above-mentioned reasoning, the following hypotheses are formed.

H3: The mediated relationship between COVID-19 perception and entrepreneurial intentions, self-efficacy, and perceived desirability act as serial mediating factors.

H4: The mediated relationship between attitudes towards the situation and entrepreneurial intentions, self-efficacy, and perceived desirability act as serial mediating factors.

The direct effect of self-efficacy and perceived desirability towards entrepreneurial intentions

Udayanan (2019) reported that self-efficacy plays a pivotal role in determining entrepreneurial intentions and outcome expectations. This view implied that individuals with higher self-efficacy also have high entrepreneurial intentions (Liguori et al., 2018). Higher entrepreneurial intentions could also be nurtured through the positive effect of perceived desirability (e.g., Uansa-ard & Wannamakok, 2020; Hernández-Sánchez et al., 2020; Păunescu, Popescu, & Duennweber, 2018). In parallel, several studies have investigated the effects of self-efficacy and perceived desirability, and found that these determinant factors are the backbone of individuals' entrepreneurial intentions. For instance, Kruger (2000) stated that those entrepreneurial actions could be developed further based on individuals' perceptions of the desirability and feasibility of the business. However, in the situation of high uncertainty and dangerous contexts, individuals' entrepreneurial intentions could be also fostered directly when they have self-efficacy and adversity (Bullough et al., 2014). Therefore, the last two hypotheses are raised as follows:

H5: Self-efficacy has a direct influence on desirability towards entrepreneurship.

H6: Desirability towards entrepreneurship has a direct influence on entrepreneurial intentions.

Based on the above-mentioned literature review, we further developed the theoretical framework to test a structural model empirically. In Figure 1, the framework explains the interrelationships between attitude and perception towards the COVID-19 situation and Thai individuals' entrepreneurial intentions. All hypotheses proposed in the study have also been visualized in Figure 1.

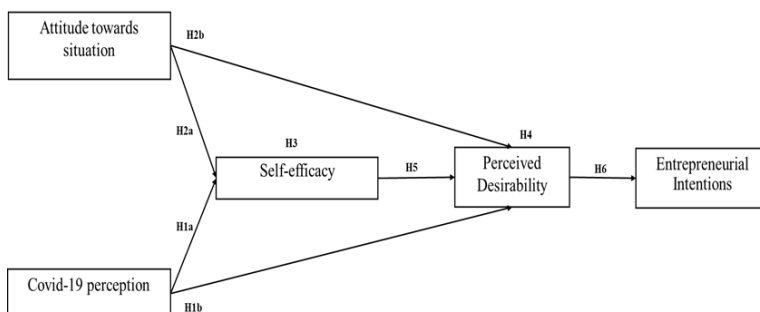


Figure 1. Theoretical framework

METHODOLOGY

Data collection

The data in this study were collected through questionnaire-based surveys in the Thai language. The quota sampling approach was carried out with the faculty members' support and access to distribute the questionnaires in multiple universities. The Thai sample includes undergraduate students from several public and private universities located in eight provinces, eight districts, and eight cities throughout Thailand. The surveys were initially received from 800 respondents. After screening out incomplete responses, a sample of 798 college students was used to examine the hypotheses using structural equation modeling (SEM) and Process Macro Model 6.

Because this study explores casual relationships and serial mediators, the SEM and Process macro procedures were applied. SEM is a multivariate approach to testing the causal relationship that empirically tests direct and indirect effects on pre-assumed causal relationships (Fan et al., 2016). In the same vein, Process macro is a path analysis, and modeling tool for observed variables. It is widely used in the social, business, and health sciences to estimate the direct and indirect effects of parallel and serial mediators (Hayes, 2017). Therefore, these two approaches could be properly adopted to test the hypothesized model of the study empirically.

A statement of confidentiality was presented at the beginning of the questionnaire to assure participants of the strict privacy of their responses and to comply with the requirements of research ethics. Table 1 shows that 72.3% of the participants were female and 27.7% were male. Due to participant concerns, in some entrepreneurial intention-related studies, the samples may not be balanced (e.g., Doanh, 2021; Shahzad et al., 2021; Younis et al., 2021). One plausible reason is based on the work of Simundic (2013), who stated that the samples in a study should ideally be chosen at random while still complying with the study's criteria. Additionally, over 89.8% of the participants were interested in indoor activities, such as social media, movies, music, surfing the net, and resting. Few university students (7.1%) are into outdoor activities, such as sports, meeting with friends, hanging out, and nightlife. Meanwhile, 70.6% stay with their parents and the majority of them have never had any entrepreneurial experiences. Based on the Global Entrepreneurship Monitor Report (GEM, 2015), youth who study at a university tend to have a higher propensity for entrepreneurial careers. As such, scholarly interest in understanding the factors that may influence the entrepreneurial motivations of students in educational institutions has been growing.

Table 1. Sample characteristics

Variable	Category	n	%
Gender	Male	221	27.7
	Female	577	72.3
Activity	Indoor (Social media, movies, music, surfing the net, resting)	717	89.8
	Outdoor (Sport, meeting friends, hangout, nightlife)	57	7.1
	Others	24	3.1
Living condition	With parents	563	70.6
	With grandparents	73	9.1
	Alone	25	3.1
	Friends or soul mate	59	7.4
	Others	78	9.8
Previous experience in entrepreneurship	Yes, I used to have my own business	35	4.4
	Yes, my family used to have a business	125	15.7
	Never	638	79.9
Current experience in entrepreneurship	Yes, I currently have my own business	21	2.6
	Yes, my family currently owns a business	140	17.5
	Never	637	79.9

Measures and validation

Attitude towards the situation. The five scale items have been adopted and adjusted from the literature (e.g., Kelberer, Kraines, & Wells, 2018; Antoci, 2021; Peng et al., 2020). An example is “Despite the COVID-19 situation, I am still positive towards my future career.” The respondents rated items using a scale ranging from 1 (disagree) to 7 (agree). The average variance extracted (AVE) and composite reliability (CR) for this construct are 0.63 and 0.89, respectively.

COVID-19 perception. Six question items were used to measure this construct and were adjusted from the work of Hernández-Sánchez et al. (2020). One of the items is “I believe that COVID-19 will affect my future career as an entrepreneur.” We designed questionnaires wherein the respondents used a scale ranging from 1 (disagree) to 7 (agree) to rate items. The AVE and CR for this construct are 0.60 and 0.89, respectively.

Self-efficacy. This variable contained five scale items that were adjusted from Bullough et al. (2014). The respondents were asked to conduct self-report questionnaires and one example item is "I believe that I could adjust myself into the new situation and environment." The AVE and CR for this construct are 0.54 and 0.86, respectively.

Perceived desirability. We adopted four scale items from the existing literature (e.g., Linan & Fayolle, 2015). An example is "among various career options, being an entrepreneur is my desired career choice." The AVE and CR for this construct are 0.62 and 0.86, respectively.

Entrepreneurial intentions. The four scale items included in this study were from existing literature (e.g., Păunescu et al., 2018; Kruger, 2000). For example, "I purposely aim to be an entrepreneur." The AVE and CR for this construct are 0.78 and 0.93, respectively. More details on the scale assessment are presented in Table 7 listed in the Appendix 2.

Control variables. Three control variables have been added in the study namely gender (Male=1, Female=0), previous entrepreneurial experience (2=Yes, I used to have my own business, 1=Yes, my family used to have a business, 0=Never), and current entrepreneurial experience (2=Yes, I currently have my own business, 1=Yes, my family currently owns a business, and 0=Never), respectively.

Common Method Bias (CMB)

The data from the survey follow steps to reduce biases, including common method variance (Podsakoff et al., 2013). Thus, we undertook procedures recommended by Podsakoff et al. (2013) to reduce and evaluate the magnitude of common method bias. Next, Kaiser's criterion for retention of factors was followed. The sample size appeared to be large enough for the factor analysis, at least based on the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO=0.917). Although the questionnaire items in this study have been rigorously adopted from relevant literature, the confounding influence of CMB on the statistical results can emerge. Then, we conducted Harman's one-factor test on all items, extracting five distinct factors to examine any potential CMB. According to Podsakoff et al. (2003), the total variance for one factor should not exceed 50%. Harman's single factor score for this study was 32.5%. Thus, no single factor emerged. These results suggested support for the validity of our measures. Before testing the six hypothesized assumptions

using SEM and Process Macro (Hayes), the mean, standard deviations, and correlations among constructs have been examined.

Table 2. Correlations

	Mean	SD	Correlations				COVID-19 perception
			Attitude	Self-Efficacy	Desirability	Intention	
Attitude	5.714	0.960	0.793				
Self-efficacy	5.423	0.847	0.650**	0.734			
Desirability	5.238	1.120	0.376**	0.402**	0.787		
Intention	5.323	1.191	0.352**	0.349**	0.686**	0.883	
COVID-19 perception	5.294	1.239	0.207**	0.216**	0.221**	0.206**	0.774

Note: The square root of AVE (in bold on diagonal), SD = Standard deviation.

Table 2 shows further results of the correlations and relationships between the five influential factors and entrepreneurial intention. This table demonstrates that the investigation on the constructs' correlations of all factors and entrepreneurial intention construct is found to be significantly consistent. Among all variables, the perceived desirability variable obtained the least score at 5.238 with a 1.120 SD score. The correlation of each construct is smaller than the square root of each construct's AVE. The squared AVE was used to assess discriminant validity, as shown on the diagonal lines that imply that the discriminant validity and inter-correlations between variables are sufficient.

RESULTS

In the next step, SEM was used to analyze the data and relationships of variables by applying the statistical software, AMOS. SEM or Linear Structural Relations is a modeling technique used in behavioral science. It combines factors analysis and regression or path analysis. The technique is often based on theoretical constructs and is represented by hidden factors. SEM analysis can analyze the correlation of model determinants, relationship strength for cross-sectional data, and the development of a modeling strategy.

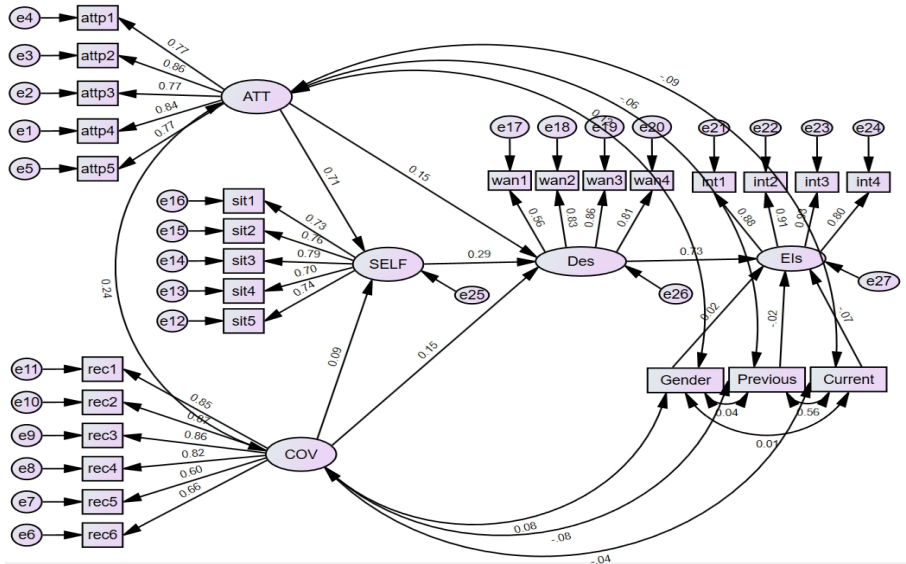


Figure 2. Structural Equation Modeling (SEM).

Figure 2 shows that the path analysis has illuminated research findings based on path relationships between constructs. The goodness of fit model was also satisfactory and indicated a model fit (standardized root mean square residual: standardized RMR = 0.080, root mean square error of approximation: RMSEA= 0.061, comparative fit index: CFI = 0.931, goodness of fit index: GFI = 0.918, and adjusted goodness of fit index: AGFI = 0.897).

Table 3. Results of Structural Equation Modeling (SEM)

Hypotheses	Paths	t-value	β	Results
H1a	COVID-19 perception → Efficacy	2.74	0.030**	Supported
H1b	COVID-19 perception → Desirability	4.41	0.032***	Supported
H2a	Attitude towards the situation → Efficacy	16.82	0.038***	Supported
H2b	Attitude towards the situation → Desirability	2.61	0.047**	Supported
H5	Efficacy → Desirability	4.57	0.055***	Supported
H6	Desirability → Entrepreneurial intention	14.34	0.079***	Supported

Note: **p< 0.01, ***p< 0.001.

Table 3 shows that the results of SEM indicated that COVID-19 perception had a positive effect on efficacy, thereby supporting H1a (**p< 0.01, Coef=0.030, t-value=2.74). This result implies that individuals'

previous COVID-19 perceptions affect their self-esteem in coping with the current pandemic. COVID-19 perceptions also positively significantly affect their perceived desirability towards entrepreneurship, which confirms H1b ($***p < 0.001$, Coef=0.032, t-value = 4.41). Individuals perceived COVID-19 as a situation that aroused their desire to be entrepreneurs, which fully confirms Hypothesis 1. These positive findings statistically signify individuals' attitude towards their self-efficacy ($***p < 0.001$, Coef=0.038, t-value= 16.82) and perceived desirability ($**p < 0.01$, Coef=0.047, t-value= 2.61). Therefore, H2a and H2b are statistically significant and confirmed Hypothesis 2. Based on the last two hypotheses that have been postulated to have direct effects on antecedents, the results showed that H5 directly posited a positive effect on individuals' perceived desirability ($***p < 0.001$, Coef=0.055, t-value = 4.57). In the same line, H6 is also found to be influenced by perceived desirability towards entrepreneurial intentions ($***p < 0.001$, Coef=0.079, t-value = 14.34), which affirms our assumptions. Additionally, before testing Hypotheses 3 and 4, a preliminary investigation to examine the mediating roles of self-efficacy and desirability towards entrepreneurial intentions by the bootstrapping technique was applied with the resampling of 5000, and the bias-corrected confidence interval was adopted at 95% through AMOS software as shown in Table 4.

Table 4. Results of mediating effects using the bootstrapping technique

Paths	Indirect effects	Standard Error	95% confidence interval	
			LLCI	ULCI
ATT → SE → DES	0.265***	0.069	0.136	0.411
ATT → DES → EI	0.327***	0.041	0.252	0.413
COV → SE → DES	0.026**	0.012	0.007	0.056
COV → DES → EI	0.134***	0.034	0.071	0.205
SE → DES → EI	0.287***	0.071	0.149	0.434

Note: $**p < 0.01$, $***p < 0.001$; ATT= Attitude towards the situation, Cov= COVID-19 perception, SE=Self-efficacy, DES= Desirability, and EI= Entrepreneurial intention. LLCI=Lower level of 95% confidence interval; ULCI= Upper level of 95% confidence interval.

Table 4 shows that self-efficacy and perceived desirability play mediating roles in determining entrepreneurial intentions, which are statistically significant at 0.01 and 0.001 levels. The LLCI (lower level) and ULCI (upper level) of the 95% confidence interval do not include zero, which further confirms that self-efficacy and perceived desirability have indirect effects on individuals' entrepreneurial intentions. Lastly, Hypotheses 3 and 4 were investigated to

examine the serial mediating roles of self-efficacy and perceived desirability using Process Macro Model 6 based on the recommendation of Hayes (2017). According to Hayes (2017), any regression program may be useful for model coefficient estimation. In this sense, the statistics tools can be also computed to validate research results and inferential tests that require the integration of information in the equations of mediation (M) and dependent variable (Y).

To validate the significant level and serial mediation model, the lower limit confidence interval (LLCI) and upper limit confidence interval (ULCI) should not include zero as adopted in Model 6. We also followed Preacher and Hayes (2017) on the use of a bias-corrected bootstrapping procedure of 5,000 resamples with the bias-corrected 95% confidence interval (CI) of multiple mediation effects.

Table 5. Results of Process Macro Model 6

Effects	β	SE	Bootstrap 95% CI		Results
			LLCI	ULCI	
Hypothesis 3					
Total direct Effect	0.05	0.03	-0.10	0.10	Supported
Total indirect Effect	0.15	0.03	0.10	0.21	
Ind1: Cov → Eff → EI	0.02	0.01	0.01	0.03	
Ind2: Cov → Des → EI	0.09	0.02	0.04	0.14	
Ind3: Cov → Eff → Des → EI	0.05	0.01	0.03	0.07	
Hypothesis 4					
Total direct Effect	0.11	0.04	0.03	0.19	Supported
Total indirect Effect	0.33	0.04	0.25	0.40	
Ind1: Att → Eff → EI	0.03	0.03	-0.03	0.09	
Ind2: Att → Des → EI	0.16	0.04	0.09	0.23	
Ind3: Att → Eff → Des → EI	0.14	0.03	0.09	0.19	

Note: ATT= Attitude towards the situation, Cov= COVID-19 perception, SE=Self-efficacy, DES= Desirability, and EI= Entrepreneurial intention. LLCI= Lower level of 95% confidence interval; ULCI= Upper level of 95% confidence interval.

Table 5 shows the results of the serial mediating roles of self-efficacy and perceived desirability towards entrepreneurial intentions using Process Macro Model 6. Hypothesis 3 posits a positive and supportive assumption, which implies that individuals' COVID-19 perceptions play a role in determining their entrepreneurial intentions through the positive influence of self-efficacy and perceived desirability. This assumption is in the same direction as

Hypothesis 4, which postulates a positive and supportive assumption, which could further be explained by individuals who post their attitude towards the current situation are influenced by the serial mediating roles of self-efficacy and perceived desirability towards their entrepreneurial intentions.

DISCUSSION

The global challenges that the COVID-19 pandemic has posed to the economy and society have led to entrepreneurial activities being considered as the backbone of transformational and unsolved economic activities for growth (Maritz et al., 2020). By taking an entrepreneurship perspective, recent graduates will face more challenges when embarking on their careers. However, they were trained and attended entrepreneurship education in educational institutions that have also changed normal classroom learning to online methods, which has enabled the youth to think innovatively in response to the pandemic by nurturing their entrepreneurial resilience thinking (Ratten, 2021). As such, in this adverse situation, a profound understanding of what factors could contribute to the extent of entrepreneurship as a career choice in times of crisis is of great importance for individuals' desire to grow and be innovatively resilient.

This study found that perceived desirability would mediate and directly affect relationships between COVID-19 pandemic perception, attitude towards the situation, and entrepreneurial intention. The finding is in line with the view of the premise of SCCT and TPB that self-efficacy would mediate and directly affect relationships between COVID-19 pandemic perception, attitude towards the situation, and perceived desirability. Therefore, the theoretical model of this study adds to the literature on the significant roles of self-efficacy and perceived desirability towards entrepreneurship. In particular, this study joins the few studies on the potential serial mediating effects of self-efficacy and perceived desirability on individuals' perceptions and entrepreneurial intentions during the COVID-19 pandemic as presented in the current literature.

Our research results resonate with the current literature. For instance, Liguori and Pittz (2020) found that the COVID-19 pandemic had brought about a positive change in individuals' mindsets to be more resilient, which later recognized emerging opportunities for entrepreneurship. Maritz et al. (2020) also explicated that the COVID-19 pandemic could serve as an enabler of new business establishments. They highlighted the opportunities for new businesses around the pandemic and provided narratives from expert opinions on the relationship between the COVID-19 pandemic

and entrepreneurial mindsets and initiatives through this entrepreneurial hardship condition. Our results are also in accordance with the premises of SCCT that could explain individuals' reinforcements to their career choices through the lens of cognitive determinants (Lent et al., 2002), particularly on how individuals could adapt and foster entrepreneurship during this pandemic. However, the existing literature has not produced consistent results, which may be due to human behaviors on risk evaluation, attitude towards situations, and failure that may jointly be the main suppressors for their career choice (Lent et al., 2000).

In terms of the influence of individual risk-takers, our findings help reconcile the dispute over the role of SCCT by disentangling the complicated relationship between self-efficacy, expected outcomes as entrepreneurs, and their planned behaviors. Hernández-Sánchez et al. (2020) also argued that individuals' perceptions towards the COVID-19 pandemic may mitigate their entrepreneurial intention. However, they also found that those who were more proactive and optimistic about the current situation increased their entrepreneurial intentions. In this sense, Krichen and Chaabouni (2021) found that few studies have focused on the COVID-19 pandemic and its effects on students' entrepreneurial intentions. They also noted that academic students' perceptions of personal risks on their entrepreneurial intentions are contingent upon the concurrent crisis because it could be perceived as either an opportunity or an obstacle. Therefore, this study elucidates how individuals' cognitive perceptions are translated into their motivations to become entrepreneurs under the contingent effect of self-efficacy and perceived desirability.

CONCLUSION

The findings of this research shed new light on the quest of authorities and relevant policymakers in launching effective policies to nurture potential entrepreneurs who are viewed as unsung heroes in times of crisis. All hypothesized assumptions are supported. The formulated hypotheses on the serial mediating effects of self-efficacy and perceived desirability are confirmed and statistically significant. Generally, individuals' positive attitude and perception towards the COVID-19 pandemic have influenced their entrepreneurial intentions: individuals' intentions to become entrepreneurs are cultivated when they perceived their capability to cope with the current situation and perceived desirability towards entrepreneurship. Additionally, our research findings also provide insight into the joint determinants of self-efficacy and perceived desirability that serve as serial mediating roles

in examining entrepreneurial intentions. Thus, a crisis such as the COVID-19 pandemic requires the inclusion of further investigating components and breakthrough new frontiers, which could help in the empirical testing of the manifestation of entrepreneurial aspirants' motivating factors. As a result, the entrepreneurial ecosystem could be fostered, and consequently mitigate the unemployment rate and poverty of the country.

This paper has presented several contributions. This research echoes the social cognitive career theory and planned behavior theory to examine academic students' entrepreneurial intentions during the COVID-19 pandemic. However, this paper has limitations. First, although the analyses suggest that the magnitude of common method variance was not serious, our findings should still be interpreted with caution. Sample characteristics, such as gender, age, and academic major, should be examined further to understand how the demographic factors influence individuals' entrepreneurial behaviors. Second, because of causality concern, we investigated entrepreneurial intentions based on the individuals' perceptions and their entrepreneurial intentions indirectly through perceived desirability (Krueger, 1993) and self-efficacy (Liguori et al., 2018). However, individuals' perceptions may also depend on events rather than perception and experience (Gist & Mitchell, 1992). Moreover, because explanatory, mediator, and response variables are contemporaneous variables at the same time point, future research may consider inserting contemporaneous variables measured at different time points. Although these variables could be malleable, future research should consider this issue. Third, the limitations of the theoretical model of the study mean a more plausible theoretical model could be considered when engaging in an in-depth exploration. In this sense, future research could investigate how entrepreneurial intentions could be influenced by the moderation of perceptions and attitudes related to the COVID-19 pandemic in different contexts. However, Doanh (2021) found that self-efficacy may not play a moderating role in the relationship between antecedents and entrepreneurial intentions. Thus, future research could also explore these causal relationships more thoroughly. Besides, measuring COVID-19 perception by using panel data, instead of participants' subjective ratings are recommended to highlight properly the ongoing nature of the pandemic and how it affects entrepreneurial trajectories. In particular, entrepreneurship education programs and other incentives provided for young people to engage in sustainable entrepreneurship during the COVID-19 pandemic should be assessed further (Ratten, 2021).

Based on these concerns, we have demonstrated additional model testing (see Appendix) and we hope that our proposed research model could be advantageous for future research to replicate and further consider other

cognitive factors to explore university students' entrepreneurial intentions within a traumatic situation.

Policymakers and institutions that intend to nurture entrepreneurship through training programs should design the curriculum such that it supports the unique challenges of launching an enterprise around a crisis. A more accommodating and more instrumental ambiance in education can support individuals' self-efficacy and perceived desirability towards entrepreneurship as a career choice. Future studies could also examine the effects of the cognitive perceptions of different individuals with different disciplines and backgrounds who wish to devote themselves to an entrepreneurial career. It could also give rise to more innovators and resilient individuals who can adopt a crisis analogy to address an unsolved problem.

Additionally, our findings provide useful implications for boosting potential individuals to engage in entrepreneurial activities. Governments, policymakers, and universities should work together to design various guidance and policies to foster innovative and self-confident inputs for individuals. Therefore, those individuals may have a brilliant idea to resolve social and economic problems that would largely alleviate social exhaustion and the disequilibrium between crisis and their behavioral tendencies towards entrepreneurship, consequently influencing the sustainable improvement of economic and social welfare.

Appendix 1. Additional Model Testing

The alternative model testing has been proposed to test the possible research model empirically. This research model concept relates how attitude towards the situation and COVID-19 perception play moderating roles in predicting the relationship between self-efficacy, perceived desirability, and entrepreneurial intentions. Figure 3 below demonstrated the alternative theoretical framework.

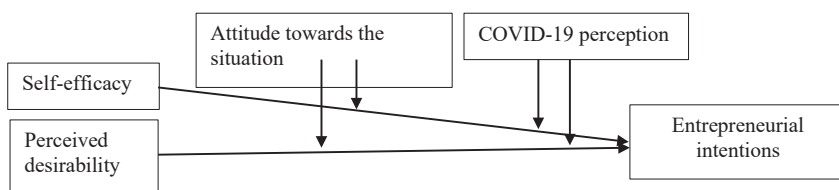


Figure 3. The alternative theoretical framework

Table 6. Multiple regression analysis results.

	Model1	Model2	Model3	Results
Control Variables				
<i>Gender</i>	0.212*	0.008	0.003	
<i>Previous Entrepreneurial Experience</i>	-0.264**	-0.058	-0.060	
<i>Current Entrepreneurial Experience</i>	-0.237*	-0.141	-0.126	
Main effects				
<i>Self-efficacy</i>		0.038	0.043	(n.s.)
<i>Perceived Desirability</i>		0.656***	0.649***	(Sig.)
Attitude towards the situation		0.107**	0.115**	
Perceived COVID-19		0.038	0.033	
Two-way interactions				
<i>Desirability*Attitude</i>			0.117***	(Sig.)
<i>Efficacy*Attitude</i>			-0.082**	(Sig.)
<i>Desirability*COVID-19</i>			-0.036	(n.s.)
<i>Efficacy*COVID-19</i>			0.027	(n.s.)
ΔR^2	0.043***	0.451***	0.010**	
R^2	0.043	0.494	0.504	
Adjusted R^2	0.039	0.490	0.497	
F-test	10.76***	99.50***	65.49***	
Durbin-Watson			2.001	

Note: ** $p < 0.001$, *** $p < 0.01$, * $p < 0.05$.

Based on Table 6 above, the empirical results from model 1 show that the three control variables were significant. In model 2, main effects, as well as moderating roles, are included. The results show that perceived desirability and attitude towards the situation indicated significant results ($\beta = 0.656$, $p < 0.001$, $\beta = 0.107$, $p < 0.001$). Then, interaction terms are entered, which further explain the moderating roles of attitude towards the situation and perceived COVID-19 on the relationship between self-efficacy, perceived desirability, and entrepreneurial intentions. The results show that attitude towards the situation significantly moderated the relationship between perceived desirability, self-efficacy, and entrepreneurial intentions ($\beta = 0.117$, $p < 0.001$, $\beta = -0.082$, $p < 0.01$). However, the moderating role of COVID-19 perception did not indicate significant results in the relationship between perceived desirability, self-efficacy, and entrepreneurial intentions.

As we further examined the significant two-way interpretations among attitude towards the situation, perceived desirability, self-efficacy, and entrepreneurial intentions, we have plotted the interaction effects, as presented in Figures 4 and 5 below.

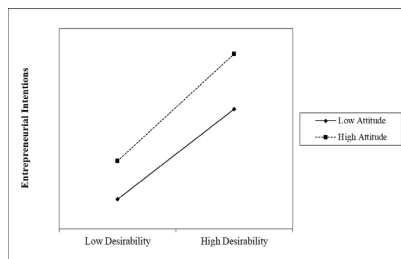


Figure 4. Moderating effect of attitude towards the situation on perceived desirability and entrepreneurial intention

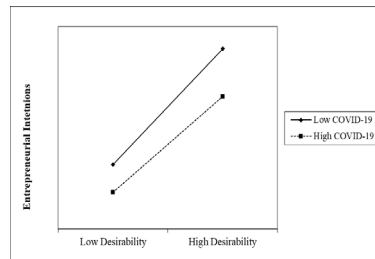


Figure 5. Moderating effect of COVID-19 perception on perceived desirability and entrepreneurial intention

In Figure 4, the plot suggests that the impact of university students' perceived entrepreneurship as a career desirable on their entrepreneurial intention is highest when the level of their attitude towards the situation is also high. On the other hand, Figure 5 elucidates the two-way interaction plot, illustrating the impact of university students' perceived desirability on their entrepreneurial intentions is highest when the level of COVID-19 perception is low than when it is high. This could signal theoretical implications for researchers to focus on these cognitive factors that may have an impact on individuals' entrepreneurial intentions and apply them to different contexts.

Appendix 2.

Table 7. The results of scale assessment.

Constructs	Items	Factors Loading	AVE	CR
Attitude towards the situation	Due to the COVID-19 situation, I am still positive about my future career.	0.71	0.63	0.89
	Due to the COVID-19 situation, I am still thinking about my success in my future career.	0.82		
	I think I have my own career interest during the concurrent of COVID-19.	0.78		
	Although the COVID-19 situation, I will still positively fulfill my future career.	0.86		
	I believe that I will make the right decision for my career during COVID-19.	0.79		

Constructs	Items	Factors Loading	AVE	CR
Self-efficacy in adaptation	I believe that I could adjust myself to the new situation and environment.	0.68	0.54	0.86
	I believe that I could adjust to the situation if my plans for my future career change.	0.73		
	I believe that I could adapt and overcome difficulties that arise when working.	0.80		
	I believe that I will adapt positively to the COVID-19 situation.	0.72		
	I believe that I could adjust myself to my future career and market.	0.75		
Perceived desirability	I believe that having my own business would be a good idea.	0.60	0.62	0.86
	I believe that being an entrepreneur would be well suited for me.	0.83		
	If I have the opportunity, I genuinely would like to be an entrepreneur.	0.85		
	Among various career options, being an entrepreneur is my desired career choice.	0.83		
COVID-19 perceptions	I believe that COVID-19 will slightly affect my future career as an entrepreneur.	0.79	0.60	0.89
	I believe that COVID-19 will slightly affect my future opportunity for my career.	0.82		
	I believe that COVID-19 will slightly influence my future plan and decisions.	0.89		
	I believe that COVID-19 will slightly influence my future intention to be an entrepreneur.	0.83		
	I believe that COVID-19 will slightly influence my thoughts and considerations towards future plans.	0.61		
	I believe that I am still confident about my future career as an entrepreneur.	0.67		

Constructs	Items	Factors Loading	AVE	CR
Entrepreneurial Intentions	I purposely aim to be an entrepreneur.	0.88	0.78	0.93
	I always come up with the idea of being an entrepreneur.	0.91		
	I intentionally create my venture in the future.	0.93		
	My ultimate goal is to be an entrepreneur.	0.80		

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Abstrakt

CEL: *Chociaż pandemia COVID-19 miała katastrofalny wpływ na działalność gospodarczą na całym świecie, paradoksalne zjawisko tej sytuacji czarnego łabędzia można uznać za ułatwiające przedsięwzięcia intencje. Niniejsze badanie ma na celu zbadać postrzeganie aspiracji przedsięwzięcia studentów z Tajlandii w czasie pandemii COVID-19.* **METODOLOGIA:** *Opierając się na społecznej teorii kariery poznawczej, badanie to bada głębokie powiązanie postrzeganie COVID-19 przez studentów uniwersytetów i postaw wobec sytuacji związanych z uwierzeniem w siebie w adaptację do przedsiębiorczości. Prawidłowa próba 798 ankiet zebrana z ośmiu prowincji, ośmiu okręgów i ośmiu miast w całej Tajlandii została uwzględniona do dalszej analizy przy użyciu Modelowania Równań Strukturalnych (SEM) i Modelu Makro Procesu 6.* **WNIOSKI:** *Postrzeganie pandemii COVID-19 przez studentów uniwersytetów wpływa na ich samoocenę, skuteczność w adaptacjach sytuacyjnych i postrzegane pożądanie wobec intencji przedsięwzięcia na poziomie indywidualnym. Co ciekawe, poczucie własnej skuteczności i skłonność do przedsiębiorczości działają jako seryjne czynniki pośredniczące, wobec zapośredniczonej relacji między postawą wobec sytuacji, percepcją COVID-19 a przedsięwzięciami intencjami studentów.* **IMPLIKACJE:** *Wyniki tych badań mogą wzbogacić literaturę dotyczącą przedsiębiorczości, zaproponowano*

również dodatkowe testy modelowe. Ponadto praktycy i badacze mogliby współpracować z gubernatorami w celu kultywowania trajektorii przedsiębiorczości w oparciu o wyniki badań. **ORYGINALNOŚĆ I WARTOŚĆ:** Społeczna teoria kariery (SCCT) może zracjonalizować wybór kariery zawodowej studenta akademickiego w zakresie przedsiębiorczości, biorąc pod uwagę jego postrzeganie procesów uruchamiania firm podczas COVID-19. Przyszłe badania mogą również dokonać weryfikacji wyników na reprezentatywnej próbie na poziomie krajowym.

Słowa kluczowe: COVID-19, intencje przedsiębiorcze, poczucie własnej skuteczności, postawa, sytuacja, celowość, teoria kariery

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Conflicts of interest

The authors declare no conflict of interest.

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An innovative approach to support interests' alignment in the context of transport management using semantic differential

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Abstract

PURPOSE: Our study aims to develop an innovative approach to scientific substantiation and practical balance of interests of cargo owners and transport companies, which will serve as a tool for freight management. **METHODOLOGY:** A specific algorithm of actions is proposed, which initially provides the creation of a system of indicators to study transportation management. The research methods include a complex method of semantic differential modeling, which integrates correlation-regression analysis, cluster analysis, and expert evaluations. The basis of such a complex method is the integration of three components: i) a system for monitoring the satisfaction of consumers of transport services; ii) the assessment of the density of connections between cargo turnover by type of transportation and the leading transportation indicators; iii) a multidimensional assessment of the homogeneity of factors by

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hierarchical clustering. **FINDINGS:** Semantic differential modeling can serve as an effective tool in strategic planning, not only for transport companies and railway enterprises, but also for those institutions where it is necessary to identify the most important areas of activity. **IMPLICATIONS:** The use of semantic differential based on the involvement of quantitative methods of mathematical modeling allows increasing the degree of validity of management decisions. The harmonization and balancing of interests in the field of B2B take into account the results of modeling the semantic differential in management. The proposed methodology consists of main indicators of rolling stock transportation and certain economic indicators; we advise to focus on. These indicators were obtained through cooperation with an expert group of participants in the transportation process. Application of the created model allows defining priority directions in the field of freight owners' service by the Ukrainian railways in the dynamics by types of cargo and transportation and substantiating the corresponding management decisions by freight carriers. **ORIGINALITY AND VALUE:** Innovation is a complex interdisciplinary integration of research methods based on the philosophy of semantic differential, allowing the integration of approaches to harmonize the interests of transport companies and consumers of their services with the results of cooperation in the field of freight transportation. Therefore, the developed innovative methodology can be used not only for railway transport but also for other types of transport and business.

Keywords: modeling, harmonization of interests, semantic differential, freight transport, cargo owners, innovative approach, cluster analysis, correlation-regression analysis, transport management

INTRODUCTION

In today's world, the issue of balancing the interests of businesses and consumers of their goods and services is very relevant. This is due to increasing competition, complicating economic systems, and changing consumer preferences. Moreover, this is typical not only for B2C but also for the B2B market. Thus, harmonizing the interests of transport companies and cargo owners is one of the very important fields of research.

An essential aspect of modern organizations' activities is to consider the mutually beneficial partnership interests of business process participants. For all types of business, the infrastructure industries are system forming. A typical representative of the infrastructure sectors is the transport field as an integral part of B2B in freight transport. A number of works devoted to methods of ensuring successful coordination of transport services market participants based on structural aspects of communications and changing the organizational management structure were written (e.g., Vlaar et al., 2008; Cornelissen et al., 2014; Mattsson & Jenelius (2015). Their authors contributed to the study of the problem of analysis of transport dynamics.

In their opinion, the use of non-traditional methods of research based on time slices in communication dynamics is promising. Moreover, they also emphasize the need for greater interdisciplinary cooperation between government, transport market operators, and scientists to transform knowledge into practical strategies that will enhance the stability of the transport system. However, besides the cooperation between the different participants of the railway market, the problem of harmonizing the interests of carriers and cargo owners as participants in the B2B chain becomes especially relevant, but this problem is still under researched for now. In this regard, Bala Myneni and Dandamudi (2019) proposed a new approach to clustering social graphs to predict passengers' opinions on assessing the quality of railway services. Also, the mood factors of users of these services were researched using semantic analysis in this study. However, to identify the latent properties of interaction in this area, it is necessary to apply a non-traditional paradigm. The concept of semantic differential can become such a paradigmatic shift. Therefore, the purpose of our study is to develop a model of the semantic differential as a tool for harmonizing the interests of consumers of transport services (cargo owners) with a supplier in the field of freight transportation (JSC "Ukrzaliznytsia"). Application of the created model allows defining priority directions in the field of cargo owners' service by the Ukrainian railways and substantiating appropriate management decisions to consider the opinions of consumers as a significant factor that influences the management of transportation work.

Our study is characterized by both scientific novelty and innovative approach. The novelty is applying classical methods (correlation-regression analysis, expert estimates, and cluster analysis) with their further integration into modeling the semantic differential as a tool for harmonizing the interests of a transport company and consumers of its services. Equally important is the innovative approach that characterizes our work. Its essence is to use the potential of the scientific paradigm of semantic differential based on the creation of the authors' three-dimensional methods of analysis to modelling the harmonization of interests of transport companies and consumers of their services. The fundamental basis for semantic differential application in science was laid in the middle of the last century (Osgood et al., 1957). However, the semantic differential was proposed without standard concepts or universal scales for measuring phenomena, and it is a "highly generalized" technique. Nevertheless, this work provided prospects for using the semantic differential in various fields of science.

The inconsistency of the goals of B2B and B2C market participants is due to the synergistic influence of different vector factors on the coherence of interests in business partnerships. This issue is not sufficiently studied in the

modern scientific literature. Therefore, the proposed innovative approach allows solving the part of management problems related to supporting the interaction of market participants. In turn, it encourages the search for new harmonization methods to reconcile the goals and models of doing business.

The rest of the paper is structured as follows. The next section presents a literature review devoted to the analyzed topic. In the methodology section, we present the research methods used in our study. This is followed by the research results and discussion consisting of: i) a study of empirical data on the results of one of the largest carriers of Ukraine, i.e. JSC "Ukrzaliznytsia; ii) generalized results of the survey of cargo owners on the quality of cooperation with railway companies; and iii) grouping the effects of railway companies by areas: exports, imports, transit, and domestic transportation. The paper ends with conclusions.

THEORETICAL BACKGROUND

The problem of cooperation and management in the transport field is the topic of a broad debate in the literature and has been analysed by numerous scholars for many years. Pech et al., (2021) studied the relationship between the characteristics of enterprises of different sizes and the relationship between suppliers and consumers, as well as properties of complex network relations as an element of strategic management. The authors concluded that there are differences between enterprises in size rather than industry. They emphasize that the long-term perspective of partnership contributes to a higher quality of relations and future integration. In turn, Nyulásziová and Pařová (2020) emphasize the need for continuous improvement of data processing methods in enterprise management and stagnant innovative approaches to business process management. It is worth adding that the authors present their conclusions based on the analysis, modeling, and optimization of business processes for transport companies, which, in their opinion, will help improve the management system in the field of transport services. In the direction of harmonization of relations in the B2B field, the work of Barile et al. (2020) is also relevant as it identifies strategic drivers and critical aspects of the service ecosystem through common ideas, development, training, value creation, and innovation. And the ideas presented by Gabryelczyk and Hernaus (2020) on the management of modern organizations, based on a process approach and innovative thinking, involve harmonizing all management systems. In addition, Schipper and Gerrits (2018) studied the differences and similarities in structuring the disruptions management process on the example of five European countries. They classified the management of failures in the

activity structure of railway transport and, based on cluster analysis, came to conclusions about the similarities and differences for the studied objects. And lastly, the methodology of dividing sections of the railway network by categories proposed by Stoilova (2019) has prospects for the analysis of the state of the railway network, planning of reconstruction activities, etc.

Another set of research on the topic is the one devoted to the widely understood cooperation among the participants of the system. In this regard, the document Smart-Rail Consortium (2016) contains a detailed study of the current state and areas for improving cooperation in rail freight to develop new business models. This document deals with studying the relationship between individual infrastructure objects and partly takes into account a sectoral collaboration.

Many researchers used clustering and other methods of multidimensional analysis for studying the complex system of cooperation in the B2B sphere. For example, for standardization in railway infrastructure, cluster analysis is proposed, which helps obtain a set of technical solutions (e.g., Fei et al., 2019; Khan et al., 2021). However, the projected cost reduction, which is attributed to technical solutions, seems debatable. Some of them are discussed in detail by Shpak et al. (2019 a, b). Noteworthy is the idea of combining a questionnaire of public maritime transport customers and cluster analysis to estimate the level of satisfaction with the services of this transport presented by Ekinci et al. (2018). Furthermore, Shpak et al. (2018) use multidimensional methods of statistical analysis, particularly taxonomic analysis, to substantiate the status of railway companies in the field of transit and the field validity of personnel. Similar methods were used to verify the hypothesis for grouping the means of transport offers. Such an approach permits to identify the groups of transport offers in EU countries (Poliak et al., 2021).

Some scholars (e.g., Gonzalez-Feliu & Morana, 2011; Gonzalez-Feliu & Salanova, 2012; Gonzalez-Feliu et al., 2013) believe that integrating standard views of transport participants is the basis of cooperation between cargo owners and transport companies. However, one study underlines also the barriers of cooperation, which, especially in the B+R sphere, are significant (see Cygler & Wyka, 2019). Among them are cultural and language barriers, insufficient brand/company recognition, difficulties in estimating the potential costs and benefits of cooperation, risk of losing independence and control of the company, limited financial resources, etc. In particular, the method of assessing collaboration in logistics and freight urban transport was proposed by Gonzalez-Feliu et al. (2013). Their study used a combination of cluster analysis methods and a scenario approach to illustrate the difficulty of approaching the consensus of transport participants. But the authors themselves point out the problem in achieving common goals for stakeholders.

Therefore, the limitation of this method is the concept's lack of harmonization of the interests of the parties. Other researchers, such as Nugymanova et al. (2021), offer a game-theoretic approach to strategic planning as a basis for modeling the interaction of cargo owners and freight forwarding companies to decide on the agreement to cooperate. In this approach, which uses binary unknowns, other variables of traffic indicators (congestion, tariff, etc.) are not used. The practical application of the proposed ideas is recommended for use in road haulage. In turn, Jian and Bao (2014) substantiated the effectiveness of cooperation between individual infrastructure elements in maritime transport based on a balanced scorecard method and used the grey relational degree method. It allows the identification of weaknesses in cooperation between relevant infrastructure but cannot be used to assess the effectiveness of cooperation of participants in the transport process. In this work, they are used only to consider the importance of indicators of the hierarchical structure.

Huang et al. (2019) constructed correlation matrices between technical and consumer metrics to assess relationships. Moreover, freight forwarders themselves have not been involved in the transportation process but freight forwarding companies and cargo owners have. The results obtained by the researchers can be used exclusively for intermediaries (forwarding companies) in the market of transport companies and they do not harmonize the interests of direct participants (cargo owners and carriers) of the transport process.

It is worth emphasizing that the method of ensuring cooperation in freight transportation is proposed by Vargas et al. (2018). In particular, they present the theoretical approach to assessing the business model of collaboration by identifying key components, strategies, and forms of allocation of resources and income. An operational decision support system has been proposed to support the validation of the current activities of transport companies, which asymmetrically considers the interests of the parties to the transportation process. However, one seems that such a theoretical construction does not fully harmonize the interests of cargo owners and carriers.

The study by Nagi and Kersten (2022) examined the problem of cooperation between stakeholders in the transportation process in seaports. The authors declared the idea of creating a model of the risk management process of stakeholders, which are grouped into natural and those that take place in the supply chain. The researchers used the potential of the expert survey and conducted a large-scale field study by forming appropriate focus groups. However, this study did not implement real scenarios for the practical verification of the model.

Also noteworthy is the study conducted by Abidi et al. (2019) to ensure vertical and horizontal integration for logistics service providers using an

analytical network process. Using analytical hierarchy (Saaty method) and expert evaluation to identify the criteria and their weights, the researchers concluded that there are reasonable differences in the hierarchy of criteria for different forms of cooperation in logistics chains to assess strategic partners. According to them: i) the distribution of profits and risks in horizontal integration inherent in the transport sector is a source of conflict; ii) vertical integration allows to harmonize the relationship between supplier and customer; iii) applying an analytical network process model increases the degree of validity of management decisions on establishing partnerships or their continuation. However, this study shows no signs of universality of application, due to the need to adapt the criteria's weights for the specific cooperations between the transport company and the client.

The deliberations presented on harmonization of interests of transport companies and consumers of their services referred to the so-called traditional approach. However, currently it is necessary to apply a non-traditional paradigm in order to identify the hidden properties of interaction in this area. We believe that the concept of semantic differential can become such a paradigmatic shift. As stated earlier, the fundamental basis for semantic differential application in science was the work of Osgood et al. (1957). Theoretical development of this concept was highlighted by Fishbein (1967), where the author argues that the semantic differential allows one to scale quantitatively the views and attitudes to something. According to him, the attitude has direction and intensity, and can be adapted to a bipolar continuum with a neutral or zero resistance point, which provides evaluative judgments. Thus, the category of semantic differential was used by Dokic (2017) to improve the company's marketing activity, better recognition of the company's image by consumers, improve marketing communications, and measure the company's image. And Schipper and Gerrits (2017) discuss approaches to managing rail transport services using statistical and semantic analysis.

Other authors, such as Ding and Ng (2008), have developed semantic differential scales for measurement, which reduce bias in management decisions in the construction industry. Based on semantic analysis, methods of collective interaction in the context of change management research are considered by Merkus et al. (2016). The authors' approach seems to be interesting. The adoption of management decisions to solve communication problems in rail transport is due to the ambiguity of organizational reality. Modeling the semantic differential is a set of quantitative methods, one of which is cluster analysis, founded by Robert Tryon (see Tryon, 1939; Tryon & Bailey, 1970). This analysis has been used to optimize logistics networks in the city's transport system (Hairui et al., 2020; Ducret et al., 2016; Akbar et al., 2020). Intelligent Transport System technologies have concentrated

in recent years on this problem too (Badura, 2017), despite barriers to implement them (Tomaszewska, 2021). One cannot also forget that transport contributes to noise, air pollution and climate change (Hajduk, 2018).

The analysis of the literature on modeling of harmonization of interests of transport companies and consumers of their services, demonstrates the importance and relevance of the problem and the interest in solving it. It also allows one to draw several conclusions. First of all, there is no doubt that the issue is a matter of wide scientific debate. Scientists, researchers, and practitioners have tried to involve different approaches and methods (or combinations of them) to achieve research interest and the practical implementation and development of specific recommendations in the field of horizontal and vertical cooperation. They have used a set of mathematical, static methods, general scientific, cluster analysis, and linear and nonlinear programming methods in various combinations. But their disadvantage is the lack of a single fundamental approach that would harmonize the potential of each of these methods to improve the effectiveness of cooperation between cargo owners and carriers. Second, the matter is a complex issue, multidimensional (not one-dimensional) and is therefore analyzed from different points of view. Third, one underlines the issue of cooperation between the parties involved. This cooperation may take the form of cooptation. And fourth, they use different methods and instruments in their analyses. Among the most popular methods are the following: correlation-regression analysis, expert survey, cluster analysis, simulation, optimization methods, and others. Thus, a paradigmatic shift was made towards creating a concept of harmonization of interests of transport companies and consumers of their services based on the semantic differential.

Railway transport in Ukraine

With regard to the railway transport, one should state that it belongs to the most important sectors of the Ukrainian economy. Railway transport of Ukraine has an operational length of railways that is more than 20,000 km and it occupies a prominent place among railway companies in Europe. Ukraine's rail transport ranks fourth in the cargo transportation ratings on the Eurasian continent. Only China and India are ahead by this indicator. Seven countries of the world are neighbors of Ukraine (Belarus, Poland, Hungary, Russia, Slovakia, Romania, Moldova) with which it is connected by rail transport corridors, including more than 50 border crossings. Of all modes of transport, the lion's share of cargo transportation belongs to railway transport and it is almost 82%. Only 18 % of these transportations are realized by other modes

of transport (road, water, air) (The main aspects of the Development Strategy of JSC “Ukrzaliznytsia” 2017-2021, 2021).

From 2013 to 2020, the railways of Ukraine reduced the volume of transportation by all types, except imports (Directory of key performance indicators of regional branches of JSC “Ukrzaliznytsia,” 2021). For reference, import transportation growth in 2020 (20225,4 million tkm) compared to 2013 (17845,4 million tkm) was about 13,34 %. While transit transportation decreased in 2020 (14276,14 million tkm) compared to 2013 (33903,2 million tkm) almost by 57,9 %, domestic (in 2020 – 63246,4 million tkm; in 2013 – 78768,9 million tkm) – by almost 19,7 %, export (in 2020 – 77838,8 million tkm; in 2013 – 93916,5 million tkm) – by almost 17,12%. There were no significant jumps during the analyzed period, and there were steady trends to reduce freight turnover, excluding imports ones. Among the reasons for freight turnover reduction is the occupation of part of the territory of Ukraine. Therefore, some elements of the infrastructure of Donetska and Prydniprovsk railway were on the territory that is not controlled by Ukraine. Such a situation has complicated the management of transportation and negatively affected transportation volumes.

Considering that freight by railways is the cheapest type of transportation for JSC “Ukrzaliznytsia” as a state corporation, it is important to stabilize the turnover indicators and promote mutually beneficial cooperation with cargo owners. It is becoming more relevant under conditions of growing competition with other types of transport. In particular, during the study period, the share of railway freight turnover compared to other types of transport decreased only by 2,13 % (State Statistics Service of Ukraine, 2021). In this regard, there is a need to stabilize the negative trends that lead to a deterioration of the production and economic activity indicators of JSC “Ukrzaliznytsia”.

METHODOLOGY

In our study, we proposed modeling of the semantic differential as a tool for managing the transportation by railway transport. The research methods included an integrated system of methods: structural-dynamic analysis, correlation-regression analysis, expert assessments, and cluster analysis for modeling the semantic differential as a tool for managing the transportation by the railway. Modeling of the semantic differential involves the sequential implementation of the following steps:

I. Study, identification, and systematization of the main (essential) factors influencing the transport work of railway transport by four

types of transportation (export, import, domestic transportation, transit) and the main types of cargo (18 groups of cargo)

This stage is based on applying structural and dynamic analysis of the transport work of JSC "Ukrzaliznytsia" in the field of freight. The complex use of expert assessments, correlation-regression, and cluster analysis made it possible to identify the most significant factors influencing freight turnover by transportation type and study their structure. The created system of indicators for research of results of transportation work in dynamics for eight years with 18 groups of cargoes includes:

1. The number of available wagons units (X_1) by types of transportation ($X_{1import}$, $X_{1transit}$, $X_{1export}$, $X_{1domestic transportation}$).
2. Weight of transported cargoes (X_2), thousand tons by types of transportation ($X_{2import}$, $X_{2transit}$, $X_{2export}$, $X_{2domestic transportation}$).
3. Fare, thousand UAH (for exports, imports, domestic transportation) and thousands USD (for transit transportation) (X_3) by types of transportation ($X_{3import}$, $X_{3transit}$, $X_{3export}$, $X_{3domestic transportation}$).
4. Income rate, UAH for 10 tkm (for export, import, domestic transportation) and USD USA for 10 tkm (for transit transportation) (X_4) by types of transportation ($X_{4import}$, $X_{4transit}$, $X_{4export}$, $X_{4domestic transportation}$).
5. Average distance of transportation, km (X_5) by types of transportation ($X_{5import}$, $X_{5transit}$, $X_{5export}$, $X_{5domestic transportation}$).
6. Average loading, tons (X_6) by types of transportation ($X_{6import}$, $X_{6transit}$, $X_{6export}$, $X_{6domestic transportation}$).
7. Freight turnover (Y) by types of transportation (Y_{import} , $Y_{transit}$, Y_{export} , $Y_{domestic transportation}$).

To study the relevant relationships, calculations were made using official statistics of JSC "Ukrzaliznytsia" (Official site of JSC "Ukrzaliznytsia," 2022).

II. The modeling information base included the conduction of “field” research to define the degree of satisfaction of the cargo owners of the Ukrainian railway by using a questionnaire

A questionnaire was developed to conduct an expert survey of customers (consumers) as essential stakeholders of JSC “Ukrzaliznytsia.” For this reason, an anonymous survey of the management of 30 carriers, which have agreements on the organization of domestic and international transportation, was conducted. To form the sample size, the principles of small samples and information adequacy were chosen. Among other main parameters of the questionnaire survey concerned the study of the assessment of the state of transport work of railway transport, the quality of management of transport work, the degree of their satisfaction with the cooperation with the railways of Ukraine. The following are highlighted: a form of conducting – anonymous individual survey, frequency of performing for this study – one-time, type of expert assessment – opinion poll. The questionnaire consisted of 10 questions. The questions were in open and closed formats. The survey results allowed us to estimate the level of satisfaction of cargo owners with the quality of services provided by JSC “Ukrzaliznytsia” in the field of freight.

III. Modeling the obtained empirical data and assessing the adequacy of the accepted models

The proposed research work uses the potential of the semantic differential method, which is a method of psycholinguistics. We also used the interdisciplinary approach proposed by Gonzalez-Feliu (2012). This paper is devoted to studying the network of transport systems and includes optimization calculations to optimize traffic on the criterion of minimum costs in cooperation simulation. The authors conclude that the social aspects of the interaction of participants in the transport process are essential to successful cooperation. At the same time, there are restrictions on the lack of efficiency in adapting the proposed model to customer needs. Another limitation concerns the lack of realism of modeling tools, which are limited by the distance factor and do not include economic factors in the study. Such factors can be involved in modeling by creating a monitoring system that will harmonize the relationship between cargo owners and transport companies. However, the relevant theoretical constructions in our study are based on the potential of the theory of semantic differential.

The classic case for the semantic differential application is quantitative and qualitative indexing with the help of scale development procedures. For the purposes of the achievement of the proposed study, the semantic

differential should include three components (expert assessment, density of the connection, multidimensional assessment of factors homogeneity). From this point of view, the sequence of application of the semantic differential as a tool for managing the transportation by railway transport of Ukraine in the field of freight provides the following procedures:

- 1) Expert assessment.
- 2) Implementation of the system of monitoring the satisfaction of cargo owners with the level of service of JSC "Ukrzaliznytsia". Such a system includes the development of a questionnaire with a list of questions to ensure appropriate feedback from cargo owners with the transportation management system. The system of transportation indicators includes the number of wagons (X_1), weight of cargo (X_2), fare (X_3), income rate (X_4), average distance of transportation (X_5), and average load (X_6). Therefore, part of the questions of the proposed questionnaire contains references to these indicators.
- 3) Processing of results with grouping of answers of cargo owners.
- 4) The density of the connection.
- 5) Mathematical modeling of the dependence of cargo turnover by types of transportation on the leading indicators of transportation:
 - i) The correlation-regression analysis conduction for the purpose of defining the density of connection between cargo turnover by types of transportations and the basic factors.
 - ii) Systematization of the obtained results based on the hierarchy of the level of influence of the main factors of transportation work on the indicators of cargo turnover by types of transportation.
 - iii) Multidimensional assessment of the homogeneity of factors. This includes cluster analysis of the formation of homogeneous groups of indicators to determine the hierarchy of the level of influence of indicators of transportation work on freight turnover by type of transportation.

RESULTS AND DISCUSSION

Our study presents analysis of the data for the period from 2013 to 2020 and provides the following classification of types of 18 groups of goods: wagons; grain, grinding products; coal; coke; non-ferrous metals and articles thereof; forest cargoes; scrap ferrous metals; mineral building materials; machines and equipment; oil and oil products; iron and manganese ore; colored ore, sulfur; salt; chemical and mineral fertilizers; chemicals; cement; ferrous metals; other cargoes. The practical implementation of the proposed modeling sequence is presented in the subsequent sub-sections.

Expert assessment

The expert assessment was carried out by developing an appropriate questionnaire, content and form, which was agreed with the heads of the functional departments of JSC “Ukrzaliznytsia”. After the formation of the necessary Google form for the survey conduction, it was sent to cargo owners, top managers, and managers of freight companies and other shippers. The results of the questionnaire were processed and they are presented in Figures 1-6.

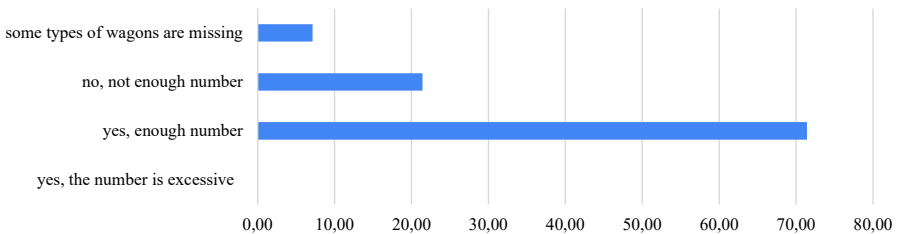


Figure 1. Is the required number of wagons available to transport your cargos?

More than 70% of respondents (cargo owners) believe that the enterprises of JSC “Ukrzaliznytsia” provide wagons in sufficient quantities (Figure 1). But for more than 20% of respondents this service is not enough.

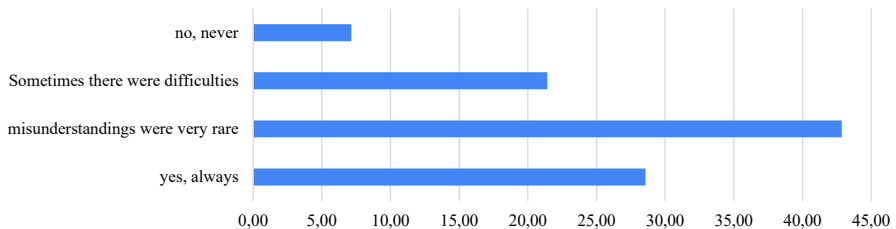


Figure 2. Could you always order the transportation for the amount (weight) of cargo that you planned?

Answering the question “Could you always order the transportation for the amount (weight) of cargo that you planned” (Figure1), only 42% of respondents stated that misunderstandings were very rare. But one in five cargo owners sometimes had difficulties, and one in three always had difficulties with transportation of the required amount of cargo.

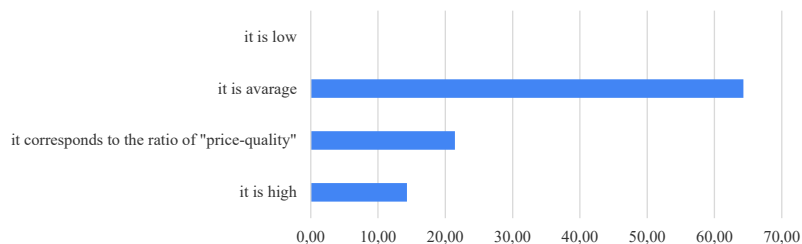


Figure 3. How much do you think the freight fare meets your expectations?

Only 20% of respondents stated that the fare for the cargos transportation corresponds to the ratio of “price-quality”. On the other hand, more than half (almost 65%) of respondents stated that the fare is average. It can be supposed that these cargo owners have experience of cooperation with other types of transport. The balance of 15% of respondents believed that the fare is high (Figure 3).

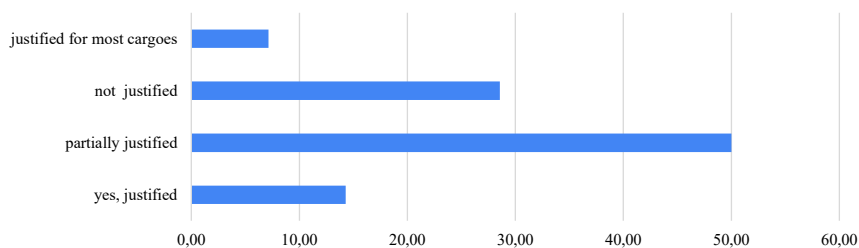


Figure 4. Is the value of the income rate of JSC “Ukrzaliznytsia” justified by the types of cargo transported by your company?

Half of the respondents answered that the income rate is partially justified, 28% - not justified. Only 14% of the respondents consider this indicator to be fully justified, others - partially or not justified at all.

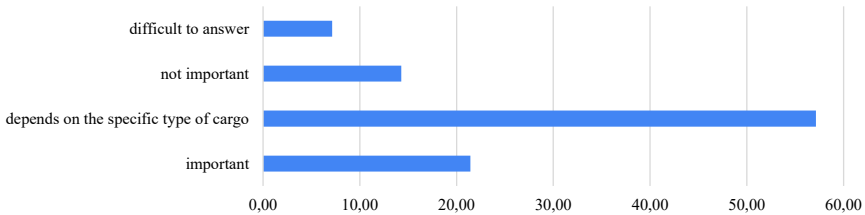


Figure 5. How important is the average distance of freight transportation by railway for you?

The indicator of average distance of cargo transportation is important for every fifth cargo owner. For more than half of the respondents, it is important, but depends on the type of cargo.

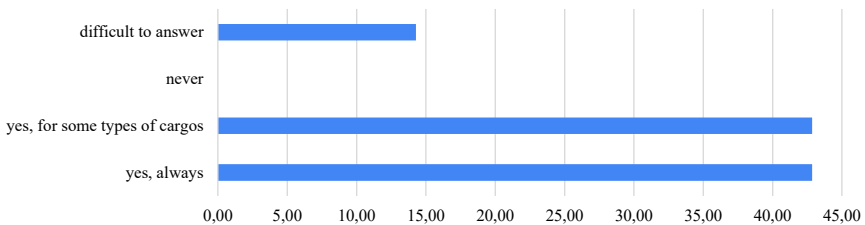


Figure 6. Does the average load of one wagon meet your needs?

One can conclude from Figure 6 that the average load of one wagon meets the needs of more than 85% of respondents. Implementing such a system for monitoring the level of satisfaction of cargo owners with the service of JSC “Ukrzaliznytsia” allows them to find flexible solutions to improve their cooperation. But to avoid subjectivity in assessing the level of such cooperation, it is necessary to make full use of the potential of the semantic differential as a tool for managing transportation.

The density of the connection

Qualitative characteristics of the dependence of freight turnover by type of transportation on the main factors are given on the basis of the correlation coefficient by the Chaddock scale. This scale is quite conditional: you can find several variants of scales in different sources. However, the scale makes it possible to “transform” the numerical (quantitative) value into a qualitative characteristic. We used the version of the scale that has more gradations.

Conclusions on the strength of the correlation by different values of the correlation coefficient, absent (0), weak (0.1–0.3), moderate (0.3–0.5), medium (0.5–0.7), high (0.7–0.9), rather high (0.9–0.99), close to functional (1), are given in the comments to Tables 1 – 4.

Table 1. Dynamics of dependence of cargo turnover (import) in 2013-2020 by types of cargo on the main factors

Years	Factors					
	Number of wagons (X_1)	Weight (ths. tons) (X_2)	Fare (ths. UAH) (X_3)	Income rate UAH per 10 t-km (X_4)	Average distance of transportation (km) (X_5)	Average loading, tons (X_6)
2013	0,6150	0,9996	0,6869	-0,2038	-0,0249	0,0993
2014	0,3246	0,6321	0,6321	-0,1343	0,0611	0,1165
2015	0,3274	0,6321	0,6460	-0,0964	0,0053	0,7890
2016	0,3438	0,9964	0,6447	-0,0964	0,2527	0,1372
2017	0,5571	0,9945	0,6853	-0,1738	0,1283	0,0635
2018	0,6490	0,9680	0,7016	-0,1905	0,2450	0,0372
2019	0,7007	0,9777	0,7890	-0,1808	0,2472	0,0587
2020	0,5958	0,9913	0,7848	-0,1540	0,3463	0,0081
min	0,3274	0,6321	0,6321	-0,2038	-0,0249	0,0081
max	0,7007	0,9996	0,7890	-0,0964	0,3463	0,1411

The correlation coefficients of the dependence of cargo turnover (imports) on the main factors allowed one to establish the most significant of them. The most influential factors that determine the volume of cargo turnover are the weight (X_2) and the fare (X_3) (Table 1). There is a moderate connection between the number of wagons (X_1) and cargo turnover. Income rate (X_4), average distance of transportation (X_5), and average loading (X_6) practically do not influence cargo turnover on import.

The correlation coefficients of the dependence of cargo turnover (transit) on the main factors allowed one to find out the most significant of them. The most influential factors that determine the volume of transit traffic in the study period are the weight (X_2) and the fare (X_3) (Table 2). The number of wagons (X_1), the average distance of transportation (X_5) and the average loading (X_6) have a moderate effect on freight turnover. The income rate (X_4) has almost no effect on transit transportation. But interestingly, the relationship between the income rate and transit cargo turnover is inverted during the study period.

Table 2. Dynamics of dependence of cargo turnover (transit) in 2013-2020 by types of cargo on the main factors

Years	Factors					
	Number of wagons (X_1)	Weight (thous. tons) (X_2)	Fare (thous. UAH) (X_3)	Income rate UAH per 10 t-km (X_4)	Average distance of transportation (km) (X_5)	Average loading, tons (X_6)
2013	0,4553	0,9939	0,8646	-0,2915	-0,2547	0,2647
2014	0,4577	0,8410	0,8410	-0,2541	0,2203	0,2478
2015	0,4694	0,8410	0,8386	-0,2186	0,2805	0,1725
2016	0,4311	0,9883	0,8125	-0,2186	0,2752	0,2547
2017	0,4408	0,9854	0,6309	-0,1599	0,3109	0,3137
2018	0,4709	0,9909	0,6012	-0,1355	0,4193	0,3358
2019	0,4872	0,9910	0,6859	-0,1631	0,3631	0,3450
2020	0,4981	0,9977	0,7642	-0,1441	0,3279	0,3891
min	0,4311	0,8410	0,6012	-0,2915	-0,2547	0,1725
max	0,4981	0,9977	0,8646	-0,1355	0,4193	0,3891

Table 3. Dynamics of dependence of cargo turnover (export) in 2013-2020 by types of cargo on the main factors

Years	Factors					
	Number of wagons (X_1)	Weight (thous. tons) (X_2)	Fare (thous. UAH) (X_3)	Income rate UAH per 10 t-km (X_4)	Average distance of transportation (km) (X_5)	Average loading, tons (X_6)
2013	0,8305	0,9538	0,8620	-0,3825	-0,2253	0,3665
2014	0,8764	0,8402	0,8599	-0,3663	0,0381	0,3547
2015	0,9059	0,8599	0,8784	-0,3665	0,1903	0,4020
2016	0,9446	0,9779	0,8962	-0,3665	0,1984	0,3898
2017	0,9603	0,9841	0,9197	-0,2793	0,0358	0,3427
2018	0,9109	0,9748	0,9148	-0,2620	0,0679	0,3231
2019	0,8858	0,9703	0,9167	-0,2644	0,0466	0,3266
2020	0,8747	0,9743	0,9415	-0,2374	0,1569	0,3203
min	0,8305	0,8402	0,8599	-0,3825	-0,2253	0,3203
max	0,9603	0,9841	0,9415	-0,2374	0,1984	0,4020

The correlation coefficients of the dependence of cargo turnover (export) on the main factors allowed one to find out the most significant of them. The most influential factors that determine the volume of export cargos turnover in the study period are the number of wagons (X_1), weight (X_2), and fare (X_3) (Table 3). A moderate connection exists between the average loading (X_6) and the export cargos turnover. The income rate (X_4) and the average distance of transportation (X_5) have practically no effect on the export cargos turnover.

Table 4. Dynamics of dependence of cargo turnover (domestic transportation) in 2013-2020 by types of cargo on the main factors

Years	Factors					
	Number of wagons (X_1)	Weight (thous tons) (X_2)	Fare (thous. UAH) (X_3)	Income rate UAH per 10 t-km (X_4)	Average distance of transportation (km) (X_5)	Average loading, tons (X_6)
2013	0,6141	0,9837	0,8970	-0,4013	-0,3004	0,2896
2014	0,4101	0,8312	0,8452	-0,3613	0,3652	0,2921
2015	0,3953	0,8452	0,8629	-0,3277	0,2829	0,2940
2016	0,3890	0,9950	0,8240	-0,3015	0,3783	0,2429
2017	0,3598	0,9930	0,7955	-0,3557	0,2573	0,2666
2018	0,3872	0,9921	0,8054	-0,3829	0,1731	0,2674
2019	0,3347	0,9895	0,7590	-0,3880	0,2278	0,2963
2020	0,3096	0,9846	0,7531	-0,3309	0,2592	0,3130
min	0,3096	0,8312	0,7531	-0,4013	-0,3004	0,2429
max	0,6141	0,9950	0,8970	-0,3015	0,3783	0,3130

The correlation coefficients of the dependence of cargo turnover (domestic transportation) on the main factors allowed one to find out the most significant of them. The most influential factors that determine the volume of domestic traffic are the weight (X_2) and the fare (X_3) (Table 4). But unlike other types of transportation, for this type of transportation there are no factors that are not important from this list. All other factors (number of wagons (X_1), income rate (X_4), average distance of transportation (X_5), average loading (X_6)) have a moderate influence on the volume of domestic cargos turnover. A comprehensive assessment of the density of the impact of key factors on the volume of freight turnover by type of transportation allowed us to reach such results:

- It identified the most influential factors for all types of transportation - weight (X_2) and fare (X_3).
- It identified that, for imports, exports and transit transportation, a moderate connection with the factor a number of wagons (X_1) exists.
- It identified that, for imports, exports and transit transportation, a weak connection with factors an income rate (X_4) and the average distance (X_5) exists.

Multidimensional assessment of the homogeneity of factors

Modeling of the semantic differential involves a cluster analysis of the main factors influencing the volume of cargo turnover. This procedure involves the application of the method of hierarchical clustering (the method of “closest convergence,” in some sources this method is called the method of “nearest neighbor”). The calculations were performed using the program SPSS (Statistical Package for the Social Sciences). Figures 7 – 10 show clusters (homogeneous groups) as a result of multidimensional grouping of transportation indicators by types of transportation for eight studied years.

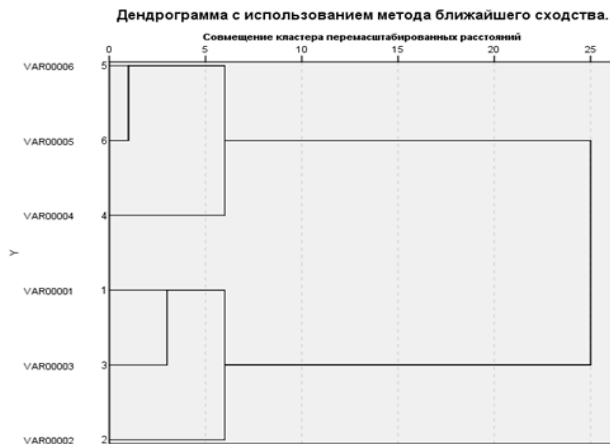


Figure 7. Dendrogram of transportation work (import) of JSC “Ukrzaliznytsia” during the period 2013-2020

According to Figure 7, the most similar groups formed variables X_4 , X_5 , X_6 (cluster 1) and X_2 , X_3 (cluster 2), with a small distance from the variables X_4 , X_1 . These two clusters illustrate the differentiation between these indicators. The results illustrate the conclusions made in Table 1.

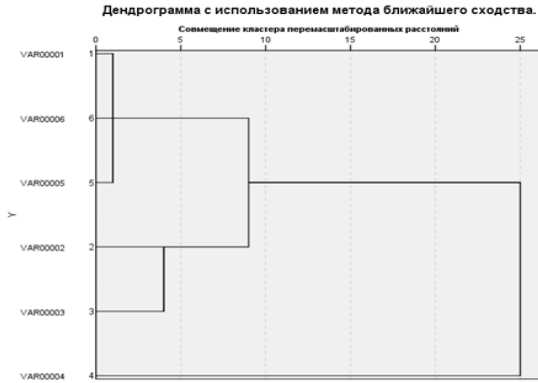


Figure 8. Dendrogram of transportation work (transit) of JSC “Ukrzaliznytsia” during the period 2013-2020

One can conclude from Figure 8 that the indicators X_2 and X_3 form a cluster (1), which is the most independent. Cluster 2 is formed by homogeneous indicators by the degree of impact on transit cargo turnover – X_1, X_5, X_6 . And a separate cluster of distances, which differs from other clusters, is formed by variable X_4 . This conclusion coincides with the conclusions made in Table 2.

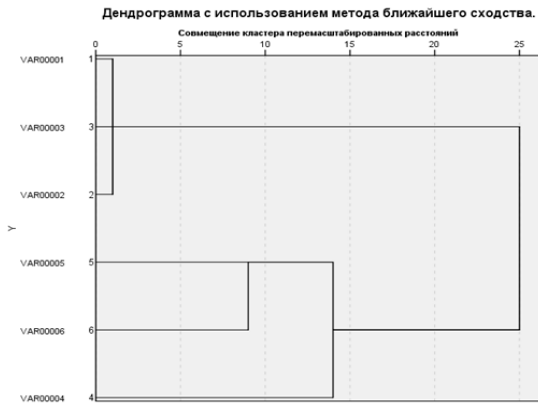


Figure 9. Dendrogram of transportation work (export) of JSC “Ukrzaliznytsia” during the period 2013-2020

One can conclude from Figure 9 that the indicators X_1, X_2 and X_3 form a cluster (1), which is the most independent. Cluster 2 and cluster 3 are formed by homogeneous indicators on the degree of impact on export cargo turnover – X_4, X_5, X_6 . This conclusion coincides with the conclusions made in Table 3.



Figure 10. Dendrogram of transportation work (domestic transportation) of JSC “Ukrzaliznytsia” during the period 2013-2020

If we analyze the indicators of the impact degree based only on the correlation analysis, the indicators X_1 , X_4 , X_5 , X_6 approximately equally determine the cargos turnover of domestic transportation (Table 4). But the results of hierarchical clustering (Figure 10) show that indicators X_2 and X_3 form a homogeneous group (cluster 1), while the indicators X_1 , X_5 , X_6 form cluster 2. And the distance of X_4 indicator from others is the largest. Thus, this gives grounds to claim that the income rate indicator for domestic transportation needs further research. Because it shows indirect connection, that is, with the growth of the income rate, domestic cargo turnover decreases.

CONCLUSION

In our paper, the semantic differential method as an innovative tool for the harmonization of interests for transport companies and consumers of their services, as well as managing the transportation by railway transport of Ukraine in the field of freight transportation, was proposed. And this is the essence of the innovative approach of our study. It involved performing certain procedures. The content of the procedures involved the practical implementation of the three-dimensional basis of the semantic differential. The first dimension is conducting an expert assessment. Based on the results of its practical implementation, the importance of transportation work indicators for clients of JSC “Ukrzaliznytsia” services was identified. According to the received results of the survey, a number of problems were diagnosed,

in particular: 20% of respondents are not satisfied with the available number of wagons for cargo transportation (X_1); more than 50% of cargo owners have claims that concerns the possibility to transport the desired amount of cargo (X_2); only 20% of respondents believe that the fare for cargo transportation corresponds to the ratio of "price-quality" (X_3); the validity of the income rate is obvious only for 14% of respondents (X_4). The second and the third dimensions of the semantic differential provide an opportunity to avoid subjectivism in assessing the quality of service of JSC "Ukrzaliznytsia". The second one is the determination of the density of the connection. According to the results of correlation analysis, the most influential indicators of transportation work by types of cargo and types of connections (import, transit, export, domestic transportation) were established. It was discovered that the most influential indicators of transportation work are the weight of the cargo (X_2) and the fare (X_3). The third dimension is a multidimensional assessment of the homogeneity of factors. It is concluded that the variables X_2 and X_3 for all types of transportation get into one cluster (for some types of transportation they were joined by other variables). This allows us to state the importance of the general conclusions for the management of JSC "Ukrzaliznytsia" in the strategic planning of transportation, we advise to focus on these indicators. Semantic differential modeling can serve as an effective tool in strategic planning not only for railway enterprises, but also for those institutions where it is necessary to identify the most important areas of activity.

Many researchers determine the degree of influence of factors only using the Chaddock scale. Depending on the purpose of the study, this may be justified. But our authors' approach to the study in terms of semantic differential involved the use of the Chaddock scale as a null hypothesis (H_0) and an alternative to it (H_3), and subsequent testing of this hypothesis by the method of hierarchical clustering. Thus, the source of our research is a questionnaire conducted on cargo owners on the degree of satisfaction with the level of management of transportation work. Evaluation of this result contained a complex structure and included three components. The first is a system for monitoring the satisfaction of consumers of transport services. The proposed monitoring system consists of an appropriate questionnaire and processing of results. The second component is the assessment of the density of connections between cargo turnover by type of transportation and the leading transportation indicators. The third one is a multidimensional assessment of the homogeneity of factors by hierarchical clustering. The implementation of the proposed procedures in the complex is a modeling of the semantic differential as a tool for managing the transportation by railway transport of Ukraine in freight transportation.

It is necessary to point out that the use of the semantic differential has its limitations, which are limited by the multiplicity of interpretations that arise in the mind and psyche of the researchers. We made attempts to minimize subjectivism in management decisions made in the study. The use of semantic differential based on the involvement of quantitative methods of mathematical modeling allows increasing the degree of validity of management decisions. The semantic differential can be applied to all B2B companies, not only to the transport industry. In our understanding, the harmonization and balancing of interests in the field of B2B take into account the results of modeling the semantic differential in management.

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Abstrakt

CEL: Celem naszego opracowania jest wypracowanie innowacyjnego podejścia do naukowego uzasadnienia i praktycznego wyważenia interesów właścicieli ładunków i firm transportowych, które posłuży jako narzędzie do zarządzania frachtem. METODYKA: Zaproponowano konkretny algorytm działań, który wstępnie przewiduje stworzenie

systemu wskaźników do badania zarządzania transportem. Metody badawcze obejmują złożoną metodę semantycznego modelowania różniczkowego, która integruje analizę korelacji i regresji, analizę skupień oraz oceny eksperckie. Podstawą tak złożonej metody jest integracja trzech komponentów: i) systemu monitorowania satysfakcji konsumentów usług transportowych; ii) ocenę gęstości powiązań między obrotem ładunków według rodzaju transportu a wiodącymi wskaźnikami przewozowymi; iii) wielowymiarową ocenę jednorodności czynników poprzez hierarchiczne grupowanie. **WYNIKI:** Semantyczne modelowanie różniczkowe może być skutecznym narzędziem planowania strategicznego nie tylko dla firm transportowych i kolejowych, ale także dla tych instytucji, w których konieczne jest zidentyfikowanie najważniejszych obszarów działalności. **IMPLIKACJE:** Zastosowanie semantycznego modelowania różniczkowego opartego na zaangażowaniu ilościowych metod modelowania matematycznego pozwala na zwiększenie stopnia trafności decyzji zarządczych. Harmonizacja i równoważenie interesów w obszarze B2B uwzględnia wyniki modelowania w zarządzaniu. Proponowana metodologia składa się z głównych wskaźników transportu taboru oraz niektórych wskaźników ekonomicznych. Wskaźniki te uzyskano dzięki współpracy z ekspercką grupą uczestników procesu transportowego. Zastosowanie stworzonego modelu pozwala na określenie kierunków priorytetowych w zakresie obsługi właścicieli ładunków przez koleje ukraińskie według rodzajów ładunków i przewozów oraz uzasadnienie odpowiednich decyzji zarządczych przez przewoźników towarowych. **ORYGINALNOŚĆ I WARTOŚĆ:** Innowacja to kompleksowa interdyscyplinarna integracja metod badawczych opartych na filozofii semantycznego modelowania różniczkowego, pozwalająca na integrację podejść harmonizujących interesy firm transportowych i konsumentów ich usług z wynikami współpracy w zakresie przewozów towarowych. Dlatego opracowaną innowacyjną metodologię można wykorzystać nie tylko w transporcie kolejowym, ale także w innych rodzajach transportu i działalności.

Słowa kluczowe: modelowanie, harmonizacja interesów, zróżnicowanie semantyczne, transport towarowy, właściciele ładunków, podejście innowacyjne, analiza skupień, analiza korelacji i regresji, zarządzanie transportem

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Conflicts of interest

The authors declare no conflict of interest.

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Technological innovation and the labor market: The two-way non-reciprocal relationships with a focus on the confectionery industry in Poland

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Abstract

PURPOSE: The theoretical aim of this study is to explore the nature of the “technological innovation–labor market” relationships presented recently in the literature, based on publications indexed in the Scopus and Web of Science databases. The empirical purpose is to examine these relationships in companies operating in the confectionery industry in Poland. **METHODOLOGY:** Literature studies, as well as a mixed-method empirical research approach, were used, including an online survey of engineers working in the confectionery industry and the case study method (with interviews and observation). **FINDINGS:** Publications from the past eleven years have covered the problems of the analyzed relationship but have not taken into consideration the market in Poland or the confectionery industry. More often than the classic literature, these publications present different relationships, not focusing mainly on the issue of unemployment resulting from technological innovation. Meanwhile, empirical studies show that the analyzed relationships are non-reciprocal. Fifty percent of the employees surveyed indicated that implementing technological innovations results in job losses. The remaining respondents were convinced that technological innovation has a neutral quantitative impact on the internal labor market. We identified that technological innovations have an impact on the labor market (both internal and external) more often than changes in the labor market affecting innovations, and that this impact is rather negative. Moreover, empirical research shows that technological innovations are positively connected with qualitative changes in the internal labor market. **IMPLICATIONS:** This study emphasizes the need for lifelong learning among employees and for a field for development at educational institutions. It should also draw the attention of top managers to the skills that their employees have now and

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should have in the future. **ORIGINALITY AND VALUE:** *The paper presents an original typology of the relationships between technological innovation and the labor market, which can serve as the basis for further development and qualitative or quantitative research. The paper also presents pioneering research because previous studies were not based on a complex framework, including different kinds of impacts (from negative through neutral to positive), treating the labor market and technological innovations relative to each other as dependent or independent variables, or highlighting two types of labor market.*

Keywords: *labor market, employment, technological innovation, process innovation, mutual relationships, confectionery industry*

INTRODUCTION

Work has always accompanied people. However, it was not until the 19th century, along with the development of the industrial society, that the terms “work” and “worker” first became a subject of interest for scientists. In those days, attention was mainly paid to the economic side of work (Piwowar-Sulej, 2010). Nonetheless, work can also be considered from the perspective of an individual. It can be approached by a human being as obligatory. Work can also represent a means of satisfying needs. Finally, it can be perceived as a value, an end in itself, and a source of personal development (International Labour Office, 2015). In this manner, work becomes an issue analyzed in the framework of economics, management, and social sciences, such as psychology and sociology.

The concept of a labor market is inseparably correlated with the concept of work. The labor market, in labor economics, covers all issues related to labor supply and labor demand. Through the interaction of workers (suppliers of labor) and employers (demanders of labor), labor sales transactions take place (Graham & Anwar, 2019). However, labor markets – as with the term “work” – are the subject of discussion carried out by researchers not only in the field of economics, but also the other above-mentioned scientific disciplines. Researchers in economics and sociology are especially interested in the external labor market (e.g., Ramskogler, 2021), whereas specialists in management (also using knowledge from psychology; e.g., Hubbard & Purcell, 2001; Jiang et al., 2012) approach it from the perspective of a particular company. They focus on both the internal (organizational) labor market and an employee’s perspective.

The 20th-century authors who studied the factors contributing to economic growth – such as Schumpeter (1934) and Solow (1956) – showed that economic growth cannot be explained solely by the increasing application of the factors of production. In particular, Solow (1956) referred

to this as “technical progress.” This progress is connected with technological innovation, which generally is reflected in changes in production methods and processes (Brem et al., 2016; Piwowar-Sulej & Podsiadły, 2019; Vonortas & Xue, 1997) and, therefore, can also be called a process innovation.

Various classic studies suggest that technological innovations lead to a reduction in jobs rather than job creation (quantitative changes; Bernhard Dachs, 2018; Blien & Ludewig, 2017; Freeman et al., 1982; Kaur & Nagaich, 2018). The interest in this topic also comes from changes resulting from the introduction of the Fourth Industrial Revolution (De Grey & Rossiter, 2017). As Brynjolfsson and McAfee (2011) stated, technological innovation is still increasing, with more sophisticated software technologies disrupting labor markets by making workers redundant. Papaioannou and Srinivas (2019) highlighted that innovation is not a phenomenon of a neutral-value and that technological growth is not an adequate measure of the success of any policy. They also recommended exploring the relationship between the dynamism of technological innovation in the context of their power (political laden) and values (related to social implications). Therefore, the first purpose of the paper is to explore whether the recent studies discuss the problem of complex (qualitative and quantitative) relationships between technological innovation and the labor market (internal and external). The research question (RQ1) that corresponds to this purpose is:

RQ1: What is the nature of the relationships between technological innovation and the labor market as presented in the recent academic literature, especially in papers published in the last eleven years?

The second purpose of this study is to present the relationships between the implementation of technological innovations and changes in the labor market, focusing on the confectionery industry in Poland. The paper also attempts to answer the following research question (RQ2):

RQ2: What do the analyzed relationships look like from the perspective of companies operating in the confectionery industry in Poland? Are they reciprocal?

The scientific analyses may refer to specific countries, industries, or professions. None of the publications discussing the labor market in the context of technological innovation – indexed in the above-mentioned databases – refers to the situation in Poland. This country gains low scores in the key European measures of innovation, including the Innovation Union Scoreboard

(European Commission, 2020). Only 23% of Polish companies are perceived as being innovative, while the average for the EU is 50% (Wielądek, 2016). Moreover, the instruments supporting innovation, currently used in Poland, cannot be considered as effective. Their low effectiveness is caused, i.a. by the lack of an innovative culture (not only in the manufacturing industry) (Jasiński, 2013b). At the same time, the confectionery industry – although based on manual labor – is one of the fastest developing industries in the food sector in Poland. The value of exports of chocolate and confectionery products amounts to approx. EUR 1.5 billion, while imports are worth approximately EUR 1 billion. For instance, chocolate – a confectionery standard – reaches 111 countries, primarily Germany (Przeździak, 2019). Therefore, the confectionery industry in Poland is an interesting research subject. As Rosenberg (1994) stated, technology and economics should be treated as path-dependent phenomena, which means that findings from one industry may be inappropriate when applied to the other industry.

Apart from analyzing the literature on the subject, a mixed-method approach to empirical research was used. The authors conducted an online survey of 48 engineers, which represented a quantitative research approach, and adopted the case study method, which reflects a qualitative research approach (Guba, 1990). The paper adopts a holistic approach towards analyzing the identified relationships, which means combining the perspective of economics with that of management.

The paper contributes to academic knowledge by a) developing an original concept of two-way relationships between technological innovation and the labor market, b) providing literature analyses and empirical evidence based on a mixed-method research approach, c) formulating implications for practitioners, and d) indicating directions for future research.

The paper is organized as follows. The second part of the paper provides a general description of the research context. In particular, technological innovation is defined and the relationship between it and the labor market, as presented in the classic literature, is shown. Then the labor market in Poland and the confectionery industry are characterized. In the third section, the material and methods are presented. The following section is devoted to a presentation of the research results. The problems explored in the publications indexed in the academic databases within the last eleven years are shown. Then the findings from the survey and the case studies are presented. Next, the authors provide a discussion that answers both research questions. The concluding section highlights the limitations connected with the research, provides practical implications, and postulates directions for further research.

LITERATURE BACKGROUND

One can state that innovation is everywhere, which means language as well as services, products, and technologies. Therefore, innovation is discussed in different scientific disciplines, including social sciences, economics, and management. In general, innovation is a process of formulating, applying, launching, and developing a creative idea and guiding it as it matures and falls (Griffin, 2004). The first sociological theory of innovation comes from Tarde (1902), who evaluated social changes (including economic regime and industry) and for whom innovation meant invention. However, the economist Schumpeter (1941) is considered the inventor of the concept of innovation. He distinguished innovation from invention and identified innovations as introducing new products and new production methods, entering new markets, obtaining new sources of raw materials, and reorganizing industry.

Different definitions of innovations have been created, some approaching innovation as an absolute novelty, and others as the implementation of a solution developed by another entity (Nelson & Winter, 1985). Currently, the latter approach dominates in the literature on the subject. It is considered that imitation requires work, experimentation, judgment, and imagination. Imitation is innovation because, when combining elements from nature, it combines the best of them and improves nature (Godin, 2008). However, it must be implemented for the first time by a particular company (Fagerberg, 2006; Freeman & Soete, 2013; Kuznets, 1962; Nelson & Winter, 1985). Kemeny (2010) defined technologies as principles and ideas which direct the way goods and services are produced. Although there is a clear definition of technologies, there is no common approach to the definition of technological innovation. For example, Maclaurin (1953) used the terms *technological innovation* and *technological change* interchangeably. In the Oslo Manual (OECD/Eurostat, 2005), two types of innovations were distinguished: technological and non-technological innovations. The first are related to changes in products and processes, while the second are associated with changes in marketing and organization. Geldes et al. (2017) and Höflinger et al. (2018) – following the OECD guidelines – identified technological innovation with technologically innovative products. For Vonortas and Xue (1997) and Brem et al. (2016), technological innovations refer to manufacturing process innovations. For the purpose of this paper, the authors use the following definition: “technological innovation results from the application of knowledge and results in technology through innovations in the production process.” It is “a new combination of production means and a change in production factors (input) used to manufacture products (output)” (Piwowar-Sulej & Podsiadły, 2019, p.313).

A construct that can sometimes be the first association that comes to mind when combining technological innovation with the labor market is technological unemployment. Keynes (1963) described technological unemployment as unemployment caused by the discovery of means of economizing the use of labor that outruns the pace at which new uses for labor can be found (for more, see Rifkin, 1995; Campa, 2017).

According to some researchers, it is a temporary phenomenon representing either frictional unemployment or a microeconomic one. They claim that modern machinery and modern company organization systems make workers redundant and at the same time reabsorb them in the form of compensation by investing the resources in new industries and services, thus opening new jobs. Another type of compensation is manifested by technological innovations in production processes turning into product innovations and creating new sales markets, services, and, as a result, new jobs. Finally, the implementation of new technology compensates for production costs, allowing a higher supply of cheap goods, thus acting as a purchasing power incentive and simultaneously creating new jobs. There are also authors who disagree with these forms of compensation, presenting a vision of an approaching labor market collapse and the prospect of an end-of-work society (for more, see Vivarelli, 1996; Mokyr, Vickers, & Ziebarth, 2015).

From the times of the British industrial revolution, through the displacement of the 1930s in the USA, to the arguments on technological unemployment, numerous individuals have expressed doubts regarding the advantages of using machines and have fiercely refused to implement any kind of modernization in industry (Lipsitz & Bix, 2001; Soete & ter Weel, 2001; Stern, 1937). This was followed by a new approach developed in the 1960s, accepting the introduction of machines in production processes. For example, Marx (1867) described production automation as a process that deprives people of their essential functions in the system. An employee was seen as a component of a machine that functions according to a new work discipline in line with the pace imposed by the machine (Mackenzie, 1998).

This was followed by a debate held in the 1970s, mainly in Europe, as a result of the introduction of microelectronic technologies (Bartlett, 1984; Byrne, 1986). Nowadays, a global debate continues, primarily focused on communication and information technologies and their consequences on the rate of employment and quality of life (e.g., Pianta, 2006; Vivarelli, 1996). Technological innovation has an impact on growth in the IT sector (Freeman & Soete, 1985). Technological innovation usually allows a company to produce the same amount of products with less capital and/or labor (Edquist et al., 2001). Therefore, innovation most often leads to a negative quantitative effect on employment. It is worth mentioning that, historically,

new technologies have primarily been confined to routine tasks, though modern technologies can also reduce the number of non-routine tasks (Frey & Osborne, 2017). The size of this effect depends on the direction of technological change, the type of current technology (the rate of substitution between input factors), and the industry.

DESCRIPTION OF THE RESEARCH CONTEXT

Characteristics of the labor market in Poland

An analysis of the Web of Science and Scopus databases, covering the last eleven years, indicates that scientists focusing solely on the problems of the labor market in Poland discuss the following aspects:

- how the transition process of this post-communist country to a market economy affected the labor market (Witkowska, 2016). One of the conclusions is that in Poland the economic activity rate of women is lower than that observed before the transformation and
- the issue of labor migration to Poland (Kaczmarczyk & Okolski, 2008; Polkowska & Filipek, 2020; Szeptycki, 2016) and classification of the regional labor markets by identifying specific criteria (e.g., the rank of the labor market and the scale of impact) (Sitek & Zuzanska-Żyśko, 2015).

There are also publications comparing the situation in Poland with other countries (Blanchflower, 2001; Lübke & Erlinghagen, 2014; Smith et al., 2008; Tvrdoň, 2016) and emigration from Poland (Bygnes & Erdal, 2017; Janta, 2011; Krings et al., 2013; Levrau et al., 2014).

Useful data on the labor market situation in Poland are provided by Statistics Poland (Central Statistical Office, 2019b). In general, the Polish labor market deals with problems of insufficient workforce resources. At the end of the second quarter of 2019, the number of vacancies in companies employing at least one person exceeded 151,800 and was higher than at the end of the first quarter of 2019 by 9,400 (6.6%). At the end of the second quarter of 2019, 52,100 organizations had vacancies, i.e., 6.7% of all organizations in Poland. The ownership structure with the indication of job vacancies corresponds to the structure of the entire population – private sector enterprises accounted for 91.2%. As with previous quarters, the largest number of vacancies remained in entities operating in the area of industrial processing (22.5%). The companies offering vacancies were most frequently searching for industrial workers and craftsmen – 37,800 (24.9%). Vacancies for operators and assemblers of machines and devices also constituted

a significant share – 24,500 (16.1%), specialists – 24,400 (16.1%), and service and sales employees – 22,800 (15.0%) (Central Statistical Office, 2019a).

The reasons for the insufficient number of people willing to work in Poland include low wages (employee compensation and employers' tax and social security contributions) and the high level of economic emigration to Western European countries. Polish labor costs are still under half of the European average. According to data presented by Eurostat, labor costs in Poland are placed at EUR 10.10 per hour, while the EU average is EUR 27.40 (Eurostat, 2020b). The low level of labor costs results in a continuously growing demand for employees from foreign companies investing in Poland (Hernik, 2018). However, it is worth mentioning that although labor costs in Poland remain one of the lowest in Europe, it is growing rapidly (6% in Poland compared to 2.3% in the EU; Jurczak, 2018).

The growing immigration from Ukraine does not even compensate for the shortage of employees on the Polish market. Currently, Ukraine represents the most important source country for migration to Poland. Poland's popularity as a destination country for Ukrainians is enhanced by numerous factors, such as geographical and cultural proximity. The migration of Ukrainians to Poland is, in most cases, of a profit-making and short-term nature (cyclical, often seasonal). For example, they come to Poland to work in the construction, home care, and agriculture sectors, rather than in industry (Brunarska et al., 2012).

The number of immigrants from Ukraine working in Poland is estimated to be approximately one million. The main basis for such estimates is the number of registered declarations regarding the intention to entrust work to a foreigner in Poland (over 600,000) and the data on the number of Ukrainians taking up illegal employment in Poland as part of the shadow economy. The latter of these values is difficult to determine, but based on the available data, it is estimated that between 30,000 and 270,000 Ukrainians may be working illegally in Poland (Bińkowski, 2017).

The confectionery industry in Poland – its history and current challenges

Over the past thirty years, the confectionery sector of the food industry has been subjected to extensive changes. Until 1989, as a result of the nationalization of the industry and the economic system based on the central state management model, all factories manufacturing confectionery products were affiliated with a state organization. This resulted in an obsolete machine park, limited availability of raw materials for production, confined supply, and a highly reduced and standardized portfolio of finished products (Piwowar-Sulej & Podsiadły, 2020).

The socioeconomic transformations of the 1990s, consisting of the transition from a socialist economy to a market economy, initiated an intensive development of this industry. This was made possible by the investment of domestic capital and as a result of direct investment made by foreign global corporations in the confectionery industry. Regardless of the capital's origin, these investments were focused on privatizing production plants, forming associations, or establishing new production companies – greenfield investments. The high investment level resulted from the vast potential of Poland's confectionery market. Before 1989, the availability of confectionery products was highly limited or even rationed. In the period 1993–1995, the average consumption of chocolate and confectionery products in Poland was 0.36 kg per month per person, which was several times lower than in such markets as Germany, Belgium, Switzerland, Great Britain, and France (Podsiadły, 2019a). Local investors approached it as an opportunity to multiply their capital. At the same time, foreign companies saw a chance to increase the sales of their products by penetrating a new sales market and building a strong brand in the customers' minds.

An additional investment incentive on the part of foreign businesses was the desire to optimize labor costs. The high unemployment rate in Poland significantly affected the level of Poles' earnings. The high labor supply resulted in reduced labor costs. In 1996, the total labor cost per employee in Poland was USD 5.42, whereas the average cost in the European Union in the same period amounted to USD 33.57. Owing to the investments mentioned above, Poland became one of the key confectionery producers worldwide, ranked eighth among the global exporters of these products in 2017 with a share of 4.8% (Kwil & Podsiadły, 2019). As Domański (2003) stated, foreign investments helped enhance the competitiveness of the Polish industry and narrow the gap between Poland and the European Union. At present, the confectionery sector in Poland is characterized by stability, valued at over PLN 12 billion; including salty snacks and ice cream, the sector is worth over PLN 16 billion, with a predicted order increase of 1%–2% per year (Przeździak, 2019).

Based on Nielsen data (Rogalska, 2017), the confectionery and snack market retail sales grew in 2018 by 5.8% over 2017. According to the statistics, in October 2018, a 4.0% growth year-on-year in the production of chocolate and chocolate products was recorded, bringing the total to 45,200 tons, whereas comparing the monthly production of chocolate and chocolate products between September and October 2018, the increase was 8.9%. In the period from January to October 2018, the production of chocolate and chocolate goods went up by 9.0% year on year, reaching a total of 353,000 tons. The most desirable goods remained within the premium segment; the consumption of pralines increased as well (by approx. 8%), with

cookies as the leading category. Poland is ranked 22nd on the global market regarding chocolate consumption, with each person consuming approx. 5 kg of chocolate per year. For comparison, the data for Switzerland and Germany show twice larger consumption in both of these countries (Przeździak, 2019).

Even though chocolate remains a global bestseller, its manufacturers have to investigate methods for attracting new customers and keeping the current ones. The growing health-oriented trends have been contributing to a stronger consumer focus on products that offer fewer calories, reduced sugar, and additional ingredients such as vitamins and minerals (Pszczola, 2013). Therefore, manufacturers must focus on meeting their clients' expectations by providing updated alternatives to classic confectionery goods that highlight their health-oriented advantages. They are under pressure to develop innovative and original products in this respect. Several years ago, the production of goods combining caramel and salt was initiated along with new flavors, such as bacon and chocolate. Unusual flavors in the chocolate segment have been gaining popularity in many countries. Chocolate enhanced with bacon, wasabi, salt, or a herbal flavor has an increasing number of devoted fans, primarily in the USA. This trend might also spread to Polish consumers, giving way to unconventional flavors, becoming strong competition for traditional confectionery, since Poles have always accepted novelties (Pszczola, 2013). Thus, it might be implied that the spectrum of innovative confectionery products will be widened.

There are many challenges affecting the confectionery industry, but three of them seem to be the most crucial. The first challenge for the entire chocolate industry refers to price fluctuations of the upstream product, that is, cocoa beans. It has a direct impact on the production cost. In 2013, the cocoa bean deficit amounted to approx. 70,000 tons. As a result of bad weather conditions, the harvest in the years to follow was also low. Thus, it was expected that in 2020 the deficit could reach the level of 1 million tons and even 2 million tons in 2030. The situation started changing after the 2016–17 season, when cocoa bean production increased by 15%, and harvests were about 600,000 tons higher as compared to the previous season. This sudden change resulted in greater availability of cocoa beans on the market, resulting in a dramatic slump in the raw material price, from USD 3,000 per ton of cocoa beans down to just USD 1,900 (Podsiadły, 2019b). Paradoxically, this situation caused a deficit of cocoa beans, not because of the weather conditions but due to some farmers changing their production profile away from the less profitable crop. A similar situation was observed in the market for other raw materials. Therefore, the confectionery manufacturers continue to optimize production costs so that the fluctuations in raw material prices do not adversely affect their profit margins or the price of the finished product paid by the consumer.

The second challenge is meeting customers' expectations related to environmental sustainability and CSR activities. Consumers pay attention to the information on the confectionery labels. They show great interest in the symbols of social or charity organizations, which indicate that the product was manufactured in accordance with specific rules or that a portion of the profit from its sale has been donated to charity organizations (Didier & Lucie, 2008; Hainmueller et al., 2011; Stenn, 2013). Manufacturers must ensure that the raw materials they use guarantee sustainable development, and they must investigate alternatives to "controversial" raw materials, such as palm kernel oil, for example. For this reason, one of the major challenges faced by confectionery manufacturers is to ensure the continuity of raw material supplies and stable prices (Podsiadły, 2019a).

The last challenge is related to the Polish labor market. The companies have to compete with other companies from the same and other industries in order to obtain the necessary human resources. As mentioned above, the labor market in Poland is now considered an employee's market. The unemployment rate in 2019 was 5% (Central Statistical Office, n.d.). It is estimated that in the following years, the unemployment rate will trend downwards (International Labour Office, 2021).

MATERIAL AND METHODS

The authors used Web of Science (WoS) and Scopus because these two databases include the most academic papers from the entire world. The following queries were used: "process innovation" and "technological innovation" in connection with "labor market." The authors searched the paper topics (in WoS) and the paper titles, abstracts, and keywords (in Scopus). Searching covered publications from the past eleven years because this paper is not a systematic review and the sources used for research on social science fields require more "cutting-edge" research (these research fields change quickly) (Wolf, 2019).

Empirical research aimed at answering the second research question (R2) was carried out with a combination of qualitative and quantitative methods, which is an especially valuable approach in the social sciences (Blien & Ludewig, 2017; Creswell & Tashakkori, 2007; Flyvbjerg, 2006). The adapted sequential, explanatory design allowed both the macro-level of analysis (industry) and the micro-level of analysis (particular companies) to be presented (Figure 1).

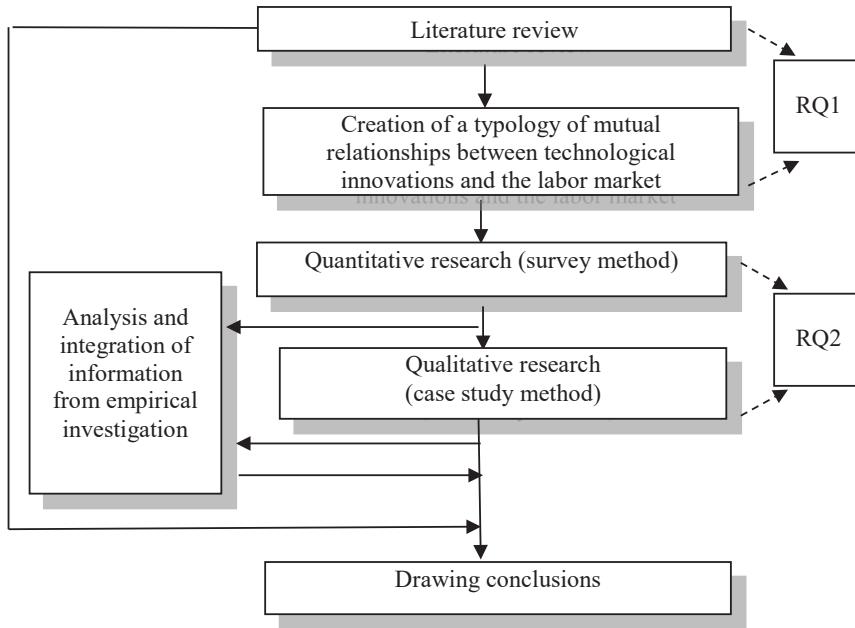


Figure 1. The research processes

From December 2019 to January 2020, a survey using the online questionnaire method was carried out among engineers working in the confectionery industry. It is complicated to measure the size of the general population of engineers working in this industry, as Eurostat provides only general data about the number of scientists and engineers. In Poland in 2019, there were 1,220,600 scientists and engineers (Eurostat, 2020a). The questionnaire was sent to 57 engineers working in the confectionery industry, 48 of whom (from nine different companies) sent back completed questionnaires. A minimum sample size of 30 is necessary for quantitative studies (Lenth, 2001).

Finally, to illustrate the analyzed correlations from the perspective of industrial companies and the labor market in Poland, the authors used the case study method. It is justified to apply a case study as a research method in the following circumstances (for more, see Yin, 2014):

- the initial stage of knowledge development was identified in a given area of research (e.g., contradictory or insufficient results of quantitative research or a small number of publications);
- it is important to analyze the phenomenon in its actual conditions;

- there are vague boundaries between the phenomenon and the circumstances in which it occurs.

In general terms, it is recommended to conduct research based on a multiple case studies (de Weerd-Nederhof, 2001). It is said that a case study should cover at least two to four entities (Perry, 1998). In this study, based on the case study method, four companies – later referred to as A, B, C, and D – were analyzed. All companies represented the confectionery industry.

Company A is placed in the central part of Poland, close to the capital of the country. Due to this, the supply in the labor market is low. The plant employs 486 workers. The main building was constructed in the second half of the 70s in the 20th century but the equipment is continuously modernized according to the new technology and solutions available on the market. The main assortment produced in the plant is various types of soft cakes and biscuits for the Central European Markets.

Company B is situated in the southwest part of Poland in a direct neighborhood of one of the biggest cities in Poland. The plant is located in a special economic zone, which causes a highly competitive labor market and creates challenges in the employment of blue-collar workers with good skills and experience. The factory opened at the beginning of the 90s in the 20th century and it was extended and modernized in the first years of the 21st century. 634 workers are employed in this company. The main product is a variety of chocolate products, like tablets, countlines and pralines, which are exported mainly to the United Kingdom, Ireland, and other countries in Western Europe.

Company C is located in the west part of Poland, also close to one of the biggest cities in Poland, as well being in a special economic zone. The plant was founded at the beginning of the 90s in the 20th century. Approx. 300 workers are employed in the factory. A few years ago, the portfolio of products changed and currently, production specializes in chocolate tablets for France and the Benelux countries.

Company D is in a small town in the southeast of Poland. The plant was built in the 30s of the 20th century. Throughout the history of the factory there have been a few modernizations and changes in the portfolio of the finished goods produced there. Approx. 481 workers are employed in the factory. Currently, the production specializes in various types of biscuits, soft cakes, and in big format chocolate tablets for the Polish market and Germany, France, and the Benelux countries.

For the purpose of the case study, from January to March 2020, unstructured interviews and direct observation of production processes were conducted. The core concept to ask about was – “example(s) of the

implementation of technological innovation and its result(s) for the internal/external labor market.” There was no formal structured instrument or protocol. Direct observation is distinguished from participant observation. During the direct observation, a researcher is only watching, not taking part in the observed process.

The respondents were employees from the technology departments of the surveyed companies (engineers, two people from each company). In an individual interview (conducted by one of the authors of the study) which lasted about one hour, the respondents willingly talked about the implementation of innovations in their companies and its results for the internal/external labor market; however, it was more difficult to obtain specific data regarding innovations and employment rates. Because of this, the results are presented only in a descriptive form. The interviews were recorded. An analysis of the recordings was carried out on the day after the interview because, when analyzing qualitative data, it is important that the people conducting the research remember the events. An interpretative approach was adopted in the data analysis. The thematic analysis conducted in this study aimed at answering the following questions:

- 1) What is an innovation in this case?
- 2) What are the results from the implementation of this innovation?

Each of the authors prepared their own interpretation of the research results (following the procedure of thematic analysis) (Nowell et al., 2017), and then (to ensure greater objectivity) a mutual verification of the interpretation of the conclusions were made. Further in-depth studies in plants were impossible because of the COVID-19 pandemic.

RESULTS

The relationship “technological innovations vs. labor market” in recent works and empirical research framework

As stated above, an analysis of scientific publication databases was used to answer the first research question (RQ1). The statistics of these publications are presented in Table 1.

Table 1. Statistics of publications discussing the research problem in the past eleven years

Keyword and database	Number of publications in a particular year											Total
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
„Process innovation” + „labor market” (WoS)	0	0	2	0	0	2	1	1	0	1	0	7
„Process innovation” + „labor market” (Scopus)	0	0	3	1	2	2	1	6	1	3	5	24
„Technological innovation” + „labor market” (WoS)	0	0	0	0	0	2	2	4	3	2	2	15
„Technological innovation” + „labor market” (Scopus)	1	5	3	3	6	6	6	8	13	14	20	85

Source: own study on data base for 2021-01-06.

The analysis of the content of the publication shows that the most frequently discussed problem is the creation of labor demand (quantitative approach to the labor market), combining technological innovations with the labor market. Innovations are indicated as one of many factors influencing a company's demand for labor. The other factors include company structure (organization), labor market flexibility, corporate culture, and the nature of a given sector. As far as a qualitative approach to the labor market is concerned, academic publications cover the problems of properly educating society and developing in employees the competencies required by innovations, including cooperation between humans and machines. The publications indexed in WoS and Scopus do not address the problem of the relationship between technological innovations and the labor market in Poland.

For example, Greenan and Guellec (2000) found that innovating firms and sectors create more jobs than others. Lachenmaier and Rottmann (2011), based on data from German manufacturing companies, reported a significant positive effect of technological innovations on employment growth (higher than product innovations). Technological innovations allow the company to decrease its production costs. As a result, the manufacturer can reduce the price of their product. This activity can lead to overall market expansion and company development, which requires employment growth. Ugur et al. (2018) also proved the positive impact of innovation on employment growth. This impact, however, is small and highly variable.

Capello and Lenzi (2013) analyzed the relationship between implementing innovations and increasing employment for EU Member States. The authors indicated that the impact of innovation varies depending

on the type of innovation. Other issues related to the labor market are also important, e.g., macroeconomic and cyclical conditions, the structure of the workforce, and the dynamics of the labor market and its regulations. The authors concluded that the impact of process innovation on employment is negative in urban areas.

Calvino and Virgillito (2018) emphasized that job creation and reduction are associated with various types of innovative activities, including product and process innovations. They critically assessed the role of technological changes in developing employment dynamics at multiple levels of aggregation and identified various compensation mechanisms aimed at adjusting employment after introducing an innovation. In the summary of their study, the authors distinguished four categories of enterprises after implementing innovations:

- employment and labor productivity both increased;
- labor productivity increased, but the level of employment declined;
- both labor productivity and employment declined;
- labor productivity declined while employment increased.

The paper by Baensch et al. (2018) confirmed that process innovations do not affect employment growth. These findings conflict with the above-presented results obtained by Lachenmaier and Rottmann (2011) and Ugur et al. (2018). In turn, Campos et al. (2019) stated that process innovations have a negative impact on the level of employment. In addition, they found that a higher level of process innovations led to more of a decline in payroll share and to a larger gap between employee productivity growth and an increase of pay.

Díaz et al. (2020) showed that in the case of companies with a high degree of innovation, employment reduction in times of crisis was lower than for non-innovative companies. The positive effect of innovations is particularly visible among highly skilled employees; however, depending on the type of innovation, the impact on employment may vary. The authors emphasized that process innovations can result in job losses due to higher machine performance. However, if lower production costs result in a lower product price, the total demand may increase, which means that job losses would be mitigated.

As far as the qualitative changes in the labor market are concerned, Ilie and Bondrea (2016) analyzed the impact of technological innovations on the availability of jobs and the requirements regarding future employee skills. In turn, Trompisch (2017) ruled out the possibility of overall work automation resulting from the implementation of technological innovations and posed a question about the best model of cooperation between people and machines.

Also, Diaz et al. (2020) addressed the qualitative aspects of human resources in addition to the quantitative impact of innovation on employment. They stated that product innovations are largely responsible for the skill-focused innovation effect. Although they have a positive impact on both types of employees, this effect is much greater for highly qualified specialists.

An emerging topic concerning the impact of technological innovation on jobs and employees' skills is related to environmental management (Piwowar-Sulej, 2021). For example, Orsatti et al. (2020) found that the availability of abstract skills among local employees drives the generation of green technologies. In turn, Sulich and Rutkowska (2020) stated that creating new green jobs can reduce unemployment, highlighting that such jobs are also available for less qualified young people.

Examples of papers addressing the problem of innovations' impact on the labor market have been presented above. There are also publications covering the problem of the external labor market's impact on innovations. For example, Wachsen and Blind (2016) and Oliveira and Holland (2017) studied the issue of labor market flexibility. The research conducted by the former pair of authors showed that the impact of labor market flexibility on innovations is not clear-cut and depends on the type of innovation and the characteristics of an enterprise. Oliveira and Holland (2017) pointed out that high innovation can also be achieved in situations of low flexibility in the labor market. In turn, Lorenz (2015) focused on qualitative changes on the internal labor market and their impact on process innovations. He emphasized the great value of discretionary learning in creating process innovations.

Above, more types of correlation between the analyzed variables than in the classic literature are presented. However, they do not cover all possible relationships between technological innovation and the labor market. Therefore, the authors have developed an extended typology of relationships between technological innovations and the labor market (see Table 2), which served as an empirical research framework in this study.

This framework includes different kinds of impacts (from negative through neutral to positive), treats the labor market and technological innovations relative to each other as dependent or independent variables, and highlights two types of the labor market. It extends the range of impacts identified in previous studies.

Table 2. Technological innovations and the labor market – types of proposed correlations

Independent variable	Dependent variable	Quantitative impact	Qualitative impact
Technological innovations	Internal labor market	positive: higher employment in a company as a result of technological innovations	positive: technological innovations help improve employees' skills (more extensive knowledge and competencies)
		neutral: technological innovations have no impact on employment figures in a company	neutral: technological innovations have no impact on the competencies presented by employees
		negative: layoffs in a company caused by technological innovations	
Technological innovations	External labor market	positive: technological innovations reduce unemployment rate in the labor market	positive: technological innovations stimulate job candidates to acquire new competencies (further training)
		neutral: technological innovations have no impact on unemployment figures	neutral: technological innovations have no impact on the competencies presented by job candidates
		negative: higher unemployment in the labor market as a result of technological innovations	
External labor market	Technological innovations	positive: companies introduce innovations in response to quantitative changes in the labor market	positive: innovations introduced in companies result from the competencies presented by job candidates (labor supply quality)
		neutral: companies do not introduce innovations in response to quantitative changes in the labor market	neutral: innovations introduced in companies do not result from the competencies presented by job candidates (labor supply quality)
Internal labor market	Technological innovations	positive: companies introduce innovations in response to quantitative changes on the internal labor market (employees terminating employment contracts)	positive: innovations introduced in companies result from the competencies presented by employees
		neutral: companies do not introduce innovations in response to quantitative changes on the internal labor market (employees terminating employment contracts)	neutral: innovations introduced in companies do not result from the competencies presented by employees

Results of the survey

Although the respondents were familiar with the problem of innovations, the authors explained the questionnaire's basic definitions, such as technological innovation or internal and external labor markets. The respondents were able to choose one response for each group of statements.

Group 1:

- a) technological innovations have a higher impact on the internal labor market than the internal labor market has on technological innovations;
- b) technological innovations have a lower impact on the internal labor market than the internal labor market has on technological innovations.

Group 2:

- a) technological innovations have a higher impact on the external labor market than the external labor market has on technological innovations;
- b) technological innovations have a lower impact on the external labor market than the external labor market has on technological innovations.

Then the respondents marked the dominant type of impact (positive/neutral/negative) as in the typology presented in Table 2. Table 3 presents the choices made by the respondents. As far as relationships between technological innovations and the internal labor market are concerned, an equal number of respondents selected Statement A and Statement B. It is difficult to assess the impact of the analyzed variables. A completely different situation resulted when the respondents chose statements from Group 2. According to 100% of the respondents, technological innovations have a higher impact on the external labor market than the external labor market has on technological innovations.

Table 3. Respondents' choices regarding the impact between technological innovations and two types of labor market

Group of statements	Statement	% of answers (n=48)	% of answers for a given question
1	a. technological innovations have a higher impact on the internal labor market than the internal labor market has on technological innovations	50%	100%
	b. technological innovations have a lower impact on the internal labor market than the internal labor market has on technological innovations	50%	

Group of statements	Statement	% of answers (n=48)	% of answers for a given question
2	a. technological innovations have a higher impact on the external labor market than the external labor market has on technological innovations	100%	100%
	b. technological innovations have a lower impact on the external labor market than the external labor market has on technological innovations	0%	

Regardless of the answer given by the respondents to the above-presented issues, they were required to present their perspectives on the relationships between the variables. The results are shown in Table 4.

Table 4. The types of relationships between technological innovations and the labor market according to the respondents

Independent variable	Dependent variable	Quantitative impact	% of answers	Qualitative impact	% of answers	% of answers related to a given relationship
Technological innovations	Internal labor market	negative	50.00%	positive	87.50%	100%
		neutral	50.00%	neutral	12.50%	
		positive	0.00%			
Technological innovations	External labor market	negative	50.00%	positive	87.50%	100%
		neutral	37.50%	neutral	12.50%	
		positive	12.50%			
External labor market	Technological innovations	positive	50.00%	positive	87.50%	100%
		neutral	50.00%	neutral	12.50%	
Internal labor market	Technological innovations	positive	50.00%	positive	75.00%	100%
		neutral	50.00%	neutral	25.00%	

According to the respondents, technological innovations can have a negative or neutral quantitative impact on the internal labor market. The qualitative impact related to this case was considered positive by 87.5% of the respondents. Half of them declared that technological innovations have a negative quantitative impact on the external labor market, but as many as 87.5% stated that the qualitative impact is positive. No matter which type of labor market was analyzed as the independent variable, its quantitative impact on technological innovation is assessed equally as positive and neutral. The qualitative impact of the labor market on innovations is seen as positive by the majority of respondents.

Brief presentation of the case studies

As part of the case study in Company A, as an example for the implementation of technological innovation that impacted the internal or external labor market, the engineers shared a situation about the manual task of replacing rolls of packaging material. During a continuous improvement workshop on the line, a “bottleneck” was identified in the production process, which adversely affected the key performance indicators. The issue stemmed from replenishing packaging material in the packaging machine. The responsibility for this operation rested on the duties of the operator of the packaging machines. It often happened that a machine required a new roll when the operator was making an adjustment to the parameters of another packaging machine. Due to this, production from the first machine was halted for 2 to 10 minutes, depending on the type of adjustments being made to the other machine. The first proposal for an improvement was to employ an additional operator, who would only be responsible for replenishing the rolls of packaging material. A test covering temporary workers was performed and indicated as follows:

- this position is not very attractive to workers – a low number of candidates;
- potential candidates expected their salary to be on the same level as that of a regular operator – a significant increase in labor cost;
- the duties were very boring – no possibility for development, as it was a simple and repetitious operation;
- it often looked like the operator responsible for replenishing the rolls was not working and due to this the operator was assigned other activities, which causes the same delays in production as in the original situation.

In order to streamline the roll change operation, it was decided to implement technological innovation in this area that would eliminate the need for the additional headcount. The proposed solution was to purchase a robot for replenishing the packaging machine in a shorter time than previously performed by an employee. Implementing this technological innovation did not affect the employment level in the company, because an employee was trained to perform both maintenance and service tasks for the robot.

In Company B, one of the biggest issues on the packaging line dedicated to assortment boxes of chocolate praline were the losses in the general efficiency of the line and negative deviation on the consumption of the plastic trays used for picking the chocolate pralines. During a shopfloor observation on the line, the project team noted that one of the biggest challenges for

employees is manually placing the plastic trays on the conveyer belt. This material is delivered in carton boxes and stacked. Employees must unpack the trays from the carton box, then separate each individual tray from the stack and place the tray on the conveyer belt. Due to the design of the tray, it often happens that the trays are stuck to each other and it is hard to separate them. This causes the following issues:

- employees further down the line are unable to put chocolates on some trays – decreasing the output of the line, a negative impact on the general efficiency;
- two or more trays are placed on the belt – a negative deviation of consumption of the material in the bill of material.

The operation of placing plastic moldings on the conveyor belt was performed manually by two employees, but during critical blockages, in this process stage, a third worker was occasionally needed – support from an employee from another packaging stage process. As a result of changes in the labor market (lower labor supply and higher labor costs), the company's management decided to purchase a pick and place robot dedicated to the plastic trays. Due to the situation in the labor market the profitability of the investment, described as a return on investment (ROI), was approved. Apart from reducing the demand for labor, the robot improved production line efficiency by performing the work more efficiently than an employee. The packing line staff was reduced by two people and the management of the new equipment was entrusted to the operator responsible for the carton erector machine, which is installed near the new equipment. There was no negative impact on the ergonomics of the employee's work.

In Company C, the main challenges were linked to a reduction in demand for the finished goods produced in the factory. As a part of the network of a global producer of confectionery, the prospects for the future of this facility were not so good. The location of the plant was not perfect from the perspective of the local or national labor market, but taking into consideration the European network of factories, the location was attractive due to lower labor costs when compared to Western European countries. Central office management took the decision to reorganize the supply chain for the chocolate bars and transfer the production of chocolate bars from another plant, located outside of Poland, to the analyzed company. In-depth analysis showed the potential risks of using the current equipment installed in the plant for the production process. The main challenges for the old line were:

- low precision of dosing the chocolate;

- low quality of products due to the old ways of packing, installed machines cause the issues with scratching the surface of the chocolate or their breaks;
- old software, which does not allow the implementation of new tools linked with the Statistical Process Control;
- not an ergonomic workplace.

In line with the plan to transfer production and increase production volume, it was decided to install the next generation of the production line to manufacture chocolate bars instead of modifying the old production line. The new line increased the demand for labor and created 90 new jobs. Working on this line is more accessible than the old one; it increases production efficiency by introducing universal production modules that communicate with each other. In addition, the new line allows the production of additional products, and thus people working in such conditions perform more diversified tasks than they did working on the old line.

In Company D, it was decided to change the design of the chocolate carton box packaging in response to complaints from the market that traders have a challenge merchandizing the big chocolate bars properly on store shelves. After consumers take the first few tablets from the carton box, the remaining tablets often fall over in the carton box and the product loses its visibility. It was also observed that the tablets are cracking when they fall over, resulting in a quality issue that is not acceptable to consumers. Based on this feedback, the research and development team invented a new carton equipped with a special elastic band, ensuring a good chocolate display on the store shelf. As a result, an additional operation had to be included in the process. An additional process stage was added for the manual stretching of an elastic band before putting the chocolate bars into the carton box. This operation impacted the process efficiency and impaired work ergonomics. A lot of mistakes were observed during the manual stretching of the elastic band, which created a bottleneck at this stage of the process. The plant's location ensured the labor supply was at a good level and at an attractive cost. Based on that, a lot of action was taken by the Continuous Improvement department to improve this stage of the process and continue with a manual work solution. For example, an additional tool was developed, some kind of fork, to support the manual stretching of the elastic band. Unfortunately, a lot of challenges were still observed, and finally, it was decided to replace the old carton-forming machine with a device that would allow all packaging stages to be performed automatically. Thus, it was possible to reduce the staff the line by three people because the new machine could not only stretch the elastic band but also pack the tablets inside the carton box.

In order to organize the information collected in the case studies, the authors used the previously developed typology of the two-way relationships between technological innovation and the labor market (Table 5).

Table 5. Relationships between technological innovations and the labor market in the companies under study

Independent variable	Dependent variable	Quantitative impact	Was it observed as part of the case study?	Qualitative impact	Was it observed as part of the case study?
Technological innovations	Internal labor market	negative	Yes – in Companies B and D	positive	Yes– in Companies A, B, C, and D
		neutral	Yes – in Company A	neutral	No
		positive	Yes – in Company C		No
Technological innovations	External labor market	negative	Yes – in Companies B and D	positive	Yes – in Company C
		neutral	Yes – in Company A	neutral	No
		positive	Yes – in Company C		No
External labor market	Technological innovations	positive	Yes – in Company B	positive	No
		neutral		neutral	No
Internal labor market	Technological innovations	positive	No	positive	
		neutral		neutral	

DISCUSSION AND CONCLUSION

As presented above, the authors of early scientific publications focused mainly on the problem of technological unemployment. An analysis of publications from the last eleven years indicated greater diversification of the issues referring to the relationship between innovation and the labor market. However, it is worth noting that the published results are occasionally quite contradictory. This applies, for example, to the impact of labor market flexibility on the innovation of enterprises (Oliveira & Holland, 2017; Wachsen & Blind, 2016). There is also a discrepancy between results about whether the impact of technological innovation on the labor market is positive or negative (Baensch et al., 2018; Lachenmaier & Rottmann, 2011; Neves et al., 2019; Ugur et al., 2018).

The survey results showed that no respondents observed a positive quantitative impact of technological innovations on the labor market. Although the respondents were highly skilled employees, 50% of them perceived a potential threat from implementing technological innovations in the form of layoffs. At the same time, in two of the four companies covered by the case study, a negative impact of innovations on the level of employment

was diagnosed. Referring to the typology of companies presented by Calvino and Virgillito (2018), two cases are “enterprises in which, as a result of implementing innovations, an increase in labor productivity was observed; however, the level of employment showed a decline.” The results obtained from both methods of empirical research were similar.

It is worth emphasizing here that the changes occurring in the external labor market resulted in the implementation of innovations in only one company. The results of surveys also indicated that innovations have a higher impact on the labor market than changes in the labor market have on innovations (especially in the context of the external labor market).

In each case, the observed reduction in employment referred to line workers only. Their jobs, characterized by the lowest skills requirements, are simultaneously the most routine and intensive ones. As Acemoglu and Autor (2011) stated, the “routine-biased technological change” means the substitution of routine human work by machines and leads to technological unemployment. Similar findings have also been presented by Frey and Osborne (2017), Gregory et al. (2019), and Hardy et al. (2018). For the highly qualified engineers who were the respondents of the survey, the implementation of innovations each time meant a new professional challenge, a unique project offering an opportunity for development. In each company, technological innovations positively affected the qualitative changes in the internal labor market, which is in line with the survey results. As Lachenmaier and Rottmann (2011) stated, technological innovations can lead to a reduction in a products’ price, which further leads to market expansion and the company’s development, which requires more employees. A positive quantitative change in employment was observed only in Company C, but other factors unidentified by the empirical research could have contributed to this result. In the other companies in the study, this effect may appear after many years.

The paper attempts to answer questions about the nature of relationships between technological innovation and the labor market, with a focus on the confectionery industry. The literature on the subject shows that technological innovations have a general impact on the demand for work and the nature of tasks performed by employees. In the classic literature, the focus was on the issue of technological unemployment. Publications from the past eleven years also presented a positive impact of technological innovation on the labor market, though the results obtained by different authors are not consistent and do not refer to the industry in question.

This study emphasizes that there are more different relationships between technological innovations and the labor market – especially when focusing on two types of labor market (internal and external). Previous studies were not based on a complex framework, including different kinds

of impacts (from negative through neutral to positive), treating the labor market and technological innovations relative to each other as dependent or independent variables, or highlighting two types of labor market. Therefore, this paper contributes to knowledge development by filling this research gap.

Both the survey and the case study demonstrate that innovations have a higher impact on the labor market than vice versa (especially in the context of the external labor market, resulting in more unemployed people). As far as the internal labor market is concerned, technological innovations do not create new jobs. This raises the question of the future of the labor market from the perspective of the Fourth Industrial Revolution. Theoretically, the number of jobs for unqualified people should be reduced, whereas the demand for highly skilled people should increase (Piwowar-Sulej, 2018). The surveyed businesses reported changes only in the employment size of line workers; no increase in the employment of engineers was recorded. Perhaps the implemented innovations were not advanced enough to require more employment of highly qualified personnel. This problem should be the subject of further, more in-depth research. It would also be interesting to determine the relationships between innovations and the labor market regarding sectors other than the confectionery industry.

The above-presented findings also provide implications for policymakers. Previous studies emphasized that innovation should be placed at the center of the Polish public policy agenda and that new, more effective public instruments are required (Bukowski et al., 2012, Jasiński, 2013a). Moreover, they associated innovation mainly with financial profits. Various consequences and scenarios should be studied while designing and executing an innovation policy. In particular, it is worth determining the impact of technological innovation on the labor market. This would be in line with a sustainability approach, which emphasizes that both businesses and countries should treat the economic, environmental, and social goals and consequences as equally important. This study also makes managers (not only working in Poland and in the confectionery industry) aware that the results of technological innovation go beyond the organization's boundaries. In addition, the answers collected in the survey point to the respondents being aware of the impact of technological innovations on the requirements for future employees. This awareness among the respondents will not only facilitate their work in projects aimed at implementing innovations, but will also protect them against unemployment (not technological, but general unemployment). Within the framework of the case study, it was identified that technological innovations have an impact on the labor market more often than changes in the labor market affect innovations and that this impact is rather negative. Although the reduction in jobs applies to people with lower qualifications,

no more qualified employees are being employed at the current stage of enterprise development. This emphasizes the need for lifelong learning among employees and for a field for development at educational institutions. It should also draw the attention of top managers to the skills that their employees have now and should have in the future (Piwowar-Sulej, 2021). Through appropriate HR development, they may increase the impact of the internal labor market (its qualitative dimension) on innovation.

At this point, it is worth emphasizing the limitations resulting from the research. Firstly, while searching the databases, the authors used terms related to the labor market and technological innovation. In further analyses, a wider scope of terms can be used, for example, those associated with the Fourth Industrial Revolution and employee competencies. This can result in a more complex description of the possible relationships between two types of labor market and technological innovation.

Although the use of multiple methods can neutralize or cancel out some of the disadvantages of certain methods (Creswell et al., 2003), the empirical study conducted in the form of a survey is not representative. Also, a case study method based on a non-random sample selection (as in this paper) prevents the researcher from using the results to make generalizations covering the general population. However, case studies may become generalizing studies if the issue of generalization, which means gaining and accumulating knowledge rather than formal generalization, is concerned. A case study may also be central to scientific development via generalization as a supplement to other methods. To overcome this limitation, further research based on the case study method may use a representative random sample or critical cases, which will be decisive for formal generalization (Flyvbjerg, 2006).

Other factors not included in the study may influence the phenomenon under study. As indicated in the introduction section, production processes based on manual work can be the basis for creating a luxury brand of a product. Therefore, a challenge for scholars is to provide further in-depth studies covering various antecedents of innovation and to overcome difficulties in collecting data resulting from the Covid-19 pandemic.

In addition, the focus here was on the confectionery industry. The typology of the relationships between technological innovation and the labor market presented in the paper can serve as the basis for further development and qualitative or quantitative research. For example, it may be extended by the relationships between technological innovation and working conditions (another aspect of a company's internal labor market related to, e.g., health and safety) as presented by Papaioannou and Srinivas (2019) and may include mediating/moderating variables, such as the participation of labor unions (Ulph & Ulph, 1989).

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Abstrakt

CEL: *Celem teoretycznym niniejszej pracy jest zbadanie natury relacji „innowacje technologiczne - rynek pracy” przedstawianych w publikacjach z ostatnich 11 lat, indeksowanych w bazach Scopus i Web of Science. Celem empirycznym artykułu jest zbadanie zależności między wskazanymi zmiennymi w firmach działających w branży cukierniczej w Polsce.* **METODYKA:** *W pracy wykorzystano takie metody jak studia literaturowe oraz badania empiryczne oparte na podejściu mieszanym, łączące metodę ankiety on-line (z inżynierami branży cukierniczej) z metodą studium przypadku.* **WYNIKI:** *Publikacje z ostatnich lat, poruszające problemy analizowanych relacji, nie przedstawiają specyfiki Polski i branży cukierniczej. Publikacje te jednak częściej niż tradycyjna literatura przedmiotu prezentują wielorakie relacje między analizowanymi zmiennymi, nie skupiając się tylko na zagadnieniu bezrobocia technologicznego. Tymczasem 50% badanych pracowników utożsamia właśnie utratę pracy z efektem wdrożenia innowacji technologicznych. Pozostali respondenci są przekonani, że innowacje technologiczne mają neutralny ilościowy wpływ na wewnętrzny rynek pracy. Na podstawie metody studium przypadku stwierdzono, że innowacje technologiczne wpływają na rynek pracy (zarówno wewnętrzny, jak i zewnętrzny) częściej niż zmiany na tym rynku wpływają na innowacje, a analizowany wpływ jest raczej negatywny. Ponadto badania empiryczne pokazują, że innowacje technologiczne są pozytywnie powiązane ze zmianami jakościowymi na wewnętrznym rynku pracy.* **IMPLIKACJE:** *W artykule podkreślono potrzebę uczenia się przez całe życie, co stanowi grunt dla rozwoju oferty instytucji edukacyjnych. Menedżerowie najwyższego szczebla powinni identyfikować umiejętności, które ich pracownicy mają teraz a które powinni posiadać w przyszłości.* **ORYGINALNOŚĆ I WARTOŚĆ:** *W artykule przedstawiono został autorski model umożliwiającą przeprowadzenie analizy wzajemnych zależności między innowacjami technologicznymi a rynkiem pracy, który naukowcy mogą dalej rozwijać i wykorzystywać w kolejnych projektach badawczych. Autorzy przeprowa-*

dzili ponadto pionierskie badania, oparte na złożonych ramach, obejmujących różne rodzaje wpływów (od negatywnego przez neutralny do pozytywnego), traktujących rynek pracy i innowacje technologiczne względem siebie jako zmienne zależne lub niezależne, a także dwa typy rynku pracy.

Słowa kluczowe: rynek pracy, zatrudnienie, innowacje technologiczne, innowacje procesowe, wzajemne relacje, przemysł cukierniczy

Biographical notes

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Conflicts of interest

The authors declare no conflict of interest.

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Table of Contents

Transnational water resource management in the Karawanken/Karavanke UNESCO Global Geopark	7
Lilia Schmalzl, Gerald Hartmann, Michael Jungmeier, Darja Komar, Rahel M. Schomaker	
From transition management towards just transition and place-based governance. The case of Western Macedonia in Greece	37
Lefteris Topaloglou, Lefteris Ioannidis	
University students' entrepreneurial intentions during COVID-19: The perspective of social cognitive career theory	75
Suwaluck Uansa-ard, Wisuwat Wannamakok	
An innovative approach to support interests' alignment in the context of transport management using semantic differential	107
Nestor Shpak, Zoriana Dvulit, Liana Maznyk, Włodzimierz Sroka, Olha Podra, Nataliia Petryshyn	
Technological innovation and the labor market: The two-way non-reciprocal relationships with a focus on the confectionery industry in Poland	135
Katarzyna Piwowar-Sulej, Krzysztof Podsiadły	

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