

ARTICLES

CENTRAL EUROPEAN REVIEW OF ECONOMICS & FINANCE

Vol. 42. No 1 (2023) pp. 71-94

DOI <https://doi.org/10.24136/ceref.2023.005>

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POWER OF INNOVATION NETWORKS FOR THE ENERGY SECTOR AFTER COVID-19. A CASE STUDY OF THE ENTERPRISE EUROPE NETWORK

Abstract

Innovation networks such as the Enterprise Europe Network (EEN) are an important element supporting the development of small and medium enterprises (SMEs) from various economic sectors. Their operations focus mainly on organizing brokerage events, business mission conferences, etc. These events are to facilitate networking, learning about new industry trends, or exchanging experiences. The global COVID-19 pandemic has significantly curbed the effectiveness of innovation networks, forcing them to look for new forms of contact. Entrepreneurs from the energy industry who have so far actively participated in events organized by the EEN have also been affected. The article analyzes the impact of EEN pandemic on the activities of the EEN and its effectiveness, focusing mainly on the quantitative aspect of the impact of the crisis. In particular, it shows how the number of events organized, their structure and the effectiveness of EEN's activities have changed, which is reflected in the number of cooperation

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contracts between entrepreneurs participating in the events. The paper compares the impact of the pandemic on the organization of all types of promotional events for companies in the energy industry. Furthermore, based on a case study, the article discusses the problems faced by innovation networks during the pandemic and those faced by companies in the energy industry. The results of the study clearly show a decrease in the number of events organized by innovation networks in times of crisis, but the decrease in energy-related events is not as significant as in events related to other industries. At the same time, the effectiveness of organized events increased.

JEL classification: D22, O32

Keywords: impact of COVID-19 pandemic, innovation networks, energy promotion, EEN, efficiency

Paper type: Research article

1. Introduction

The concept of an innovation network has become a popular term for the structure of links between institutions and organizations. It is closely related to the conceptualizations of economics theories (Desmarchelier et al., 2021). In the available literature, researchers analyze in detail (Desmarchelier et al, 2020; Powell et al., 2005; Bergenholtz et al. 2011) national or regional networks of technological innovation run by commercial organizations that cooperate with public institutions (universities, research laboratories) supported by public administration. In their research, Möller and Halinen (2017) emphasized that the theory of industrial networks provides a broader picture of actors and their contribution to innovation. Research has also been carried out to understand how public-private cooperation contributes to business offering, based on research and development cooperation (Partanen et al. 2014). Other network researchers emphasize the role of nonbusiness actors in the final stage of innovation, i.e., in commercialization. Aarikka-Stenroos et al. (2017) stated that business partners outside the traditional supply chain facilitate the process of bringing innovation to the market and contribute to reducing the so-called "innovation resistance." The results of the research by Leite and Bengtson (2018) follow this trend, emphasizing that non-business actors are important primarily in social projects, because they can help companies gain public support and build trust and reputation.

Initiated in 2008, the Enterprise Europe Network (EEN) plays a special role in promoting innovation and popularizing technological cooperation. EEN aims, e.g. to improve the EU support services offered to enterprises

so that firms can access practical and effective solutions to their business needs through any contact organization (Ferraro, Iovanella, 2017). Thus, the Enterprise Europe Network offers a wide range of services to European SMEs. EEN provides entrepreneurs with the free use of support instruments in international cooperation, resulting in the finalization of technology transfer (Kotulewicz-Wisińska, Gródek-Szostak, 2021). The network centers are run by diverse organizations supporting economic development, e.g., chambers of commerce and industry, regional development agencies, business support centers and technology transfer centers (Gródek-Szostak et al., 2017). The main goal of EEN is to offer comprehensive services to SMEs to increase their potential and innovative capacity. Its services are standardized and provided by qualified consultants in accordance with the code of conduct. The structure of EEN services includes three main areas of business development support: international partnerships, international growth and expansion consulting, and business innovation support.

With the detection of the SARS-CoV-2 coronavirus in late 2019 (Zhu et al. 2019; Kuckertz et al. 2020; Kraus et al. 2020; Al-Awadhi et al. 2020) and subsequent development of the COVID-19 pandemic (JHCRC, 2020), societies, economies and global inter-organizational networks experienced an unprecedented exogenous shock (GDA, 2020). In addition to the humanitarian tragedy, the COVID-19 pandemic has also had an increasing impact on local economies and the global economy. Concerns regarding the unpredictable effects of COVID-19 have already had a significant impact on the world's largest economies, and many economists are now predicting a recession (GDA, 2020). A crisis such as the COVID-19 pandemic has threatened not only the operations and efficiency of individual enterprises, but also inter-organizational networks and connections (Boin, 2009; Comfort, 2002; Williams, Vorley, 2015). Turbulence in business could result from disrupted structures, procedures, and opportunities (Williams et al. 2017). The authors of crisis research offer diverse views on the impact of this on the business environment. Some of them, such as Filippetti and Archibugi (2011) claim that crises have a negative impact on the innovative activity of economic organizations. Brem et al. (2020), who explained how the 2008 financial crisis hampered new, dominant projects following innovation, were of a similar opinion, as were Dachs and Peters (2020), who proved that the crisis caused by the COVID-19 pandemic, like other crises, curbs innovation in organizations.

At the same time, a second group of researchers believes that crises have the potential of new challenges, i.e., meeting new needs with innovation (Archibugi et al., 2013). Furthermore, innovation developed by innovation networks becomes the main driving force behind the success of an organization, especially in the aftermath of economic crises

(Devece, 2016; Naidoo, 2010). The activities of innovation networks that correspond to the determinants of the external environment can significantly contribute to the reconstruction of the innovative and competitive potential of enterprises to mitigate the crises (Hausman, Johnston, 2014). In the COVID-19 crisis, it is important not only to protect the key activities that determine the company's value, but also its knowledge base, technological facilities or access to network resources promoting innovative solutions (Zouaghi et al., 2018).

The COVID-19 pandemic caused changes in the business environment, posing new challenges to enterprises. Thus, it changed their priorities and needs. In response to new challenges, such as broken supply chains, an urgent need to find new customers and new sources of financing, creating new business plans, as well as a sudden transition from office work to home office, the Enterprise Europe Network (EEN) has taken certain steps to support business.

The fact that researchers rarely analyze the activity of innovation networks, which in turn causes a significant publication gap in this area, motivated the authors to work on the manuscript. This could also be due to the lack of access to detailed data that describe the activities of specific innovation networks. In particular, the authors of this manuscript did not identify any studies on the analysis of the impact of the COVID-19 pandemic on the effectiveness of innovation networks. The analysis of EEN is particularly relevant, due to its contribution to the promotion of innovative technologies, especially renewable energy technologies and environmental responsibility. The network's promotional activities aim to increase the efficiency of the energy sector and the number of innovations in the energy sector by developing smart energy, as well as to reduce the level of pollutant emissions generated by electro-energy operators.

The COVID-19 pandemic severely affected the environment (Facciola et al., 2021), as reported by several authors, in different contexts, e.g., on the impact of plastic pollution during COVID-19 (Shams et al., 2021), and the impact of the COVID-19 crisis on the progress of Sustainable Development Goals (SDGs) (Fulzele et al., 2021). The research conducted by these authors showed that the pandemic has both negative as well as positive impact on the SDGs. Other authors such as Pirasteh-Anosheha et al. (2021) analyzed the negative impacts of a pandemic on the environment, society and economy, with an emphasis on COVID-19, and showed that haloculture is an essential system, accelerated in the agricultural sector by COVID-19.

However, there is a lack of research and publications on the impact of the COVID-19 pandemic on the effectiveness of innovation networks. Therefore, this aim of the article is to present the limitations and problems for the operation of innovation networks resulting from the outbreak of the

COVID-19 pandemic and to present how they dealt with the aftermath of the crisis. In particular, statistical data on the number and structure of events organized globally were presented, as exemplified by the EEN network, with particular emphasis on the changes resulting from the COVID-19 pandemic. The analyzes included events for all sectors, with a focus on and analysis of those related to the energy sector.

The structure of the article is as follows: the next section describes the methods and data used in the research. Additionally, research questions were formulated. Then, the results obtained were described and discussed. The last part, which contains conclusions, limitations, and recommendations, summarizes the article.

2. Materials and Methods

The analysis in question was carried out by using an empirical study of an innovation broker network, i.e. the Enterprise Europe Network (EEN). The Enterprise Europe Network helps enterprises to innovate and enter international markets. It is the world's largest support network for SMEs, which have ambitions to expand internationally. The network operates in over 60 countries around the world. It brings together 3,000 experts from over 600 member organizations who are renowned for their excellent business support (EEN, 2021).

The research was carried out in two stages. In the first stage, a statistical analysis of the number and type of events organized by the EEN was carried out. Statistical and visual analysis of the instruments that promote innovative technologies was carried out based on data obtained from EEN for the years 2016-2020. Their database of promotional events contains over 4,200 records, of which over 800 (i.e. approximately 20% events) was related to all types of energy. Each record contains detailed information on the organized events: the type of event, categorized as: brokerage event (BE), company mission (CE), conference/seminar/information day (C/S/ID), sector group meeting (SGM) and workshops (W) (35.Gródek-Szostak et al., 2020), place, form (on-site or remote), number of meetings as part of the event, and the number of cooperation projects launched.

In the second stage, the most important problems EEN faced during the COVID-19 crisis and methods of adapting the network's activities to the current situation were presented based on an interview with EEN employees and using the case study method (Yin, 2009). The article presents the following research questions:

Q1: The number of events organized by innovation networks has decreased significantly over the course of the epidemic, regardless of the location of the event. This decrease also applies to promotional events related to the promotion of energy technologies.

Q2: The structure of the events organized in 2020 has changed significantly compared to previous events both general events and those promoting energy technologies.

Q3: The average effectiveness of individual events increased, i.e., the average number of formalized partnerships per one meeting increased.

Q4: Online events have become an alternative to traditional events.

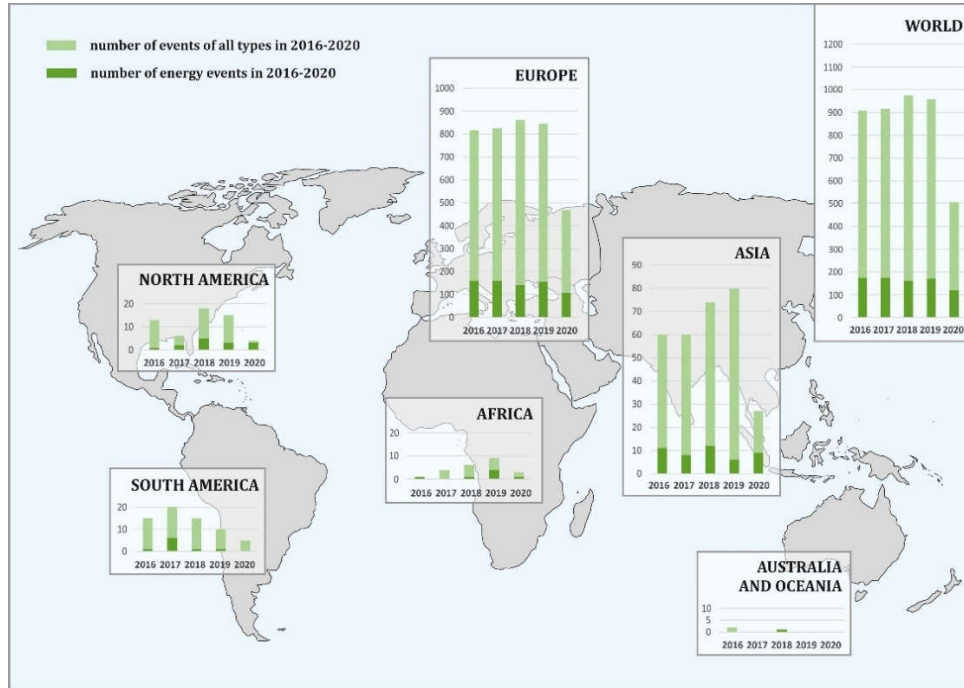
3. Results and Discussion

This part of the article presents the results of a two-stage research and analysis of the activities of the EEN network in 2020, i.e. in the period when the COVID-19 epidemic began. The first stage is a statistical analysis involving elements of graphical presentation, in which the changes that took place in the network's activities in 2020 were compared to the previous four years. The analysis included events related to all industries and highlighted those related to the energy industry. There was also a comparative analysis of changes in the global network activity and that sphere that concerned energy aspects. The second part presents conclusions from an interview with EEN employees who organize events and monitor all network activities related to supporting the SMEs associated with the network, especially those related to the energy industry.

The first element of the statistical analysis of the data and their graphical presentation was the analysis of the change in the number of events in selected years.

Figure 1 shows the number of events organized by the EEN in 2016-2020. Charts presenting changes in the annual number of events have been drawn up, both globally, and broken down by continent. In addition, the events during which the meetings were held were listed.

Figure 1. Change in the number of promotional events organized by EEN in 2016-2020 listing events related to the energy industry.

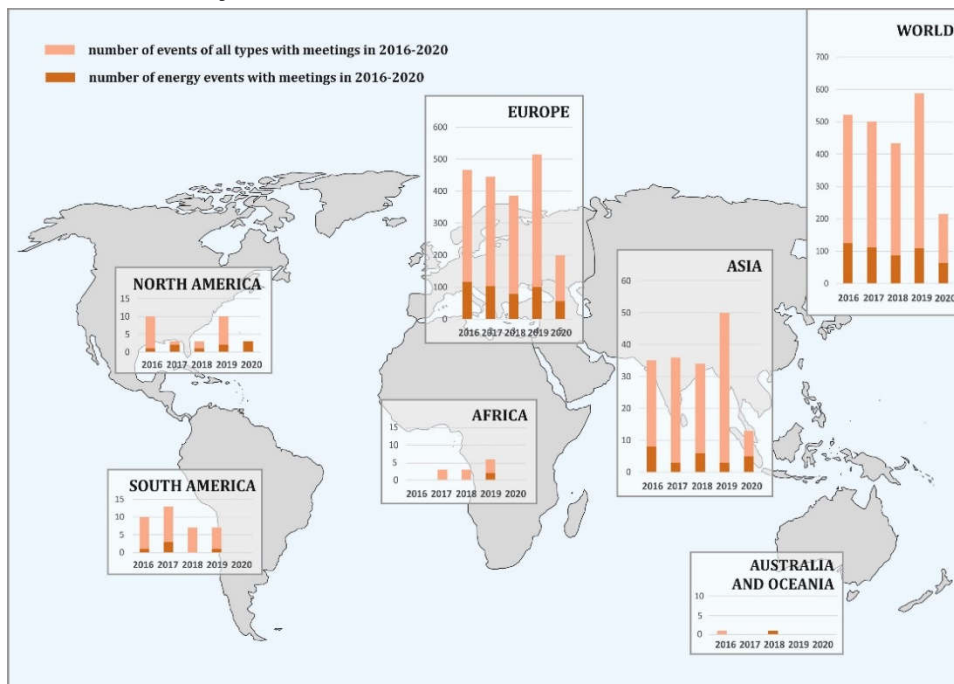


As observed, in the period under consideration, the vast majority of events were organized in Europe (an average of 90% of events a year). There are fewer of them in Asian countries (an average of 7% per year). Only a few to a dozen or so events took place on other continents each year. In 2016-2019, the differences in the annual number of events organized by the EEN network were slight, the average was 940. In 2020, i.e. during the COVID-19 pandemic, a sharp decrease in the number of events was recorded, clearly visible both in the chart relating to the world and in those presenting the number of events organized in Europe and Asia. In Europe, out of approximately 800 meetings on average organized annually in 2016-2019, there were just over 400 in 2020 (a decrease of nearly 50%). In Asia, on the other hand, the decline was relatively greater. Here, EEN organized approximately 80 events annually before the pandemic; in 2020, there were only 30 of them. In 2020, a total of 507 promotional events took place worldwide, which is only 54% of the average annual number of events in the previous four years.

The second part of Fig. 1 presents the dynamics of the change in the annual number of energy-related events compared to the annual change in the number of all events organized by the EEN between 2016 and 2020.

A clear decrease in the number of energy events in 2020 compared to previous years can be observed in the graph referring to the world and to Europe. As can be seen in the bar charts for the other continents, energy-related events outside Europe were sporadic and their annual number ranged from zero to no more than a dozen (depending on the year and the continent). Conclusions regarding the impact of the pandemic on the number of energy-related events should therefore be based primarily on data relating to the world as a whole, and to Europe. The number of all such events in 2020 was 120 which is 70% of the 2016-2019 average. In European countries, the number of such events in 2020 decreased by about 26% compared to the average of the previous four years (107 events in 2020 compared to an average of 145 events annually in previous years). These results, as well as the bar charts in the second part of Fig. 1 clearly show that although the number of energy industry events decreased significantly during the pandemic period, the decrease was not as strong as the overall decrease in the number of all EEN events.

Figure 2. Change in the number of promotional events (with meetings) organized by EEN in 2016-2020 listing events related to the energy industry.



Similar drops are visible in the charts showing the annual number of events with meetings in 2020. In 2016-2019, the number of such meetings worldwide ranged from 434 in 2018 to 588 in 2019 and represented an average of 55% of all events organized by ENN in a given year. However, in 2020 only 215 events took place, which was 42% of the total number. The vast majority of them were organized in Europe (199).

A comparison of the change in the annual number of events with meetings between all event types and those related to the energy industry is presented in Fig. 2. In 2020, there were 64 energy-related events with meetings (53% of the total). In the previous four years, the number averaged 109 (63%). Again, a significant decrease is evident in 2020. The bar charts in Fig. 2 show, however, that in energy-related events the trend is weaker than in the group of all events organized by the ENN. However, it is clearly visible only in the graphs relating to the world and to Europe, which is due to the fact that each year approximately 90% of the events took place in European countries.

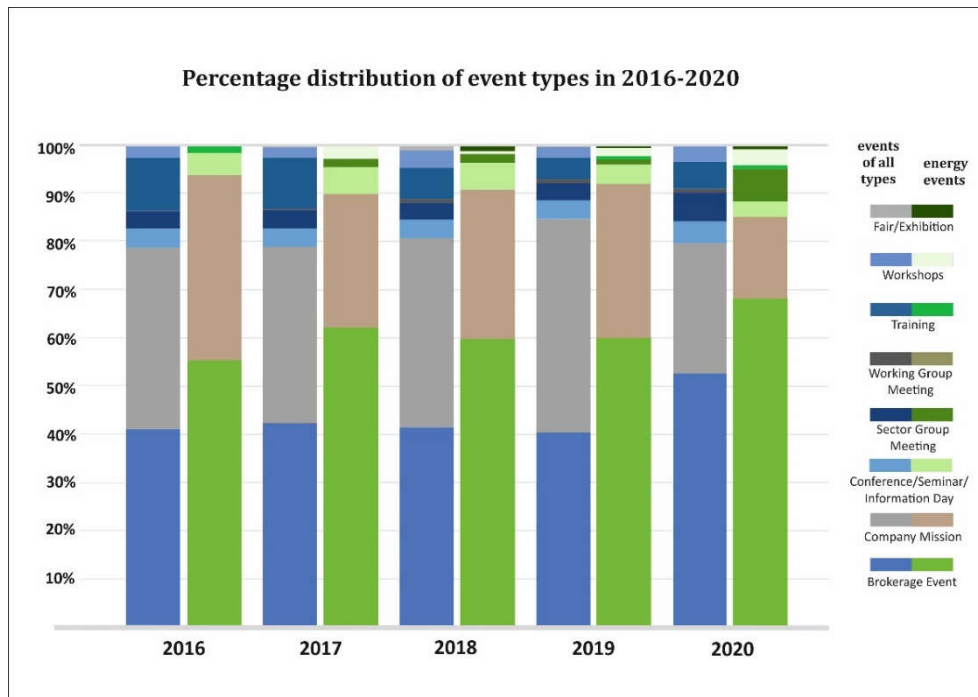
In summary, the data in Figures 1 and 2 clearly show that the outbreak of the COVID-19 pandemic contributed to a significant decrease in the number of events organized by the ENN network, and to a decrease in the percentage of events which included meetings. However, please note that the decrease in the number of energy-related events was relatively lower than in the total of all events. Thus, the answer to research question Q1 is partially confirmed positive.

As it turns out, the pandemic not only affected the number of events, but also slightly changed the structure of the types of these events worldwide. Fig. 3 presents the cumulative distribution of the types of promotional events organized by ENN in subsequent years, from 2016 to 2020, with a particular focus only on events organized for the energy industry. The charts show that in the years 2016 to 2019, the number of brokerage events (BE) and company missions (CM) was similar and each of them represented approximately 40% of all events. The year 2020 brought a slight change in this structure and this year the majority of events (i.e. over 50%) were BE, while CM accounted for approximately 28%.

Upon analyzing the graph depicting the structure of event types from the energy industry, we see that it differs from the structure observed for a total of events organized by the ENN. Each year, there was a clear predominance of brokerage events, and there were significantly fewer company missions. Other types of events were organized only occasionally. Nevertheless, also in this specified group a clear decrease in the percentage share of company missions in the total number of events is observable in 2020 (17% in 2020 against an average of 32% in 2016-2019) with a simultaneous increase in the share of brokerage events (from an average of 59% in the previous four years to 68%).

This change can result from the fact that the EEN has found new ways to connect companies. At the start of the crisis, network partners have set up helplines to support SMEs; most of the callers expressed concerns about liquidity and measures to limit job losses. EEN collected, updated and provided information on measures and/or regional, national, and European institutions supporting SMEs. Also, most of the events organized by EEN have been changed to the online formula, e.g., online customer meetings, or brokerage meetings. The network has launched a special so-called "fast track" of publication of technological profiles related to COVID-19, i.e. disinfectants, medications, masks, etc. These offers were promoted to the maximum in the network to find a partner as soon as possible and help combat the global pandemic. The above conclusions confirm the positive answer to question Q2.

Figure 3. Cumulative distribution of all events by type in 2016-2020.



Since every year most of the events organized by the EEN take place in the countries of Europe and Asia (cf. Figure 1 and 2), the impact of the COVID-19 pandemic on the number of events that took place in 2020 in individual countries of these two continents was examined in detail. For this purpose, the average annual number of events in a given country in 2016-2019 was compared with the number of events held there in 2020.

Individual countries in Europe have been divided into four groups. The first three are countries in which a decrease in the number of events was recorded, compared to the average for the previous four years by, respectively: less than 25%, from 25% to 50% and more than 50%. The last group includes countries in which the number of events in 2020 was greater than the 2016-2019 average. The results of the analysis are presented in Figures 3 and 4.

Figure 4. Map of changes in the number of all promotional events in individual European countries (2020 compared to the average for 2016-2019).



Figure 5. Map of changes in the number of energy promotional events in individual European countries (2020 compared to the average for 2016-2019).



As observed, in the vast majority of 46 European countries included in the study (cf. Fig. 4), in 2020 there was a decrease in the number of events compared to the average for the previous years. At the same time, 21 countries recorded a decrease of more than 50%. In 17 countries, including Poland, the reduction in the number of events ranges from 25% to 50%, and in five countries it did not exceed 25%. Figure 3 shows that only three European countries: Norway, Switzerland and Ukraine saw an increase in the number of events organized by the EEN in 2020 compared to the average of the previous four years. In generalizing the results of the analysis of the impact of the COVID-19 pandemic on the number of events organized in Europe, it should be stated that in most European countries the outbreak of the pandemic contributed to a significant reduction in the number of events in question. This result is understandable because 2020 was a time of widespread isolation, resulting both from the ubiquitous fear of disease and the lockdowns introduced in many countries. For many people, it forced a radical limitation of social contacts, also changing the way of working to home office-based. Thus, the EEN's possibility of organizing on-site events was severely limited in the first year of the

pandemic. In turn, the increase in the number of events compared to previous years in a few selected countries was the result of the fact that these events took place earlier that year, when there were no restrictions in Europe. Additionally, some of them were organized online.

Fig. 5, comparing the number of energy-related events with the average annual number of such events in a given European country in 2016-2019, differs significantly from the previous figure. It can be observed that in up to 13 of the 43 European countries considered (30%), the number of energy events in 2020 was not less than the 2016-2019 average. However, in the remaining countries, there was a decrease in the number of events in 2020 compared to the previous years' average, and in almost half of them (21 out of 43) it was greater than 50%. Upon juxtaposing Figs. 4 and 5, we can therefore conclude that the negative impact of the COVID-19 pandemic on the number of events organized by ENN in European countries is evident both overall and in the group of events related to the energy industry. Nevertheless, the impact is weaker than average for this particular group of events.

Therefore, this analysis largely confirms the positive response to Q1 regarding the decrease in the number of events not only globally but also locally, but this is true mainly for global events. For events related to the energy industry, the decrease is not so clear-cut, with a large variation for European countries. This fact can be associated with differences resulting from the policy of governments of individual countries in combatting the pandemics. The inability to organize promotional events on-site encouraged entrepreneurs to search for other forms of contact. One solution was to organize online meetings by the EEN. As shown in the graph in Table 1, while in 2016-2020 the percentage share of online events in the total number of events conducted by EEN was 0% in 2019, in 2020 it amounted to as much as 40%. It turned out that more than 200 online meetings were held in 2020. An even more pronounced increase in the demand for online events can be observed in the group of events related to the energy industry. While in 2017-2019 all events of this kind were held on-site, in 2020 as many as 59% of them (71 out of 120) were held online. These data clearly confirm the positive response to question Q4.

Table 1. Percentage share of online events in all events and energy events organized between 2016 and 2020.

	2016	2017	2018	2019	2020
all type of events	4%	3%	1%	0%	40%
energy events	2%	0%	0%	0%	59%

Source: own elaboration

The number of promotional events to be organized by the EEN is of course an important element that could affect the effective operation of the organization, as its main goal is to facilitate international technological cooperation of businesses. Reducing the number of events certainly hampers the achievement of this goal. However, the effectiveness of EEN's operation is demonstrated not only by the number of events organized but also by the number of cooperation projects initiated during these events. Table 2 contains information on the number of cooperation projects initiated during meetings in the years 2016-2020, broken down by continent and in total for the entire world, to verify whether the pandemic affected the initiation of cooperation by organizations participating in organized events.

Table 2. Number of cooperation projects initiated during meetings in 2016-2020 on individual continents (events related to the promotion of energy technologies are given in brackets).

	2016	2017	2018	2019	2020
Europe	16340 (4898)	15021 (4769)	9863 (2324)	15343 (3941)	9046 (2821)
Asia	843 (416)	1016 (29)	337 (37)	399 (121)	460 0
Africa	0 0	32 0	110 0	22 (11)	0 0
North America	134 (36)	92 (87)	98 (12)	224 (99)	24 (24)
South America	132 (71)	170 (81)	25 (0)	95 (25)	0 0
Australia and Oceania	0 (0)	0 (0)	11 (0)	0 (0)	0 (0)
TOTAL	17449 (5421)	16331 (4966)	10444 (2384)	16083 (4197)	9530 (2845)

Source: own elaboration

The table above shows that in 2020 the number of cooperation contracts decreased by approximately 40% -45% compared to 2019, 2017 and 2016. However, compared to 2018, this change is not so significant (a decrease of approximately 9%). The data in Table 1 show that the decrease in the total number of cooperation projects undertaken in 2020 was mainly due to the reduction in cooperation projects following the events organized in Europe (in 2019 there were approximately 1.5 times more of them than in 2020). In turn, in Asia, the number of cooperation projects undertaken in 2020 was higher than in the previous two years.

In the group of events related to the energy industry, in 2020 a decrease in the number of collaboration projects can be observed compared to 2016, 2017 and 2019 (by 48%, 43% and 32% respectively). Compared to 2018, however, an increase is visible (by 19%). This is due to a higher number of collaboration projects undertaken after events organized in European countries and in North American countries than in 2018. After five events with a nonzero number of meetings held in Asia, no collaboration projects were undertaken in 2020. Meanwhile, in previous years, just a few energy industry events held annually in Asian countries resulted in dozens to hundreds of collaboration projects.

However, based on the above data, no conclusions can be drawn with respect to the negative impact of COVID-19 on the operation of the EEN. In 2020, a sharp decrease in the total number of events organized by the EEN was observed, by approximately 50% (30% for energy sector events) compared to the four previous years (cf. analysis of Figure 1), which naturally resulted in a decrease in initiated cooperation projects.

Therefore, reliable information on the effectiveness of the organized events can only be established by analyzing the average number of cooperation projects initiated per one event. Such data, broken down by continents, are presented in Table 3. A significant drop in the efficiency of events in terms of initiated cooperation projects can be observed in events that took place in North America. No cooperation was initiated following the three events that took place in 2020 in African countries and the five events organized in South American countries. However, taking into account all events jointly, as well as considering separately the events in Europe and Asia (accounting for a total of approximately 97% of all events), it should be stated that in 2020 the efficiency, measured by the average number of cooperation projects undertaken per one event, increased significantly compared to previous years. When analyzing the events organized in Europe, it can be observed that this number amounted to approximately 45 in 2020, while in the previous years it ranged from less than 26 (in 2018) to approximately 35 (in 2016). An even greater increase is visible in the case of Asian events. The average number of cooperation projects initiated per event was approximately 35 in 2020 and was twice as high as the average for 2016-2020.

An analysis of the average number of collaboration projects per event dedicated to the energy industry shows that in 2020, the increase in effectiveness of this type of event was observed only for 56 events organized in Europe. The average number of collaboration projects was approximately 50 compared to an average of 39 in the previous four years. Interestingly, the other 8 events held in 2020 showed a decrease in the average number of collaboration projects. As already noted when discussing the data in Table 2, no collaboration projects were carried out

following the five events held in Asian countries. After the three events held in North America, the average number of collaboration projects was only 8, while the year before the two meetings on the continent had resulted in an average of approximately 50 projects. Energy-related events held outside of Europe should therefore be considered exceptions to the observed rule of increased effectiveness of events, as measured by the average number of collaboration projects in 2020 compared to previous years.

Such an increase in the effectiveness of the events could be related to the fact that access to events is more difficult. Not only is the number of events lower, but participation in an event taking place on-site carries the risk of contracting the virus. Therefore, this result can be interpreted as follows: people who decided to participate in an event organized by the EEN during the pandemic despite various difficulties were adequately motivated to do so. It can therefore be understood that they were much more interested in cooperation with the EEN than participants of the meetings organized in previous years. On the basis of the above discussion and analysis, it is clear that the answer to question Q3 is fully confirmed.

Table 3. Average number of cooperation projects initiated per event with at least one meeting (events related to the promotion of energy technologies are given in brackets).

	2016	2017	2018	2019	2020
		33.68	25.55	29.79	45.46
Europe	35.06 (42.22)	(45.86)	(29.42)	(40.33)	(50.38)
	24.09	28.22	9.91	7.98	35.38
Asia	(52.00)	(9.67)	(6.17)	(40.33)	-
	0.00	10.67	36.67	3.67	0.00
Africa	-	-	-	(5.50)	-
					8.00
North America	13.40	30.67	32.67	22.40	(8.00)
	(36.00)	(43.50)	(12.00)	(49.50)	
	13.20	13.08	3.57	13.57	0.00
South America	(71.00)	(27.00)	(0.00)	(25.00)	-
		0.00			
	0.00	-	11.00	0.00	0.00
Australia and Oceania	-		(11.00)	-	-
	33.43	32.60	24.06	27.35	44.33
TOTAL	(43.02)	(44.34)	(27.40)	(38.50)	(44.45)

Source: own elaboration

Meeting the current needs of the participants and customers of an innovation network is possible thanks to the flexibility that characterizes the Enterprise Europe Network project, in which rigid compliance to the previously scheduled events is not necessary. This allows for dynamic

adaptation of the offer to the needs and requirements of the market and the current economic situation. This also allows training, BEs, or information meetings to be organized when they are needed. This flexibility allowed the entire network to offer the SME sector a number of webinars and information meetings. It also allowed responding to the need for information and advisory services in terms of subsidies, the so-called 'anticrisis shields', as well as the business challenges of the COVID-19 pandemic last year.

The first need reported by EEN clients was related to the legal and organizational aspects of running a business on international markets. The centers of the network offered free expert consultation on legal and procedural issues that were to secure business or limit the negative effects of COVID-19. The network also enhanced its activities and developed a training offer in securing foreign markets and developing export in a crisis.

In the interviews, EEN employees as well as customers pointed to the solutions introduced during the pandemic:

1. *"Due to the specific needs of the medical market that emerged during the pandemic, the network launched an international platform for enterprises, healthcare providers and state institutions."* (EEN consultant).

Care & Industry together against CORONA offers targeted and effective contacts with all actors in the healthcare, industry, academia and government sectors. Interested parties can submit their offers, orders, and demand via an internet platform.

2. *"For me, a client of the EEN, a very important element of a trade fair is participation in brokerage meetings. The pandemic has significantly changed the market of fairs and exhibitions, and brokerage meetings have been moved into the online channel. I believe this is a very good solution because I can participate in a brokerage meeting and at the same time the online participation saves time and money, making access to the meetings easier."* (Entrepreneur).

Among the various ways of reaching foreign audience, brokerage meetings play a special role. Meetings are initiated during international industry events, both in Poland and abroad. Its participants have a unique opportunity for direct contact with potential business partners: not only presenting their offer, but identify their expectations and establishing lasting business relationships. Such meetings are often the beginning of a long-lasting and fruitful cooperation. The catalog of brokerage meetings is constantly updated and published on EEN websites.

3. *"I operate in international markets and the collision with the COVID -19 pandemic was a real shock for me as an entrepreneur, as well as for my business. Scheduled participation in fair and ongoing*

negotiations with technological partners and all the efforts made over the years were jeopardized. The support of the EEN network allowed me to find solutions to a seemingly unsolvable situation. During the COVID-19 pandemic, I chose to work with various business partners from geographically different markets." (Entrepreneur).

Establishing cooperation with other external partners, including business customers and competitors, has allowed SMEs to create an effective process to create innovation, which positively impacts coping with the effects of the COVID-19 crisis. This quick response to market and business environment changes was possible due to the high flexibility of SMEs, due to their simple structures and small sizes (Bigliardi, Galati 2016; Koporcic, Törnroos 2019).

Many companies during the COVID-19 pandemic switched to remote work in a wide variety of areas. This is confirmed by the statements of our respondents below. The first area mentioned is the change in meeting mode from onsite to online.

1. *The crisis has cut down on unnecessary travel; many company meetings that used to be held on-site have been replaced by online meetings.* (Entrepreneur 1)
2. *We handled the crisis very well because we had already worked on the on-line system (i.e. the meetings and training platform). In our case, the crisis accelerated the implementation of these solutions.* (Entrepreneur 2)
3. *This crisis revealed new solutions; for example, we started organizing online meetings.* (Entrepreneur 3)

The second area implemented in the online paradigm is remote work.

4. *If someone had people at risk at home, we tried to organize their work in such a way that they could work on-line (although it was not easy because we are a service company)* (Entrepreneur 4)
5. *We organized online work for our office staff* (Entrepreneur 5)

The third area implemented in the online paradigm is training.

6. *In the midst of the crisis, we included on-line training in our offer. We have built an entire system to support on-line training* (Entrepreneur 6)
7. *We have tried online training.* (Entrepreneur 1)

The fourth area is related to changing the business model.

8. *The crisis changed our sales model. Online sales were twice as high as the previous year.* (Entrepreneur 7)
9. *We switched the company to online in 5 days; it required our trainers and clients to undergo a drastic change. This change saved us, as it slowed down the decrease in number of orders.* (Entrepreneur 6)

10. *We introduced a virtual showroom, in which a salesperson can tour the customer online.* (Entrepreneur 5)
11. *We have gone online when it comes to administration and management.* (Entrepreneur 7)

As can be seen from the above examples, remote work yielded environmental benefits, such as less environmental pollution due to lower fuel consumption and decreased traffic in cities, as well as time savings for commuters. For entrepreneurs, it has reduced business costs associated with renting office space and parking, but has not contributed to overall lower energy consumption. Home-office work increased household energy consumption. Employees often appealed to their employers for a remote work allowance to compensate for the additional power costs incurred. As a result, employer cost increased costs.

In conclusion, the crisis caused by the COVID-19 pandemic positively impacted a number of environmental issues mentioned, but had no impact on the economic situation of companies in the energy sector in the operational perspective. On the other hand, when considering the impact of COVID-19 in strategic terms, it can be presumed that the decrease in the number of meetings in which energy market stakeholders could discuss plans for the development of the sector could have a negative impact on the development of energy companies in the future.

Based on the research results conducted and presented, it can be concluded that the network coped perfectly with the increase in online activities at the expense of on-site activities. The form of online meetings was appealing and attracted the interest of companies which held business meetings online, in private online „rooms”, and discussed the potential cooperation. The effectiveness of online meetings was similar to that of on-site meetings. Now the EEN is slowly returning to face-to-face meetings. At the moment the hybrid form is proposed, i.e. participation in on-site fairs and at the same time connecting with the participants online.

4. Conclusions

The COVID-19 pandemic and numerous restrictions in economies around the world have created a unique situation that has no documented equivalent in the literature on entrepreneurship and innovation networks. However, the literature review provided a series of studies on entrepreneurship, networking, and crisis management (Williams, Vorley 2015; 41. Williams et al., 2017) that present two research currents. The first of them can be called crisis management in the organization. It relates to the response of companies to the crisis. and much of the research concerns resilience (Doern, 2016). The second current suggests what policies can support an organization's survival during a crisis (Barreiro-Gen 2020) and identifies

the barriers. It can support policymakers in developing appropriate intervention tools.

Unfortunately, preparation is needed to deal with the crisis well, and few innovation networks (Al Omoush, 2020) were prepared for a crisis the size of the COVID-19 pandemic. The limited amount of research available on entrepreneurial resilience, innovation networks and crises focuses mainly on the precrisis period and on the skills or re-sources that entrepreneurs and organizations accumulate to resist or adapt to crisis events. In general, the character of innovation networks should enable them to be better prepared to deal with the COVID-19 crisis than other organizations. Being a member of an innovation network is a prerequisite for resilience, as innovative actors tend to constantly anticipate and adapt to a wide range of crises. However, innovation organizations and networks are not always aware of the real threat posed by a potential crisis event.

In a turbulent environment, contemporary organizations and interorganizational networks need to monitor trends and skillfully use digital opportunities. Al Omoush (2020) lists the level of proactivity of the top management as one of the main organizational resources that support the role of online business in creating the organization's future survival strategy. Quickly grasping opportunities, spotting obstacles, organizing resources and creating innovation is a powerful engine of organizational resilience in a dynamic environment

COVID-19 has shown that the flexibility of innovation networks, and their ability to quickly implement IT solutions, is an effective approach to support the technological development of SMEs to generate appropriate innovations to overcome the negative effects of the pandemic. In the third decade of the 21st century, the world has faced an unprecedented situation that requires additional analysis and efforts in all areas of innovative activity of the EEN.

Furthermore, during the pandemic crisis, EEN has reinforced the collaborative mindset of SMEs, triggered by a "common cause" that relates to technological development. Maciel and Fischer (2020) argue that it is the "common cause" that usually drives a collaborative mindset. In the literature on the subject, there is a lot of evidence showing the response of organizations to critical crisis situations (Alesi, 2008). This article contributed to a comprehensive and evidence-based analysis of the actual responses of a business network in the face of a pandemic. Please note that the COVID-19 pandemic has encouraged a new look at business networks and management to foster survival in the turbulent conditions of the epidemic (Kraus et al., 2020). What is more, the cross-network, innovative business cooperation has great potential for its participants to face the challenges resulting from the global pandemic.

In conclusion, it can be stated that the analyses conducted in this paper based on statistical studies of the number and effectiveness of meetings, as well as interviews with EEN network staff and participants, have partially confirmed the initial assumptions contained in the research question. First, the COVID-19 pandemic had a significant impact on innovation network activities in general (for events related to all sectors and industries). This impact was confirmed mainly by the drastic changes in the number of events organized by these networks. However, the analysis of the number of events dedicated to the energy industry does not provide such clear results anymore. Although globally there was a noticeable decrease in the number of events, it was not as drastic as in the overall picture. In particular, there is a large disparity in this respect for individual countries. This demonstrates the strong determination of players in the energy industry and the fact that this industry is crucial for many economies. In turn, the results of efficiency studies show a greater awareness and involvement of participants in promotional events in general for all industries as well as for the energy sector.

The main limitation of our research is the fact that the analyzed data relate only to one innovation network, the EEN. The analysis also lacks data on the types and effectiveness of EEN's activities in 2021. These data would allow us to determine how the network dealt with the crisis in the long run. For this purpose, research work has been planned, to include the analysis of EEN's effectiveness when data for the year 2021 are collected.

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