




## EXPLORING THE SYNERGY OF TECHNICAL AND SOCIAL SCIENCES: AN OVERVIEW OF PROFESSOR JOANICJUSZ NAZARKO'S 45-YEAR SCIENTIFIC JOURNEY

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**Abstract.** This article presents Professor Joanicjusz Nazarko's outstanding achievements in research, scientific cooperation, teaching and organizational work, in celebration of the 45<sup>th</sup> jubilee of his scientific work. Over the years, Professor Nazarko has contributed significantly to the development of technical and social sciences in Poland. He authored more than 300 publications, which constitutes a substantial knowledge base on its own. Using bibliometric and statistical methods and techniques, we present an overview of Professor's most important scientific achievements and major works. We also highlight his efforts to establish a national and international network for scientific cooperation. Lastly, we present his didactic successes. This jubilee serves as the opportunity to recognize and honour Professor Joanicjusz Nazarko's significant contribution to the development of science in Poland.

**Keywords:** scientific work, scientific cooperation, higher education, electrical engineering, forecasting, benchmarking, productivity analysis, foresight, logistics and supply chain management.

**JEL Classification:** I23, O39, A29.

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## 1. Introduction

2023 marks the 45th year of Professor Joanicjusz Nazarko's scientific work. This jubilee serves as an opportunity to present Professor's achievements in scientific and educational work and highlight his efforts in developing Białystok University of Technology, his home university, as an important research and education center.

Professor Joanicjusz Nazarko pursued his scientific career in fields of technical sciences (currently referred to in Poland as engineering and technology) and economic sciences (currently considered a discipline within the field of social sciences). He is the only Polish scientist to have been awarded the title of professor by the President of the Republic of Poland in two fields of science, which is reflected in his significant scientific output. Over the course of 45 years, Professor has authored or edited more than 300 scientific publications of all sorts (i.e., articles, chapters, monographs, conference presentations and proceedings, speeches and panel discussions). He cooperated with scientists from more than 100 Polish and foreign

universities and other institutions; he participated in more than 50 projects and grants of national and international reach. Such an extensive scale of scientific output justifies, in our opinion, using bibliometric and statistical methods and techniques – and, thus, treating this output as an object of study – in order to present Professor's most important achievements.

The rest of the article is structured as follows: the next section presents a brief overview of Professor Joanicjusz Nazarko's scientific career over 45 years of his work. Next, a review of Professor's research achievements is presented using the bibliometric analysis techniques such as performance analysis, clustering, and visualization (Donthu et al., 2021). The subsequent section contains information and statistics on Professor's domestic and international cooperation on written publications, presentations, speeches and panel discussions, and projects and grants. Finally, Professor's achievements in scientific supervision, teaching and popularization of science are presented and followed by conclusions.

## **2. The scientific career of Professor Joanicjusz Nazarko**

Professor Joanicjusz Nazarko obtained his first degrees at the Faculty of Electrical Engineering at the Warsaw University of Technology. In 1978, he earned a master's degree in engineering with a specialization in electrical power engineering. In 1983, he completed his doctorate in technical sciences in the field of electrical engineering, and in 1992, he was awarded a postdoctoral degree in engineering sciences with a focus on automation, electronics, and electrical engineering. In 1998, by the order of the President of the Republic of Poland, he was granted the title of professor of technical sciences, and in 2015, he was honored with the title of professor of economic sciences.

Throughout his career, Professor Nazarko has been closely associated with Bialystok University of Technology. He held the position of the university's rector from 2005 to 2008 and served as the dean of the Faculty of Management during the terms of 2002–2005 and 2008–2016. Presently, he holds the position of a professor at the Faculty of Engineering Management, where he lectures on the implementation of research and development work and conducts scientific seminars for students and doctoral students. Additionally, he serves as the chairman of the Scientific Council of the Faculty of Engineering Management. He also holds an associate professorship at the Université du Québec in Trois-Rivières, Canada, and an honorary professorship at Zhejiang University Ningbo Institute of Technology in Ningbo, China.

Professor Nazarko has authored or co-authored more than 300 scientific publications, many of which have found their place in prestigious scientific journals. He has also presented the outcomes of his research at numerous national and international scientific conferences. He has played a pivotal role as the principal investigator in numerous research projects, which received funding from Polish institutions such as National Science Centre and National Centre for Research and Development, as well as international bodies, including the European Commission. His commitment to advancing his knowledge led to him being awarded various scientific scholarships that facilitated his studies and participation in specialized courses abroad, including scholarships under TEMPUS, IREX, or Erasmus programs. Furthermore, Professor Nazarko's dedication to academic excellence has seen him undertake research internships at several esteemed institutions worldwide.

Professor Nazarko is a member of numerous scientific organizations and associations. He serves as a member of the Committee on Production Engineering of the Polish Academy of Sciences. He is the Chairman of both the International Society for Manufacturing, Service, and Management Engineering and the Polish Branch of IEEE Technology and Engineering.

Additionally, from 2004 to 2015 he was the Chairman of the Podlasie branch of the Polish Production Management Association and served as an President of the Association of Engineering Project and Production Management from 2018 to 2020. Besides his organizational roles, he actively contributes to the academic community by serving on the editorial boards of several esteemed scientific journals, including, among others, *Technological and Economic Development of Economy*, *Management and Production Engineering Review*, or *Engineering Management in Production and Services*. Furthermore, between 2016 and 2020, he served as a member of the Council of the National Center for Research and Development, and since 2020 he has been serving as a member of the Steering Committee of the GOSPOSTRATEG strategic research and development program led by the National Center for Research and Development. He has been acting as an advisor in these entities, offering his expertise and playing a key role in evaluating research proposals and setting research priorities.

Professor Nazarko received numerous awards for his outstanding scientific, teaching and organizational achievements. He was awarded, among others, the Silver Badge of Honor of the SEP (1994), the Medal of the Commission of National Education (1995), the Gold Cross of Merit (2001), the Gold Badge of the Council of Polish Engineers in North America (2007), individual award of the first degree from the Minister of Science and Higher Education for organizational achievements (2007, 2008), the Knight's Cross of the Order of Polonia Restituta (2019), the SEP medal of Prof. Stanislaw Frize (2019), and numerous awards from the Rector of the Bialystok University of Technology.

### 3. Scientific work and accomplishments

Professor Nazarko has a rich record of scientific and research activities. This section presents information on Professor's publication activities, with a focus on the main research directions throughout his 45-year scientific path. Table 1 presents a numerical summary of published works, including authored and co-authored works.

**Table 1.** Summary of published scientific publications

Type of publication	Authored	Co-authored	Total
Books	4	27	31
Book chapters	1	38	39
Journal articles	5	75	80
Conference papers	10	86	96
Abstracts, speeches and communications	24	53	77
Total	44	279	323

Overall, Professor Nazarko's scientific contribution includes authorship or editorship of 31 monographs. He has authored regarded academic textbooks on forecasting (Nazarko, 2022, 2018, 2005, 2004b, 2004c) and has also served as the editor of several monographs on management and production engineering (Kowalczewski & Nazarko, 2006; Nazarko & Kiełtyka, 2008). He has authored or co-authored 39 chapters in collective publications, 80 scientific articles and 77 abstracts, speeches or communications. He has published in reputable scientific journals, for example *IEEE Transactions on Power Delivery* (Broadwater et al., 1997), *IEEE Transactions on Power Systems* (Sargent et al., 1994), *IEEE Transactions on*

*Engineering Management* (Nazarko et al., 2022b), *IEEE Sensors Journal* (Gao et al., 2021), *Foresight and STI Governance* (Ejdys et al., 2019), *Progress in Planning* (Bokun & Nazarko, 2023), and *Technological and Economic Development of Economy* (Chodakowska & Nazarko, 2020b; Nazarko & Kononiuk, 2013). Many of his works are indexed in prestigious scientific databases such as Web of Science and Scopus. Table 2 shows the most cited publications according to Web of Science and Scopus.

**Table 2.** Most frequently cited articles co-authored by Professor Joanicjusz Nazarko according to Web of Science and Scopus databases

No	Title	Citation count		Authors
		WoS	Scopus	
1.	Application of DEA method in efficiency evaluation of public higher education institutions	96	102	Nazarko and Šaparauskas (2014)
2.	The fuzzy regression approach to peak load estimation in power distribution systems	71	86	Nazarko and Zalewski (1999)
3.	Estimating substation peaks from load research data	48	57	Broadwater et al. (1997)
4.	Estimation of diversity and kWHR-to-peak-kW factors from load research data	45	55	Sargent et al. (1994)
5.	Future trends in road pavement technologies development in the context of environmental protection	31	38	Radziszewski et al. (2016)

Among the most cited publications are those in electric engineering (Nazarko & Zalewski, 1999; Broadwater et al., 1997; Sargent et al., 1994) foresight (Radziszewski et al., 2016), and benchmarking and productivity analysis (Nazarko & Šaparauskas, 2014). The most cited publication is the article "Application of DEA method in efficiency evaluation of public higher education institutions" published in 2014 in *Technological and Economic Development of Economy* (Nazarko & Šaparauskas, 2014). It was followed by the article "The fuzzy regression approach to peak load estimation in power distribution systems" published in *IEEE Transactions on Power Systems* (Nazarko & Zalewski, 1999) and "Estimating substation peaks from load research data" published in *IEEE Transactions On Power Delivery* (Broadwater et al., 1997), respectively.

Throughout his 45-year research career, Professor has conducted research in many areas. In order to present the main research directions, a keyword analysis of his publications was conducted. This included books, book chapters, articles, and conference papers. The final set contained 246 publications, including 116 publications in English, 123 publications in Polish and 7 publications in Russian. For non-English publications, the keywords indicated by the author(s) were translated into English. If no keywords were indicated, they were completed based on the publication title or abstract.

Graphical visualization of keyword links was prepared using the VOSviewer software. The file containing the keywords was exported to text format and loaded into the program. The list of keywords contained 479 words. In these case, the largest set of connected items



End of Table 3

Thematic areas	Thematic subareas	Examples of publications
Benchmarking and productivity analysis	Benchmarking in higher education institutions	Nazarko et al. (2009), Nazarko and Kuźmicz (2013), Nazarko and Šaparauskas (2014)
	Benchmarking in the corporate sector	Nazarko (2004a), Nazarko et al. (2007)
	Applications of the DEA method	Nazarko and Chodakowska (2015), Chodakowska and Nazarko (2016), Nazarko and Chodakowska (2017), Chodakowska and Nazarko (2017), Nazarko et al. (2022a)
Foresight	Theoretical basis of foresight studies	Nazarko (2013a), Kononiuk and Nazarko (2014)
	Regional economic foresight	Szum and Nazarko (2020), Nazarko (2013b, 2013d)
	Technology foresight	Nazarko et al. (2015a, 2015b), Radziszewski et al. (2016), Nazarko et al. (2017b, 2017c, 2022b)
	Sectoral foresight	Nazarko et al. (2013), Ejdyś et al. (2015), Radziszewski (2016)
Logistics and supply chain management	Supply chain management	Szymczak et al. (2018), Leończuk et al. (2019), Ryciuk and Nazarko (2020)
	Projects and initiatives in logistics	Nazarko and Urban (2010), Nazarko et al. (2016, 2017a), Nazarko and Kuźmicz (2017), Wilczewska et al. (2022)

Keyword analysis allowed us to identify five main thematic areas: electrical engineering, forecasting, benchmarking, foresight, and logistics and supply chain management. It should be noted that Professor Nazarko's research interests have evolved over the years. Initially, his research focused on the field of technical sciences, with a particular emphasis on electrical engineering. Before obtaining his doctorate in 1983, he worked on fault localization in electric power distribution networks (Nazarko, 1983). This period of research culminated in the conferment of his doctoral degree by the Council of the Electrical Faculty of the Warsaw University of Technology in 1983. Subsequently, Professor Nazarko directed his efforts towards the static and dynamic estimation of operating states in electric power grids, making significant contributions to the development of the theoretical foundations in this field (Charytoniuk & Nazarko, 1992; Nazarko & Zalewski, 1996; Nazarko, 1993).

After receiving his postdoctoral degree in 1992, he focused on electricity demand management (Nazarko & Jurczuk, 1996b). Several of his papers from this period address the use of computerized solutions in the energy industry (Nazarko & Truszkowski, 1985). He also conducted research using modern research methods in the electric power industry, including statistics (Nazarko & Zalewski, 1996), probabilistic (Nazarko et al., 1995), and neural networks (Nazarko & Styczynski, 1999). His impactful scientific articles in electrical engineering found their place in well-known international scientific journals: *IEEE Transactions on Power Systems* (Sargent et al., 1994) and *IEEE Transactions on Power Delivery* (Broadwater et al., 1997).

During that period, Professor Nazarko had already published numerous works that skillfully integrated both technical and economic aspects (Nazarko & Jurczuk, 1996a). His particular area of expertise lay in the field of forecasting, where he authored several academic

textbooks. These textbooks delved into the practical application of forecasting methods in the realm of business management, encompassing topics such as time series analysis (Nazarko, 2004c), adaptive models (Nazarko, 2005), trend models (Nazarko, 2018), and ARIMA models (Nazarko, 2022). In addition to his written contributions, Professor Nazarko explored the versatile application of ARIMA models across various domains, including their utilization in predicting sales (Chraślowska & Nazarko, 2004), electrical load (Nazarko et al., 2005; Chodakowska et al., 2021), and solar radiation (Chodakowska et al., 2023).

A clear reorientation toward economic sciences occurred after he was awarded the title of professor of technical sciences in 1998. Keyword analysis allowed us to identify three more research directions: benchmarking, foresight, and logistics and supply chain management. In case of the first area, Professor Nazarko has been involved in analyzing the productivity of corporate sector units and public sector institutions. He conducted research on the use of benchmarking to assess the productivity of entrepreneurial ventures (Nazarko, 2004a; Nazarko et al., 2007) and he contributed to the development and practical implementation of the idea of benchmarking for the evaluation of higher education institutions (Nazarko et al., 2009; Nazarko & Kuźmicz, 2013). He has also pioneered the use of Data Envelopment Analysis in assessing productivity of public sector organizations and units (Nazarko & Šaparauskas, 2014). He has made significant contributions to both the development of theoretical foundations and the practical implementation of these concepts.

Professor Nazarko has a substantial academic record in the field of foresight, evidenced by numerous publications in books and articles in recognized Polish and foreign journals. He has conducted cognitive and implication research to develop the theoretical foundations of foresight, including the enhancement of foresight methods such as extended SWOT analysis (Szum & Nazarko, 2020), STEEPVL analysis (Nazarko & Kuźmicz, 2017), and structural analysis (Nazarko et al., 2017c). He is also a co-developer of a scenario construction methodology (Kononiuk & Nazarko, 2014; Nazarko, 2013a). Professor's primary interests lie in three types of foresight: technological foresight (Radziszewski et al., 2016), regional foresight (Nazarko, 2013b), and sectoral foresight (Nazarko et al., 2013). Many of his publications in this area stem from ongoing foresight projects like NT for Podlaskie or foresight survey conducted as part of the project "Mazovian Economic Information Center". His research findings from these projects have been disseminated through numerous publications, demonstrating the broader academic and practical impact of his work (Nazarko et al., 2022b; Nazarko, 2013b).

The last thematic domain identified is logistics and supply chain management. Within this area, two distinct research sub-areas have been delineated: supply chain management and logistics projects and initiatives. Within the first sub-area, Professor has conducted research on identifying factors that influence the establishment of trust-based cooperation in the supply chain (Rygiel & Nazarko, 2020) and on issues related to information management within supply chains (Szymczak et al., 2018). He has also explored the measurement of adaptive supply chain performance (Leończuk et al., 2019). The domain of logistics projects and initiatives encompasses a wide spectrum of research topics related to the planning, execution, and optimization of logistics projects. His work not only addresses the theoretical aspects but also provides practical insights that can be applied to enhance the efficiency and effectiveness of logistics projects such as New Silk Road or Rail Baltica. He has investigated the potential of initiatives (Nazarko et al., 2016), countries' capacity to participate (Nazarko et al., 2017a), factors influencing initiative development (Nazarko & Kuźmicz, 2017), and their impact on participating regions (Wilczewska et al., 2022).



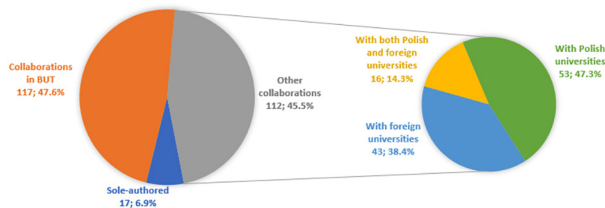
In addition to his extensive contributions in the fields of electrical engineering, forecasting, benchmarking, foresight, and logistics, Professor Nazarko also explores emerging research directions, including computational intelligence (Gao et al., 2021, 2022; Orłowski et al., 2017), development measurement (Ginevičius et al., 2021), and intelligent concepts of rural development (Bokun & Nazarko, 2023).

#### 4. Domestic and international cooperation

During his 45 years of scientific work, Professor Joanicjusz Nazarko has worked with many scientists from Poland and abroad. This section presents information about Professor's activities and collaborations in the area of written publications, presentations, speeches and panel discussions, and projects and grants.

#### 5. Written publications

Out of his 246 written publications (i.e., monographs, chapters, articles and conference papers, both written and edited), Professor Joanicjusz Nazarko was sole writer or sole editor of 17 works. On 117 other works he collaborated with colleagues from Bialystok University of Technology (BUT). The remaining 112 works were Professor's collaborations with scientist from other Polish and foreign universities. Figure 2 presents the detailed overview of Professor's publications.



Note: 12 works that Professor both authored and edited were included once, based on aggregated information.

**Figure 2.** Scientific collaborations of Professor Joanicjusz Nazarko – written publications

Sole-authored and sole-edited publications (e.g., Nazarko, 2011) accounted for around 7% of Professor's written work. Other 93% were the result of scientific collaborations, in almost equal parts at BUT (47.6%) and outside of Professor's home university (45.5%). At BUT, in the vast majority of instances he collaborated with scientists from two faculties: Faculty of Electrical Engineering and Faculty of Engineering Management. He engaged in different types of works, including leading multi-departmental teams in conducting large-scale research (Nazarko, 2013d), compiling thematic papers focused on the development of a particular field (Nazarko & Ejdy, 2011; Kowalczewski & Nazarko, 2006), creating academic textbooks (Nazarko, 2022, 2018, 2005, 2004b, 2004c), or working with young researchers and supporting them in embarking on their publication work (Bokun & Nazarko, 2023; Wilczewska et al., 2022; Nazarko et al., 2009). During his 45 years of scientific work, Professor Joanicjusz Nazarko collaborated with 61 colleagues from BUT on written publications.

Regarding Professor's scientific collaborations outside of BUT, almost half of the instances (47.3%) accounted for his work with scientists from other Polish universities; Polish universities were also accounted for in joint research teams from both Polish and foreign universities (14.3%). Table 4 presents the five Polish universities with which Professor collaborated most frequently on his written publications.



**Table 4.** Polish universities that Professor Joanicjusz Nazarko most frequently collaborated with

No.	University	No. of collaborations
1	Warsaw University of Technology, Warsaw, Poland	23
2	Czestochowa University of Technology, Czestochowa, Poland	8
	University of Bialystok, Bialystok, Poland	8
	Wroclaw University of Economics and Business, Wroclaw, Poland	8
3	Poznan University of Economics and Business, Poznan, Poland	5

Among the universities listed in Table 4, the most frequently represented in Professor's work was Warsaw University of Technology (WUT), which is Poland's leading technical university. Professor's scientific collaborations with scientists from WUT included, among others, conducting research in cooperation between BUT and WUT (Radziszewski et al., 2016), as well as BUT and WUT's joint participation in international research teams (Nazarko et al., 2015b; Kujaszczyk et al., 1993).

Professor's scientific collaborations with foreign and with both foreign and Polish universities accounted for, respectively, 38.4% and 14.3% of his work outside of BUT. Table 5 presents the six universities outside of Poland with which Professor collaborated most frequently on his written publications.

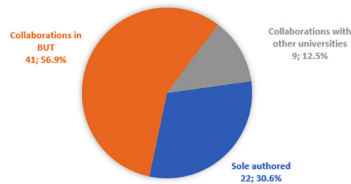
**Table 5.** Foreign universities that Professor Joanicjusz Nazarko most frequently collaborated with

No.	University	No. of collaborations
1	University of Stuttgart, Stuttgart, Germany	8
2	Vilnius Gediminas Technical University, Vilnius, Lithuania	7
	Virginia Polytechnic Institute and State University, Blacksburg, USA	7
3	Ulster University, Coleraine, UK	6
	Université du Québec à Trois-Rivières, Trois-Rivieres, Canada	6

Out of foreign universities that Professor Joanicjusz Nazarko had the opportunity to work with, he most often conducted research with scientists from University of Stuttgart in Germany. In collaboration with scientists from Stuttgart he engaged in projects of international reach (Feser et al., 1998) as well as conducted smaller-scale research (Nazarko et al., 1999a). The majority of this research was within the engineering and technology field, similarly to Professor's work with scientists from Virginia Polytechnic Institute and State University in Blacksburg, USA (Broadwater et al., 1997) or Ulster University in Coleraine, UK (Nazarko et al., 1995). In contrast, most of the research projects carried out with colleagues from Vilnius Gediminas Technical University in Lithuania was related to the social sciences field (Ginevičius et al., 2021; Nazarko & Šaparauskas, 2014; Ginevičius et al., 2023).

## 6. Presentations, speeches and panel discussions

Apart from written publications, Professor Joanicjusz Nazarko has also delivered 72 talks in different forms, such as presentations at scientific and business conferences, speeches at professional events, or participation in panel discussions. Figure 3 presents the detailed overview of Professor's talks.

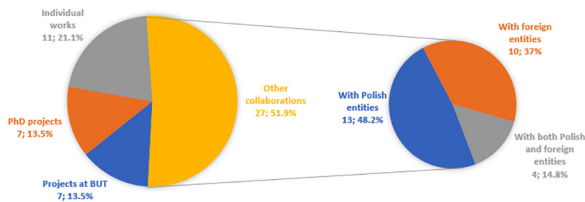


**Figure 3.** Scientific collaborations of Professor Joanicjusz Nazarko – presentations and other addresses

Professor delivered 22 talks as a sole author, during which he, for example, represented his faculty and university in discussions about the advancement of research in Poland (Nazarko, 2015, 2016a), addressed the issues related to the regional development of his home region (Nazarko, 2013c, 2012), or presented the results of large-scale research projects led by him (Nazarko, 2013d). At 41 occasions, he presented results of the research projects carried out within BUT (Nazarko & El-Saadawi, 2002; Nazarko, 2000). He also delivered 9 presentations on the behalf of research teams comprising scientists from BUT and other universities (Nazarko et al., 2015a). While approximately half of Professor's talks was delivered in Poland (38; 51.4%), the other part (34; 48.6%) took place in 16 other countries, including Australia, China, Germany, Jordan, Korea, Lithuania, or South Africa.

## 7. Projects and grants

Professor Joanicjusz Nazarko has been involved in more than 50 projects and grants of various reach: carried out in cooperation with international partners, carried out at BUT, PhD candidates' dissertation projects, or individual and statutory works. Figure 4 presents the detailed overview of Professor's publications.



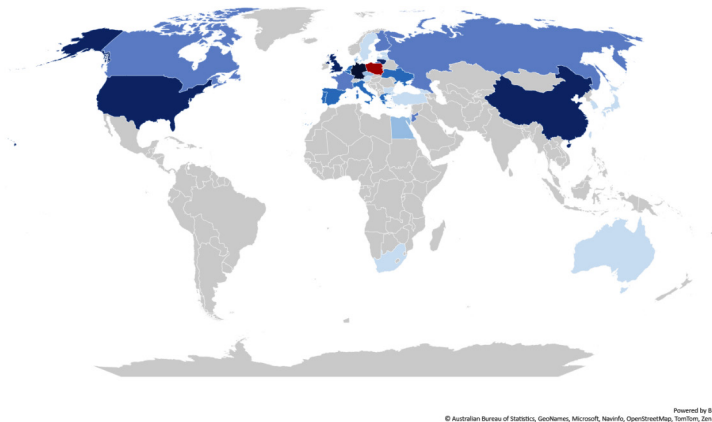
**Figure 4.** Scientific collaborations of Professor Joanicjusz Nazarko – projects and grants

Out of 52 projects included in the Figure 4, 11 (21.1%) were Professor's individual and group statutory works conducted and financed at BUT. Another seven (13.5%) were also conducted at BUT; however, their conduct and publication of their results (e.g., Kononiuk & Nazarko, 2014) was supported with outside resources, e.g., granted by the National Science Centre. Seven works (13.5%) were the projects of Professor's PhD students, while the remaining 27 projects were conducted in collaboration with other 83 Polish and foreign entities, including universities (23), research or educational institutions (18), non-profit foundations and associations (16), government or local authorities and governmental organizations (18), and private enterprises (8). Almost half of these projects (13; 48.2%) were the result of cooperation of Polish institutions (Radziszewski et al., 2016), while the other half accounted for

the cooperation with foreign entities (Nazarko et al., 1999b) or within mixed teams (Nazarko & Urban, 2010).

## 8. Overview

Considering all of the scientific work of Professor Joanicjusz Nazarko described in this section thus far, he has accomplished an impressive number of scientific collaborations with both Polish and foreign institutions. Figure 5 presents the graphical representation of geographical distribution of Professor's scientific collaborations with Polish and foreign entities. Poland, as Professor's home country, was marked in red; other countries that Professor has worked with were marked in blue, with the darker the shade of color, the more frequent the collaboration was.



**Figure 5.** Geographical distribution of scientific collaborations of Professor Joanicjusz Nazarko

When it comes to Professor's foreign collaborations, he has worked with 91 different foreign entities 155 times; those entities were located in 33 countries across five continents. Most often, he had the opportunity to work with German institutions (21 times, with 12 entities, including universities, non-profit foundations, government authorities, and private enterprises). Lithuanian institutions were also often represented among Professor's scientific partners (13 times, with nine entities, including universities, government authorities, and research institutions). Other countries of frequent collaborations were China, United Kingdom, United States (11 times each), France (nine times), Canada, Finland, Jordan, or Russia (seven times each).

Professor has also worked 111 times with Polish entities (excluding his home university), located across 11 out of 16 Polish regions. Most often, these institutions were located in Warsaw (Masovian voivodeship), following with Białystok (Podlaskie voivodeship), and Cześćochowa (Silesian voivodeship).

Presented scale of Professor Nazarko's accomplishments in different kinds of scientific collaboration with other institutions in Poland and abroad can vouch for his efforts to develop new scientific relationships between BUT and other institutions. Often it was his ideas and efforts that resulted in establishing long-term cooperation in research and education, as it was in the case of cooperation between BUT and Vilnius Tech University in Vilnius, Lithuania.

Many years of both universities' joint work resulted in a wide range of measurable and valuable outcomes. These include carrying out collaborative scientific projects that yielded the publication of recognized works (e.g., Nazarko & Šaparauskas, 2014; Radziszewski et al., 2016; Ginevičius et al., 2021), co-organization of numerous scientific conferences in the area of management science and quality, or reciprocal participation on the scientific boards of journals published at both universities (including *Journal of Business Economics and Management* issued by Vilnius Tech, or *Engineering Management in Production and Services* issued by BUT). Many achievements have also been recorded in the area of educational partnerships, such as multiple cases of students' and teachers' participation in internships (e.g., under the Erasmus+ program), or mutual assistance and sharing of expertise in reviewing promotion procedures. Among many examples of Professor Joanicjusz Nazarko's work with other institutions, the cooperation with Vilnius Tech illustrates well the benefits and contributions that a long-term strengthening of cooperation ties can bring.

## 9. Achievements in scientific supervision, teaching and popularization of science

In addition to his scientific achievements, Professor Joanicjusz Nazarko has an outstanding track record in the field of didactics. He has supervised over 300 undergraduate and graduate theses and 19 doctoral dissertations. In his efforts, in addition to providing methodological guidance, substantive assistance and formal supervision, Professor also fosters overall scientific development of his students. He, for example, encourages them to develop teamwork skills, both by strongly emphasizing benefits and synergies of research teamwork, and by organizing formal training in this area. Over the years, he has hosted scientific seminars for young researchers, which prepare them to design research methodologies, write monographs and dissertations and teach them the culture of scientific work. As a result, more than 20 participants have succeeded in obtaining grants and scholarships, and four of them obtained post-doctoral degrees.

Professor's many years of educational work have also resulted in deepening the cooperation ties between his home university and many Polish and foreign universities. Since the Faculty of Engineering Management, where Professor works, did not have the right to confer the doctoral degree until 2016, Professor Joanicjusz Nazarko helped his PhD students to obtain their doctoral degrees at other reputed Polish universities. He has also cooperated with other universities during multiple promotion procedures, including acting as a reviewer in 38 doctoral, 12 post-doctoral and 3 professor procedures, as well as writing numerous editorial reviews for promotion procedures monographs. Most often, Professor provided reviews for promotion procedures at Polish universities, including, for example, Warsaw University of Technology; however, on multiple occasions he has also reviewed dissertations from foreign universities, including 12 reviews of doctoral dissertations at Vilnius Tech University.

Professor Joanicjusz Nazarko is also an experienced and valued academic teacher, as he taught classes at BUT and three other universities in his home region. He has designed the curricula for several courses, such as *Technology foresight*, *Planning of R&D works*, or *Effectiveness assessment*, which are strongly based on own scientific research, and, thus, include information on the latest developments in these respective fields. He has also gained teaching experience during numerous teaching fellowships in, for example, Australia, China, Canada, South Korea, Lithuania, Germany, Taiwan, USA and UK. Over the years, he has implemented

the principles of lifelong learning, both in developing his own teaching skills and in improving the quality of education at BUT. He initiated the implementation of the educational quality assurance system at BUT under the TEMPUS framework; he was also one of the main contributors to the creation of new courses and specializations at Faculty of Engineering Management.

Professor's achievements in promoting cooperation between science and business should also be noted. He initiated and chaired the Faculty of Engineering Management Business Council, with the aim of matching the educational curriculums taught at the Faculty of Engineering Management to needs of the job market. Professor Joanicjusz Nazarko is also an active disseminator of science and education. He organized and moderated discussion panels during several editions of Eastern Economic Congress in Białystok (Nazarko & Kuźmicz, 2016), during which various representatives of local economic environment discussed the problems of development of Eastern Poland. He also presented lectures to various audiences and popularized the issues of science and higher education through media appearances on television, radio and in magazines (Nazarko et al., 2016; Nazarko, 2016b).

## 10. Conclusions

In summary, Professor Nazarko's publishing activities exemplify an impressive blend of interdisciplinarity, adaptability, innovation, and integration. His work not only responds to the dynamic demands of the contemporary academic and economic landscape but also catalyzes intellectual progress, benefiting a wide range of fields and making a substantial contribution to the advancement of knowledge in various domains. He engages with a wide array of research topics, effectively merging technical and economic expertise. His work demonstrates considerable adaptability and a keen responsiveness to contemporary scientific and economic demands. He is renowned for his unconventional and innovative research approaches, which incorporate diverse perspectives, techniques, and tools from various disciplines. This integration of disparate elements contributes significantly to advancing knowledge within the areas he investigates.

Equally noteworthy is Professor Nazarko's work towards developing and strengthening ties of scientific cooperation with other universities as well as with other entities, including research or educational institutions, non-profit foundations and associations, government or local authorities and governmental organizations, and private enterprises. His continued efforts resulted in the conduct of many impactful studies and projects of national and international reach. Professor Nazarko contributed significantly to the development of his home university, BUT, as a significant scientific center in northeastern Poland, both as an accomplished scientist as well as an outstanding leader. During his entire tenure as a university's rector and Faculty of Engineering Management's dean, he contributed significantly to the development of the university, and his efforts have benefitted the university community for years to come. His didactic work at BUT has also yielded positive results over the years, which can be seen on many levels: successful mentoring of students, growing variety of courses of study and continuous improvement of their curricula, or strengthening the cooperation between university and business.

The 45th jubilee of Professor Joanicjusz Nazarko's scientific and educational work is not only an excellent opportunity to summarize his outstanding achievements, but also to wish him many more years of successful work and professional fulfillment.

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## Author contributions

The authors contributed equally to this work.

## Disclosure statement

The authors declare no conflict of interest.

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