

INNOVATION and ENTREPRENEURSHIP

Theory and practice

Edited by
Marcin Lis
Grzegorz Kądziałowski

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Introduction

The phenomenon of innovation is inseparably connected with the notion of change, novelty, reform or an idea perceived as new. W.T. Brady claims that “managing change and innovations is probably the most critical and most important task that modern business and industry face.” Introducing changes in the organisation not only refers to the implementation of new technologies, executive procedures, structures, logistic modifications, etc., but above all the impact on the people forming the organisation – their beliefs, attitudes, values, and behaviour.

Innovation is not only an economic mechanism or a technical process. It is primarily a social phenomenon, the result of various interactions and relationships between individuals; to be implemented, it must obtain public approval as it changes paradigms, both in ways of thinking, production, organisation and management, as well as in consumption. An innovation process is the implementation of innovation in the social system of an organisation that has specific conditions both at the organisational level (e.g., organisational culture or structure), group level (including the leadership style) and individual level (including creativity, knowledge, competencies, personality, and learning).

Innovation is inherently complex and unpredictable. Companies, guided by financial and operational considerations as well as strategic goals, employ various techniques to capture the uncertainty of innovation in measurable and, consequently, manageable ways. An innovative enterprise can be defined as an organisation with the ability to create, acquire, and market new products or services, utilising the appropriate resources. This monograph delves into the interplay between innovation and entrepreneurship, unravelling the threads that weave together ground-breaking ideas, daring ventures, and transformative progress. In the first part of the monograph the author explores the dimensions of innovation, research, and development within the Polish economy. Emphasising the broader significance of innovation beyond technical and economic realms, it examines their integral role in socioeconomic advancement. This part focuses on financing aspects within innovation, research, and development in the Polish economy, aiming to evaluate their structural and dynamic dimensions via the statistical analysis of financial data.

In the next chapter the author characterises the impact of the crisis on micro and small enterprises in Poland and identify the role of cooperation among these companies at this critical time caused by the SARS-CoV-2 coronavirus pandemic or the military conflict between Russia and Ukraine, restrictions introduced by states (e.g. restrictions on movement, lockdowns, or temporary restrictions on the functioning of commercial service providers). One of the most important factors allowing businesses to survive the crisis is cooperation among the enterprises and the time horizon of the business before the crisis. In this respect, the desk research method was used, which allowed the researchers to capture the most important data in an analytical way while illustrating the situation of micro and small enterprises in Poland in the period of 2020-2022.

Aside from other conventional drivers of sustainable development, international entrepreneurship and innovation have been shown to play a significant role. Economic sustainability, one of the dimensions of sustainability, is driven by international entrepreneurship. The next study examined the role of global entrepreneurship and innovation in sustainable development in Nigeria and Poland from 1996-2021. The research adopted the exogenous theory related to the exogenous flow of technological progress on which growth partly depends.

The application of the Innovator Behaviour Questionnaire (IBQ) was presented as well. The questionnaire was used to select experts dealing with innovation and, in particular, innovation risk assessment. The statements used in the questionnaire characterise selected personality traits of a potential innovation risk assessment expert. The presented works are mainly concerned with the process of innovation implementation and its evaluation, and seldom present the important and significant stage related to the selection of experts.

In the final part of the monograph, the authors presented examples of the application of innovation strategies in various types of organizations. One of the chapters shows the synergies between the area of entrepreneurship and the area of social media in companies. This is because an entrepreneurial organisation is able to recognise emerging opportunities, which nowadays also include the skilful use of social media in business activities. Companies that are able to use social media can gain an advantage over their competitors. The next one explores the evolution of the model for managing innovative processes in enterprises. By tracing historical roots and delving into key paradigm shifts, our aim is to unravel the intricate scheme of how companies have changed their approaches to remain at the forefront of progress. The finale chapters present Innovative projects to improve road safety and the set of patients' rights adopted in individual European countries what was created based on the developed standards of ethics of the medical profession and international law.

Activities in the areas of innovation, research and development in the Polish economy – legal, organisational and financial determinants

Abstract

This article explores the dimensions of innovation, research, and development within the Polish economy. Emphasising the broader significance of innovation beyond technical and economic realms, it examines their integral role in socioeconomic advancement. Drawing on a comprehensive analysis of literature, normative acts, and statistical data from the Central Statistical Office, the study notes progress but highlights the slow pace in addressing the competitiveness challenges. It underscores the need for greater attention and adequate funding for these areas to bolster Poland's socioeconomic growth.

Keywords

innovation, competitive advantage, economic development, intellectual property.

Introduction

Innovation embodies the introduction of novel advancements, and is pivotal in enhancing existing states across various spheres. From a business perspective, it underlines a competitive edge and potential maximisation, while within national economies, it hinges upon entrepreneurs translating scientific research into economic practices. However, it encompasses a learning process intertwined with national scientific potential, education systems, and the business environment. Broadly, it fosters the capacity to absorb new technologies, significantly impacting industry

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development. Innovative countries exhibit robust R&D systems and adeptness in embracing innovation within enterprises.³

The nexus between innovation and socioeconomic development extends to sectors, economies, and international cooperation, catalysing economic progress. Key to competitive advantage, innovation correlates with economic competitiveness, urging sustained development and realistic strategies to match advanced nations.⁴

These necessitate adequate funding, although substantial investment in research and development does not invariably elevate innovation levels. Since the Lisbon Strategy, innovation has become a cornerstone of the EU's socioeconomic policy, aiming for a knowledge-based, competitive, and sustainable economy.⁵ After Poland's accession to the EU, the emphasis on innovation, research, and development policies, crucial to the modernisation of the economy, has been pronounced. These realms have perennially captivated academic researchers and business practitioners due to their profound implications for socioeconomic growth.

Reliable data is indispensable to the formulation of effective policies in innovation, research, and development, but measuring the innovation level remains challenging. The Central Statistical Office provides extensive but occasionally inconsistent data, impacting longitudinal analyses. International innovation rankings consistently depict Poland's low level of innovation, despite significant EU and national investments, prompting queries about the nation's position relative to highly innovative countries.⁶

This article focuses on financing aspects within innovation, research, and development in the Polish economy, aiming to evaluate their structural and dynamic dimensions via the statistical analysis of financial data.

3 J. Brzóska, J. Cierkosz, *Ocena innowacyjności przedsiębiorstw w Polsce* [An assessment of the innovativeness of enterprises in Poland], "Przegląd Organizacji" 2016, no. 10, p. 12.

4 In an innovative economy, it is entire sectors of the economy, considered innovation leaders, which should not only achieve particularly high research and development expenditure indexes (although this seems to be a necessary condition), but also dominate in terms of the level of industrial property protection, especially patent protection. Cf. W. Gajda, *Innowacyjność polskiego przemysłu na tle przemysłu światowego* [The innovativeness of Polish industry in comparison to global industry], "Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego" 2015, no. 29 (1), p. 52.

5 M. Ciechanowska, *Innowacyjność gospodarki jako jedna z form przewagi konkurencyjnej UE* [Innovation of the economy as one of the forms of the EU's competitive advantage], "Nafta – Gaz" 2016, no. 12, p. 11-56.

6 This issue is documented not only by extensive monographs, but also by articles documenting this state in detail, based on numerous rankings. Cf. M. Romanowska, *Innowacyjne przedsiębiorstwo w nieinnowacyjnej gospodarce* [An innovative enterprise in a non-innovative economy], "Przegląd Organizacji" 2015, no. 8, L. Knop, *Innowacyjność Polski na tle krajów Unii Europejskiej* [Innovativeness of Poland as compared to the European Union countries], "Zeszyty Naukowe Politechniki Śląskiej" 2018, the series "Organisation and Management", paper 121, K. Osieczko, S. Stec, *Poziom innowacyjności gospodarki Polski na tle krajów Unii Europejskiej* [Level of innovativeness of the Polish economy compared to the European Union countries], "Zarządzanie Innowacyjne w Gospodarce i Biznesie" 2019, no. 2, J. Różański, *Innowacyjność polskich przedsiębiorstw na tle europejskich systemów innowacyjności*, [Innovativeness of Polish enterprises compared to European innovation systems], "Przegląd Organizacji" 2020, no. 9, and many others.

Basic concepts – innovation and research and development activities

The concept of innovation was first introduced to economic sciences by J. Schumpeter, who emphasised its decisive role in the development of an economy, even more significant than that of capital.⁷ Innovation was perceived in a similar way by P. F. Drucker, who regarded it as a specific tool of entrepreneurship, i.e. an activity that gives resources new opportunities for wealth creation. He claimed that innovation relates more to the social and economic sphere than to the technical sphere, although, at the level of an individual enterprise, it is technical innovations that should be decisive.⁸

The innovativeness of an economy should be understood as the propensity of entrepreneurs to constantly explore and apply the results of scientific research and development projects, new ideas, concepts and inventions. Innovativeness also comprises improvements in already known production and operation technologies (including in the sphere of services), the application of new solutions in organisation and management, as well as progress in infrastructure development⁹. In the broad sense, innovation is therefore identified with any change in production. Thus, contemporary definitions of innovation go well beyond the realm of technology alone, recognising that it occurs when there is an economically successful exploitation of new ideas.¹⁰ However, all innovations, being an eminently interdisciplinary category described by various research methods and techniques, must contain a significant element of novelty and significant change.¹¹ Nowadays, such changes can (and should) be seen as indispensable entrepreneurial tools that transform an idea into concrete products or services, thus influencing economic development.

Innovative activities, a driver for innovation, include a whole range of scientific, research, technical and organisational measures aimed at the development of new

7 J. Schumpeter distinguished five situations to which the concept of innovation can be applied, namely (i) a new product, (ii) a new method of production, (iii) a new market, (iv) a new source of supply of raw materials, and (v) (the carrying out of) a new organisation of any industry. J. A. Schumpeter, *Teoria rozwoju gospodarczego [Theory of Economic Development]*, Warszawa 1960, p. 10 et seq.

8 In his reflections, P. Drucker also emphasised the special role of innovation in economic development. Cf. P. F. Drucker, *Innowacja i przedsiębiorczość. Praktyka i zasady [Innovation and entrepreneurship. Practice and principles]*, Warszawa 1992, p. 39.

9 W. Janasz, K. Kozioł, *Determinanty działalności innowacyjnej przedsiębiorstw [Determinants of enterprises' innovative activities]*, Warszawa 2007, p. 45.

10 M. Czajkowska-Dąbrowska, *Własność czy własności (intelektualne) [(Intellectual) property or properties]*, in: A. Kidyba, R. Skubisz (eds.), *Współczesne problemy prawa handlowego. Księga jubileuszowa dedykowana prof. dr hab. Marii Poźniak-Niedzielskiej [Contemporary issues in commercial law. A jubilee book dedicated to Prof. Maria Poźniak-Niedzielska]*, Kraków 2007, p. 61 et. seq.

11 J. Duraj, M. Papiernik-Wojdera, *Przedsiębiorczość i innowacyjność [Entrepreneurship and innovativeness]*, Warszawa 2010, p. 61.

or significantly improved products or processes, as well as their implementation in economic practice. An innovative economy is characterised by the ability to create and implement innovations, understood either as the ability to develop innovative solutions or as a total result of the innovative activities of entities comprising a given economy.¹²

Innovation and accompanying (and at the same time conditioning) research and development activities also have a 'legal' definition, included in not only Polish law, but in international documents.

According to the *Oslo Manual*¹³, innovation is understood as the implementation of a new or considerably improved product or process, a new marketing method or a new organisational method in business practice, workplace organisation or in relations with the environment.¹⁴ Such a definition, therefore, offers a broad possible scope of innovation. The *Oslo Manual* distinguishes three levels of novelty: novelty for the company (in Polish nomenclature the term 'for the enterprise' should rather be used), novelty for the market and novelty on a global scale. With regard to the area of application, a distinction is made in the *Oslo Manual* between product innovation (a new or improved product or service that differs significantly from the company's existing products or services and that has been introduced to the market) and business process innovation (a new or improved business process for one or more business functions that differs significantly from the company's existing business processes and that has been introduced to the market by the company).

An integral (core) component of innovativeness should be activities in the research and development sphere, while expenditure on research and development (R&D) alone is considered to be the most important factor determining the innovativeness of the economy, in addition to access to sources of financing, legal regulations and an efficient education system.¹⁵ Research and development (R&D) is, according to the Act on Corporate Income Tax¹⁶ and the Act on Personal Income Tax¹⁷, a *creative activity, including scientific research or development work, undertak-*

12 M. A. Weresa, *Polityka innowacyjna [Innovation policy]*, Warszawa 2014, p. 22 et seq.

13 Podręcznik Oslo 2018. Pomiar działalności naukowo-technicznej i innowacyjne, opr. OECD/Unia Europejska, [Oslo Manual 2018. Measurement of scientific, technological and innovation activities, compiled by OECD/European Union], Główny Urząd Statystyczny, Warszawa 2020.

14 This is how the concept was defined in the 2005 edition of the Oslo Manual. This definition was also included in the next edition of the Manual in 2018.

15 J. Czerniak, *Polityka innowacyjna w Polsce. Analiza i proponowane kierunki zmian [Innovation policy in Poland. An analysis and proposed directions for change]*, Warszawa 2013, p. 49.

16 The Act of 15 February 1992 on Corporate Income Tax, Journal of Laws of 1992 no. 21 item 86, as amended.

17 The Act of 26 July 1991 on Personal Income Tax, Journal of Laws of 1991 no. 80 item 350, as amended.

en in a systematic manner in order to increase knowledge resources and use resources to create new applications.

According to the definition provided by the Organisation for Economic Co-operation and Development (OECD) in the *Frascati Manual*¹⁸, research and development (R&D) should be understood as *creative work undertaken on a systematic basis in order to increase the stock of knowledge (including knowledge of man, culture and society) and the use of this knowledge to devise new applications.*

R&D covers several types of activities, i.e. basic research, applied research and development work.

Basic research is, according to the *Frascati Manual*, *experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.* It is similarly defined in Polish law (Law on Higher Education and Science¹⁹) as *empirical or theoretical work aimed primarily at gaining new knowledge of the foundation of phenomena and observable facts without aiming at direct commercial application.* It is divided into pure basic research (carried out for the advancement of knowledge, without seeking long-term benefits) and oriented basic research (carried out with the expectation that it will produce a broad base of knowledge likely to form a basis for solving recognised or expected problems).

Applied research is *research undertaken in order to acquire new knowledge and skills for the purpose of developing new products, services and processes or implementing considerable improvements in them.*

Development work, according to the *Frascati Manual*, is *work undertaken in a methodical manner, based on knowledge gained through research and practical experience and the creation of additional knowledge, aimed at developing new products or processes or improving existing products or processes.* According to the Law on Higher Education and Science, it is an *activity involving the acquisition, combination, formation and use of currently available knowledge and skills, including in the field of IT tools or software, for production planning and the design and creation of changed, improved or new products, processes or services, excluding activities involving routine and periodic changes introduced to them, even if such changes have the character of improvements.*

18 *Podręcznik Frascati 2015. Pomiar działalności naukowo-technicznej i innowacyjnej*, opr. Organizacja Współpracy Gospodarczej i Rozwoju [*Frascati Manual 2015. Measurement of scientific and technological activities and innovation*, compiled by the Organisation for Economic Co-operation and Development], Główny Urząd Statystyczny, Warszawa 2018.

19 The Act of 20 July 2018 The Law on Higher Education and Science, Journal of Laws, no. 2018, item 1668.

Innovation in EU and Polish programmatic documents

The European Union recognises innovativeness as one of the most important factors determining economic competitiveness. Thus, research and development activities occupy a particularly important place in the European Union's innovation policy.

In the *Lisbon Strategy* formulated by the European Commission and adopted in March 2000²⁰, innovation and the innovativeness of enterprises was recognised as a key factor in the economic growth of European Union member states. The primary goal was to make the EU the most dynamic, competitive and knowledge-based economy. The EU's innovativeness was to be increased through a transformation towards a knowledge-based economy, and this was to be achieved by creating a *European Research and Innovation Space / European Innovation Area* (including the creation of favourable conditions for the establishment and development of innovative companies²¹) and by increasing expenditure on research and development to 3% of GDP by 2010, with one-third of this expenditure to be financed by public funds and two-thirds by the private sector.²²

In Poland, the emergence (reconstitution) of a strategic planning system was important from the point of view of further directions of Poland's innovation policy. The *National Development Plan (NDP)*²³, which was the first strategic document after Poland's accession to the EU, defining the most important economic objectives and priorities in the post-accession period, correlated with the *EU Strategy*.²⁴ The Plan included a strategy for increasing the innovativeness of the economy in Poland by 2006, defining, among other things, priorities for innovation-oriented activities (the continuation of which was the programme '*Directions of increasing the innovativeness of the economy for the years 2007-2013*', adopted six years later). Operational documents relating to the NDP, such as the *Sectoral Operational Plan for Increasing Competitiveness of Enterprises (SOP ICE)*,

20 *Lisbon Strategy, Lisbon Strategy* – strategializbonska.pl

21 J. Siekierski, R. Śliwa, *Otoczenie instytucjonalne a procesy innowacyjne w polskiej gospodarce w latach 2004-2020 (w świetle dokumentów strategicznych i operacyjnych)* [Institutional environment and innovation processes in the Polish economy in the years 2004-2020 (in the light of strategic and operational documents)], "Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie" 2015, vol. 26, no. 1, p. 142.

22 L. Pawłowicz (ed.), *Strategia Lizbońska a zarządzanie wartością* [The Lisbon Strategy and value management], Warszawa 2006, p. 43 et seq.

23 National Development Plan 2004-2006, Document adopted by the Council of Ministers on 14 January 2003.

24 J. Siekierski, R. Śliwa, *Otoczenie instytucjonalne a procesy innowacyjne w polskiej gospodarce w latach 2004-2020 (w świetle dokumentów strategicznych i operacyjnych)* [Institutional environment and innovation processes in the Polish economy in the years 2004-2020 (in the light of strategic and operational documents)], "Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie 2015", vol. 26, no. 1, p. 142.

envisaged support for innovation activities with sustainable development, among other things.²⁵

As the early years of the implementation of the *Lisbon Strategy* were already characterised by significant difficulties with implementation and the limited effectiveness of activities, corrective measures were taken, resulting in 2005 in the adoption of the so-called *Renewed Lisbon Strategy*²⁶, which placed greater emphasis on research and development in modern technologies, R&D infrastructure, investments in innovative enterprises, diffusion of innovation, and, as a result, increased innovativeness of the economy.²⁷

Thus, the next version of the NDP, for the period until 2013, was also to put even more emphasis on innovation, which was reflected in the *Operational Programme Innovative Economy*, complementary to the aforementioned *Renewed Lisbon Strategy*.²⁸

After the failures of the (original and 'renewed') *Lisbon Strategy*, in 2010 the European Commission published the *Europe 2020 Strategy*, a long-term programme of smart, sustainable and inclusive growth for the period 2010-2020 (which is, albeit only partly, a continuation of the *Renewed Lisbon Strategy*).²⁹ The implementation of the *Strategy* provided for the adoption of the following three priorities: smart growth (constituting a knowledge and innovation-based economy), sustainable development (appropriate use of natural resources and care for the environment) and

25 The Innovation Centre, Innovation Transfer Centres, Regional Innovation and Knowledge Transfer Centres and others were of great importance in creating the institutional environment of the economy. Cf. J. Siekierski, R. Śliwa, *Otoczenie instytucjonalne a procesy innowacyjne w polskiej gospodarce w latach 2004-2020 (w świetle dokumentów strategicznych i operacyjnych)* [Institutional environment and innovation processes in the Polish economy in the years 2004-2020 (in the light of strategic and operational documents)], "Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie 2015", vol. 26, no. 1, p. 142 et seq.

26 Renewed Lisbon Strategy, Renewed Lisbon Strategy – Control Engineering Polska, <https://controlengineering.pl/odnowiona-strategia-lizbonska/>

27 J. Siekierski, R. Śliwa, *Otoczenie instytucjonalne a procesy innowacyjne w polskiej gospodarce w latach 2004-2020 (w świetle dokumentów strategicznych i operacyjnych)* [Institutional environment and innovation processes in the Polish economy in the years 2004-2020 (in the light of strategic and operational documents)], "Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie 2015", vol. 26, no. 1, p. 144.

28 J. Siekierski, R. Śliwa, *Otoczenie instytucjonalne a procesy innowacyjne w polskiej gospodarce w latach 2004-2020 (w świetle dokumentów strategicznych i operacyjnych)* [Institutional environment and innovation processes in the Polish economy in the years 2004-2020 (in the light of strategic and operational documents)], "Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie" 2015, vol. 26, no. 1, p. 144.

29 J. Siekierski, R. Śliwa, *Otoczenie instytucjonalne a procesy innowacyjne w polskiej gospodarce w latach 2004-2020 (w świetle dokumentów strategicznych i operacyjnych)* [Institutional environment and innovation processes in the Polish economy in the years 2004-2020 (in the light of strategic and operational documents)], "Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie" 2015, vol. 26, no. 1, p. 144.

development supporting social inclusion (higher employment and improved socio-economic cohesion).³⁰

The success of the strategy depended on the achievement of several measurable targets, based on reliable data, one of which was to be increased investment in R&D, up to 3% of GDP.³¹ This target, therefore, drew particular attention to the need to improve the conditions for R&D activities in the European Union, especially those carried out by the private sector.

Corresponding to the European programme, the Medium-term National Development Strategy 2020 became an element of the new system of the country's development management, complementary to the implementation of the *Europe 2020 Strategy*.³²

The intention to increase innovation was reflected in the *Innovation and Economic Efficiency Strategy "Dynamic Poland 2020"*³³. The economic policy intended to foster the adaptation of the environment to the needs of innovation by stimulating innovative actions.³⁴ Adopted in 2013, the *Smart Development Operational Programme* was to be a continuation of the *Innovative Economy Operational Programme*.³⁵

When properly conducted thanks to financing for innovation activities, including by the public sector, an innovation policy should aim to build an innovation system.³⁶ The plan was to turn Poland into a modern and innovative economy,

30 M. Żmuda, *Strategia Europa 2020 jako plan rozwoju społeczno-gospodarczego Unii Europejskiej [Europe 2020 Strategy as a plan for the socio-economic development of the European Union]*, "Ekonomia" 2011, no. 4, p. 205.

31 *Europe 2020. A strategy for smart, sustainable and inclusive growth*, developed by the European Commission, Brussels 2010, p. 12.

32 J. Siekierski, R. Śliwa, *Otoczenie instytucjonalne a procesy innowacyjne w polskiej gospodarce w latach 2004–2020 (w świetle dokumentów strategicznych i operacyjnych) [Institutional environment and innovation processes in the Polish economy in the years 2004–2020 (in the light of strategic and operational documents)]*, "Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie" 2015, vol. 26, no. 1, p. 145.

33 *Strategia Innowacyjności i Efektywności Gospodarki Dynamiczna Polska 2020 [Innovation and economic efficiency strategy Dynamic Poland 2020]*, <https://www.gov.pl/web/rozwoj-technologie/strategia-innowacyjnosci-i-efektywnosci-gospodarki-dynamiczna-polska-2020>

34 J. Siekierski, R. Śliwa, *Otoczenie instytucjonalne a procesy innowacyjne w polskiej gospodarce w latach 2004–2020 (w świetle dokumentów strategicznych i operacyjnych) [Institutional environment and innovation processes in the Polish economy in the years 2004–2020 (in the light of strategic and operational documents)]*, "Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie" 2015, vol. 26, no. 1, p. 145.

35 J. Siekierski, R. Śliwa, *Otoczenie instytucjonalne a procesy innowacyjne w polskiej gospodarce w latach 2004–2020 (w świetle dokumentów strategicznych i operacyjnych) [Institutional environment and innovation processes in the Polish economy in the years 2004–2020 (in the light of strategic and operational documents)]*, "Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie" 2015, vol. 26, no. 1, p. 145.

36 J. Siekierski, R. Śliwa, *Otoczenie instytucjonalne a procesy innowacyjne w polskiej gospodarce w latach 2004–2020 (w świetle dokumentów strategicznych i operacyjnych) [Institutional environment and innovation processes in the Polish economy in the years 2004–2020 (in the light of strategic and operational documents)]*, "Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie" 2015, vol. 26, no. 1, p. 145.

although the country had earlier adopted, as a national goal of the *Europe 2020 Strategy*, a slightly lower level of expenditure on research and development activities, amounting to 1.7% of GDP.³⁷

An assessment of the implementation of this programme will be the subject of a separate analysis. This paper attempts to assess the financial stimulation of innovation and R&D activities. Therefore, it is worth analysing statistical data illustrating the system of financing innovation and R&D activities in Poland in the second decade of the 21st century.

Dynamics and structure of expenditure on innovation and R&D activities in Poland in the second decade of the 21st century - analysis and evaluation

The innovativeness of both individual entities and entire national economies is a largely subjective concept, and thus not easy to quantify. Nevertheless, it can be (and is) measured according to various criteria.³⁸ One of the ways of implementing a certain 'measurability' is to introduce, as a criterion, the volume of financial expenditure, while constantly bearing in mind that the impact of various factors, especially R&D activities, on the actual innovativeness of the economy depends on not only the volume of financial expenditure, but also its subjective and objective structures.³⁹

Measurements of the scale of innovation are carried out at both the international level (i.e. the OECD, UN, and European Union) and the national level (by governmental and non-governmental organisations in individual countries). The methodology of innovation research in the European Union is based on recommendations stemming from a series of *Frascati Family* documents, published since 1963 by the OECD, and in particular the *Oslo Manual* on innovation policy⁴⁰, which was published as early as 1992 by the OECD (and a later edition in 2005, together with Eurostat), as a certain set of recommendations for researchers analysing data related to the topic of innovation, for the work of national statistical research

37 M. Gasz, *Strategia Europa 2020 – założenia i perspektywy realizacji* [*Europe 2020 Strategy – assumptions and implementation perspectives*], "Nierówności społeczne a wzrost gospodarczy" 2014, no. 38, p. 87.

38 The variety of measurement methods, among others, in the work of R. Borowiecki and B. Siuta-Tokarska, *Wyzwania i dylematy społeczno-gospodarcze Polski w procesie transformacji* [*Poland's socio-economic challenges and dilemmas in the transformation process*], Toruń 2012, p. 262 et seq.

39 R. Borowiecki, B. Siuta-Tokarska, *Problemy innowacyjności gospodarki Polski ze szczególnym uwzględnieniem działalności badawczo-rozwojowej* [*Problems of innovativeness of the Polish economy with particular reference to research and development activities*], "Nierówności Społeczne a Wzrost Gospodarczy" 2017, no. 2, p. 168.

40 K. Kozioł, *Ewolucja polityki innowacyjnej w Unii Europejskiej* [*Evolution of innovation policy in the European Union*], in: W. Janasz (ed.), *Innowacje w Strategii Rozwoju Organizacji w Unii Europejskiej* [*Innovation in Organisational Development Strategy in the European Union*], Warszawa 2009, p. 142.

offices.⁴¹ According to the Oslo methodology, innovative solutions are not regarded as an impulse or mechanism that triggers the innovation process, but as the effect thereof.⁴² The *Frascati Manual* also contains recommendations for research and development activities.

The study covered the period of 2010-2021; it seems to be a sufficiently long period to draw at least preliminary conclusions on the volume (dynamics) and structure of expenditure based on the analysis conducted.

The starting point for further considerations is expenditure on innovative activities in the industrial and service sectors.

Table 1. Expenditure on innovative activities in Poland in the period of 2010-2021

Year	sector		total enterprises in relation to GDP (%)
	industrial (million PLN)	service (million PLN)	
2010	23757.8	10790.3	2.41
2011	20821.1	10979.1	2.05
2012	21535.4	15145.4	2.27
2013	20958.9	11980.9	2.02
2014	24621.6	12995.2	2.21
2015	31094.1	12640.9	2.43
2016	28304.7	10706.2	2.11
2017	28023.5	13142.2	2.08
2018	23388.7	13094.8	1.72
2019	23178.8	15400.8	1.69
2020	20378.2	18399.2	1.66
2021	19041.5	22348.6	1.58

Source: Nauka i technika w 2021 r. [Science and Technology in 2020], compiled by the Central Statistical Office and the Statistical Office in Szczecin, Warszawa, Szczecin 2023 and publications from previous years, *Działalność badawcza i rozwojowa w Polsce w 2021 r.* [Research and development activities in Poland in 2021], compiled by the Central Statistical Office and the Statistical Office in Szczecin, Warszawa, Szczecin 2022 and publications from previous years, *Działalność innowacyjna przedsiębiorstw w latach 2019-2021* [Innovative activities of enterprises in 2019-2021], compiled by the Central Statistical Office and the Statistical Office in Szczecin, Warszawa – Szczecin 2022, as well as other publications from previous years.

41 K. Klincewicz, Polska innowacyjność. Analiza bibliometryczna [Polish innovativeness. Bibliometric Analysis], Warszawa 2008, p. 5.

42 P. Nowak, Poziom innowacyjności polskiej gospodarki na tle krajów UE [The level of innovativeness of the Polish economy as compared to EU Member States], Prace Komisji Geografii Przemysłu 2012, no. 19, p. 157.

In the period of 2010-2021, expenditure on innovative activities in Poland increased by 107.1% in service enterprises, but at the same time decreased by 19.9% in industrial enterprises (it reached its highest level in 2015, with a systematic decrease since then). In relation to GDP among all enterprises, it decreased by 0.83 percentage points, and simultaneously by 34.4%. However, taking into account not only the real money depreciation (inflation), but also the somewhat high rate of economic growth, a dramatic deterioration is evident. The emerging trend has even distanced Poland from “pretending” to be an innovative country.

The prerequisite for innovation is research and development activities. Among the most important (and most frequently used) indexes for assessing the innovativeness of the economy are those relating to research and development. The most important index for examining national R&D activities is the GERD index (gross expenditure on research and development), which shows the sum of national gross domestic expenditure on R&D by all units in a given country (and in a given year). This index can also be related to the size of GDP, in which case it expresses the percentage of resources invested in R&D.

Table 2. Expenditure on research and development (R&D) in Poland in the period of 2010-2021

Year	Gross domestic expenditure on R&D (GERD) (million PLN)	Relation of gross domestic expenditure on R&D (GERD) to GDP (%)
2010	10416	0.74
2011	11687	0.77
2012	14353	0.88
2013	14424	0.87
2014	16168	0.94
2015	18061	1.00
2016	17943	0.96
2017	20578	1.03
2018	25648	1.21
2019	30285	1.32
2020	32402	1.39
2021	37676	1.44

Source: see Table 1.

Expenditure on research and development (R&D) in Poland between 2010 and 2021 increased by 261.7%, with the average annual change reaching 12.4%; therefore, it was very high, well above the rate of economic growth. The highest year-on-year growth of 24.6% occurred in 2018; there was only one slight decrease by 0.7% in 2016. A strong upward trend in the ratio of GERD to GDP could be observed in Poland throughout the period under examination. While R&D expenditure in Poland in 2010 amounted to 0.74% of GDP, at the end of the period it was 1.44%, which translated into an increase of 94.6%. On average, this meant an annual increase of 6.2%, or six percentage points. It is worth noting that the growth was almost continuous, and the only slowdown (decrease in expenditure and reduction in its ratio to GDP by 0.04 percentage points) occurred in 2016. However, taking into account the GERD to GDP ratio, its value for Poland was much lower than the EU average.⁴³

For a more comprehensive assessment, however, it is not only the size of expenditure that matters, but also its subjective and objective structure.

Expenditure on R&D broken down by executive sector shows the intensity of R&D activities in different types of entities.⁴⁴

Table 3. Internal expenditure on R&D by executive sector (thousands PLN) in the period of 2010-2021

Year	Total	of which			
		business enterprises	government	higher education	private non-commercial entities
2010	10416158.2	2773545.9	3738891.8	3874091.7	29628.8
2011	11686705.8	3521602.4	4035832.9	4102261.5	27009.0
2012	14352914.6	5341069.8	4012943.3	4942174.3	56727.2
2013	14423788.6	6291241.2	3869799.9	4220307.0	42440.5
2014	16168229.3	7532079.4	3872714.3	4714844.4	48591.2
2015	18060685.9	8411352.8	4405763.0	5215158.0	28412.1
2016	17943044.6	11782491.7	451034.4	5630383.9	79134.6

43 W. Gajda, *Innowacyjność polskiego przemysłu na tle przemysłu światowego [Innovativeness of Polish industry in comparison to global industry]*, "Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego" 2015, no. 29 (1), p. 52.

44 T. Geodecki, *Metodyka pomiaru działalności innowacyjnej [Methodology of measuring innovative activities]*, in: T. Geodecki, E. Mamica (ed.), *Polityka innowacyjna [Innovation policy]*, Warszawa 2014, p. 50 et seq.

Year	Total	of which			
		business enterprises	government	higher education	private non-commercial entities
2017	20578461.7	13271902.6	470249.6	6764892.5	71417.0
2018	25647791.6	16950841.8	498581.6	8121700.3	76667.9
2019	30284822.1	19030892.7	384212.7	10779435.2	90281.5
2020	32402089.1	20359056.8	639096.0	11324448.4	79487.9
2021	37675849.2	23769059.4	770294.0	13058960.0	77535.8

Source: see Table 1.

An analysis of the structure of R&D expenditure in Poland by executive sector indicates that there have been significant changes in their relative shares between 2010 and 2021.

With a 261.7% increase in total expenditure in the period of 2010-2021, the largest increase among the executive sectors was in the enterprise sector – 757%. Another high increase, although much smaller at 237.1%, occurred in the higher education sector. In the private non-commercial sector, growth amounted to 167.1%, which was lower than the overall level of expenditure, and its share in the total expenditure was negligible, at the level of 0.2–0.3%. In the government sector, there was a decrease of 79.4%. As a result, the share of the government sector in the financing of R&D fell from 35.9% to barely 2.0% over the period, while the comparable share of the business sector rose from 26.6% to 63.1%. The share of the higher education sector declined slightly, from 37.2% to 34.7%. This was an evident sign of the state's withdrawal from activity that is not its core responsibility (whether it should be is yet another question), a shift from the function of implementer (performer) to that of coordinator (organiser) and funder.

R&D activities can be funded by entities belonging to the government, business, higher education, non-profit and foreign (rest-of-the-world) sectors.

Table 4. Internal expenditure on R&D by financing sector (thousands PLN) in the period of 2010-2021

Year	Total	of which				
		business enterprises	government	higher education	private non-commercial entities	rest of the world
2010	10416158.2	2543077.5	6347111.2	262240.0	32772.3	1230957.2
2011	11686705.8	6521536.6	3285802.9	285146.0	29199.9	1565020.4
2012	14352914.6	7367472.4	4636630.5	373434.6	59482.0	1915895.1
2013	14423788.6	6814497.6	5384339.7	307313.2	25538.0	1892100.1
2014	16168229.3	7310246.8	6304999.5	360087.6	32236.8	2160658.6
2015	18060685.9	7553710.1	7044483.6	397414.3	41239.8	3023838.1
2016	17943044.6	9528423.3	6972673.7	422477.7	38346.5	981123.4
2017	20578461.7	10812206.8	7877717.7	609298.1	54113.7	1225125.4
2018	25647791.6	13642935.3	9083674.4	1055042.7	61605.0	1804534.2
2019	30284822.1	15348425.6	11755321.5	894846.1	152022.7	2134206.2
2020	32402089.1	16407169.6	12625501.6	881783.6	162244.3	2325390.0
2021	37675849.2	19203720.3	14088359.8	1150751.8	153895.3	3079122.0

Source: see Table 1.

The analysis of the sources of financing for R&D in Poland shows that in the years under examination, in parallel to the overall increase in expenditure by 261.7% in the period of 2010–2021, the largest increase of 655.1% occurred in the business enterprise sector, and a much smaller increase of only 122% in the government sector. In the other sectors, which by all accounts were of minimal importance in the overall R&D funding system, the increases were somewhat greater: in the higher education sector 338.8%, in the private non-commercial sector 369.6%, and in the so-called ‘rest-of-the-world’ sector 150%. As a result, the share of the government sector fell from 60.9% to 37.4% over the period, while the share of the business sector increased from 24.4% to 51.0%. The share of the other sectors was negligible: in higher education it increased from 2.5% to 3.1%, in private non-commercial institutions it decreased from 0.4% to 0.3%, and in the rest of the world it fell from 11.8% to 8.2%. However, the ratio recommended by EU programmes, i.e. one-third of financing provided by the government sector and two-thirds of financing provided by the business sector, was not achieved.

The above analysis of the executive and funding sectors does not exhaust the possibilities of assessing the structure of financing for R&D. It can be supplemented by an analysis of expenditure broken down by the type of R&D activity.

Table 5. Internal expenditure on R&D by the type of R&D activity (thousands PLN) in the period of 2013-2021

Year	total	of which		
		basic research	applied research	development work
2013	14423788.6	5042709.7	2962674.8	6418404.1
2014	16168229.3	5420420.1	3191727.6	7556081.6
2015	18060685.9	5758496.0	3669616.6	8632573.3
2016	17943044.6	5403123.5	2824367.8	9715553.3
2017	20578461.7	5971495.3	3620438.9	10986527.5
2018	25647791.6	8346527.0	3395652.2	13905612.4
2019	30284822.1	12146532.9	4064805.1	14073484.1
2020	32402089.1	10768992.9	5102293.6	16530802.6
2021	37675849.2	12084016.6	5457040.5	20134792.1

Source: see Table 1.

In the structure of R&D expenditure, quite small changes were actually visible. With an overall increase in expenditure of 161.2% between 2013 and 2021 (earlier data for the years 2010-2013 are inconsistent with subsequent data), there were small increases in expenditure on applied research (84.2%) and basic research (139.6%) (so the increase in expenditure on both types of research was smaller than the increase on all R&D activities), while the increase in expenditure on development work reached 213.7%. As a result, there was an increase in the share of expenditure on development work from 44.5% to 53.4%, a large decrease in expenditure on applied research from 20.5% to 14.5%, and a relatively small decrease in expenditure on basic research from 35% to 32.1%.

This means that – besides the very low level of expenditure on R&D – Poland, as compared to all other EU member states, was characterised by a different structure of expenditure. This was first of all illustrated (taking into account the subjective structure) by the insufficient share of industrial enterprises' expenditure, but also (taking into account the objective structure) by the insufficient share of expenditure on applied research and development work in total R&D expenditure. However, the increase in the share of the business sector in R&D funding, as well as

among the executive sectors, should be regarded as positive aspects. Until 2021, the excessive share of the government sector was a characteristic feature of the structure of internal expenditure; although systematically declining, it was higher than the corresponding share adopted in the R&D policy. Nevertheless, the course of changes in the respective sectors' shares in the funding of R&D activities allows us to expect that the structure of R&D expenditure will change in a more desirable direction in the coming years.

This trend should be assessed very positively, although – despite changes in the amount of expenditure and in their structure – the values of indexes such as GERD/GDP indicate that Poland is still among the least innovative countries in the European Union, definitely below the EU average, and the distance between Poland and other EU member states in this respect remains significant.

Conclusion – an attempt at evaluation

The semantic scope of innovation is becoming ever more extensive, which means that in the contemporary economy it cannot be limited to the material dimension only, because it goes beyond the sphere of strictly technical or even business solutions⁴⁵, covering an increasing number of new areas. In fact, it is not only the quintessence of the process of building competitive advantage of individual economies, but also an expression of (broadly understood) development or progress.

Thus, contemporary states, aspiring to be at least highly developed economically in order to increase the importance of innovation as a factor of competitiveness, have for many years been pursuing an increasing number of intensive innovation policies, which are combinations of industrial, science and technology policies, covering, in fact, all activities of the state, which – with the assistance of specialised legal, institutional and economic instruments – influence innovation processes in the economy in order to achieve goals in line with those included in comprehensive socioeconomic policies.⁴⁶ The ability of a country to generate and implement innovations is crucial because it facilitates the increased efficiency of all production factors, and thus stimulates not only growth but also socioeconomic development.⁴⁷

Appreciating its enormous role, the European Union recognised innovation and accompanying (in technical and business terms) research and development activities as one of the most important factors that could determine the competitiveness

45 P. Nowak, *Kulturowe bariery rozwoju innowacyjności polskiej gospodarki* [Cultural barriers to the development of innovation in the Polish economy], "Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego" 2015, no. 29 (4), p. 87.

46 S. Marciniak, *Innowacje i rozwój gospodarczy* [Innovations and Economic Development], Warszawa 2000, p. 90.

47 S. Pangsy-Kania, *Polityka innowacyjna państwa a narodowa strategia konkurencyjnego rozwoju* [The state's innovation policy and the National Competitive Development Strategy], Gdańsk 2007, p. 95.

of the EU economy and the economies of individual member states. The almost unique importance of R&D was highlighted in both the *Lisbon Strategy* and the subsequent *Europe 2020 Strategy*. The two strategies claim that R&D is the most important source for building the most competitive knowledge-based economic region in Europe. The achievement of the established objectives was to lead to an improvement in the conditions for conducting research and development activities by member states, among other things, by allocating 3% of GDP to investment in R&D (1.7% in Poland).

Despite numerous initiatives undertaken by the European Commission and aimed at increasing the level of innovativeness of the European economy, no significant successes were achieved in this area. Although Poland's accession to the Community improved the access of Polish entities (especially business enterprises) to not only the latest technologies, but above all public funds for research and development activities, money is not the problem, and the financial (funding) system is obviously not the panacea for existing problems.

Continuously increasing expenditure on innovation and R&D activities did not translate into a higher number of innovative solutions in the economy. Despite the launch of a number of programmes allowing for broad access to vast financial resources, no clear effects in the form of improved innovativeness could be seen.⁴⁸ It is therefore difficult not to get the impression that a huge part of the funds was spent inefficiently, to say the least (with inefficiency being a far-fetched euphemism). Consequently, even Polish exports, of which we so often boast, remain dominated by low-processed goods, with a low degree of technical advancement and an equally low level of modernity. For years, Poland has been regarded as an insufficiently innovative economy⁴⁹, a country still at an early stage of the innovation development process.⁵⁰ There are, of course, many reasons for this state of affairs, but particularly important is likely the lack of a clearly formulated and properly implemented state policy supporting the development of innovativeness.

48 M. Gasz, *Kierunki zmian w polityce innowacji w Polsce i Unii Europejskiej* [Directions of change in innovation policy in Poland and the European Union], "Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach" 2015, Studia Ekonomiczne, no. 214, p. 223.

49 The level of innovative activities of both Polish industry and the service sector was very low; especially small and medium-sized enterprises, which are supposed to be the "lever" of our economy, were not innovative and did not invest in innovation or R&D. Cf.: P. Nowak, *Kulturowe bariery rozwoju innowacyjności polskiej gospodarki* [Cultural barriers to the development of innovation in the Polish economy], "Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego" 2015, no. 29 (4), p. 88.

50 U. Płowiec, *Innowacyjność polskiej gospodarki w ocenie uczestników VIII Kongresu PTE* [Innovativeness of the Polish economy as perceived by the participants of the 8th Congress of the Polish Economic Society], in: E. Okoń-Horodyńska, A. Zachorowska-Mazurkiewicz (eds.) *Tendencje innowacyjnego rozwoju polskich przedsiębiorstw* [Trends in the Innovative Development of Polish Enterprises], Warszawa 2008, p. 3.

The situation of the Polish economy is definitely unfavourable, as there is a lack of understanding of the great importance of innovation in the process of building the competitive position of not only individual entities, but also the entire country.⁵¹ Polish enterprises have been unwilling to invest their resources in R&D activities; this could (and still can) be one of the biggest problems that needs to be addressed. This is compounded by the poor structure of expenditure on research, while at the same time cooperation between businesses and universities remains almost illusory.

A huge problem (but not a challenge) was that too much expenditure was not allocated strictly to R&D and to the creation of innovative products or technologies, but rather to so-called business environment institutions (thus, only part of it was spent on the modernisation of research infrastructure) and capital investments, i.e. support for the purchase of new technologies, machinery and equipment, which did not always translate into an increase in the actual level of innovation.

A change in the culture of entrepreneurship is therefore necessary to achieve favourable and sustainable changes, but the quality and scale of these must be the subject of separate studies. Meanwhile, it is the increase in the innovativeness of the Polish economy that should constitute a priority in the state's economic policy. This is, of course, not possible in all economic conditions. Taking into account the specificity of R&D activities, on the one hand, it can be (and often is) a source of quite measurable benefits; on the other hand, it is a serious burden for the economy, because conducting research and development activities is connected with the necessity of incurring considerable financial expenditure, and moreover, a very high risk.⁵²

51 This is 'fostered' not only by the relatively low quality of the research system, but also by the limited willingness/ability to cooperate between economic entities and between universities and businesses. Many Polish entrepreneurs are still not interested in innovation at all, and still gain their basic competitive advantage through low manufacturing costs, rather than upgrading technology, increasing product quality or strengthening existing brands. In fact, very few businesses innovate on a scale that ensures growth, just as few operate on the basis of long-term development plans, all of which translates into a less competitive economy. A certain limitation is also the conservative, mainly survival-oriented approach of Polish entrepreneurs on the market, as well as the way of management, focused on rewarding short-term 'successes'. Cf. P. Nowak, *Kulturowe bariery rozwoju innowacyjności polskiej gospodarki [Cultural barriers to the development of innovation in the Polish economy]*, "Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego" 2015, no. 29 (4), p. 90 et seq.

52 If the research process is unsuccessful, the return on investment may never materialise or the benefits achieved may be significantly less than expected. Also, it is not always possible to determine the moment when the results of R&D work will be possible to implement, and consequently R&D activities are not often a source of innovation in Polish enterprises. Cf. R. Knosala, A. Boratyńska-Sala, M. Jurczyk-Bunkowska, A. Moczala, *Zarządzanie innowacjami [Innovation management]*, Warszawa 2014, p. 221.

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The role of cooperation among enterprises in Poland in the period of global crisis based on the example of micro and small companies – selected aspects

Abstract

The global crisis caused by the SARS-CoV-2 pandemic and the Russian–Ukrainian military conflict, among others, has affected all economic entities, but especially micro and small enterprises. Although it is difficult today to accurately estimate the consequences of the crisis in relation to economic activities, it is in these conditions of unpredictability that two areas of consequences faced by economic entities are outlined. They are also visible in the case of micro and small enterprises. The first area is related to the adoption of a defence strategy by enterprises, the aim of which is to secure the continuity of management processes in the face of growing uncertainty in the multidimensional institutional environment in which entities operate (such as job reduction). The second area of consequences concerns the loss of control of owners and managers over enterprises (e.g. loss of liquidity of enterprises). The main objective of the paper is therefore an attempt to characterise the impact of the crisis on micro and small enterprises in Poland and identify the role of cooperation among these companies at this critical time. In this respect, the desk research method was used, which allowed the researchers to capture the most important data in an analytical manner while illustrating the situation of micro and small enterprises in Poland in the period of 2020-2022. The article also presents selected conclusions from primary research, which was conducted using the CAWI method among 400 micro and small companies in Poland in the period from July 2022 to January 2023. The conclusions of the analysis confirm the thesis adopted in the introduction of the paper that compared to large market players, micro and small companies had fewer possibilities of coping with the crisis caused by the SARS-CoV-2 coronavirus pandemic or the military conflict between Russia and Ukraine, among others.

¹ Uniwersytet Ekonomiczny w Katowicach.

Some of the most important factors allowing businesses to survive the crisis are cooperation among enterprises and the time horizon of the business before the COVID-19 pandemic. Most of those enterprises that started their activities several years before the COVID-19 pandemic and which had developed a competitive position in the economy in the meantime have survived on the market. The micro and small enterprises that have been most severely affected by the crisis are young companies that were operating or founded shortly before the outbreak of the COVID-19 pandemic. Also, cooperation among companies with local or/and regional/national entities helped businesses to continue in those difficult times.

Keywords

crisis, economic entities, entrepreneurship, small enterprises, micro enterprises, cooperation.

1. Introduction

The current critical period caused by the coronavirus pandemic is exogenous, which does not directly depend on the weakness of a given economy. In the literature on the subject, many authors emphasise that both demand and supply shocks are consequences of the crisis. In the face of recent events, one can see a strong reaction on both the demand side and the supply side. In the case of the crises caused firstly by the pandemic and then by the war in Ukraine, the demand shock was mainly caused by restrictions introduced by states (e.g. restrictions on movement, lockdowns, or temporary restrictions on the functioning of commercial service providers).

Problems on the labour market also contributed to the reduction in demand (the deterioration of the status of many workers employed mainly in service sectors such as tourism, gastronomy, and culture). The economy was further weakened by other factors causing demand–supply shocks. Broken supply chains and problems with access to resources brought about the inflexible behaviour of producers, who in the first phase of the shock were not able to respond to the changing needs of consumers and supplement the shortages of products Bednarczyk J., Żakowska-Kalita J, 2021, 270-272).

In a crisis situation, the words of G. Kolodko seem apt: “the market itself, without government intervention, neither develops nor has the ability to self-regulate, [which] has become even more important. If the market were left to its own devices, it would annihilate itself” (Kołodko G., 2013, 127).

It should be remembered, however, that state interventionism, apart from correcting markets in crisis situations (e.g. by affecting insufficient demand), may have a detrimental effect on the economy and its entities (Kołodko G., 2021, 59). It may be destructive to create unfavourable conditions for entities participating in management processes, which will weaken their competitiveness on the market or use

interventionist tools to achieve political goals. In a situation of deepening crisis, the mechanisms of state interventionism were activated, which were to prevent a further recession at least to some extent. For this reason, the role of cooperation among enterprises in these difficult times has become even more important than before. Thanks to cooperation and social capital, many enterprises, mainly micro and small companies, have been able to survive and continue their business activities.

The main objective of the paper is an attempt to characterise the impact of the crisis on the situation of micro and small enterprises in Poland and identify the role of cooperation among these companies in these critical times. The main research assumption claims that, compared to large market players, micro and small companies as entities operating on the market had fewer possibilities of coping with the crisis situation caused by the SARS-CoV-2 coronavirus pandemic or the military conflict between Russia and Ukraine, among others. One of the most important factors allowing businesses to survive the crisis is cooperation among the enterprises and the time horizon of the business before the crisis. In this respect, the desk research method was used, which allowed the researchers to capture the most important data in an analytical way while illustrating the situation of micro and small enterprises in Poland in the period of 2020-2022. The article also presents selected conclusions from the primary research, which was conducted using the CAWI method among 400 micro and small companies in Poland in the period from July 2022 to January 2023.

2. Business activity of companies in the world in times of global crisis

In times of global crisis caused by the coronavirus (COVID-19) pandemic, among others, many business activities were paralysed by the introduction of institutional defence mechanisms by states (the suspension of stationary economic activities and the implementation of tools for the remote operation of entities in many economic sectors were consequences of the spread of COVID-19). Today, it is difficult to estimate the consequences of the transition of economies to standby mode in the ensuing months or years (Grabowska-Powaga A., 2020, 38). A sense of anxiety likely befell all market entities, but it seems that micro and small enterprises especially could feel the consequences of the economic suspension and may continue to do so in the near future. Systemic solutions proposed by governments do not ensure the continuity of economic processes in the long term, but are only a certain tool for calming the public mood.

In conditions of economic unpredictability, two areas of consequences faced by economic entities occur, and are also observed in the case of micro and small enterprises:

- The first area is related to the adoption of a defence strategy by enterprises aimed at securing the continuity of management processes in the face of increasing uncertainty in the multidimensional institutional environment in which they operate. Manifestations of behaviours in the described area can be reduced to examples of redundancies or reduction of production volumes, which is a response to limited demand or to visible tendencies of declining demand in a given period.
- The second area of consequences that companies have to deal with is the loss of control of owners and managers over enterprises. In this area, we may recognise behaviours such as:
 - loss of liquidity in a short period of time, which translates into the unstable activity of the entire enterprise;
 - forced breaks in the business activity of enterprises caused by problems in the fluidity and regularity of supply chains, among others;
 - suspension of activity for an indefinite period with the option of returning to business activity when the economy recovers from the stagnation caused by the global crisis;
 - the complete abandonment of business activity, the continuity of which was not ensured by the defence mechanisms proposed by governments (anti-crisis shields, exemptions from the necessity to pay fees at a given time) and, on the other hand, demand and supply trends.

The extent to which entities experienced the consequences of the crisis caused by the COVID-19 pandemic and then by the war in Ukraine depended on many factors, including the type of industry, financial condition, or size of the entity. During the global crisis, some economic sectors were forced to diversify their business profiles; for some enterprises, the crisis became an opportunity for development, while others only partially modified their business goals. Therefore, assuming the new conditions resulting from the crisis as the criterion for distinguishing between them, the analysis introduces four groups of economic areas in which the enterprises were found:

- Industries that were not affected economically as a result of the pandemic or whose development is noticeable (IT services, maintenance services, or health and health-related services, among others),
- Neutral industries upon which the existing crisis situation did not have a significant impact (e.g. construction services),
- Industries that suffered as a result of restrictions and lockdowns, and which, due to the profile of their economic activities, were not significantly helped by government actions or those initiated by the local community (this applies to the cultural or tourism industry, among others). It should also be noted that these are industries that do not significantly contribute to the

increase in unemployment (the percentage of people employed in these industries is lower than in other industrial or commercial sectors).

- Industries that were hit hard by the crisis caused by the coronavirus pandemic, but which could count on the support of local communities.

The survival of companies in times of crisis also depends on their financial condition (cash reserves), creditworthiness, and their place in investor rankings. Survival on the market is also determined by government support and the vision for the development of the company's potential. As S. Galloway writes, "if the market recognises Amazon, Tesla or some other promising companies as companies with potential, it will lower the cost of capital and artificially pump the value of remuneration paid there (using the stock options). Thus, it will enable these companies to obtain resources that they would not be able to generate on their own." Therefore, according to the author, survival is highly possible for companies that, having reserves of financial resources, creditworthiness and the recognition of investors, will have a high probability of protecting the liquidity of their business processes and will be able to take over the assets of companies that have not coped with the unpredictable economic reality (Galloway S., 2021, 63). Examples of companies that unexpectedly failed to cope with new challenges, or rather the limitations that were the result of the need to fight the spreading virus, included companies that either completely or partially limited their business operations as early as the first months of the pandemic. Important companies from the American market that should be mentioned here comprised, among others, JC Penney, Papyrus, J. Cew, Brooks Brothers, Hertz (Dollar & Thrifty), Advantage, Lord & Taylor, True Religion, Lucky Brand Jeans, Lane Bryant, Men's Warehouse, John Varrots, Ann Taylor, 24 Hour Fitness, Gold's Gym, GNC, Model's Sporting Goods, XFL, Sur La Table, Dean & De Luca, Muji, Chesapeake Energy, Diamond Offshore, Whiting Petroleum, California Pizza Kitchen, Le Pain Quotidien, and Chuck E. Cheese. Among examples from the European markets, the Spanish holding Inditex, the Polish company LPP or Camaieu deserve attention. After the first reaction limiting business activity, some enterprises partially returned to their operations, both stationary and online.

Another factor that played a vital role in coping with the reality of the pandemic was the size of the entities. As a result of unequal opportunities and emerging disproportions in the functioning of business entities in crisis situations, larger economic entities had, and still have, a greater chance of maintaining liquidity, which in turn led to the increased monopolisation of markets. Since March 2020, when the spread of the virus that caused widespread disease and the death of many millions of people around the world, as well as the subsequent lockdowns, impacted the economy and contributed to the growing recession and the increase in unemployment, the largest technology companies, who were and still are the largest

market players, increased their revenues by several trillion dollars. Thereby, they strengthened their monopolistic position in the global economy.

The question arises whether, in relation to large corporations, smaller companies that do not have sufficient resources to survive the crisis are doomed to abandon their current economic activities.

The survival of weaker companies depends on whether it is possible to reduce, freeze or eliminate some of their costs, and on the time horizon of the company's operation on the market before the crisis. S. Galloway proposes a modification of the most burdensome financial liabilities of entrepreneurs regarding the maintenance of jobs (such as cutting the highest wages or offering unpaid leave) or a partial reduction of fixed costs (switching to the virtual world where possible and eliminating stationary points that generate high maintenance costs) (Galloway S., 2021, 64 and further). Weaker companies should also seek model solutions in relation to their businesses that allow the use of other entities' resources².

3. The sector of micro, small and medium-sized enterprises in Poland during the crisis

The small and medium-sized enterprise sector in Poland continues to grow. For comparison, there were 1.86 million companies in 2008, and over 2.15 million enterprises in 2020. Currently, the small and medium-sized enterprise sector comprises 99.8% of all companies operating in Poland, of which micro companies account for 96.5%, and small companies for 2.6%. In 2020 such enterprises in Poland generated revenues in the amount of PLN 5.26 trillion, constituting a 72.7% share of GDP. The value of exports of goods and services in the analysed period was PLN 1.28 trillion, while imports of goods and services amounted to PLN 1.16 trillion. The high share of micro and small enterprises in the economy implied a similar share of these companies in GDP (in 2020 the share of GDP generated by micro and small enterprises was 38.1%). Most micro and small enterprises engaged in service activities (54.3%), trade and repair of vehicles (21.6%), construction activities (14.5%), industrial activities (9.2%) and agriculture (0.4%). The share of large enterprises classified by industry differs from that of the sector of small and medium-sized enterprises, i.e. industrial enterprises constitute 52%, service enterprises 30.7%, trade companies 13.7%, and construction enterprises 3.6%. In the group of over 10 million employees working in the enterprise sector, 67.4% are employees of small and medium-sized enterprises, of which the largest group are people employed in microenterprises (4.12 million). The average gross salary of employees in the enterprise sector in 2020 was PLN 5,168. The activity of enterprises in Poland is

2 Dzikowska M., Gorynia M., Jankowska B. 2016, pp. 40 and further.

illustrated by the state of ongoing investments, which at the end of 2020 amounted to PLN 240.6 billion. In the small and medium-sized enterprise sector, an increase by 5.7% was recorded as compared to the period of the previous year. Such companies mostly financed their activities from their own resources (72.7%) or from loans (10.1%), while other forms of financial support came from direct funds from abroad (6.7%), budget funds (3.6%) and other sources (6.8%).

The year 2020, and with it the SARS-CoV-2 coronavirus pandemic, changed not only the global economy, but also local markets. As a result of the global threat, more countries introduced defence mechanisms in the form of restrictions on the functioning of economies and societies. The conditions for the functioning of economic entities have changed, which also had a significant impact on their structure and market competitiveness. The continuity of management processes has become questionable, especially in the case of the smallest business entities, i.e. micro and small enterprises. In 2020, a bad or very bad economic situation was observed in 21% of operating microenterprises (an increase of 16% compared to 2019) and in 24% of small enterprises (an increase of 20% compared to the previous year). In 2020, 170,000 enterprises were removed from the register, of which 42,000 dealt with trade and repair, 27,400 operated in the construction industry, 15,100 in manufacturing and 14.4% conducted professional, scientific or technical activities. At the same time, 329,000 new business entities were registered. The largest number of newly established enterprises were registered in the construction sector (68,400), trade and repair (56,500), professional, scientific and technical activities (36,000), and industrial processing (22,700).

Compared to 2019, the number of newly established companies decreased by 13.2%, while the number of companies liquidated in 2020 was higher by 25% in comparison with the previous year. More than 80% of the companies that were created in the first year of the pandemic are business activities conducted by natural persons. Out of 278,583 companies established in 2019, 69.3% continued operating in the following year. The largest number of companies survived in the sectors related to information and communication (78.3%) and education (75.6%), while the lowest survival rates in 2020 were recorded by companies operating in the catering industry (59.7%) and on the real estate market (64.1%).

In terms of regional structure, the largest number of companies established in 2019, when the COVID-19 pandemic began, operated in Małopolskie (81.8%) and Podlaskie (78.9%) voivodeships, while the smallest number operated in Warmińsko-Mazurskie (43.9%) and Świętokrzyskie voivodeships (51%).

At this point, it should be emphasised that such dynamics of changes in entrepreneurship are not unusual. The specificity of the market verifies the survival of companies in the short term (usually one or two years). The longer the time horizon of the company's activity, the greater the chance of its survival on the market.

Among companies operating for more than one year, the highest survival rates are characteristic of industrial companies (93.3%), service companies (93.2%) and companies dealing with transport and warehouse management (93.1%).

3.1. Micro and small enterprises during the crisis – selected aspects based on secondary research

The sector of enterprises in Poland consists mainly of micro and small companies (in the case of micro companies the share in the entire economy is 97%, and the share of small companies 2.2%), The companies also have an impact on national GDP – the share of GDP in the case of micro firms is 29%, and small companies 9.1%. Over 50% of micro and small companies operate in the services sector, over 20% trade, while the remainder deal with construction and industry. They also cooperate on the international markets – the share of exports of goods and services in the case of micro companies is 4.7%, and in the case of small firms 15.3%. Micro and small companies employ over 5 million workers (Table 1).

Table 1. Characteristics of micro and small enterprises in the period of 2020-2022

Criteria	Micro	Small
Number of entities	2,144,200	48,900
Share in the entire economy	97%	2.2%
Share of GDP	29%	9.1%
The structure of entities	I. 53.2% services: <ul style="list-style-type: none"> • 14.2% professional, scientific and technical activities, • 8.8 % healthcare, aid, • 6.8% transport, warehouse management, • 23.4% other. II. 22.4% trade III. 15% construction IV. 9.5% industry	I. 52.5% services: <ul style="list-style-type: none"> • 13.9% professional, scientific and technical activities, • 8.8% health care, assistance, • 6.8% transport, warehouse management, • 23.1% other. II. 22.4% trade III. 14.9% construction IV. 10.1% industry
Workers	4.1 million	1.05 million
Capital expenditures	34,059 million (20,070 per company)	15,833 million (392,700 per company)
Share of exports of goods and services in total revenue	4.7%	15.3%

Source: own study based on secondary data (PARP, 2021, 2022).

With regard to the situation of micro and small enterprises in Poland, below are the results of research conducted by the Polish Agency for Enterprise Development as part of the Panel of Polish Enterprises research program. This survey was conducted from 22 March to 9 April 2021 on a sample of 397 respondents, i.e. owners and managers of companies operating in Poland. The study was carried out using the Computer-Assisted Web Interview technique (PARP, 2021)

In response to the crisis, as many as 68% of companies operating on the market several years before the outbreak of the pandemic coped with the new situation relatively efficiently. The remaining companies indicated difficulties in conducting business in the analysed period. These most often concerned both supply barriers (high labour costs, unstable and unclear legal regulations, high burdens for the state) and demand barriers (strong competition or insufficient customer funds).

Until 2020, the factors identified by entrepreneurs as barriers to the development of their economic activity were mainly financial barriers (high taxes, high employment costs), market barriers (such as increasing competition from other domestic and foreign entities with increasing price competition), legal barriers (such as inflexible labour law), and institutional barriers (related to the risk of conducting business activity and economic uncertainty).

According to the respondents, despite the difficulties that arose during the pandemic and which primarily concerned the lack of adequate financial or technological security, the majority of companies (in general, but with particular emphasis on micro and small companies) maintained their operations.

The economic and social shocks provoked entities to look for solutions to maintain their economic activity in the era of economic unpredictability. According to the respondents, state aid on the one hand, and the growing importance of cooperation between entities on the other hand, have proven to be effective in the fight against the invisible enemy.

4. The role of cooperation during a global crisis based on the example of micro and small companies - selected problems from primary research

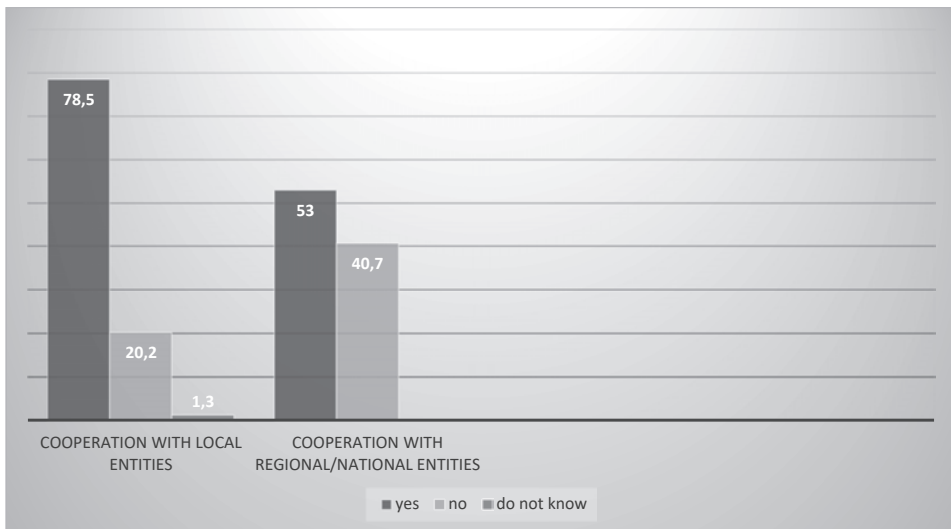
The situation of micro and small companies during a period of global crisis inspired deeper research to recognise how they coped with such a situation. One of the most important parts of the research was to identify the role of cooperation at that time. To that end, the main questions in the interview were as follows:

- Has cooperation among the enterprises studied and other entities become even more important than before the crisis?
- Have the companies studied cooperated with entities with which they were familiar before the crisis, or have they found new partners during this time?

- Have they cooperated only with local entities or have they established new relations with regional or national entities (other companies, institutions)?
- The research was conducted between July 2022 and January 2023 using the CAWI method. Almost 1000 entrepreneurs were invited to participate in the research, of whom 40% replied.

For the main question in regard to cooperation, almost 80% stated that they have business relations with local partners, and 53% with regional or national entities (see Graph 1). The entrepreneurs who do not cooperate with others underlined the barriers to doing so – as outlined above, these include financial and legal barriers (e.g. high costs of contracts, complicated legal procedures that make cooperation difficult).

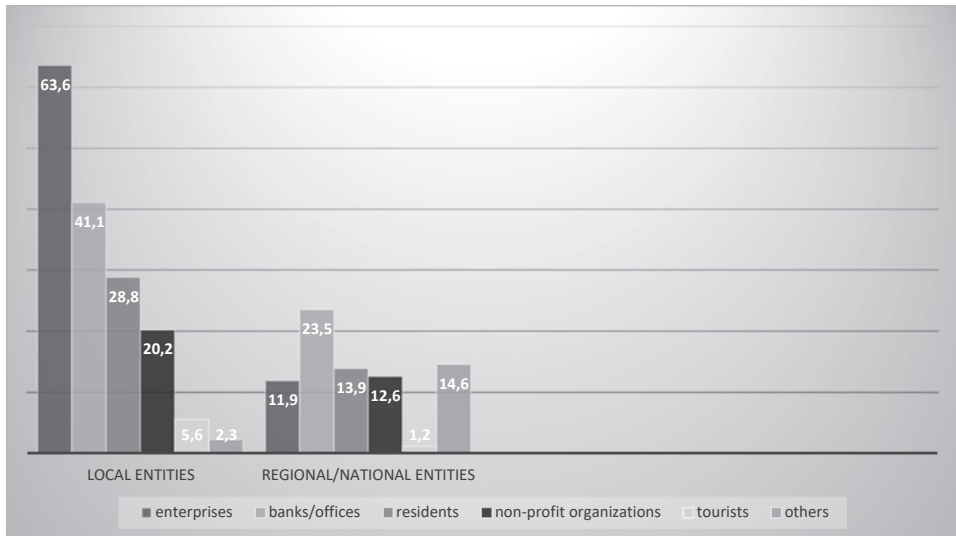
Graph 1. Cooperation among micro and small enterprises



Source: own study.

In the case of local entities, such enterprises mostly cooperate with other local companies (63.6%), banks and offices (41.4%), and residents (28.8%). With regard to regional and national entities, they mostly cooperate with banks and offices (23.5%), other organisations and institutions (14.6%) and residents (13.9%) (Graph 2).

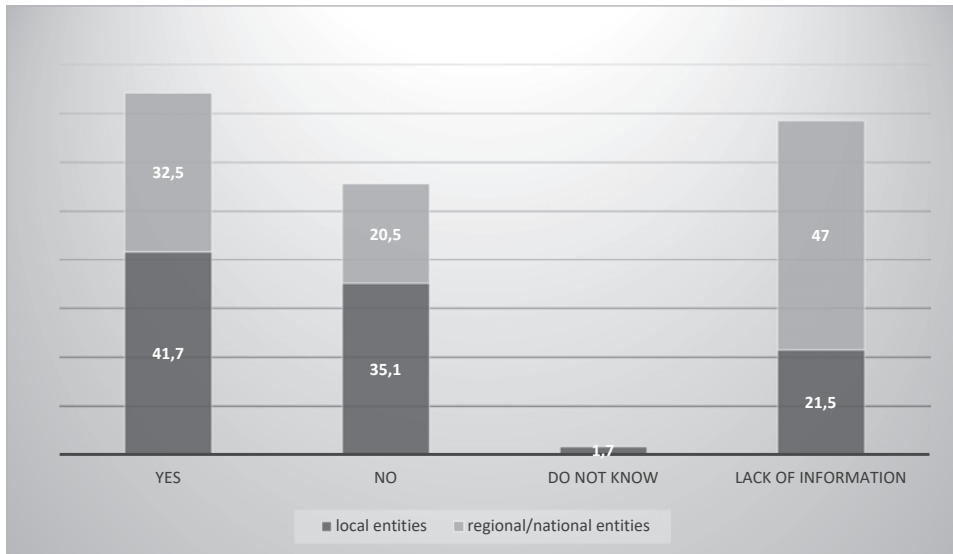
Graph 2. Cooperation of business entities with micro and small enterprises



Source: own study.

As was stated above, cooperation is one of the most important factors that have an impact on the continuation of business activities in times of crisis. For this reason, one of the most important questions during the research was the issue of firms' ability to establish new relations during crisis periods. Were the enterprises able to find new partners at such a critical time or did they cooperate only with partners already known to them? Only 32.5% of respondents answered the question positively. Surprisingly, 47% of the entrepreneurs did not reply to the question about new relationships during the time of crisis. The conclusions drawn here may therefore differ: perhaps it was difficult to indicate how long they had cooperated with their partners, or they did not have knowledge of new enterprises with which they cooperated (Graph 3).

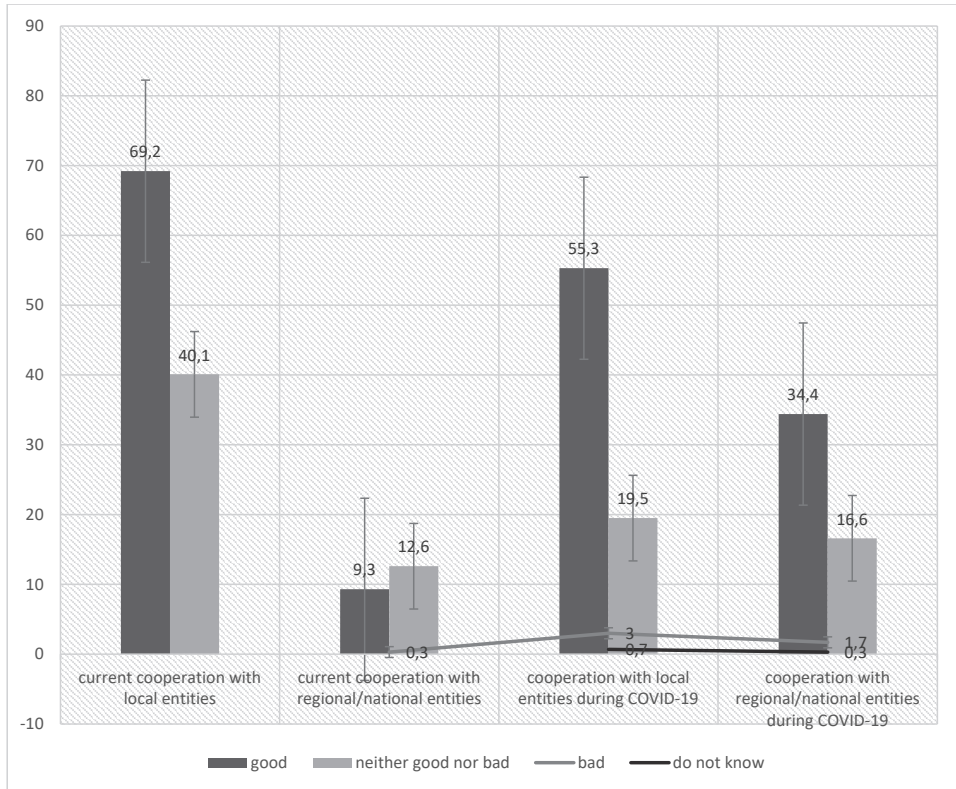
Graph 3. Cooperation with new entities during the crisis



Source: own study.

The entrepreneurs mostly evaluated cooperation positively, as almost 70% had a very positive opinion of cooperation with local entities, and almost 10% evaluated the cooperation with the regional or national entities very positively. The trend slightly changed during the crisis, as the positive evaluation of cooperation among local entities fell to 55.3%, but increased in the case of cooperation with regional and national entities (Graph 4).

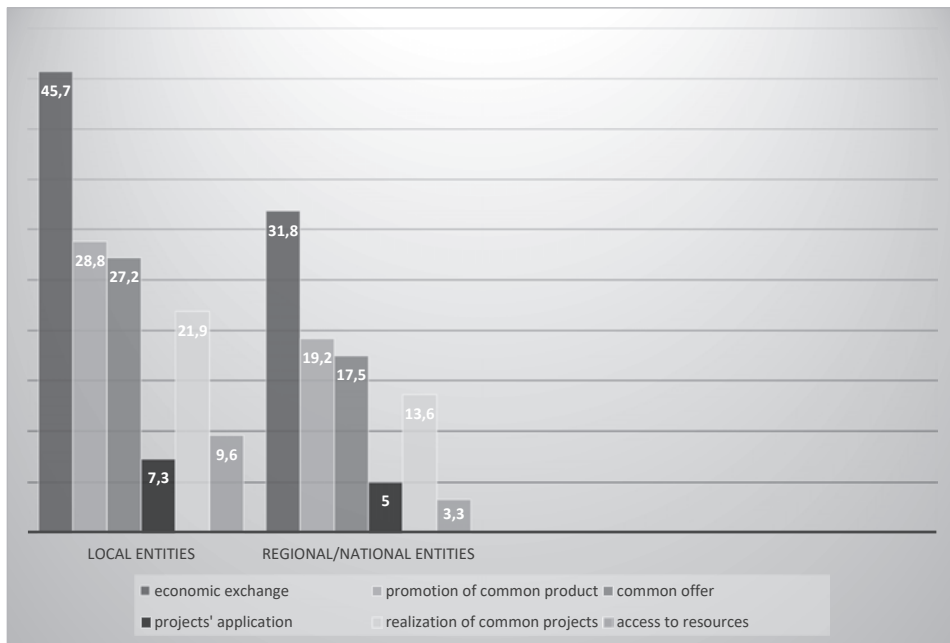
Graph 4. Evaluation of current cooperation from respondents' points of view



Source: own study.

From the point of view of the respondents, the main aims of cooperation include economic exchange (almost 46% for local cooperation, and 31.8% for regional and national cooperation); the promotion of common products (local cooperation – 28.8%, regional and national cooperation – 19.2%); common offer (local cooperation – 27.2%, regional/national cooperation – 17.5%); and the application and realisation of projects and access to resources (Graph 5).

Graph 5. The aims of cooperation among micro and small enterprises and other entities



Source: own study.

On the basis of the above premises, cooperation among enterprises, especially among micro and small enterprises, is still one of the most important factors that have an impact on business activities. It helps not only to provide and extend economic activity on the market, but also to ensure that businesses continue as going concerns in critical times of unpredictability. One crucial conclusion from the research is that, during global crises such as those caused by the COVID-19 pandemic and the war in Ukraine, the importance of supra-local cooperation has increased.

Conclusions

The conclusions of the analysis confirm the thesis adopted in the introduction of the paper. As can be seen from the above considerations, micro and small enterprises had significantly lower chances of surviving the test of time than their largest competitors. The micro and small enterprises that have been most severely affected by the crisis are young companies that started operating shortly before the outbreak of the COVID-19 pandemic.

Most of those enterprises that started their activities several years before crisis and which had developed a competitive position in the economy in the meantime have survived. Two-thirds of companies maintained the liquidity of their economic activities without any major restrictions, and the time horizon of doing business before the COVID-19 pandemic was the crucial factor influencing the efficiency of companies in coping with the crisis.

There are many determinants that have had an impact on business activities at this time, e.g. a flexible style of working (many firms have taken advantage of on-line working to continue their activities). Also, cooperation among companies with local and regional or national entities helped to continue businesses in those difficult times. Almost 80% of micro and small companies cooperate with other entities and also found new partners in times of crisis. Entrepreneurs claim that the ability to cooperate is one of the most important factors that enable them to do business, even in critical times. There are also some barriers to establishing new business relationships. Until 2020, the factors identified by entrepreneurs as barriers to the development of their economic activity and cooperation with other entities mainly included financial barriers (high taxes, high employment costs), market barriers (such as increasing competition from other domestic and foreign entities with increasing price competition), legal barriers (such as inflexible labour law) and institutional barriers (related to the risk of business activity and economic uncertainty). The initial results of the research conducted during the ongoing crisis confirm that, apart from the unpredictable conditions of running a business during the crisis, financial, legal and organisational barriers continue to significantly constrain the development and cooperation of micro and small businesses in Poland.

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International Entrepreneurship, Innovation and Sustainable Development: Evidence from Nigeria and Poland

Abstract

Aside from other conventional drivers of sustainable development, international entrepreneurship and innovation have been shown to play a significant role. This study examined the role of global entrepreneurship and innovation in sustainable development in Nigeria and Poland from 1996-2021. The research adopted the exogenous theory related to the exogenous flow of technological progress on which growth partly depends. Furthermore, the study adopted the estimation method based on the robust least squares, with the results that international entrepreneurship performed better in development in Poland than in Nigeria, particularly in travel services. However, medium, and high technology exports drive the Nigerian economy. Innovation plays a more significant role in Poland than in Nigeria. Electric power consumption as a driver of innovation fostered the Polish economy more than Nigeria's.

In contrast, the research found scientific and technical journal articles as a guide to both countries' development paths positively, indicating the role of innovation research. Of utmost importance is to develop the innovation process through a stable power supply and significant resources are invested in the realm of research and development, and the outcomes of these efforts are often published in scientific journals. These would increase the motivation for entrepreneurship. Policies should be

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implemented to stabilise local currency and increase competitiveness for macroeconomic stability, especially in Nigeria.

Keywords

international entrepreneurship, innovation, sustainable development.

1. Introduction

Economic sustainability, one of the dimensions of sustainability, is driven by international entrepreneurship (Von, 2005), cited in Perényi and Losonczi, 2018). Economic development theorists have emphasised the interrelationship among economic, social, and environmental sustainability and economic development (Grabowski, Self and Shields, 2012; Griffin, 1999; Nafziger, 2012; Todaro & Smith, 2015). The idea of international entrepreneurship is rooted in the small and medium-sized enterprises (SMEs) that are drivers of economic development through increasing employment, human capital development and R&D for sustainable economic outputs in modern economies. The SMEs in question have been fundamentally relevant to open and closed economies to maintain their sustainable development efforts (Huwart and Verdier, 2013; Ács et al., 1999), among others. The foreign market entry of SMEs has become a focus for policymakers, providing enormous benefits for market integration and economic globalisation.,

International entrepreneurship bridges the gap between international business and entrepreneurship. McDougall (1989 cited in Perényi and Losonczi 2018), coined global entrepreneurship as a concept. After that, many empirical discussions have systematically been captured within the scope of international entrepreneurship. Literature has pointed to factors such as sector (high-tech or high-team size, the presence or absence of aggregations, and the relevance of international experience within firms, which determine internalisation. Knowledge and acquisition are relevant in the internalised firm and its immediate external environment. Economic models of internalisation concentrate on the relevance of sunk costs and varying heterogeneity across firms in terms of differing productivity. For entry costs to be subdued, firms should be equipped with a knowledge base and complementary resources, particularly in the areas of R&D and human assets that foster absorptive capacity. In line with this, differences in productivity depend on differing knowledge and resource bases, which again rely on innovation rates and other aspects of total factor productivity. The internationalisation process can be explained through firms' specific assets and knowledge accumulation. Understanding the reasons why certain firms choose to internalise their operations while others do not and the different options available to them, such as exporting, FDI, or joint ventures, can help us determine which firms can benefit in terms of improving the economic performance of their origin.

Innovation, as a driver of economic growth in emerging economies (Radas and Božić, 2009), helps to develop the required solutions for lower- and middle-class consumers (Cavusgil et al., (2018)). Accordingly, international business cross-border trade and investment flows significantly impact countries' economic growth, employment opportunities and innovation potential (Gereffi, 2019).

Innovation, knowledge, and technology play a significant role in international entrepreneurship and are essential in achieving competitive advantages within business environments. In the view of Cantwell, the increasing interlink between innovation and internationalisation has been known to be a catalyst for growth and development since the Industrial Revolution, and it continues to be so today.

Whether or not a country is competitive depends on its stages of development, as emphasised by the Global Competitiveness Index (World Economic Forum, 2015). Based on the World Economic Forum (2015), the development and transition stages have been categorised into the factor-driven economy, the first stage of development wherein countries compete based on their factor endowments. The efficiency-driven stage is the second stage in which countries implement more efficient production processes and improve product quality (Onukwuli et al., 2016). As a country moves into the innovation-driven stage, it produces new and different goods using a more sophisticated production process and innovating new ones. A country with a high degree of competitiveness at any level of development depends primarily on the basic requirements sub-index, the efficiency enhancer sub-index and the innovative and sophisticated factor sub-index for the early stages of development.

Nigeria has long aspired to be among the top 20 economies globally, with diversification as a top priority amidst dwindling revenue from oil. These motives emerged from believing Nigeria's material and human resources endowment put it in good standing to climb the ladder. Creativity is undoubtedly the primary driver of innovation and economic progress in Nigeria and Poland (Florida et al., 2015). Regrettably, Nigeria was excluded from the 2015 Global Creativity Index (GCI) ranking of 139 countries. The GCI reflects technology, talent, and tolerance as critical factors that shape long-term economic prosperity. Australia, the United States, New Zealand, and Canada were at the top of the list in that order, Denmark, Finland, Sweden, Iceland, Singapore, and the Netherlands were among the top 10. By implication, Nigeria and Poland were not included in the top 10 in the 2015 GCI. For 2015, the Global Index (GII), covering 141 countries globally and using 79 indicators within a range of themes, put Nigeria at 128th. Unfortunately, Nigeria, presumed to be the giant of Africa, was ranked even below some African countries, including Mauritius (49th), South Africa (60th), Tunisia (76th), Morocco (78th), Senegal (84th), Botswana (90th), Kenya (92nd), Rwanda (94th), Mozambique (95th), Malawi (98th) and many others (Cornell University, INSEAD & WIPO, 2015). Among other factors, this

accounts for low international business potential and weak economic growth. In a recent GII, as shown in Figure 1, comprising Switzerland, Sweden, the United Kingdom, the United States of America, Finland, Singapore, Ireland, Denmark, the Netherlands, and Germany, among others, Nigeria came 114th in the ranking, with Poland placed significantly higher at 39th. Going by this, Poland is comparatively higher in terms of innovation index ranking than Nigeria, even though it is still far below other developed countries in terms of innovation.

Figure 1. Global Innovative Index: Nigeria and Poland



Source: <https://www.researchgate.net>

Due to institutional instability and environmental turbulence, entrepreneurship and sustainable development are significant challenges in Nigeria. In Nigeria, the informal sector is a substantial part of the entrepreneurial landscape since many entrepreneurs conduct businesses outside the formal institutional framework. Entrepreneurial growth and innovation are hindered by a limited framework and a need for more access to finance (Adeleye et al., 2021; Olokundun et al., 2017).

Poland, one of the fastest-growing EU economies and a significant market player within Central and Eastern Europe has achieved tremendous GDP growth in the last 30 years, transforming it into a high-income economy within the shortest possible time among the countries in focus. Investing in public funds to achieve the highest possible return is a valuable insight. The project financed by the European Commission pilots a methodology through the World Bank to measure and foster innovation and SME support instruments. The Polish Ministry of Development

Funds and Regional Policy, Ministry of Economic Development, Statistics Poland, and national and international authorities are working together to provide decision-makers with a suitable platform for public support to achieve significant developmental objectives.

On the other hand, Poland, with its more established institutional framework, presents a different context for international entrepreneurship and innovation. The country's institutional environment provides a supportive ecosystem for entrepreneurship and innovation, enabling firms to leverage resources and networks for growth and development. Cultural, institutional, and resource-related factors shape the interplay between international entrepreneurship, innovation, and sustainable development in Nigeria and Poland. Cultural differences, institutional frameworks, and access to resources influence entrepreneurial behaviours, innovation processes, and the pursuit of sustainable development goals. Understanding these dynamics is crucial for policymakers, researchers, and entrepreneurs to create conducive environments that foster international entrepreneurship, drive innovation, and promote sustainable development in these countries. It brings about a strong motivation for the study.

Consequently, the study attempts to answer the following questions: How does innovation foster international entrepreneurship in Nigeria and Poland? What is the relationship between innovation and sustainable development in Nigeria and Poland? How is global entrepreneurship related to sustainable development in Nigeria and Poland? How do competitiveness and macroeconomic instability impact sustainable development in Nigeria and Poland? Thus, the study's objectives are to examine the effect of innovation on sustainable development, identify the relationship between international entrepreneurship and sustainable development in Nigeria and Poland, and analyse the impact of competitiveness and macroeconomic instability on sustainable development in Nigeria and Poland.

Finally, empirical studies gave insights from a series of scholarly works focusing on the dynamics of international entrepreneurship, innovation, and sustainable development in Poland and Nigeria; the reviews offered a comparative understanding of the entrepreneurial ecosystems in both countries and their implications for sustainable development. The empirical works of Nowak (2018), Lisiak-Zielińska & Ziernicka-Wojtaszek (2021), Pilipczuk (2021) and Kowalski & Weresa (2021), Weresa, Kowalski & Guz-Rudzki (2021), Wojtysiak-Kotlarski, Pietrasieński & Marciniak (2022) revealed the findings that underscore the significance of innovation drivers, the role of government policies the dynamics of entrepreneurial ecosystems, and the contributions of social enterprises in shaping sustainable development agendas. The comparative perspective enriches our understanding of the contextual factors influencing entrepreneurial endeavours and their implications for sustainable development across diverse economic landscapes. Furthermore, the

empirical studies of Mohammed (2018), Adeyemi (2019), Ibidunni et al. (2021), Ukwueze (2022), and Binuyo et al. (2023) provided a multifaceted view of international entrepreneurship, innovation, and sustainable development in Nigeria. The findings underscore the resilience of Nigerian entrepreneurs, the importance of innovation in start-ups, the challenges SMEs face in internationalisation, the significant role of women entrepreneurs, and the impact of government policies on the entrepreneurial ecosystem. The insights garnered from these studies contribute to a holistic understanding of the Nigerian entrepreneurial landscape and its implications for sustainable development.

2. Literature Review

International entrepreneurship refers to creating, developing, and managing entrepreneurial ventures operating across national borders (McDougall et al., 2018; Oviatt and McDougall, 2005). It involves identifying and exploiting opportunities in foreign markets, navigating the complexities of international business environments, and leveraging resources and capabilities to achieve a competitive advantage on a global scale (Coviello and McAuley, 1999; Knight and Cavusgil, 2004). Innovation introduces new ideas, products, processes, or business models that create value and drive economic and social progress (Damanpour, 1991; Schumpeter, 1934). It involves generating, adopting, and implementing novel solutions that address market needs, improve efficiency, or radically transform industries and societies (Damanpour, 1991; Teece, 2018). Sustainable development is a holistic approach to economic growth that considers environmental protection, social equity, and long-term viability (Brundtland, 1987; United Nations, 2015). It involves meeting the requirements of the present generation without trading off the ability of future generations to meet their own needs. Sustainable development encompasses economic, environmental, and social dimensions, aiming to balance economic prosperity, environmental stewardship, and social wellbeing (Brundtland, 1987; United Nations, 2015). Hence, to understand the relationship between international entrepreneurship, innovation, and sustainable development, it is crucial to consider the influence of cultural disparities, institutional structures, and resource availability on entrepreneurial attitudes and accomplishments (Chidiebere-Mark et al., 2021; Gupta et al., 2021). A country's cultural practices and values impact the entrepreneurial orientation and strategies of entrepreneurs operating within that country (Gupta et al., 2021; Liñán and Fernandez-Serrano, 2014). Institutions' policies, regulations, and support structures can either facilitate or impede entrepreneurial activities and innovation (Etzkowitz et al., 2019; Salim et al., 2020). Access to resources such as finance, technology, and human capital makes it easier for entrepreneurs to enter foreign markets and promotes sustainable development through innovation (Adeyele et al., 2021; Iqbal et al., 2017).

Understanding international entrepreneurship, innovation, and sustainable development entails evaluating some theoretical underpinnings. These include institutional theory, the resource-based view (RBV), the dynamic capabilities theory, the entrepreneurial ecosystem framework, Sustainable Development Goals (SDGs), Social Capital Theory, Technology Transfer and Knowledge Spillover, the Triple Helix Model, Absorptive Capacity, and entrepreneurial orientation. By integrating these perspectives into the study of innovation, entrepreneurship, and sustainable development, researchers can lay a strong foundation for identifying underlying mechanisms, dynamics, and outcomes, which can inform empirical studies, policy interventions, and strategic decision-making to promote international entrepreneurial activities, innovation, and sustainable development.

According to DiMaggio and Powell (1983), institutional theory analyses how formal and informal rules, norms, and practices affect the behaviours of individuals and organisations. Specifically, in international entrepreneurship, this theory highlights how institutional environments, including legal systems, regulatory frameworks, and cultural norms, can impact entrepreneurial activities (Ogbor, 2012). The fortuities and challenges faced by entrepreneurs in Nigeria and Poland are influenced by institutional factors (Oyedele et al., 2021).

To emphasise a company's different resources and abilities as crucial sources of competitive advantage, Barney (1991) and Wernerfelt (1984) developed the Resource-based view (RBV). RBV is particularly relevant in international entrepreneurship and innovation, highlighting the significance of utilising company-specific resources such as technology, knowledge, and human capital to promote innovation and sustainable growth (Okpara and Wynn, 2018). This viewpoint pertains to analysing how Nigerian and Polish companies utilise their resources to compete globally (Ibrahim, 2020).

According to Teece et al. (1997), the dynamic capabilities theory highlights a company's capacity to adjust, innovate, and reorganise its resources to meet the demands of evolving market conditions. In global entrepreneurship and innovation, dynamic capabilities are essential for identifying and capitalising on opportunities in foreign markets, devising innovative strategies, and navigating cross-cultural differences (Adegbite et al., 2022). This theory explains the improvement in the competitive advantage of nations by implementing adaptive and innovative practices. Thus, this applies to Nigeria and Poland in their quest to improve competitive advantage through innovative techniques.

The entrepreneurial ecosystem framework, created by Mason and Brown in 2014 and further developed by Spigel in 2017, offers a complete view of the factors and dynamics that influence entrepreneurship. This approach acknowledges the interrelationships between elements, such as support organisations, networks,

funding sources, and regulatory frameworks, to establish an environment favourable to innovation and entrepreneurship (Ademola et al., 2020). Examining Nigeria and Poland's entrepreneurial ecosystems is essential to understanding sustainable entrepreneurship and innovation. It will help identify the factors that promote or hinder these endeavours (Osabuohien et al., 2022).

The Sustainable Development Goals (SDGs) of the United Nations offer a structure for incorporating sustainability into global entrepreneurship and innovation. These goals cover sustainability's social, environmental, and economic aspects and direct actions towards achieving sustainable development (Okafor et al., 2021). Ensuring that international entrepreneurship and innovation activities align with the SDGs contributes to the community's wellbeing and helps tackle environmental issues (Ibenegbu and Nwankwo, 2022).

The social capital theory, created by Putnam (1993) and Coleman (1988), highlights the significance of social relationships, networks, and trust in promoting entrepreneurship and innovation. In international entrepreneurship, social capital is critical to obtaining resources, information, and market opportunities (Obembe et al., 2018). Understanding the social networks and trust mechanisms in Nigeria and Poland can show how entrepreneurs and firms use social capital to expand internationally and drive innovation (Nkamnebe et al., 2021).

The theories of technology transfer and knowledge spillover emphasise spreading knowledge, technology, and innovation between different countries. These theories stress the significance of cross-border collaborations, foreign direct investment, and technology transfer methods in promoting sustainable development and innovation (Achugamonu et al., 2019).

The Triple Helix model, proposed by Etzkowitz and Leydesdorff in 2000, is the eighth theory emphasising the collaboration between academia, industry, and government to promote innovation and economic growth. This model highlights the importance of sharing knowledge and working among these sectors to drive innovation-led entrepreneurship (Ajayi et al., 2021). We can gather valuable knowledge on supporting innovation and sustainable development by evaluating the connections between universities, government policies, and industry collaborations in Nigeria and Poland (Oladapo et al., 2021).

The absorptive capacity theory explains how a company can effectively acquire, integrate, and apply external knowledge and innovative concepts. In global entrepreneurship and innovation, absorptive capacity is essential for companies to effectively implement and adapt foreign knowledge and technologies (Awolusi et al., 2020). Achieving long-term entrepreneurial success is critical to understanding how companies in Nigeria and Poland can effectively incorporate and utilise external knowledge. Therefore, examining their absorptive capacity is crucial (Awolusi et al., 2021).

Entrepreneurial orientation (EO) refers to a company's strategic focus on innovation, proactiveness, and risk-taking. A potent EO leads to increased entrepreneurial behaviours, innovation, and overall success for the company (Zahra et al., 2006). By analysing firms' entrepreneurial orientation in Nigeria and Poland, we can gain valuable insights into the likelihood of engaging in internationalisation, innovation-driven activities, and sustainable development initiatives.

2.1 The Case of Poland and Nigeria

This study investigates the relationship between international entrepreneurship, innovation, and sustainable development in Nigeria and Poland. The title suggests that the survey will comprehensively explore how these three elements interact within the business landscapes of both countries. The research intends to provide insights into entrepreneurship, innovation, and sustainable development dynamics in diverse economic and cultural settings. The choice of Nigeria and Poland as the research locations add a comparative dimension to the study. Nigeria represents the challenges and opportunities in a developing context, a rapidly growing African economy. The intersection of international entrepreneurship and innovation is crucial in promoting sustainable development. Examining Nigeria and Poland as two contrasting but significant examples, the connection between these elements offers valuable insights. This empirical review explores four dimensions: 1) economic, 2) social and environmental factors, 3) policy frameworks, and 4) cultural dynamics.

Nigeria

A. International Entrepreneurship

1. **Economic impact:** According to the World Bank, Nigeria's GDP grew by 2.2% in 2019, with the non-oil sector, where most entrepreneurs operate, contributing to 90% of the total GDP (World Bank, 2020). The economic impact shows that: a) international entrepreneurship has contributed to GDP growth in Nigeria through foreign investment and market diversification (Adeleye et al., 2016); b) entrepreneurs have played a vital role in expanding exports, thus enhancing Nigeria's global market presence (Obi and Wun, 2018).

2. **Social impact:** The National Bureau of Statistics reported that SMEs have created around 59.7% of jobs in Nigeria (National Bureau of Statistics, 2020). The social impact shows that: a) employment generation through entrepreneurial initiatives has created jobs, significantly impacted youth employment and reduced poverty (Chika et al., 2019); b) empowerment through entrepreneurship has empowered women and minority communities, contributing to social inclusiveness and cohesion (Uche and Chijioke, 2017).

3. **Challenges and barriers:** Empirical statistics focusing specifically on challenges and barriers to international entrepreneurship and innovation in Nigeria and Poland showed that in Nigeria, only 45% of the population had access to stable electricity in 2019, a significant barrier to businesses operating smoothly (World Bank, 2019). The Global Competitiveness Report (2019) ranks Nigeria 116th out of 141 countries in terms of infrastructure quality. Entrepreneurs face hurdles such as a lack of infrastructure, complex regulations, and financing challenges (Oyelaran-Oyeyinka, 2016). According to UNESCO 2018, only 10% of Nigerians aged 25–34 had a tertiary education. This data suggests a potential skill and educational gap for entrepreneurial ventures (UNESCO, 2018). Closing the education and skills gap requires more relevant education and training programmes, another significant barrier to entrepreneurship development (Madichie and Nkamnebe, 2021).

B. Innovation and Sustainable Development

1. **Technological innovation:** Nigeria had 36 tech hubs in 2015, which increased to 90 by 2021, demonstrating the tech sector's rapid growth (GSMA, 2021). Nigeria recorded massive growth in the fintech sector, fostering financial inclusion, transparency, and economic stability (Chika et al., 2019). In the renewable energy sector, innovations in renewable energy have positioned Nigeria as a potential leader in sustainable energy solutions, although challenges remain (Oyelaran-Oyeyinka, 2016).

2. **Policy and support:** However, in 2021, Nigeria ranked 131st out of 190 in the Ease of Doing Business Index, indicating the challenging business environment (World Bank, 2021). Government policies supporting innovation have been vital but have faced implementation challenges and a need for coordination (Uche and Chijioke, 2017). At the same time, partnerships with international organisations have facilitated access to knowledge, technology, and funding for sustainable development (Adeleye et al., 2016).

Poland

International Entrepreneurship

1. **Economic impact:** According to the World Bank, in 2019, Poland's GDP grew by 4.1%, with small and medium-sized enterprises (SMEs) contributing to about 40% of the total GDP (World Bank, 2020). In terms of GDP contribution, Poland's international entrepreneurs have substantially contributed to the country's economic growth and competitiveness (Trąpczyński et al., 2016), while in terms of export growth, entrepreneurial firms have expanded Poland's exports and forged new trade relationships (Wach, 2015).

2. **Social impact:** As per Eurostat data from 2019, SMEs in Poland employed 6.8 million people, accounting for 69.4% of total employment (Eurostat, 2019). Entrepreneurial initiatives have contributed to regional development, balancing economic opportunities nationwide (Kowalski and Kowalska, 2017).

3. **Challenges and barriers:** According to the World Bank's 2020 report, Poland ranks 76th out of 190 countries regarding the ease of starting a business. This suggests that there is room for improvement in simplifying the registration process. Additionally, Poland faces regulatory challenges and administrative burdens that can hinder business growth (Pietrzykowski and Balcerzak, 2018). While Poland has a robust banking system, entrepreneurs may still encounter difficulties obtaining funding for expansion and innovation (Kozuch and Frączkiewicz-Wronka, 2020). Despite the robust banking system, only 67% of SMEs could secure the total financing they requested in 2019 (European Commission, 2019).

Innovation and Sustainable Development

1. **Technological innovation:** Although Poland is an innovation follower per the European Innovation Scoreboard 2019, it scored below the EU average in terms of sales of new-to-market and new-to-firm innovations (European Commission, 2019). Regarding smart cities, Poland's investments in its urban technologies have showcased its commitment to sustainable urban development (Kozuch and Frączkiewicz-Wronka, 2020). Innovations in waste management have transformed the industry, contributing to environmental sustainability (Pachura, 2017). In 2020, Poland invested only 1.4% of its GDP in research and development, which falls short of the European Union's target of 3% (Eurostat, 2020). However, the Polish government has invested in R&D to promote innovation in transportation, energy, and healthcare (Pachura, 2017). Poland's membership in the EU has enabled it to access funding, technology, and collaboration opportunities, contributing to its sustainability initiatives (Wach, 2015).

Valuable insights into the relationship between international entrepreneurship, innovation, and sustainable development can be gained by examining the experiences of Nigeria and Poland. The distinct paths and obstacles these two countries due to their cultural, economic, and political differences highlight the importance of considering specific circumstances when utilising entrepreneurship and innovation for sustainable development. To support sustainable development effectively, future policies must consider these circumstances and leverage local and global resources and partnerships.

The above review comprehensively analyses international entrepreneurship and innovation and their impact on sustainable development in Nigeria and Poland. The study covers different aspects, such as specific sectors, policy initiatives, and challenges. It incorporates various sources to provide a well-rounded

understanding of the subject in these two unique settings. The empirical findings reveal intriguing insights into the interplay of international entrepreneurship, innovation, and sustainable development in Nigeria and Poland. Themes such as the role of government policies, access to finance, cultural influences, and collaborative networks emerge as critical factors shaping the entrepreneurial landscape. The study identifies innovative practices contributing to sustainable development and explores variations between the two countries. The empirical review sheds light on the intricate relationship between international entrepreneurship, innovation, and sustainable development in Nigeria and Poland. The findings provide valuable knowledge for policymakers, entrepreneurs, and scholars interested in fostering economic growth while addressing environmental and social challenges. The comparative analysis enriches our understanding of contextual factors influencing entrepreneurial endeavours in diverse global settings.

3. Methodology and the model

The study's theoretical framework is based on exogenous growth theories. The neoclassical growth theory was formulated by Swann (1956) and Solow (1957) and inspired by Ramsey's seminar essay (1928), looking at the role of savings in utility maximisation. The neoclassical theory of growth also called the idea of exogenous growth, is related to the exogenous flow of technological innovation through which the per capita income of countries with distinctive features of a market economy continuously increases. However, the drivers of technological progress are often overlooked. The Solow-Swann model needs more relevance to economic policy due to its long-term stability in the equilibrium condition and exogenous determination of economic growth. It is essential to look at the contributions of production factors to output growth. Each factor is attributed to its contribution to the growth and is decomposed based on the change in input over the period field t to $t + 1$. The contribution of each input is essential in output growth, as demonstrated by the growth accounting exercise. The Cobb-Douglas production function is:

$$Y = AK^{\beta}L^{1-\beta} \quad (1)$$

The following equation emerges for growth calculation in terms of decomposition into components.

$$g = \frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \beta \frac{\Delta K}{K} + (1 - \beta) \frac{\Delta L}{L} \quad (2)$$

Equation (2) states that the growth rate of income (g) reflects the change in income $\frac{\Delta Y}{Y}$ over a given period, which equals the sum of the growth rate of total factor productivity $\frac{\Delta A}{A}$, the growth rate of capital $\frac{\Delta K}{K}$ and the growth rate of labour $\frac{\Delta L}{L}$. The growth rate of capital and labour are weighted by their share in real income β and $(1 - \beta)$ respectively. Growth is a function of technological change that demonstrates the growth rate of the total factor productivity, capital accumulation and labour, both at full employment. It is unnecessary to assume that labour and capital contributions are equal. As indicated by the parameters, the ratio of the shares remains constant.

In extending and modifying the neoclassical model to suit the analysis of sustainable development amidst entrepreneurship and innovative ideas, the C–D technology is re-examined such that other factors, including entrepreneurship and innovative measures, determine output growth. Equation (2), therefore, takes care of this new development.

$g^s = f(nemg, ts, mhte, epc, istja, exch, inf, \mu_1)$ As such, the behavioural equations are:

$$gc = \beta_0 + \beta_1 nemg + \beta_2 ts + \beta_3 mhte + \beta_4 epc + \beta_5 stja + \beta_6 exch + \beta_7 inf + \mu_1 \quad (3)$$

Equation (3) defines the general specification for both Nigeria and Poland on the link between sustainable development and international entrepreneurship and innovation. Based on these specifications, the research adheres to the criteria of different types of sustainable development. These measures include social, economic, and institutional measures. In terms of data, this study adopted the economic measure to avoid some notable econometric issues, using gross domestic product per capita in the long term (gc) as a measure of sustainable development. Measures of international entrepreneurship adopted are net emigration ($nemg$), assumed to be for international business motives, travel service as a percentage of commercial service exports (ts) and medium and high technology exports ($mhte$). For innovation measures, the study considers electric power consumption (epc), which is assumed to facilitate innovation process, and scientific and technical journal articles ($stja$), which provides a lead towards innovative ideas randomly and identically distributed error term. In equation (3) only β_7 is expected to be negative due to relationship between price dynamics and sustainable growth. All variables are in natural log form except gc for Nigeria to fulfil normality. The study was carried out from 1996 to 2021 based on data availability; even at that, missing data is inevitable in some cases. The estimation technique was robust least squares method because it is

insensitive to the classical assumptions of the conventional ordinary least squares technique.

4. Estimation and Discussion

Table 1. Descriptive statistics for Nigeria and Poland

Var.	Mean	Median	Std. dev	Skew	Kurt	J-B Pr.	Obs.
<i>epc</i>	4.69	4.78	0.26	-0.34	1.61	0.39	19
	8.16	8.14	0.08	0.21	1.51	0.39	19
<i>exch</i>	4.84	4.89	0.76	-1.25	4.22	0.02	25
	1.24	1.26	0.15	-0.53	11.19	0.48	26
<i>inv</i>	3.17	3.25	0.34	-0.02	1.64	0.36	26
	3.06	3.04	0.09	0.50	2.29	0.45	26
<i>gc</i>	2.12	2.38	3.43	0.56	4.43	0.17	26
	1.27	1.50	0.77	-2.67	11.19	0.00	26
<i>inf</i>	2.28	2.30	0.65	-0.48	2.96	0.60	26
	0.88	1.12	1.19	-0.91	4.11	0.08	26
<i>mhte</i>	3.55	3.93	0.77	-0.61	1.96	0.26	25
	3.95	4.00	0.13	-1.50	4.12	0.00	25
<i>nemg</i>	10.23	10.54	0.78	-1.05	3.38	0.27	14
	-18124.7	-21119.5	13707.22	-0.30	2.17	0.57	26
<i>stja</i>	7.71	7.73	0.66	0.10	1.89	0.52	25
	9.98	10.07	0.40	-0.38	1.82	0.35	25
<i>ts</i>	2.51	2.45	0.98	-0.18	1.77	0.41	26
	3.34	3.34	0.37	-0.70	3.63	0.28	26

Source: computed from E-Views.

The descriptive statistics in Table 1 provide the statistical trends in the variables employed for Nigeria and Poland in this study. In the data series, values in the first and second rows corresponding to each variable represent the statistics for Nigeria and Poland, respectively. Starting from the mean and median values, the net emigration variable has the highest mean and median values in the given variables for Nigeria compared to those of Poland, demonstrating a wide gap between emigrants and immigrants in Nigeria during the period, hence connoting broader international entrepreneurship experiences. The lowest mean and median values are from the same net migration for Poland, showing a downward pull towards Nigeria. Even with this situation, it has the most significant fluctuation during the period. As indicated by the standard deviation, Nigeria's gross domestic product

per capita over time, a measure of sustainable development, fluctuates compared to Poland's sustainable development measure. This indicates sectional growth records in Nigeria amidst high levels of poverty. Gross domestic product per capita and scientists' technical journal articles are right-tailed distributions based on the positive skewness coefficient values. For Poland, only electric power consumption and investment are positively skewed. However, all kurtosis coefficients are positive for all the variables in Nigeria and Poland, with the highest kurtosis value from Poland. The closeness of the mean and median, as shown by the J-B probabilities, indicates that nearly all variables are normally distributed. More precisely, only the exchange rate for Nigeria appears non-normally distributed, while for Poland, only gross domestic product per capita and medium and high technology exports appear non-normally distributed.

Table 2. Unit root test

Var.	Test Eqn.	Test Measure	Prob.	Sig. level	OI	Remark
<i>ü</i>	Constant	ADF	0.02	0.05	I(1)	Stationary
	Constant	ADF	0.00	0.05	I(1)	
<i>exch</i>	Constant	ADF	0.00	0.05	I(1)	Stationary
			0.00	0.05	I(1)	
<i>ü</i>	Constant	ADF	0.00	0.05	I(2)	Stationary
			0.00		I(1)	
<i>gc</i>	Constant	ADF	0.00	0.05	I(1)	Stationary
			0.00		I(0)	
<i>inf</i>	Constant	ADF	0.00	0.05	I(0)	Stationary
			0.04		I(1)	
<i>mhte</i>	Constant	ADF	0.00	0.05	I(1)	Stationary
			0.00	0.05	I(0)	
<i>nemg</i>	Constant	ADF	0.00	0.05	I(1)	Stationary
			0.00	0.05	I(1)	
<i>stja</i>	Constant	ADF	0.04	0.05	I(1)	Stationary
			0.00	0.05	I(2)	
<i>ts</i>	Constant	ADF	0.01	0.05	I(1)	Stationary
			0.00	0.05	I(1)	

Source: computed from E-views.

The unit root test results are mixed for the two countries and, in some cases, are similar. The electric power consumption, exchange rate, net migration and travel services are seen to be stationary in their first differences for Nigeria and Poland,

demonstrating similar behaviour in the pre-test outcome. Examining individual cases, other stationary variables in their first differences for Nigeria are gross domestic product per capita growth, medium and high technology exports, and scientific-technical journal article variables. At the same time, investment and inflation are stationary in their first differences for Poland. Of all the variables for Nigeria, only inflation is static. At the same time, for Poland, gross domestic product per capita and medium and high technology exports are stationary at levels. Results here align with the idea that economic data are usually static in the first differences. However, investment and scientific–technical journal articles are stationary at second differences.

Table 3. Robust Least Squares Regression

Dep. Var: <i>gc</i>	Coefficient	Std. Error	z-stat	Prob.
<i>C</i>	-97.32	12.64	-7.70	0.00
	-81.75	15.08	-5.42	0.00
<i>ü</i>	-11.40	1.94	-5.87	0.00
	9.83	2.42	4.07	0.00
<i>exch</i>	-4.27	0.46	-9.23	0.00
	1.52	0.54	2.83	0.00
<i>ü</i>	4.22	0.50	8.42	0.00
	0.54	0.08	6.80	0.00
<i>mhte</i>	4.78	0.78	5.99	0.00
	-1.26	1.40	-0.90	0.37
<i>nemg</i>	-1.34	0.29	-4.71	0.00
	-0.00002	0.00	-4.87	0.00
<i>stja</i>	22.01	2.30	9.57	0.00
	0.11	1.03	0.11	0.91
<i>ts</i>	-1.93	0.60	-3.22	0.00
	1.13	0.45	2.51	0.01
$R^2_{\ddot{u}}$	0.65			
	0.52			
<i>ü</i>	28.47			
	53.74			
<i>ü</i>	44.97			
	65.51			

Source: computed from E-views.

The robust least squares regression results for Nigeria and Poland's sustainable development measures represented by the gross domestic product per capita growth are indicated in Table 3. Starting from the measures of international entrepreneurship, namely medium and high technology exports, net migration and travel services, it is medium and high technology exports which significantly positively relate to gross domestic product per capita growth in Nigeria. At the same time, it has an insignificant reverse effect on Poland's gross domestic product per capita. Thus, the low development level of the Nigerian economy may be highly supported by international entrepreneurship through greater concentration on the technology exports trade compared to Poland, which may have passed beyond such a stage but is seeking better avenues. Thus, this finding for Nigeria is in line with those obtained by Adeleye et al. (2021) and Ofori and Asongu (2021), who conclude that technology has enhanced inclusiveness in Africa. Net migration coefficients are significant with negative effects on development for the two countries, implying that the gap between immigrants and emigrants may not favour the countries, especially without gainful entrepreneurship skills. Where emigrants are underutilised in foreign countries, the situation often leads to distraction away from acquiring certain levels of professionalism, thus living below some expected per capita income levels.

Travel services positively and significantly impact the Polish economy's gross domestic product per capita but negatively impact that of Nigeria. Thus, goods and services acquired by travellers into Poland can be of great benefit in terms of inter-trade improvement. In Nigeria, as shown by the results, the ability to retrieve such entrepreneurship benefits may be low due to concentration on activities that diminish entrepreneurship intention.

Next, the study considers the impact of electric power consumption and scientific-technical journal articles as innovation measures on gross domestic product per capita. Electric power consumption positively impacts Poland's sustainable development and negatively impacts Nigeria's sustainable development, but it is significant in both cases. Electric power consumption is expected to increase innovation in acquiring new skills valuable for development, as is the case for the Polish economy. In Nigeria, there has been a chronic problem of inadequate power supply resulting in a decline in welfare and hindering developmental goals. However, scientific and technical journal articles have shown that they positively impact development, which is significant for Nigeria. This indicates that innovative knowledge from extensive research can drive sustainable development.

As control variables, exchange, and inflation rates impact both countries' development. While appreciation of the currency improves development in Poland, the reverse is the case for Nigeria. This reason may be connected to the unpredictable nature of Nigeria's domestic currency, leading to misleading outcomes and

less competition. In both cases, inflation, measured here by the annual growth rate of the GDP implicit deflator, positively impacts development. Although inflation damages growth, some magnitudes are still pertinent for development. The results contradict those of Ofori and Asongu (2021), which have a negative relationship with inclusive growth.

The explanatory power of the right-hand-side variables is higher for Nigeria compared to Poland. About 65% of the variation in sustainable development measures is precisely explained by the components of international entrepreneurship and innovation compared to Poland, for which about 52% of the variation in sustainable development is presented. The AIC and SIC values are positive, as shown.

5. Conclusion

The study examined the role of international entrepreneurship and innovation in sustainable development in Nigeria and Poland from 1996 to 2021. The reviews summarily submitted that innovation could drive international entrepreneurship to foster development. The research adopted the exogenous theory related to the exogenous flow of technological progress on which growth partly depends. Also, the study adopted the estimation method based on the robust least squares, with the result that international entrepreneurship performed better in development in Poland than in Nigeria, particularly in travel services. However, medium and high technology exports drive the Nigerian economy. Innovation plays a larger role in Poland than in Nigeria. Electric power consumption as a driver of innovation fostered the Polish economy more than Nigeria's.

The positive impact of scientific and technical journal articles on the development paths of nations cannot be understated. This underscores the crucial role of innovation research in the development process. A stable power supply and significant investment in research and development are essential to promote innovation. These concepts are often discussed in scientific and journal articles and can catalyse entrepreneurial motivation. It is highly recommended that guiding policies be established to stabilise the local currency, particularly in Nigeria, to enhance its competitiveness and ensure macroeconomic stability.

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IBQ questionnaire in expert selection – a case study

Abstract (unstructured)

This article presents the application of the Innovator Behaviour Questionnaire (IBQ). The questionnaire was used to select experts dealing with innovation and, in particular, innovation risk assessment. The statements used in the questionnaire characterise selected personality traits of a potential innovation risk assessment expert.

It is based on the following four scales (factors): open mind, closed mind, cognitive motivation, and response to uncertainty.

The use of the questionnaire is to facilitate the selection of individuals who are focused on independent and courageous problem solving and evaluation statements. At the same time they respect an adequate level of caution when characterising people with risk aversion. What is more, they are creative and open, coupled with a considerable ability to develop new solutions. Moreover, they are able to respond in a rational manner to difficult and unpredictable situations.

The approach to the method of selecting an expert presented in the article is a new solution that is founded in both risk and innovation theory, and also takes psychometric standards into account.

Thanks to the developed tool, which can be used not only for the process of creating a team of experts in a company but also for the process of recruiting people to deal with innovation, there is a chance to significantly reduce the risk of failure.

Keywords

expert, innovation, creativity, risk, questionnaire, assessment, open mind, closed mind, cognitive motivation, response to uncertainty.

Introduction

The literature on innovation is full of studies on the subject. The presented works are mainly concerned with the process of innovation implementation and its evaluation, and seldom present the important and significant stage related to the

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selection of experts. In general, the topics related to the expert himself and the determination of the criteria for his selection represent a certain gap in the literature. Experts are written about in the context of human resources responsible for the decision-making process. There is limited definition of the conditions for the selection of an expert, and certainly no definition of the psychological conditions which should be an important element in the selection of a potential expert candidate.

Researchers take a very loose approach to answering the question: “Who is an expert?” An expert appears in research papers only as a specialist with nothing more clearly defined than obligatory education or skills. It is generally recognised that an expert is a specialist in a particular field, a person with theoretical and practical knowledge of a particular subject. Some define an expert as a person whose competence is trusted, presenting a broad horizon of thinking and in-depth knowledge of a particular field. Practitioners in the field of project management locate this definition in the area of unequivocally indicating a person who is sure to cope with a given activity, not necessarily pointing to the need for qualifications. It is more important to have a feel for and skill in the field. It is worth noting that a new element in this area is the emergence of intuition in terms of the colloquial definition of the term ‘expert’. This element is becoming a topical research area mainly in the field of decision-making by the decision-maker (Malewska, 2018; Dörfler and Ackermann, 2012); therefore, it seems necessary to include the area of intuition in the definition of the term expert. Combining these perfunctory attempts to define the term ‘expert’ and the results of our own research (MINIATURA 4, 2020/04/X/HS4/00632), the following understanding is proposed under this term:

An expert is a specialist in a particular field with specialised knowledge and skills and often broad intuition for choosing the best possible solutions in a given subject area.

The decision-making process is the deliberate and non-random selection of one of at least two possible solutions. It is often a complex and multi-faceted process. Among the factors influencing its course are (Malewska, 2018):

- the qualifications, experience and psychophysical characteristics of the decision-maker,
- the method of decision-making,
- the quality and availability of information,
- the nature of the decision problem,
- the nature of the decision-making situation and the use of decision support systems.

These factors condition both rational and intuitive decision-making.

The selection of the expert itself is also a decision-making process that undoubtedly determines the correctness of the remainder of the decision-making process. Its correct course based on certain guidelines will minimise the risk of failure in

terms of project implementation. In the literature there are no clear guidelines on how to select an expert. The only guideline that seems to be definitive in this regard is education. Some also take experience working on a particular issue into account. An attempt to undertake this task in an orderly and purposeful manner is the use of the Innovator Behaviour Questionnaire (IBQ), a measurement tool characterising selected personality traits of an innovator. The article aims to demonstrate how the IBQ questionnaire can be used to select an innovation risk assessment expert.

1. Literature review

One of the most important stages in the decision-making process is the selection of an expert. It is the expert who directs the entire decision-making process and determines its correctness and effectiveness. Undoubtedly of importance in this regard is the specific set of personality traits that a given expert possesses (Brzeziński and Wagner, 1996). Research shows that learning about the cognitive qualities of experts' minds lays the groundwork for more effective and efficient decision-making (Sarbin, 1944; Garb, 1989; Gustafson, 1963; Goldberg, 1970; Alegre, Pérez-Escoda et al., 2019).

Choosing the right expert is a difficult and complicated task. There are many works in the literature indicating the importance of this issue (Simon, 1992; Tversky and Kahneman, 1983; Chase and Simon, 1973; Ericsson, and Polson, 1988; Larkin et al., 1980; Reber, 2017; Wood, 1984; Busenitz, 1999; Nagler et al., 2014; Zuckerman, 2007; Strelau, 2014; Rotter, 1966; Singer, 1975; Zimmerman, 2000; Austin et al., 2007; Neubauer and Freudenthaler, 2005; Dörfler and Ackermann, 2012; Chirumbolo et al., 2019). Personality questionnaires can support the selection of an appropriate expert. They are designed to assess a person's selected behaviours.

Most commonly, questionnaires address self-assessment in neuroticism, extraversion, cognitive motivation, novelty tolerance, and positive valuing of life (The Big Five test) and have a dimension of support for psychological issues or the HR process more broadly (Goldberg, 1992; Credé, Harms et al., 2012; Andrei, Siegling et al., 2016). The available questionnaires use various combinations to measure selected traits of both the personality and temperament of a person. They indicate the need for internal analysis of one's personality and work on oneself (Bayon et al., 1996; Cattell, 1943; Cloninger et al., 1993; Costa and McCrae, 1992; Oldham and Moriss, 1995).

2. Methodology – how to choose an expert?

In practice, companies look for suitable specialists to direct to certain tasks due to selected personality traits. Particularly important in this regard is the selection of experts to assess the risk of innovation (Credé et al, 2012). The implementation of innovations is a risky task, so it is worth ensuring that those working on this task

have the desired set of personality traits. It is assumed (Deptuła and Nosal, 2021) that the following aspects should be taken into account in the selection of an expert:

1. Does the decision maker have an open mind? Holders of this mind trait are open to new information and they prefer more difficult tasks.
2. Does the decision maker have a closed mind? Such people are characterised by a limited range of searching for new information. A dogmatic mind limits the ranges of information sought because its thinking is based on narrow conceptual categories.
3. Does the decision maker have cognitive motivation? The answer to this question is to determine a person's level of motivation to create and generate new solutions or ideas. People who are characterised by an urgent need to create new solutions are highly desirable for tasks where the range of uncertainty and risk is high.
4. How does a decision maker react to uncertain situations? This is because determining how a person reacts to uncertain situations can significantly reduce irrational decisions that bypass substantive analysis of facts and data. The higher the score an employee obtains on this scale, the more it indicates his lack of resilience to act in sudden and uncertain situations, and therefore his poor adaptation to working under stressful conditions, i.e. his low level of competence as an expert.

A favourable organisation of the mind should condition not only a constant tendency to seek information but also an appropriate attitude toward emerging uncertainty. This attitude is a kind of substitute for the ability to anticipate and not to block the mind in the face of emerging changes and various forms of uncertainty in the environment.

The choice of an expert is very much embedded in decision-making models related to the decision-making process. Decision-making models can be divided into rational and behavioural models. It would seem that rational models should be an obvious model of decision-making; however, they do not tell the story of decision-making patterns in enterprises in practice (Kubczyk, 2009; Bolesta-Kukuła, 2000; 2003; Malewska, 2018). In essence, rational models assume the presence of methodological rationality, which is associated with a strictly defined way of doing things – an algorithm. However, practitioners emphasise the need to also incorporate factual rationality derived from practice and experience into the decision-making process. The shortcomings of these models have led researchers to propose decision-making models that correspond more closely to management practice. Behavioural models, as they are referred to, have been divided into two groups: bounded rationality models and heuristic models (Malewska, 2018).

In bounded rationality models, the decision maker follows the basic principles of full rationality but is not perfect in doing so and makes some mistakes. These

are explained by Simon's suboptimisation model, which assumes the existence of certain constraints that limit this rationality, including cognitive errors and motivational constraints. These elements are included precisely in the models of bounded rationality. On the other hand, in heuristic models the decision-making process is based on creative thinking and logical combinations. They assume a complete departure from the assumptions of full rationality (Malewska, 2018).

The assessment of the expert's personality is carried out on the basis of the IBQ questionnaire presented more extensively in the paper (Deptula and Nosal, 2021). Details of the application of the questionnaire will be available in the paper (Deptula and Nosal. The IBQ is a tool for the evaluation and selection of people involved in the implementation and risk assessment of innovations. It is based on the following four scales (factors): open mind – OM, closed mind – CLM, cognitive motivation – CM, reaction to uncertainty – RN.

In the questionnaire, the potential expert assesses a set of statements according to a scale:

- I completely disagree,
- I disagree,
- Difficult to say,
- I agree,
- I completely agree.

During the study, the potential expert assesses the following statements:

1. I keep my promise, no matter how bad it is for me.
2. I feel a strong need to accept my surroundings.
3. I like to accomplish new tasks as a means to learn something.
4. Too many changes make me feel uncomfortable.
5. In my life I am guided by advice/suggestions from my parents.
6. Sometimes I do not know how to act in many situations.
7. All my habits are good and desirable.
8. I like to deal with difficult issues.
9. I feel uncomfortable in difficult and complex situations.
10. I like learning.
11. Rapid changes make me feel confused.
12. On occasion, I have taken something (even a trinket) that belongs to someone else.
13. I feel anxious when a new employee appears in the company.
14. Existing work methods and techniques should not be changed.
15. Companies should offer products similar to their competitors.
16. I always make sure to leave things in order.
17. In general, I seek tasks that I have never performed.
18. Sometimes I don't know how to act in many situations.

19. I like to follow/walk/run along unknown paths.
20. When I carry out tasks in a company, I like to focus on new solutions.
21. I am happy to provide new solutions and ideas.
22. I like complicated tasks.

Each of the examined areas of the mind is assessed on measurement scales specifying OM, CLM, CM, and RN. Points are awarded according to the rule:

- I completely disagree = 1 point,
- I disagree = 2 points,
- difficult to say = 3 points,
- I agree = 4 points,
- I completely agree = 5 points.

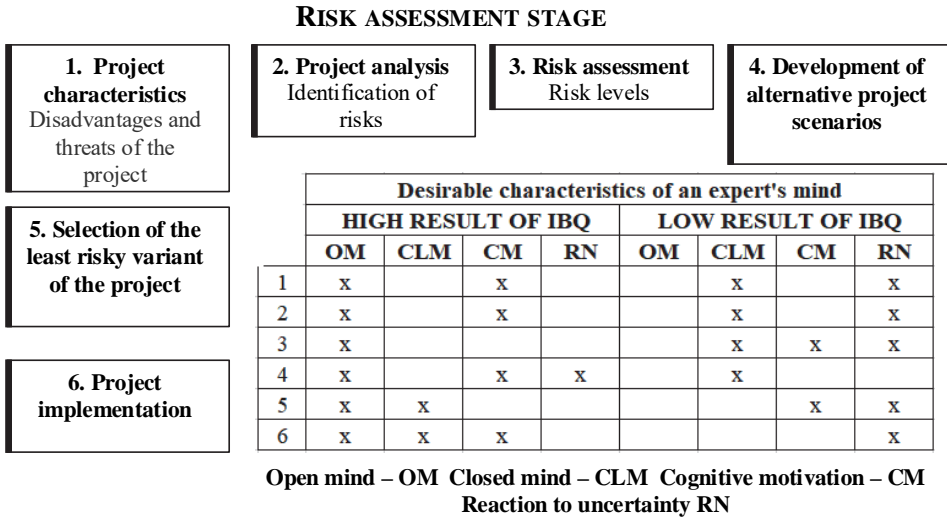
3. Research results - application of the questionnaire

The selection of an innovation risk assessment expert is part of the decision-making process that will ultimately lead to a decision on whether the project can be implemented or not. In a general way, taking into account the most relevant stages of risk assessment, this process can be divided into stages (cf. Simon, 1978; 1982; Stoner, 1992; Leigh, 1992; March, 2010; Moustakas, 1990):

1. Project characteristics. Disadvantages and threats of the project.
2. Project analysis. Identification of risks.
3. Risk assessment. Risk levels.
4. Development of alternative project scenarios.
5. Selection of the least risky variant of the project.
6. Project implementation.

The analysis of innovation projects conducted by the author of the article (among others, as part of research [MINIATURA 4, 2020/04/X/HS4/00632]), indicated that at each stage the need for a slightly different type of expert mind appears, as schematically shown in Figure 1.

Figure 1. Risk assessment stage – type of expert mind



Source: own study.

The summary shown (Figure 1) refers to the analysis of the personality of a single expert. When forming a team, a variety of personality types is recommended at different stages of the decision-making process, taking into account the most relevant personality traits of individuals. Personality analysis is never a simple task. Therefore, it is necessary to take into account the strongest personality traits detected during the study, as they will be dominant in individuals.

The mind of an expert is complex and is rarely clearly defined. To give an idea of this issue, the following section presents a sample personality analysis of a selected potential expert.

An employee of a manufacturing company involved in the implementation of innovation projects was assessed.

After analysing the collected answers, the employee received the following scores within the scales:

- OM = 12 points which corresponds to the LOW range,
- CLM = 21 points which corresponds to the HIGH range,
- CM = 11 points which corresponds to the MEDIUM range,
- RN = 18 points which corresponds to the HIGH range.

4. Discussion

After compiling the individual performance of the potential expert into a matrix for interpreting his predisposition to the various stages of risk assessment, the results presented in Figure 2 were obtained.

Figure 2. Matrix for interpreting results – analysis of results for a potential expert

	Desirable characteristics of an expert’s mind							
	HIGH RESULT OF IBQ				LOW RESULT OF IBQ			
	OM	CLM	CM	RN	OM	CLM	CM	RN
1	x		x			x		x
2	x		x			x		x
3	x					x	x	x
4	x		x	x		x		
5	x	x					x	x
6	x	x	x					x

Source: own study.

The analysis of the employee’s personality did not tend to support the selection of that employee as an expert. On the matching matrix there were only single areas within stages 4, 5 and 6 for which the surveyed person could be a potential expert. However, as can be easily seen, the answers given allowed the respondent to mark only one of the four studied qualities of the expert’s mind in the indicated stages of risk assessment. This shows that in case we have the opportunity to select other people with more matching characteristics (e.g. a minimum of two characteristics within a given stage) then we should refrain from selecting the examined person as a potential expert. This is due to the fact that the person studied is characterised by a low score in the context of open-mindedness. At the same time, obtaining a high score in the area of closed mind traits will indicate that the respondent is rather intolerant of unclear and uncertain situations, while at the same time they may exhibit the trait of overconfidence, which in the case of innovation may block its development. This was confirmed by the average score obtained in the area of cognitive motivation. People with this score may be hesitant or reluctant to reveal the true reasons for their actions. Their participation in the team of experts should be monitored and confronted with the current needs of the project. In the case of a high score on the control scale, the participation of such a person in the innovation implementation team should be considered. The employee also obtained a high score in terms of RN. People who score highly on the scale of reacting to uncertain situations may hold back implementation, so their participation in the expert team should be limited or strongly controlled. All this indicates that the potential employee is not a good choice for the role of an expert in this case.

One should be aware that the interpretation of the questionnaire given in the article is simplified and does not take into account the feedback between the personality traits studied in the questionnaire. Detailed rules for interpreting the results will be found in the paper (Deptuła and Nosal¹). Nevertheless, the simplified interpretation of the IBQ makes it possible to characterise the expert candidate accurately and independently.

Conclusions

1. The IBQ (Innovator Behaviour Questionnaire) is a tool that supports the process of selecting potential experts for tasks related to the creation and implementation of innovations.
2. Its design is a response to the research needs that are associated with the proper process of carrying out innovation risk assessment on a narrow enterprise scale and a broad social scale.
3. The proposed questionnaire is a new tool that can be used in the selection of experts dealing with the assessment of innovation risk, but also for the broader process of recruiting people with appropriate mental competencies.
4. The results presented in the article may constitute the basis for the development of research in the discipline of Management and Quality Sciences, as well as having an extensive practical application due to the advantages of the presented research tool.

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Innovations to improve road safety in Poland

Abstract

The purpose of this article is to present the results of an analysis of the state of road traffic safety (Bezpieczeństwo Ruchu Drogowego, BRD) in Poland from 2002 to 2022, and to analyse and forecast what can be done to further improve the state of safety on Polish roads. In particular, it is about improving the safety of pedestrians, children and cyclists.

Keywords

Road Traffic Safety BRD (Bezpieczeństwo Ruchu Drogowego), pedestrians, children, cyclists, innovation.

Introduction

In Poland, over the past 20 years from 2002 to 2022, there has been a significant improvement in safety on the roads.

This can be ascertained after analysing data from the National Road Safety Council (Krajowa Rada Bezpieczeństwa Ruchu Drogowego, KRBRD), data from the Police Headquarters (Komenda Główna Policji, KGP), the various innovative programs and projects implemented, and other solutions.

However, in order to be able to talk about improving BRD, it is necessary to take measures aimed at this area and direction.

One such measure, in addition to various programmes to improve BRD, is the introduction of innovations and various related programmes.

What is innovation²

An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has

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² OECD/Eurostat (2018), Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, p. 20

been made available to potential users (product) or brought into use by the unit (process).

The minimum requirement for an innovation to occur is that the product, process, marketing method or organisational method be new (or significantly improved).

Innovative activity is the activity related to the preparation and initiation of the production of new or improved materials, products, equipment, services, processes or methods, intended to be marketed or otherwise used in practice.

The state of road safety and activities implemented in this area

The KRBRD set a goal eight years ago: Polish roads must be much safer. Poland must stop scouring the bottom of European statistics in this regard. Our efforts to rectify this state of affairs are based on three pillars.³

The first pillar is investment – the expansion of single carriageway roads to dual carriageways, subsidising local roads, building new intersections, and illuminating pedestrian crossings, meaning that fewer road users are exposed to danger.

The second pillar is education – constantly organising various actions, educating the public and showing how deplorable the consequences of improper behaviour on the road can be.

The third pillar is changes in the law – legislation as the best way to determine the law, but also the responsibilities of all road users.⁴

In 2022, there was a further marked decrease in the number of traffic accidents, as well as the number of those killed and injured in these incidents compared to 2019, which was the last year before the introduction of restrictions, as a result of the COVID-19 pandemic. The data shows that there was a decrease of approximately 30% in the number of accidents during this period. The number of people killed dropped by almost 35%. On the other hand, the number of people injured in these incidents was also about 30% lower. Notably, the number of pedestrians who lost their lives in accidents dropped significantly. Here the decrease was as much as 43%.⁵

To illustrate, in Poland in 2002 there were as many as 5827 victims killed on Polish roads. In 2022, there were 1896 fatalities.⁶

This is a decrease of almost 70% over these 20 years, which is good news, but it is still far too many fatalities, and efforts to improve BRD must continue.

3 Ministerstwo Infrastruktury, Raport Krajowej Rady Bezpieczeństwa Ruchu Drogowego, Warszawa 2022, s. 2

4 Ibidem

5 Elżbieta Symon, Paweł Rzepka, KGP, Warszawa 2022, p. 8-9

6 Ibidem

How does BRD in Poland compare to the EU (European Union)?

Over the course of 2020, Poland has moved up five places in the list of EU countries in terms of road fatalities per million inhabitants. The current figure for Poland is 51, with the EU average at 46.⁷

Across the EU, the number of road fatalities in 2022 increased by 3% compared to the previous year, due in part to the increase in traffic after the pandemic. Importantly, the downward trend achieved during the COVID-19 pandemic period (including a 17% decrease between 2019 and 2020) has been maintained. Compared to 2019, the number of fatalities in 2022 fell by 10%. Progress, however, has been very uneven across member states. Lithuania and Poland saw the largest declines, more than 30%, while Denmark saw a 23% drop. By contrast, the number of road fatalities in countries such as Ireland, Spain, France, Italy, the Netherlands and Sweden has remained the same or increased over the past three years. The overall ranking of countries' fatality rates has not changed significantly since before the pandemic with the safest roads in Sweden (21 deaths per million population) and Denmark (26 deaths per million population), while Romania (86 deaths per million population) and Bulgaria (78 deaths per million population) recorded the highest rates in 2022.⁸

The EU average was 46 road fatalities per million inhabitants. Poland, resisting the pan-European upward trend and deepening the national decline of 15.5% (a 14% reduction in fatalities, according to the European Commission), contributed to halting the European upward trend in fatalities in 2022, which also translated into Poland's advancement in the ranking of EU countries by five positions with 51 fatalities per million inhabitants.⁹

Based on available data for 2021 across the EU, 52% of road fatalities on roads occurred on rural roads, compared to 39% in urban areas and 9% on highways. Men account for over three-quarters of road fatalities (78%). Car passengers (drivers and passengers) accounted for 45% of all road fatalities, while pedestrians accounted for 18%, users of powered single-track vehicles (motorcycles and mopeds) accounted for 19%, and cyclists accounted for 9%.

In urban areas, however, the pattern is very different for vulnerable road users (pedestrians, bicyclists and powered single-track vehicle users) accounting for nearly 70% of all fatalities. Fatalities among urban road users predominantly occur in accidents involving cars and trucks; thus, the need to strengthen the protection of vulnerable road users should be emphasised. While the increase in cycling's share of the mobility mix in many member states is extremely high, a serious cause for concern is the trend in the number of cyclists killed on EU roads. Cyclists are

7 Barry Sheerman ETSC (European Transport Safety Council), Brussels, 2022, p. 12

8 European Commission, Directorate-General for Mobility and Transport, Brussels, 2022, p. 16

9 Ibidem

precisely the only group of road users that has not seen a significant decline in fatalities over the past decade, which is especially due to the persistent shortage of well-equipped infrastructure. In 2022, for example, preliminary data from France show a 30% increase in cyclist fatalities compared to 2019. These trends do not apply to Poland as the number of cyclist fatalities over the last decade (2012–2022) fell by 43.3%, while in 2022 the number fell by 33.8% compared to 2019.¹⁰

In 2018 the EU set a target of reducing road fatalities – and, for the first time, serious injuries – by 50% by 2030. This is set out in the Commission’s Strategic Road Action Plan, “EU Road Safety and Security Policy Framework 2021-2030”, which also sets out road safety plans for achieving zero road fatalities by 2050 (“Vision Zero”). Road safety has also been a key element of recent EU mobility policy initiatives, including the “Strategy for Sustainable and Smart Mobility”, among others.¹¹

Table 1. Road deaths per million inhabitants – preliminary data for 2022

	Ratio per million inhabitants				% change 2022 in relation to		
	2019	2020	2021	2022	2021	2019	Average 2017-19
EU 27	51	42	45	46	0.03	-0.1	-11%
Belgium	56	43	45	52	0.16	-0.07	-3%
Bulgaria	90	67	81	78	-0.05	-0.15	-17%
Czech Republic	58	48	50	50	-0.01	-0.15	-15%
Denmark	34	28	22	26	0.18	-0.23	-15%
Germany	37	33	31	34	0.09	-0.08	-12%
Estonia	39	44	41	38	-0.09	-0.04	-10%
Ireland	29	30	27	31	0.14	0.11	9%
Greece	64	54	57	58	0.01	-0.11	-13%
Spain	37	29	32	36	0.12	-0.02	-5%
France	50	39	45	49	0.11	0	-2%
Croatia	73	58	72	71	-0.06	-0.07	-13%
Italy	53	40	49	53	0.09	-0.02	-5%
Cyprus	59	54	50	42	-0.16	-0.27	-26%
Latvia	69	73	78	60	-0.24	-0.15	-19%
Lithuania	67	63	53	43	-0.19	-0.35	-35%
Luxembourg	36	42	38	40	0.08	0.18	-6%
Hungary	62	47	56	56	-0.01	-0.1	-13%

¹⁰ Ibidem

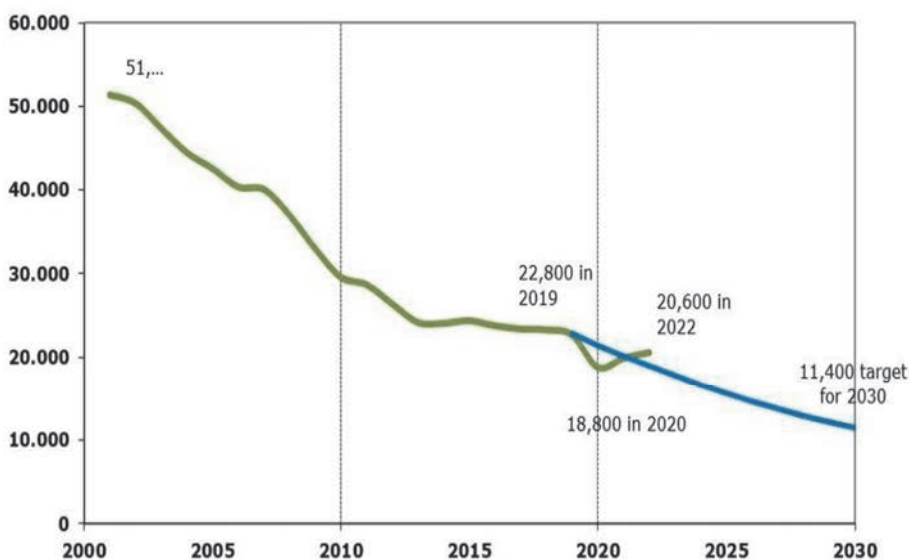
¹¹ Richard E. Allsop, *CARE (baza danych Wspólnoty o wypadkach drogowych)*, Brussels, 2022, p. 21

	Ratio per million inhabitants				% change 2022 in relation to		
	2019	2020	2021	2022	2021	2019	Average 2017-19
Malta	32	21	17	50	1.89	0.63	47%
Netherlands	34	30	29	35	0.2	0.04	7%
Austria	47	39	41	41	0.02	-0.11	-11%
Poland	77	66	59	51	-0.14	-0.34	-33%
Portugal	67	52	54	63	0.16	-0.05	-2%
Romania	96	85	92	86	-0.08	-0.12	-14%
Slovenia	49	38	54	40	-0.25	-0.17	-14%
Slovakia	50	45	45	46	0	-0.08	-8%
Finland	38	40	41	34	-0.16	-0.1	-18%
Sweden	22	20	20	21	0.05	0	-17%
Switzerland	22	26	23	31	0.35	0.44	25%
Norway	20	17	15	23	0.55	0.15	16%

2022 data is based on preliminary data for most countries and is subject to change over time. Final data will be published in autumn 2023.

Source: https://poland.representation.ec.europa.eu/news/bezpieczenstwo-na-drogach-ue-rowerzysci-za-grozeni-2023-02-22_pl

Chart 1. Year 2022 Road accident statistics with fatalities and targets.



Source: CARE (EU road accident database). Green line – fatalities; Blue line – EU 2030 target.

Change in Poland's road safety position compared to European countries over the past 20 years

In 2022, Poland moved up five places in the ranking. Of the countries ranked, only 10 countries experienced a greater decline: Cyprus, Denmark, Estonia, Spain, Ireland, Lithuania, Latvia, Luxembourg, Slovenia and Sweden. A similar decline indicator as that of Poland was recorded in Austria. The remaining 15 countries recorded smaller decreases, or in the case of Malta, an increase in the indicator in question.

Table 2. Poland compared to European countries over the last 20 years

Country	Rate of road deaths per million inhabitants in 2002	Rate of people killed in road accidents per million inhabitants in 2022	% change
Austria	119	41	-66
Belgium	127	52	-59
Bulgaria	122	78	-36
Croatia	146	71	-51
Cyprus	133	42	-68
Czech Republic	140	50	-64
Denmark	86	26	-70
Germany	83	34	-59
Estonia	161	38	-76
Finland	80	34	-57
France	128	49	-62
Greece	150	58	-61
Spain	130	36	-72
Netherlands	61	35	-43
Ireland	97	31	-68
Lithuania	202	43	-79
Latvia	241	60	-75
Luxembourg	140	40	-71
Malta	41	50	22
Poland	152	51	-66

Country	Rate of road deaths per million inhabitants in 2002	Rate of people killed in road accidents per million inhabitants in 2022	% change
Portugal	161	63	-61
Romania	110	86	-22
Slovakia	116	46	-60
Slovenia	135	40	-70
Sweden	63	21	-67
Hungary	140	56	-60
Italy	122	53	-57

Source: https://poland.representation.ec.europa.eu/news/bezpieczenstwo-na-drogach-ue-rowerzysci-za-grozeni-2023-02-22_pl

Innovative projects to improve road safety

Baseline project¹²

European research to determine performance indicators for road safety (Collection of Key Performance Indicators (KPIs) for road safety).

Funding source:

European Commission Directorate-General for Mobility and Transport (DG MOVE) grant MOVE/C2/SUB/2019-558/CEF/PSA/SI2.835753

Granted from the state budget's resources within the framework of the implementation of the "International Co-Financed Projects" programme.

On the Polish side, as one of the initiating countries of the European project Baseline – Collection of Key Performance Indicators (KPIs) for road safety – Research to determine performance indicators for road safety activities, the Motor Transport Institute ITS (Instytut Transportu Samochodowego) participated with the support of the KRBRD.

Project Objective:

The purpose of the project is to develop a survey methodology to determine performance indicators for activities in the area of road safety and to conduct measurements in partner countries. The project is designed to support EU member governments in collecting and reporting these indicators.

Project implementation period: 2020–2022

¹² <https://baseline.vias.be>

Project partners:

The BASELINE project is implemented by a consortium of partners from 19 European Union member states. The project coordinator is the Vias Institute from Belgium. Other partners:

1. Austria: Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology and Kuratorium für Verkehrssicherheit (KfV)
2. Bulgaria: Bulgarian State Agency for Road Safety
3. Cyprus: Ministry of Transport Communications and Works
4. The Czech Republic: Ministry of Transport and Transport Research Center (CDV)
5. Finland: Finnish Transport and Communications Agency Traficom and VTT Technical Research Centre of Finland
6. Germany: Federal Highway Research Institute (BAST)
7. Greece: Directorate of Road Traffic & Safety in the Ministry of Infrastructure & Transport and the National Technical University of Athens (NTUA)
8. Ireland: Road Safety Authority (RSA)
9. Latvia: Ministry of Transport
10. Lithuania: Public Enterprise Transport Competence Agency (TKA)
11. Luxembourg: Ministry of Mobility and Public Works
12. Malta: Transport Malta
13. The Netherlands: Ministry of Infrastructure and Water Management and Institute for Road Safety Research (SWOV)
14. Poland: Institute of Motor Transport (ITS)
15. Portugal: Portuguese Road Safety Authority (ANSR) and the National Laboratory for Civil Engineering (LNEC), PRP, IMT, IP, INEM
16. Slovakia: Ministry of Transport and Construction
17. Spain: Directorate-General for Traffic (DGT)
18. Sweden: Sweden Transport Administration (Trafikverket)

Project Description:

The European Commission, taking into account the need to develop and implement new rules for evaluating successive road safety programs, has defined a set of Key Performance Indicators (KPIs) covering all elements of the “safe system” (Safe System). Their constant monitoring will allow profiled interventions to reverse unfavourable trends. Determining the values of the indicators and monitoring their changes over time will make it possible to evaluate the implementation of road safety programs. The BASELINE project has identified right basic BRD indicators:

- KPI 1: Speeding: percentage of drivers not exceeding speed limits
- KPI 2: Seat belts and child restraints: percentage of people using seat belts and restraints

- KPI 3: Helmets: percentage of people using helmets
- KPI 4: Alcohol: percentage of drivers found to have alcohol in their system below the legal limit
- KPI 5: Distraction: percentage of drivers not using cell phones
- KPI 6: Vehicles: percentage of new vehicles with a certain EuroNCAP rating
- KPI 7: Road infrastructure: percentage of roads/miles travelled on roads with the specified rating
- KPI 8: Post-accident care: call response time

Data needed for the determination of KPIs – collected by the project partners in 2020-2022. In Poland, the first five indicators were determined on the basis of the collected data: KPI 1–KPI 5.

The implementation of the project is fundamental for the implementation of the next road safety program for 2021-2030 (Commission Staff Working Document EU Road Safety Policy Framework 2021-2030 – Next steps towards “Vision Zero” SWD (2019) 283 final: <https://ec.europa.eu/transport/sites/transport/files/legislation/swd20190283-roadsafety-vision-zero.pdf>).

The Baseline project is a response to the need for monitoring activities carried out to improve road safety at the level of the European Union and in individual member states. The tasks of the project include the creation of a common research methodology using advanced statistical methods and carrying out measurements that make it possible to determine the values of KPIs in individual countries at the beginning of the European road safety program for 2021–2030. The developed methodology should meet all scientific requirements, while taking into account the conditions in individual countries. In order to meet this challenge, special teams of experts from different countries have been set up within the consortium to develop methodologies for determining individual indicators.

When determining them, special consideration should be given to geographic coverage (for the entire member state) and sampling. When analysing the results, it is necessary to take into account the differences in the legal regulations in force in each country, for example, regarding the permissible concentration of alcohol in the blood.

As part of the project, each country has declared a willingness to conduct surveys to determine selected indicators. It is assumed that two series of surveys will be carried out: in the spring and in the fall (depending on the pandemic situation). The methodology of the surveys has been strictly defined for each indicator as to the sample size, the time and location of the surveys and the scope of the data collected. The results will be statistically analysed to ensure the representativeness and comparability of indicators from different countries organised by the project consortium.

Project Centre of Knowledge on Transportation Accessibility and Mobility for People with Special Needs (CWoD)¹³

Project Description:

The project serves to launch a Centre of Knowledge on Transport Accessibility and Mobility of People with Special Needs, where experts will promote to various audiences the broad knowledge and good practices on universal design.

Project implementation period: 1.10.2021–30.09.2023

Funding source:

The project is financed by the European Social Fund as part of the Operational Program Knowledge Education Development 2014–2020. The project funding is PLN 5,319,184.20, including European funds of PLN 4,624,388.14. The project will begin its activities on 1 October 2021 and will operate for the entire duration of the project, i.e. for 24 months and for at least three years after its completion, i.e. until 30 September 2026.

Project Objective:

The main objective of the project is to establish and operate a Centre of Knowledge on Accessibility, where issues concerning universal design will be promoted and, in cooperation with the socioeconomic environment, innovative solutions, products and standards for universal services leading to increased mobility and improved traffic safety for people with special needs in mobility, including the use of means of individual transportation (i.e. wheelchairs, bicycles, mopeds, and cars) will be developed and disseminated.

The intermediate goal of the project is to support the academic staff of the project applicants in preparing to conduct education and training activities in the field of universal design, counteracting the exclusion of people with special needs in mobility.

As part of the implementation of the project, training programmes will be developed and implemented for this group, as well as for students, adapters, volunteers, and people with special needs based on a universal design with a special focus on the area of transportation.

Project tasks:

- Launch and operation of the Centre for Accessibility Knowledge;
- Reconstruction of the infrastructure allocated by the WAT for the project in order to adapt it to the needs of the Centre;

¹³ <https://cwod.wim.wat.edu.pl>

- Undertaking cooperation with the socioeconomic environment related to transportation and mobility;
- Running two information and consultation points for external entities on accessibility and universal design;
- Preparing to conduct education and implement training activities;
- Improving the competence of academic staff of the Department of Mechanical Engineering at WAT and the Institute of Psychology at UKSW in the field of universal design;
- To disseminate the principles of universal design in the socioeconomic environment related to transportation and mobility.

Project partners:

The project involves three partners:

1. Military University of Technology WAT (Wojskowa Akademia Techniczna), Faculty of Mechanical Engineering, Institute of Vehicles and Transportation (leader);
2. Cardinal Stefan Wyszyński University UKSW (Uniwersytet Kardynała Stefana Wyszyńskiego), Institute of Psychology;
3. Institute of Motor Transport ITS (Instytut Transportu Samochodowego), Department of Diagnostic and Service Processes; Centre for Road Safety.

The result of the cooperation of the teams from the Military Academy of Technology, Cardinal Stefan Wyszyński University and the Motor Transport Institute is a multidisciplinary publication entitled 'Universal Design in the Context of Mobility of Persons with Special Needs and Accessibility of Personal Transportation' concerning the promotion of knowledge on the accessibility of transportation and mobility of persons with special needs and universal design among different audiences.

It contains a compilation of thematic entries centred around four issues:

1. universal design
2. people with special needs
3. people with disabilities in road transportation
4. preparing automotive services in terms of their accessibility for people with disabilities

Project MOVING Safely To All RoadS – “Moving STARS”¹⁴

“Moving Safely To All Roads – “Moving STARS”

Funding source: Erasmus+ Program of the European Union

14 <https://movingstars.eu>

Project Objective:

The goal of the MOVING STARS project is to develop an educational program primarily for elementary school teachers to teach traffic safety and mobility, incorporating teaching–learning techniques based on various types of movement games and activities. The idea behind the program is to combine digital applications with “traditional” games and activities suitable for the developmental stage of students between the ages of five and 11, incorporating sensorimotor, linguistic, cognitive, social and emotional elements, in order to promote a holistic approach to road safety.

Project implementation period: 2020–2022

Project partners:

The project involves seven partners representing five countries:

1. The Hellenic Research And Educational Institute For Road Safety, Prevention And Reduction Of Traffic Accidents “Panos Mylonas” – Rsi “Panos Mylonas”, Greece (project leader)
2. Sant Josep – Escola A. Aguilera, Spain
3. innofy – Fraud Line Enterprise Risk Management And Compliance Services, Greece
4. The Institute of Motor Transport – ITS, Poland
5. Kildare Town Educate Together, Ireland
6. Omega Tech – Theofanis Alexandridis Kai Sia Ee, Greece
7. Zographeion High School, Turkey

Project Description:

MOVING STARS proposes an innovative approach to road safety and mobility education, based on movement games designed for the youngest road users.

The target audience for the project tasks is students, teachers and schools.

Project objectives for students:

- To enhance students’ knowledge and understanding of traffic rules and situations, as well as to develop and improve their skills to safely participate in traffic as pedestrians and cyclists;
- To shape students’ movement skills through the use of traditional and digital educational games and activities to lay the foundation for safe movement in traffic;
- To promote a culture of safety, including risk awareness and personal safety;
- To promote active forms of movement and the informed choice of mode of transportation;

- To reduce the number of injuries and deaths in traffic accidents among children, on the way to/from school and on other daily routes.

Project objectives for teachers:

- To update teachers' knowledge and skills on road safety and mobility education in order to encourage them to integrate this topic into their classes;
- To enhance teachers' knowledge and skills in the design and implementation of innovative multidisciplinary educational activities, as well as methodologies and trainings on road safety, provided by entities from different EU countries;
- To provide teachers with training tools and resources for implementing game-based road safety educational activities;
- Increase teachers' intercultural awareness through cooperation with partners from European countries, based on a culture of sharing.

Project objectives for schools:

- To establish a network of 100 elementary schools to pilot the developed program, which will act as laboratories of so-called 'STARS HUBS' for the implementation of activities related to road safety and mobility education, involving the school community, including teachers, students, parents and the local community;
- Application of the 'MOVING STARS BOX' toolkit, consisting of a teacher's manual, a digital app, support materials developed for games and activities, and guidelines for creating a HUB at school, in the school's work;
- Setting up educational booths related to various traffic safety topics (e.g. safe walking, maintaining balance, crossing the street, traffic signs, road visibility, distractions, etc.), through which children will learn by participating in games and activities;
- Participation in events promoting the project at the international level organised by the project consortium.

Some innovative solutions used around the world to improve pedestrian safety on the road

Actibump¹⁵, or pothole on cue

Actibumps, or so-called "lying policemen", have been well known in Poland for years. However, did you know that their inverse also exists? Places where the asphalt

15 An automatic deceleration threshold on the road. It activates when a speeding vehicle passes over an activated section of road and causes a change in the level of the roadway, as a warning to the driver.

collapses to signal drivers that they are going too fast. Actibump is such a solution, and it is gaining popularity in Scandinavia, where the roads are among the safest in the world. There are now such “potholes on call” in more than 50 locations around the world, primarily in Sweden.

The solution is quite simple: the radar measures the speed of the vehicle that passes it. If the driver complies with the speed limit, nothing happens and he continues on the even asphalt. Exceeding the speed limit, in turn, triggers a threshold on the roadway. The Actibump collapses gently below the surface of the asphalt, creating a 60-millimetre fault, clearly calling the driver to order. Traditional static thresholds often have a detrimental effect on traffic flow, and also cause noise and ground vibration. Neither of these problems is present in areas supplied with Actibump. It has also been confirmed that the average speed in places where the solution has been installed decreases significantly. Traffic is smoother, making it easier for pedestrians to judge the speed of an oncoming vehicle. This makes it easier to cross to the other side of the road.

Illuminated crosswalks for smartphone gazers¹⁶

Traffic signals at pedestrian crossings reduce the risk of going under the wheels of a speeding car by up to more than 90%. But what about when a pedestrian is so preoccupied with his smartphone that he doesn't even look at the traffic signals? This is where Far Eastern countries have come up with a solution. Seoul, Korea, among others, has introduced special LED lights on sidewalks located at pedestrian crossings. They light up in the same colour that the traffic signals currently indicate. Is it effective? The solution gives rise to different emotions. On the one hand, smartphone users can more easily see whether a red or green light is on at any given time. On the other hand, however, according to experts, it is a kind of acquiescence to dangerous behaviour that should be eliminated.

Three-dimensional pedestrian crossings¹⁷

A solution that in India and Iceland has made it possible to significantly reduce speeds at pedestrian crossings located in sensitive areas near schools or kindergartens. Using the effect of optical illusion, the painted stripes, thanks to their three-dimensionality, give the impression as if they were hovering over the roadway and represent an actual obstacle. This is one of the solutions that is also being intensively tested in Poland. Through the Hello ICE program created by Budimex, a company working to improve the safety of children on their way to

16 <https://biznestuba.pl/featured/5-innowacyjnych-pomyslow-na-zwiekszenie-bezpieczenstwa-piesznych>

17 <https://media.budimex.pl/pr/792736/pogram-hello-ice-budimeksu-powraca-w-nowej-odsloncie>

school, such three-dimensional pedestrian crossings have been painted in more than a dozen places across the country. Local government officials who decided to take advantage of the program and test the 3D crossings are satisfied with their effects.

In Wuhan, they block pedestrians¹⁸

In most European countries, the measures tend to target drivers, and are designed to force them to be more careful. In Wuhan, China, however, the focus is on educating pedestrians, preventing them from entering crosswalks when there is no green light. How? For example, at one of the most complicated intersections where pedestrians have to cross multiple lanes, gates like those in the subway have been installed. The gates physically block pedestrians from crossing the road at the wrong time. Interestingly, the same intersection is also equipped with 3D lanes, so you could say that Wuhan is extremely innovative when it comes to fighting for pedestrian safety. In Shijiazhuang, images of people entering a crosswalk at a red light were displayed on a large video screen. In Shenzhen, on the other hand, those caught in such an infraction had to put on distinctive green caps and help others cross the road. These are indeed solutions based on different mechanisms.

Lanes popping out of the asphalt¹⁹

At the other extreme from China's gates is a solution that has emerged in the francophone part of Canada, Quebec. The road safety body there, SAAQ, has identified the fact that drivers do not give way to pedestrians who are in the lanes as one of the biggest problems. Hence, the idea to experimentally apply the installation. With it, the moment a pedestrian approached the edge of the road, the lanes would rise up, forming a kind of fence to protect pedestrians. On these lanes the inscription "This pedestrian crossing protects pedestrians. Thank you for stopping" appeared. Did this solution make sense? Evaluations vary. The educational aspect is obvious. The video recorded during the experiment has been viewed by hundreds of thousands of drivers.

Conclusions

The following conclusions can be drawn from the analysis of the state of road safety in Poland from 2002 to 2022.

Safety on Polish roads in 2002–2022 has definitely improved. There are fewer accidents, fatalities and injuries. Many different aspects have contributed to this.

18 <https://biznestuba.pl/featured/5-innowacyjnych-pomyslow-na-zwiekszenie-bezpieczenstwa-piesznych>

19 Ibidem

First and foremost, education from an early age; making the public aware not only of the moral damage associated with road accidents but also what economic damage this brings; the introduction of various innovative programs; the expansion of road infrastructure, among other things, the construction of new and safe highways and expressways, and the modernisation and repair of existing roads. All this is possible with the support of EU funds.

Literature

Materials

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Allsop Richard E CARE (*baza danych Wspólnoty o wypadkach drogowych*), Brussels, 2022.

Projects

Baseline,

Centrum wiedzy o dostępności do transportu i mobilności osób o szczególnych potrzebach (CWoD),

MOVING Safely To All RoadS – “Moving STARS”.

Solutions:

Actibump – czyli dziura na zawołanie,

Podświetlane chodniki dla wpatrzonych w smartfona,

Trójwymiarowe przejścia dla pieszych,

W Wuhan blokują pieszych,

Pasy wyskakujące z asfaltu.

Websites

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<https://baseline.vias.be>

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Entrepreneurship and organisational maturity in the area of social media

Abstract

Introduction to the topic under investigation. The theme of the study is to show the synergies between the areas of entrepreneurship and social media in companies. An entrepreneurial organisation is one that is able to recognise opportunities in its environment, including those arising from the use of social media in its operations.

Purpose. The paper identifies and systematises areas of social media use in companies' operations and shows how companies' maturity in the area of social media can be studied. For the purpose of the paper, the maturity of three selected companies in the area of social media was assessed.

Methodology. Based on the results of a survey of three selected companies, their maturity in the area of social media was analysed and assessed. A comparative analysis of the data obtained was carried out using the TOPSIS method. Maturity profiles of the surveyed companies were also developed and shown in the form of graphs. Finally, conclusions were presented and further research gaps in the studied topic were identified.

Main results. Of the companies surveyed, the most mature in terms of the use of social media in its operations was the business accelerator type of company, whose operation is by definition based on building close relationships with other companies, as the company provides substantive, organisational and legal support to other companies on a daily basis. Consequently, the company needs to be in constant contact with the business community, which social media allows it to do.

The theoretical contribution. Companies use social media at different levels in their operations (from the least advanced to the most advanced form): as support for a specific area, as an element woven into business processes or as an element included in the organisation's strategy. For social media to best foster entrepreneurship, solutions are needed at the level of the organisation's strategy, not merely the use of media for a specific purpose or in a specific area. Having a social media strategy in place makes it easier for a company to pursue a proactive approach. The company can then take action before incidents occur, rather than just reacting afterwards.

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Practical implications: Method, how to analyse the maturity of an organisation in terms of social media use.

Keywords

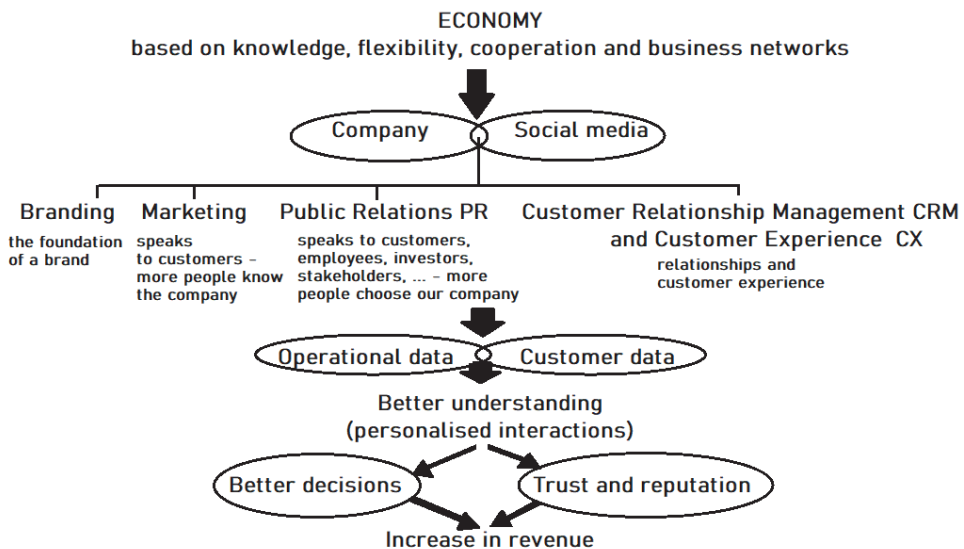
organisational maturity; social media; corporate entrepreneurship; strategy; TOPSIS.

Introduction

The theme of the study is to show the synergies between the area of entrepreneurship and the area of social media in companies. This is because an entrepreneurial organisation is able to recognise emerging opportunities, which nowadays also include the skilful use of social media in business activities. Companies that are able to use social media can gain an advantage over their competitors.

The activity of people and companies on social media is increasing (Kemp, 2022; Krzycki et al., 2012). Media is a priority for many businesses (Kaplan A. M., Haenlein M., 2010). Companies can use the media to present the brand, in marketing, in PR activities, in customer relationship management (CRM) and customer experience (CX) activities. Therefore, the issues discussed in the study are best summarised in the author’s figures. Figure 1 shows the aspect of company–social media synergies and shows the key areas of social media use in companies.

Figure 1. Synergies between the company and social media and areas of application of social media in organisations



Source: own study.

Social media helps companies:

- promote products and services;
- communicate, and thus solicit opinions and feedback that can help improve products and services and respond more quickly to needs. Social media, unlike traditional media, transforms communication with a company's customers into an interactive dialogue. By sharing and socially analysing information, social media allows a closer, more lasting relationship to be built between the company and the community. It fosters a better understanding of consumer needs (Chua and Banerjee, 2013). It allows the creation of products and services that are the result of social participation;
- build relationships with customers;
- share their knowledge and experience, thus increasing their brand recognition and reaching more customers.

Social media is a tool by means of which the consumer can communicate with a company and have a real impact on the co-creation of a product or service. Thanks to social media, the recipient can become a prosumer – a co-creator. This enables the recipient to be involved in co-creation on behalf of the company. Thanks to social media, the consumer, who is called a prosumer, can be active by offering his or her opinion, participating in research, testing prototypes, participating in competitions and co-creating products and services.

Social media provides access:

- to a community (a collective, networked entity connected by network relationships);
- to content that is subject to social control (enriched by views, i.e. so-called social analysis and often also elements of competition);
- to the context of communication. Communication context is the additional information around a given communication, both quantitative and qualitative. Context includes access to data pertaining to the participants in the communication process, the relationship between them, the location, the type of activity, the time, the course of the phenomenon over time, etc.

Examples of social media used by modern companies include YouTube, Facebook, Messenger, Instagram, WhatsApp, Twitter and others. The aforementioned social networks enable companies to build relationships with existing and new customers in a variety of ways, for example by engaging customers in an interactive dialogue with the brand, by including customers in discussions with each other about the brand, its products or services, and by providing people with gamification opportunities or as an element to enhance interactions (Yuksel et al., 2016).

Companies can use social media at different stages of entrepreneurial development:

- at the beginning of their business, i.e. in the development phase,

- as part of the company's ongoing operations,
- in order to accelerate their growth,
- at the deceleration stage of the business.

Companies use social media in their business (from least to most advanced form):

- to support a specific activity or area,
- as an element woven into business processes (e.g. sales),
- as an element incorporated into the organisation's strategy.

The COVID-19 pandemic has highlighted the need for companies to use social media in their day-to-day business activities and, in addition, has made companies aware of the need to include social media in their business strategy. It is worth noting at this point that a company must first define its business model so that it can then formulate its strategy.

Considering the technological aspects related to the use of social media, research is required on how social media works, what benefits it brings to companies, or – in modern times – how to incorporate artificial intelligence mechanisms into the management or operation of social media.

Considering the business aspects, research is required on:

- which areas organisations are most likely to see the potential of social media in;
- what benefits social media provides;
- the stage of the company's development at which social media is used (start-up, growth, acceleration of growth, deceleration of activity);
- the company's level of maturity in the area of social media compared to other competitors.

The objective of the considerations in the following section is to examine the maturity of organisations in the area of social media and to assess whether the nature of the business (type of company) influences the sophistication of the use of social media by these companies.

1. Literature review of the social media maturity survey of organisations

Companies should assess the maturity level of their business model in the context of their use of social media and explore the benefits that social media brings them, such as customer loyalty, acquisition of new markets or free advertising (Safko, 2010). A maturity model assesses the strategic use of social media through a given company, allows it to be compared to others and identifies opportunities for growth (Krakauer, 2022). A maturity model usually consists of a sequence of maturity stages (Lasardo et al., 2016).

Different concepts can be found in the literature presenting the levels (stages) at which companies achieve maturity in the context of social media use (Table 1).

Table 1. Selected maturity models of organisations regarding social media

Autor	Maturity levels of the organisation
J. Owyang (2010)	Beginner Experimental Formalised Mature Advanced
C. Lee i J. Beroff (2009, 2011)	Idle (slumbering) Testing Coordinating Being in the scaling and optimisation stage Improving
M. Sponder (2012)	Listening (monitoring) Listening and acting
L. D. Schalk (2015)	Looks and listens Establishes a social footprint Develops a social asset base Increases social value Builds its community Becomes a social brand
A. Jagannathan (2014)	Present Active Engaged Increasing reach Influencing
R. Marvin (2016)	Observational (low investment, low innovation) Conservative (high investment, low innovation) Competitive (low investment, high innovation) #SocialFirst (high investment, high innovation)

Source: own study.

On the one hand, we have companies that are not present on social media because they only operate in reality, although they are present on social media thanks to people who write comments about them; on the other hand, some companies are very active on social media and build on their experience.

Researchers have been inspired in terms of assessing the maturity of an organisation in a particular area of development by E. M. Rogers' 1962 research on the diffusion of innovation theory (Rogers, 2003). S. Corcoran and C. S. Overby of Forrester Research presented an extension of this theory in relation to social media (Corcoran, 2011; Corcoran and Overby, 2011), which identified the following types of organisational maturity in the use of social media:

1. The Marauders (Laggards: the dormant stage) / the dormant organisation – characterises organisations that do not use social media because they have no experience or are simply not interested in it.
2. Late majority: the testing stage / Testing organisation – characterises companies that are just testing – they are still operating chaotically in the social media area.
3. Early majority: the coordinating stage / Coordinating organisation – in this organisation the coordination of social media activities is present and the allocation of resources takes place.
4. Early adopters: the scaling and optimising stage / Scaling and optimising – a coordinated organisation focusing on optimising social media activities.
5. Innovators: empowering their employees / streamlining – companies where all employees have been trained and are empowered to use social media.

Another study by Altimeter Group in 2010 identified five types of organisation in terms of the use of social media in the company (Owyang et al., 2010):

1. Decentralised – no department in the company manages or coordinates social media activities,
2. Centralised – there is one department of the company that manages all social media activities (here social media activities are implemented in selected functional areas or departments of the company),
3. Hub and spoke system – there is a centralised team to manage and coordinate social media projects (across all functional areas or departments of the company),
4. Multiple hub and spoke/Dandelion – involves multinational companies operating autonomously under a common brand,
5. Holistic – every person in the company uses social media in a way that is safe and consistent across the organisation.

The least mature organisations in terms of social media are decentralised organisations, where there is little or no coordination in the use of social media and projects belong to a specific area or department. H. J. Wilson, P. J. Guinan, S. Parise and B. D. Weinberg proposed their own classification of the maturity of organisations in terms of social media use. They distinguished four types of organisational maturity in terms of social media use (Wilson et al., 2011):

1. Predictive practitioner – involves the use of social media in a specific area, for example customer service, production, research and development, brand foundation, marketing, or public relations (PR). There is little or no coordination in the implementation of social media projects.
2. Creative experimenter – involves the use of social media to improve specific functional areas or practices of the organisation.
3. Social media champion – organisations that have a centralised social media team. This team manages but also coordinates social media projects across the organisation.
4. Social media transformer – includes organisations with many centralised social media teams. The teams may be globally dispersed in different parts of the world and yet easily share knowledge through modern technology. Social media is linked to the way organisations work. Projects involve multiple functional areas and departments of the company.
The last classification was applied to the research presented in the paper.

2. Research methodology

The study followed the following methodology:

1. definition of objectives
2. formulation of research questions
3. selection of cases
4. case analysis
5. comparative analysis of data from individual organisations
6. development of organisation maturity profiles in the context of social media use
7. conclusions
8. conclusions and recommendations.

The purpose of the research presented in this article is:

- 1) to analyse selected organisations in terms of their use of social media,
- 2) to benchmark the maturity of selected organisations in terms of how they use social media,
- 3) to develop maturity profiles of organisations in terms of how they use social media in their business operations:
 - 3a) presenting the characteristics of the selected organisations,
 - 3b) identifying the dominant maturity model (type) in the organisation in terms of social media use according to the methodology proposed in the study (Wilson et al., 2011),

3c) identifying the dominant level (stage) of maturity of the organisation in the context of social media use according to the classification proposed in the study (Owyang et al., 2010).

3d) assessing whether the nature of the business (type of company) influences the sophistication of their social media use.

The following research questions were formulated:

Q1: What maturity model (type) do the selected organisations present?

Q2: Which of the surveyed organisations is the most mature in terms of social media use?

Q3: At what level (stage) of maturity are the surveyed organisations in terms of the use of social media in their activities?

The research included a survey of three organisations from Poland (Table 2), qualitative and quantitative research of the data collected through the survey, the use of the TOPSIS method to benchmark the data and data visualisation to present the maturity profiles of the organisations.

Table 2. Characteristics of the organisations

Organisation	Industry	Nature of problems	Management	External contacts
Organisation 1	Education/ University	Focus on process flow. Problems are familiar and repeatable.	Performance and reliability-oriented	Routine, well described, systematically developed
Organisation 2	Business/ Business accelerator	Focus on networking and relationship building. Problems require innovative ideas.	Results-oriented	Dense and redundant
Organisation 3	Medical/ Dental practice	Although the end result to be obtained is known, the way in which the problem is to be solved (sequence of steps) may vary from problem to problem.	Coordination-oriented	Are the basis for responding to a problem

Source: own study.

3. Research results and discussion

Stage 1: Analysis of the organisation’s maturity in terms of social media use based on survey data

Table 3 shows the averaged results of the survey data. The data was collected according to the methodology described in the paper (Wilson et al., 2011).

Table 3. Maturity of the organisation in terms of social media use

Organisation maturity model (type)	Organisation 1 – University	Organisation 2 – Business accelerator	Organisation 3 – Dental clinic
Predictive practitioner	5.43	8.00	9.56
Creative experimenter	7.30	5.25	3.89
Social media champion	6.43	10.50	3.67
Social media transformer	4.96	7.00	3.22

Source: own study.

Based on the data, the following results were obtained (answer to research question Q1):

- Organisation 1 – University – represents the creative experimenter maturity type, i.e. the use of social media is done to improve specific functional areas or practices of the organisation (processes),
- Organisation 2 – Business Accelerator – represents the social media champion maturity type, i.e. there are positions in the organisation that deal with social media. The degree of sophistication in media use is highest in this case,
- Organisation 3 – Dental clinic – represents the predictive practitioner maturity type, i.e. it assumes the use of social media in a specific activity or area. The degree of sophistication in media use is lowest in this case.

Stage 2: Benchmarking the maturity of the organisation in the context of social media use using the TOPSIS method

The Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS) method was used to benchmark the data obtained from the survey and select the best solution. This is one of the multi-criteria (Multi-Criteria Decision-Making) methods for decision-making. The starting point for obtaining decision solutions was the construction of a decision matrix. For this purpose, the data in Table 3 were used. The results obtained according to the TOPSIS method algorithm are shown in Table 4.

Table 4. Results of the study according to the TOPSIS method

	Organisation 1 – University	Organisation 2 – Business accelerator	Organisation 3 – Dental clinic
d ⁺	0.090	0.064	0.134
d ⁻	0.094	0.120	0.050
S	0.509	0.653	0.270
Ranking	2nd	1st	3rd

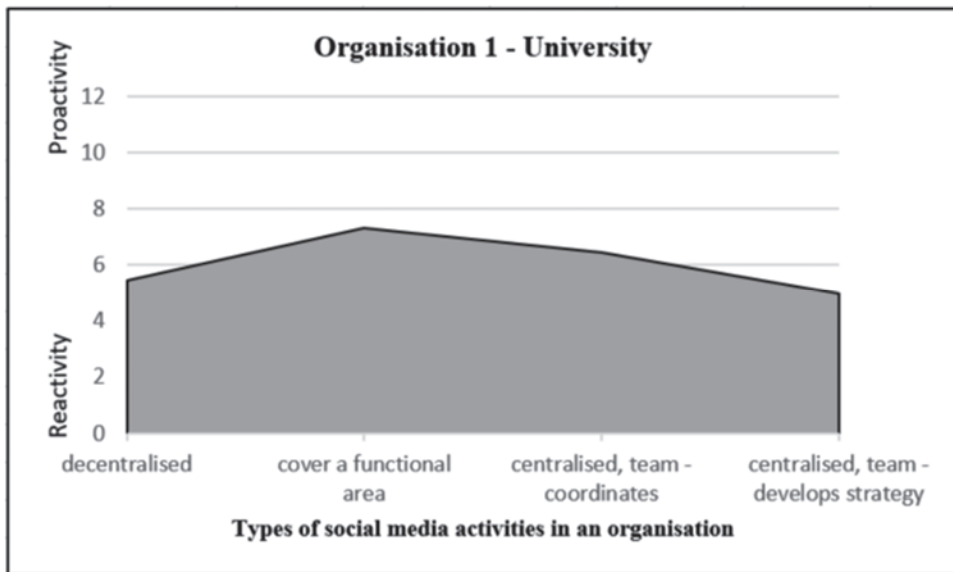
Source: own study.

Based on the results obtained, it should be concluded that Organisation 2 is the best solution according to the TOPSIS method ($S = 0.653$). Organisation 2 thus shows the best fit in terms of maturity in the context of social media use (answer to research question Q2).

Stage 3: Maturity profiles of the organisation

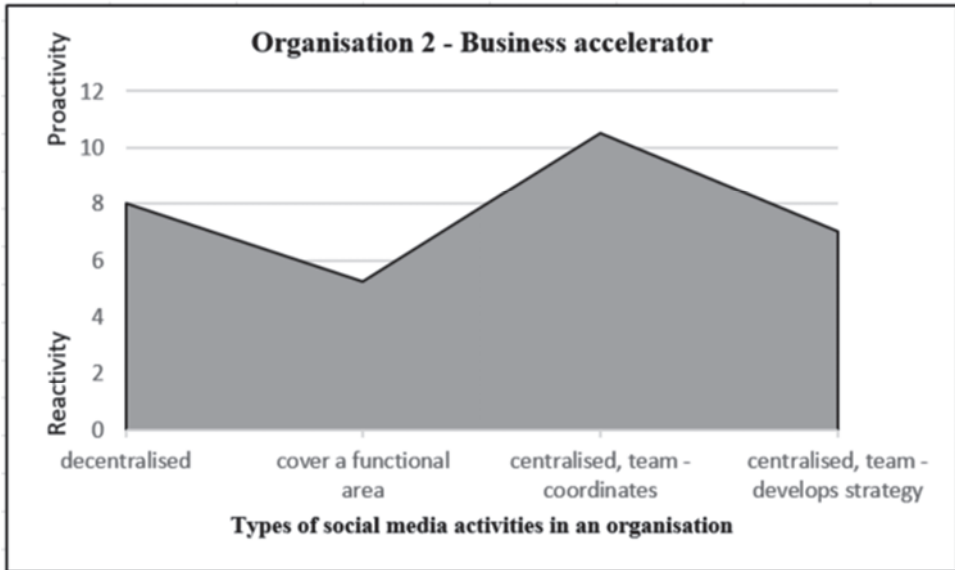
The data in Table 3 was used to develop the organisation’s maturity profiles in the area of social media (this provided an answer to research question Q3).

Figure 2. Maturity profile for Organisation 1



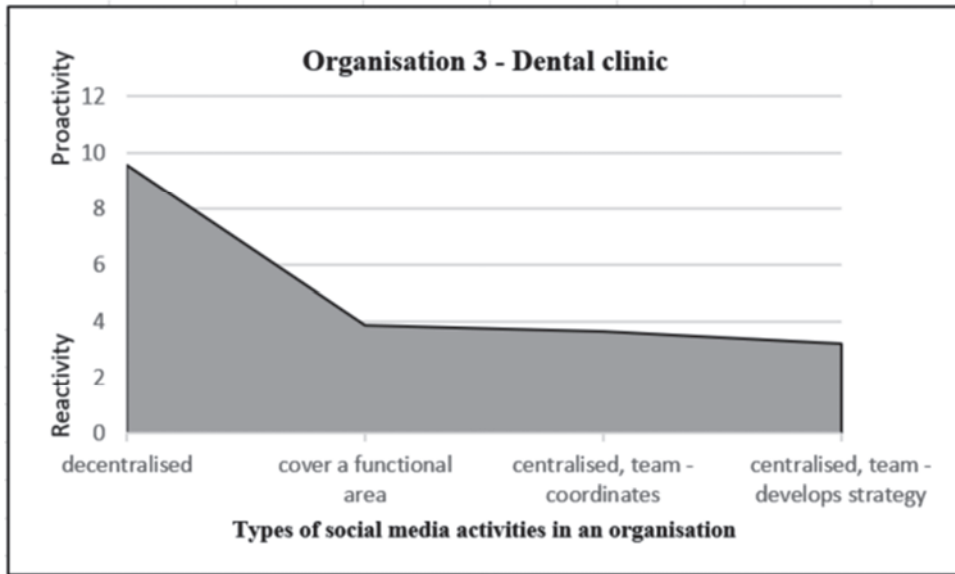
Organisation 1 is an example of an organisation experimenting with social media. This type of profile is characteristic of organisations that are implementing social media projects, but without a solid social media strategy to that point. Training staff involved in social media is recommended. Dominant type of social media activities – activities cover a specific functional area or involve specific processes.

Figure 3. Maturity profile for Organisation 2



Organisation 2 is an example of an organisation that uses social media to engage with customers. The team coordinates social media projects. The organisation learns from its own projects. Employees share experiences from different projects. Investment in the area of social media is recommended. Dominant type of social media activities – activities are centralised and coordinated by a team set up for this purpose.

Figure 4. Maturity profile for Organisation 3



Organisation 3 is an example of an organisation that is a beginner or experimenting in the area of social media. Social media activities are undertaken by an employee. The organisation has not yet integrated social media channels into its customer service strategy. Dominant type of social media activities – decentralised activities.

4. Conclusions

By examining the maturity of the organisations in the area of their use of social media, it was possible to:

- compare the companies in terms of their maturity in the area of social media – Organisation 2 is the most mature and Organisation 3 the least;
- identify the dominant maturity model (type) in the organisation – Organisation 1 is a creative experimenter, Organisation 2 is a social media champion, and Organisation 3 is a predictive practitioner;
- identify the dominant level (stage) of maturity of each company (X axis);
- assert that the nature of the company’s business influences the sophistication of these companies’ use of social media (Organisation 2 makes the most use of social media).

In order for social media to foster entrepreneurial development in companies, solutions are needed at the level of formulating business strategy or defining processes, and not only in the use of social media for a specific task or in a specific area. Having a social media strategy makes it easier for companies to pursue a proactive,

customer-focused approach (e.g. What can the company still do for the customer?), and not just a reactive, customer-centric approach, i.e. reacting on social media to situations that have already happened.

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Evolution of the innovation process management model in enterprises

Abstract

Innovation is inherently complex and unpredictable. Companies, guided by financial and operational considerations as well as strategic goals, employ various techniques to capture the uncertainty of innovation in measurable and, consequently, manageable ways. An innovative enterprise can be defined as an organisation with the ability to create, acquire, and market new products or services, utilising the appropriate resources. Such enterprises are characterised by their ability to continuously adapt to changes in their environment. The article undertakes a comprehensive exploration of the evolution of the model for managing innovative processes in enterprises. By tracing historical roots and delving into key paradigm shifts, our aim is to unravel the intricate scheme of how companies have changed their approaches to remain at the forefront of progress.

Keywords

process management, project management, process approach.

The Classical Approach to Innovation

The pioneering work conducted by J.A. Schumpeter and V. Bush helped explain the origins of organised technological development. Based on the concept of ‘push science’, they described innovation as a linear process consisting of basic, applied and development research, from design through production to marketing and sales. The situation is similar in the case of models based on linear logic, which reinforced the concept of a sequential innovation process (Porter, 1985). It is noteworthy that science and technological programmes in many Western countries still rely on this model and are often used to justify public research and science funding. This ideology implicitly assumes a causal relationship between research expenditures and innovation outcomes—higher investments in basic research will lead to greater innovation and, consequently, the development of more advanced products.

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The linear model proved effective in fields where immediate usefulness and practicality were not determinants. In the 1960s, a new paradigm emerged based on the empirical work of J. Schmookler in patent statistics. It was found that innovation was more determined by 'market pull' than by the classical 'science push'. This model also assumes a linear causative-sequential innovation, but in this case, market demand is what triggers innovative activity.

The market model strengthened the position of marketing, and R&D staff and new product development teams were assigned reactive roles in developing products according to given specifications. The market model provided companies with a tool to align internal processes with production capabilities and market expectations, significantly impacting the growing importance of R&D as a strategic element in achieving, building, and expanding market dominance. For example, AT&T actively pushed the development of transistors at Bell Labs because telecommunications companies demanded smaller and more convenient switching technologies. E. Hippel introduced the concept of lead users, further emphasising the importance of customers as a source of innovation. Lead users, as technologically experienced customers in need of improved products, can be trendsetters in emerging markets (Hippel, 1988). Hilti, a leading provider of construction technology, easily reduced R&D costs and time to market by half by applying the lead user concept. Both the 'science push' and 'market pull' can be classified into the category of linear, sequential models, differing in their initial source of innovation.

The chaotic nature of innovation

As indicated by research from the late 1970s, innovative processes are rarely linear, triggered by a single source such as scientific potential or market needs. They exhibit much greater complexity than the linear model suggests (Cohen et al., 1972). Research conducted by Van de Ven and others has demonstrated that innovation is an inherently chaotic process. However, managers often assume a degree of predictability and cause-and-effect relationships in innovation. Consequently, they frequently introduce structured management schemes to increase the stability and coherence of their efforts. Linear models have been enhanced by integrating both 'science push' and 'market pull' into non-sequential feedback loop models. Regardless of the innovation trigger, several complete feedback loops should ensure that both scientific and market knowledge are recognised as valid and implemented. For example, R. Roy described innovation as a cyclical process in which technological possibilities, inventions, knowledge creation, and market requirements are interconnected. In later years, S.J. Kline and N. Rosenberg introduced a chain-linked model, describing five innovation paths. Some of these paths are linear, following the invention through development, production, and marketing sequence, while others are based on multiple feedback loops, returning to the early stages of the

innovation process. The main implication of the presented model is that the market remains a significant driver of innovation. While science-driven innovations are relatively rare, they should not be entirely neglected. In the 1980s, several integrative approaches to research and development management emerged, initiated by Japanese companies (such as the 'rugby' approach, favouring a team-based rather than relay-based product development approach). These approaches are characterised by overlapping innovation sub-phases, mainly in product development and production (Liker et al., 1995). Based on these intertwined innovation models, i.e. innovation processes with overlapping sub-phases, interaction models were developed, emphasising interaction itself as an important source of innovation (Durand, 1992). They showed innovation as the result of intensive, continuous interaction involving both individual and institutional entities, with communication becoming a key tool supporting their implementation. I. Nonaka and H. Takeuchi, who introduced the rugby approach mentioned above into R&D management, focused on knowledge creation and sharing as the main determinant of a company's success, even considering innovation a byproduct of knowledge management.

Customers and innovations

Traditional market research methods are based on the 'law of large numbers' – the more customers want a new feature or product, the more valuable it is perceived to be. However, the methods described above often do not work well in technology-based innovation, as the target markets do not yet exist. This has led to the development of anticipatory and exploratory market research concepts, such as scenario techniques (initiated by Royal Dutch/Shell), Delphi research (Dalkey and Helmer, 1963), or beta customer testing groups (Kottler, 2000). Examples of this type of innovation include 3M's Post-it notes, Corning's fibre-optic technology, Netscape Navigator, and Schindler LiftLoc. Many innovative projects in companies primarily offering Internet-based products and services are characterised by a high degree of uncertainty regarding the alignment of the offering with market needs. Even well-established 'classic' industries are developing products with an increasing online content. This belief has gained particular significance in the situation prompted by the outbreak of the COVID-19 pandemic. Furthermore, simulation, virtual reality, and communication tools based on broadband information and communication technologies (ICT) enable research, development, and the integration of users, scientists, and engineers in virtual international teams. Greater access to information and geographical dispersion are two important factors in the design of modern innovative processes. Generally, in its initial phase, there is only a vague idea about the possible results. Team members significantly differ in their understanding of the adopted goals and methodology. By sharing their ideas during conceptual meetings, the individuals involved create common knowledge

and clarify its assumptions. In the early phases of the project, tacit knowledge is transformed into explicit knowledge. Sharing knowledge and transferring know-how is hindered not only by geographical separation but also by epistemological and cultural barriers. Historically, during most research and development work, project teams developed gates, probed situations, and learned in a single location. However, a typical development team in the early 21st century has already taken on a transnational character (Boutellier et al., 2000). It might seem that probing and learning processes also work effectively in the online sphere, allowing them to be transposed to a distributed team. Nevertheless, distance and the challenges of different time zones and cultures impose limitations and further imperfections in the innovation process.

The Process Approach to Innovation

If innovation is considered a process, then differentiating it into two phases brings several advantages. The first phase, known as the 'cloudy phase', fosters the development of creativity by allowing team members to act freely. The second phase, focused on the discipline of the 'component phase', ensures effective implementation. This differentiation enables international companies to more easily replicate and scale innovation efforts in distant locations, leveraging economies of both scale and scope. Although the characteristics of these phases are quite distinct, few companies have consistent and diverse management techniques and overall innovative actions specific to each of them. By dividing the overall innovation process into a 'cloud phase' and a 'component phase', problems in international innovation teams can be easily implemented. The innovation process is an accumulated sequence of defined stages and activities leading to innovation. Recent research, especially work done in the Minnesota Innovation Research Programme, shows that innovations are typically unpredictable and difficult to manage (Van de Ven et al., 1989). The two-phase model allows for the occurrence of chaotic and random innovative processes which arise at the beginning of the innovation phase. They influence the narrowing and redirection of creative energy from the first phase during the execution and implementation of initial ideas in the second phase. In the literature, this process has been called Cloudy-to-Component (C-to-C) (Gassmann, 1997). Diverse concepts of phases are widely accepted and applied in the industrial R&D sector. However, they suffer from strictly sequential execution of project phases. The C-to-C process concept is adequate for innovative processes taking place in large foreign companies. Due to increased internationalisation of research and development and knowledge creation, optimising global product development and integrating dispersed competencies have become more challenging (Gassmann and Zedtwitz, 1999).

Implementing the process according to the C-to-C concept does not mean that projects are conducted without reviews and milestones. The most important thing

is to focus on determining the results of its two main phases. In practice, there are situations where project implementation is slowed down or even interrupted because defects arising during the design stage must be corrected at a more advanced stage. Many projects also did not achieve their full potential because project managers emphasised cost efficiency and short-term solutions too early. To mitigate the effects of emerging errors resulting from improper management, managers attach great importance to the project preparation stage. The division into two phases must be well planned and then communicated and accepted by all parties involved. The first phase, the 'cloudy' one, is the domain of creative idea generation, research, and advanced development. It is essential to ensure freedom of thought and an open field of action for innovators. This early phase is based on market information and technological research. Market exploration in this phase is based on traditional market research tools (Leonard-Barton, 1995). Leading innovation centres, technological forecasts, expert interviews, patent database research and backward analysis of competitive products are typical techniques used at this stage. Market and technology exploration must be conducted on a global scale. This is due to the fact that as a source of technical information, knowledge is becoming increasingly less limited to selected regions, and markets are becoming more internationally oriented. Exploring needs and reviewing technology are two key sources of ideas for innovative projects. The best project ideas come from a balance between market appeal and technology development. In addition to the influence of technology and market conditions, generating project ideas can be greatly influenced by location-related issues and factors such as low utilisation of production capacity, lack of funding, and current trends. Projects with negative financial results and low cash flows are under greater pressure for changes than those with profitable products. For example, the significant outflow of qualified personnel from German aviation company DASA in 1995 was associated with long-term uncertainty pertaining to goals and changes in the leadership of MTU (a close business partner of DASA), in contrast to ABB, which experienced a 'creative crisis' in the radical innovation project GT-24/26 (Imwinkelried, 1996), and IBM, which experienced such a crisis in its VSE development project (extended virtual memory) (Gassmann, 1997).

Emerging trends often encourage managers to expand their product portfolios with the latest and most sophisticated solutions on the market. Many research and development projects are initiated not due to a clear market need or technological potential, but rather to improve the image or reputation of a specific business unit. In addition to the requirements imposed on the company by the external market (e.g. a request for a new product) and technology (e.g. exploiting technological possibilities), the main driving force for launching a new project is internal impulses to solve problems (e.g. justifying previous market investments and product

commitments). In the global environment, two external factors are predominant, while the internal motivator is local.

The innovation process in the chemical and pharmaceutical industry is a two-stage and highly model-like process, akin to the C-to-C process. BASF emphasises the distinction between the 'cloudy phase' and the 'component phase', referring to 'R&D activity' in the early stages of R&D and 'research and development projects' in later stages. For BAYER, the creation of milestones and summary meetings for project progress only begins after reaching the preclinical research phase. That is when the project is formally initiated. General Motors calls this early phase of innovation the 'bubble-up process'. This process is driven by an interdisciplinary team represented by members from the R&D, strategic purchasing, and marketing departments. Most activities focus on strategy development and exploration of markets, brands, and technologies. In Schindler, the coordination of the cloudy phase is the responsibility of a unit called the Technology Management Area, whose technological experts, marketing innovation representatives, and leaders jointly develop so-called 'concept elevators'. These functional prototypes demonstrate technical feasibility and market acceptance. These teams also define the basic product architecture and the technology to be applied. Individual stages are subject to development and continuous detailing, and the process itself is fully documented by the development centre. The distinction between the 'cloudy phase' and the 'component phase' is therefore not a purely academic term, but a fact. Successful companies in multinational innovations manage each phase differently and optimise the implementation and utilisation of specific organisation and management techniques. There is ample research indicating that innovation is stimulated by the geographical proximity between the company's R&D area and external research and development centres, suppliers, and customers (Hippel, 1988). M. Tushman noted that the methods and intensity of communication differ significantly between early creative research and development and later-stage development work. Many tools based on modern communication technology and advances in virtual engineering can enable employees to collaborate more productively remotely; however, direct meetings remain a reliable and effective way to consult on a new idea. The early 'cloudy phase' takes place in the local environment. However, factors driving the generation of new ideas and projects, such as customer needs, technological potential, and pressure related to performance improvement, may have a global origin. When the product or system architecture is initiated, and most interdependencies between different parts of the final product are defined and described, actual research and development work can be delegated and assigned to specialised and better-prepared R&D units. Some research may still require supplementation concerning basic properties and improvements to individual elements of the system, but they should not affect its overall design. Coordination and communication

in the process is now the responsibility of the entire project management team, which monitors and directs work through regular project reviews (Gassmann and Zedtwitz, 1999b). However, to ensure access to critical resources during the component phase, project support by its steering committee becomes essential. Typical members of this management unit include directors of business areas, research and development, marketing, production, and regional areas. This increases the likelihood of commercialising the results achieved. At ABB, strategic projects known as 'Joint Technology Projects' were directly managed by the director of the energy transmission business area. Only when the project had a good start and was well-grounded did the director hand over its management to a lower-ranking manager. As the steering committee could not control the entire project due to a lack of required specialised knowledge, subcommittees for individual components were established to assess project activities. Usually, expert knowledge serves as the basis for decision-making by steering committees and project managers.

Conclusion

Innovations have come a long way from unmanaged, almost accidental exploitation to a consciously managed process. This leaves no illusions about the (un)predictability of sequential logic in linear research and development models. By dividing the innovation process into two phases, research and development processes can be appropriately designed and managed at each stage of implementation. This separation significantly improves transparency and shortens the costly development phase. Although the characteristics of these two phases differ, too few companies approach them with distinct management methods. The creative phase requires soft management methods, ensuring flexibility and freedom for innovators to operate. In this phase, tacit knowledge is transformed into explicit knowledge and transferred to other team members. To meet this challenge, it is important to build a team based on a focus on project culture and a shared understanding of project goals and the base architecture of operation. In the project component phase, a significant role is played by the emphasis on moving towards the effective achievement of these goals. Costs and milestones are used to determine the progress of ongoing projects. In comparison to the cloudy phase, modern coordination and control mechanisms aim to lead the process to a positive conclusion. This often leads to the initiation of a globally implemented project, culminating in the market implementation of the product/solution. These phases of the research and development project allow for the achievement of higher levels of integration among international participants in the innovation process. It is important to find the right management approach for each phase and project. Critical success factors should be taken into account well in advance to ensure that challenges can be successfully addressed when they arise. Good ideas should be communicated, quickly evaluated,

and promoted. Potential promoters must be identified for new ideas early in the research and development project. For the project to transition from the cloudy phase to the component phase, traditional product profitability calculations must be complemented with an alternative evaluation model and qualitative criteria, such as competence building and product visions. An important aspect supporting the work of project managers from the very beginning is the establishment of a strong steering committee. Frequently, the engagement and assistance of its members pave the way to achieving intended goals within the organisation and beyond its boundaries.

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Patients' rights in Poland and around the world

Abstract

Every year on 18 April, we celebrate European Patients' Rights Day in all countries of the European Union. It would seem that, in principle, patients are aware of what rights they have, but experience shows that this knowledge is not at all common. The existence of these rights stems from the need to protect patients' autonomy in the face of interference from other actors and their right to demand the rightful conditions for the execution of any claims. The paper examines the legal norms related to this issue and the challenges faced by legislatures in Poland and internationally in the face of the crises and economic changes of recent years.

Keywords

patients' rights, coronavirus, ethics of the medical profession, intensive care, international law, European Union law, legal liability of a doctor, Patient Ombudsman, Polish legislation, medical law.

The set of patients' rights adopted in individual European countries was created based on the developed standards of ethics of the medical profession and international law. These include the European Charter of Patients' Rights² and the Declaration on the Promotion of Patients' Rights.³

In order to conduct an in-depth analysis of this issue, it is necessary to first of all identify the differences between key terms, sometimes used interchangeably, namely the concepts of "a health service" and "a health care service." A health service means actions aimed at maintaining, rescuing, restoring or improving health and other medical activities resulting from the treatment process or separate regulations governing their performance. On the other hand, a health care service is

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2 The European Charter of Patients' Rights is a non-governmental document drawn up in 2002 by the Active Citizenship Network in cooperation with 12 organisations from different countries of the European Union.

3 *The Declaration of the Promotion of Patients' Rights in Europe* was published in 1994 by the WHO.

a guaranteed service financed fully or co-financed from public funds on the terms and to the extent specified in the Act on Health Care Services.⁴

Another distinction concerns the terms “patient” and “beneficiary”. A patient is a person (sick or healthy) requesting health services or receiving health services provided by an entity authorised to provide such services or a person pursuing a medical profession. A beneficiary, on the other hand, is a person entitled to health care services financed from public funds on the basis of the Act on health care services and benefiting from services financed or co-financed by public funds, provided by medical entities or persons pursuing the medical profession under contracts concluded with the National Health Fund.⁵

As regards the categories of patients’ rights, two types of rights can be distinguished, namely the rights of a social nature that relate to the relationship between the patient and the state, and the rights of a subjective nature concerning the individual rights of the patient.

When discussing the subject of broadly understood patients’ rights, the European Charter of Patients’ Rights, which is a fundamental act of international law that deals directly with these rights, should be referred to. It consists of 14 fundamental rights which all countries are obliged to recognise and respect. The document refers primarily to the right to prevention and access to medical care (regardless of financial resources, place of residence, type of illness or duration of services). Furthermore, the right of access to all information related to the patient’s state of health, medical services, their use and innovation, taking into account diagnostic procedures, is underlined. Patients have the right to freely choose the treatment procedure and their healthcare providers. Another of the fundamental rights is the right to privacy and confidentiality. The Charter also refers to respect for the patient’s time in terms of obtaining the necessary treatment at each stage at the earliest opportunity. Patients also have the right to benefit from high-quality, error-free health services, in accordance with good medical practice and the right to lodge complaints, in the event of any harm.

Other acts which regulate patients’ rights include the European Convention for the Protection of Human Rights and Fundamental Freedoms of 1950⁶ and the International Covenant on Civil and Political Rights of 1966.⁷ In contrast, Polish legislation on patients’ rights is essentially based on a system of legal solutions contained in essential normative acts of international law. Such acts which relate to patients’ rights include

4 Act of 27 August 2004 on Health Care Services Financed from Public Funds (Journal of Laws 2004 No. 210, item 2135).

5 I. Rudawska, *Marketing w nowoczesnej opiece zdrowotnej. Wybrane aspekty* [Marketing in modern healthcare. Selected aspects], Wydawnictwo Uniwersytetu Szczecińskiego, Szczecin 2005, pp. 50-54.

6 The Convention was adopted by 12 member states of the Council of Europe in 1950 and entered into force in 1953. The Parties to the Convention are 47 countries (June 2015), i.e. all the member states of the Council of Europe.

7 International Covenant on Civil and Political Rights opened for signature in New York on 19 December 1966 (Journal of Laws 1977 No. 38, item 167).

the Constitution of the Republic of Poland of 2 April 1997⁸ and the Act of 6 November 2008 on Patients' Rights.⁹ According to the latter, public authorities competent in the field of health care such as the National Health Fund, entities which provide health services, persons which pursue medical professions and other persons involved in the provision of health services are obliged to respect the rights of the patient.¹⁰

As regards the specific rights of the patient, in accordance with the regulations, we will first discuss the right to health services corresponding to the requirements of current medical knowledge and a transparent procedure determining the order of access to these services, as well as access to medical records. Moreover, each patient has the right to consult another doctor, nurse, midwife or request a medical case conference. They also have the right to change doctors. In the case of private medical treatment, it is sufficient to make an appointment with another doctor, while in the case of the public health service the patient can approach the head of the hospital ward or head of the department and ask to change medical specialists.

Regardless of the social situation, every patient also has the right to immediate access to health services in life-threatening situations. As mentioned above, patients also have the right to obtain reliable information on their state of health, diagnosis, proposed and possible diagnostic and therapeutic methods, foreseeable consequences of their use or omission and prognosis. Another extremely important right is the right to show respect for the intimacy and dignity of the patient and the right to keep any information related to them confidential. Without their consent, no one can be informed of their state of health. They have the right to indicate who the confidential information will be communicated to, and this right also applies after the death of the patient. The patient also has the right to consent or refuse to receive health services. The patients' rights also include the right to services that ensure pain relief in a terminal state, the right to die in peace and dignity and the right to pastoral care, which means that the health care facility where the patient is staying has a duty to enable the patient to contact a clergyman of their religion.¹¹

The manager of a health care facility may restrict the exercise of patients' rights in the event of an epidemic risk or due to the health and safety of other patients and, in respect of certain rights, also due to the organisational capacity of the facility.¹²

The history of fundamental patients' rights in Poland dates back to 30 August 1991, when they were first included in the Act on Healthcare Institutions.¹³

8 The Constitution of the Republic of Poland of 2 April 1997 (Journal of Laws 1997 No. 78, item 483).

9 Act of 6 November 2008 on Patients' Rights and the Patient Ombudsman (Journal of Laws 2009 No. 52, item. 417).

10 Article 2 of the Act on Patients' Rights.

11 Article 36 of the Act on Patients' Rights.

12 Article 5 of the Act on Patients' Rights.

13 Act of 30 August 1991 on Health Care Facilities (Journal of Laws 1991 No. 91, item. 408).

More detailed laws were dispersed in various legal acts, for example on medical professions or the functioning of the National Health Fund. At that time, there was no comprehensive, uniform approach to this problem, which made it very difficult to determine patients' real rights and to assert them effectively. International instruments such as the European Charter of Patients' Rights and the Declaration on the Promotion of Patients' Rights in Europe were the reference point. The International Covenant on Civil and Political Rights of 19 December 1966, the Convention for the Protection of Human Rights and Fundamental Freedoms of 1950 and the Charter of Patients' Rights of 2002 were also a model for patients' rights. In Poland, it was only the Charter of Patients' Rights of 1998 that collected the rights of beneficiaries in one place. However, it should be borne in mind that it was not a source of law. During this time, the *Primum Non Nocere* Patients Association took measures to change the law and oblige the state to help people affected by medical errors and accidents, demanding, among others, the establishment of an institution of the Patient Ombudsman. In 2008, a set of draft laws concerning the health system were submitted to the Marshal of the Sejm, including a draft law on the protection of individual and collective patients' rights and on the Patient Ombudsman.¹⁴ On 6 November 2008, the Sejm adopted the Act on Patients' Rights and the Patient Ombudsman, which collected all the rights of the patients in one Act.

In connection with the changes then introduced, each patient has the opportunity to claim his or her rights or make claims in the event of a violation thereof. The competent authority for the protection of patients' rights in Poland is the Patient Ombudsman, who belongs to the government administration authorities. He or she is appointed, dismissed and supervised by the Prime Minister. His or her tasks include conducting proceedings in cases of practices which violate the collective rights of patients, conducting investigations, including an analysis of whether the entity which provides health services violated the rights of the patient, and conducting investigations initiated in the event of becoming aware that patients' rights were violated. In addition, the Ombudsman may request the initiation of proceedings in civil cases and take part in the ongoing proceedings, either *ex officio* or at the request of a party, with the rights of the public prosecutor. He or she also analyses patients' complaints to determine the risks and areas in the health system which require improvement and drafts and submits legal acts on the protection of patients' rights to the Council of Ministers.¹⁵

The Ombudsman also performs tasks related to the protection of the rights of people in psychiatric hospitals, related to reception, treatment, and the conditions of

14 Parliamentary paper No. 283.

15 Article 47 of the Act on Patients' Rights.

stay and discharge from the hospital. According to the Mental Health Act,¹⁶ a patient in a psychiatric hospital is primarily entitled to free health services and free medicines and sanitary supplies if he or she is in a public psychiatric health facility. In addition to the fundamental rights of patients of any other medical facility, a patient in a psychiatric hospital is entitled to be warned of the intention of direct coercion¹⁷ and about the intention to conduct a psychiatric examination without his or her consent and give the reasons for such a decision.¹⁸ Moreover, a person staying in a psychiatric hospital, including a person who is incapacitated, his or her legal representative, spouse, siblings, lineal relatives and the person who actually takes care of him or her may, in any form, submit an application to order his or her discharge from the hospital, as well as apply to the guardianship court for an order of discharge from a psychiatric hospital, after being refused discharge from the hospital. All rights of a psychiatric hospital patient are discussed in detail in the Mental Health Act.

The issue of patients' rights and violations has been the subject of intensive work and analyses undertaken by European Union bodies in relation to the outbreak of the COVID-19 pandemic. At that point, not only were civil liberties restricted, but also patients' rights. This is especially true of medical secrecy. Article 25 of the Code of Medical Ethics stipulates that exemption from medical secrecy may take place if secrecy significantly endangers the health or life of the patient or other persons and is required by law to do so. In the face of the pandemic, doctors were exempted from the obligation of medical secrecy and were obliged to report any case of coronavirus or even suspicion of a disease. Patients were also deprived of the right to receive the care of their relatives during the disease, referred to in Article 19 of the Code of Medical Ethics,¹⁹ as well as the right to consent to diagnostics.²⁰

Taking international legal regulations into account, it should be noted that the Polish legislator provided for a situation of limited possibilities to provide certain health services, while stating that the patient is entitled to a procedure based on medical criteria, which determines the order of access to these services.²¹ The principle thus formulated creates a moral dilemma, since the choice of the patient to be assisted first, assuming the same disease, often requires reference to non-medical

16 The Mental Health Act of 19 August 1994 (Journal of Laws 1994 No. 111, item 535).

17 Direct coercion measures include holding, the forced administration of drugs, immobilisation and isolation.

18 Such an examination may be carried out if the patient's behaviour indicates that, because of a mental disorder, he or she may directly endanger his or her own life or the life or health of others, or is unable to meet the basic needs of life.

19 The Code of Medical Ethics was adopted by the resolution of the 2nd Extraordinary National Convention of Physicians on 14 December 1991.

20 Article 15 of the Code stipulates that the initiation of diagnostic, therapeutic and preventive proceedings without the patient's consent may be permitted exceptionally in special cases of danger to the life or health of the patient or other persons.

21 Article 6 of the Act on Patients' Rights.

values and norms. At the same time, it can be stated that such a restriction of the patient's right is in opposition to the criteria set out in the European Charter of Patients' Rights, as regards the right to show respect for the patient's time, access to innovation or treatment tailored to his or her needs.

On the other hand, with regard to the patients' right to object to the doctor's opinion or decision, taking previous practice into account, it should be noted that the reduced number of appeals against medical commission decisions is possible by appointing panels in which the area of specialisation of the certifying doctor corresponds to the patient's disease entity. In fact, in adjudicating panels, decisions are made by doctors without sufficient expertise to assess the health of a particular patient. A certain inconsistency can be observed here, because in the context of the possibility of adjudicating, for example, on exemptions for disabled persons in connection with their disability, the Polish legislator introduced a number of restrictions, pointing to an attempt to avoid conflicts with, for example, the provisions of the Road Traffic Act, which in fact results in difficulty when it comes to making decisions in favour of the patient.

A very important right of the patient is the right to respect for intimacy and dignity. When discussing this matter, it is worth paying attention to two aspects that prevail as the cause of the dispute in court cases, namely the participation of third parties during surgery and the recording of images during the provision of services. Jurisprudence leaves no doubt that the placement of cameras in medical facilities is intentional and violates patients' collective rights to respect for intimacy and dignity. Regarding the participation of third parties in the provision of health services, it is worth emphasising that violation of the law of respect for the intimacy and dignity of the patient always entails civil liability. The patient has the right to the presence of close people in the provision of services. A close person is a spouse, relative or second-degree lineal relative, a legal representative, a person in cohabitation or a person indicated by the patient as a close person.²² In every situation, the only person who decides on the presence of a close person is the patient, whereas the failure of medical staff to give consent to such a person's participation during the service is legally unfounded.

Unfortunately, violations of patients' rights in hospitals are common. The most numerous categories of violations concern the right to health services and medical records. They result directly from the lack of transparent procedures in place in individual institutions or from the habit of already established erroneous practices. An example may be the prevention of access to medical records, loss of medical records by the facility, the installation of cameras mentioned above or the prohibition of the presence of a close person with a patient.

22 Article 3 (1) (2) of the Act on Patients' Rights.

However, taking into account the patient's health and life, a much bigger problem is to take action, even in accordance with the procedure, when the patient's life is at risk. Many violations of patients' rights are due to medical errors during the implementation of diagnostic and therapeutic procedures.²³ This is often related to non-compliance with the Code of Medical Ethics and established unethical patterns, but the element that poses the greatest risk is the incompetence of doctors.

In order to eliminate the problem of the violation of patients' rights, it is necessary to create procedures that leave no room for interpretative doubts, the observance of which would be subject to liability. A significant proportion of violations of patients' rights have their formal origin in the absence of internal regulations uniform for all hospitals.

However, not everything depends on the actions of the doctor; there is also the other side of the coin. In order for the patient to be treated successfully, responsibility and cooperation are also necessary, and unfortunately many patients do not follow medical recommendations. Failure to follow recommendations can take various forms, from an unsuitable diet to discontinuation of medications without the doctor's knowledge, which is surprisingly common among patients (for example, after reading the opinions of third parties or because of the fear of side effects).

Of course, if the patient recognises that his or her rights have been violated, he or she, or the person who represents him or her, may lodge a complaint with the healthcare provider, seek intervention from the direct superior of the person who provides the service, and then from the management of the facility, file a complaint with the Patient Ombudsman, as well as referring the case to the court or filing a complaint with the National Health Fund.

In special cases, the doctor may not provide or discontinue treatment of the patient.²⁴ However, failure to provide assistance must not result in the danger of loss of life, severe injury to the patient or the deterioration of the patient's health. However, if the doctor makes such a decision, he or she is obliged to inform the patient about this fact well in advance, indicate a doctor or health care facility where he or she has real opportunities to be provided with the service and to justify and record this fact in medical records.

Unfortunately, considering the current shape of Polish legal regulations concerning patients' rights and the procedures and practice actually applied, it turns out that these rights remain in part unfulfilled demands. The clash between the

23 An example is the transport of a patient with an unhealed surgical wound to a hospital hundreds of kilometres away, which is a state of imminent danger to his or her life. The hospital, apparently following the procedure, in fact violates all standards for the protection of health and life, transporting the patient in order to continue treatment at a specialised facility.

24 Article 38 of the Act of 5 December 1996 on the Professions of Doctor and Dentist (Journal of Laws 1997 No. 28, item 152).

provisions of the European Charter of Human Rights and the Declaration of the Promotion of Patients' Rights with the conditions of the economies of European countries, the criteria for financing medical services or the level of these services in relation to the social situation of citizens indicates significant disparities and inequality of opportunities to respect patients' rights, despite their legality.

The abovementioned fact of the pandemic affects the need to redefine patients' rights, establish precise and complementary rules for access to medical services and the responsibility of doctors for medical procedures. It is very important to standardise solutions across the European Union and, consequently, to remove loopholes consistently in the area of patients' rights. Current national and international legal regulations on individual rights with regard to access to treatment did not work in the global crisis. This was related to the challenge of eliminating the far-reaching effects of the pandemic, creating a new reality around the world, affecting economic priorities and those concerning emergency medicine procedures. The international health crisis exposed some weaknesses in the system and showed that developing standards, standardising procedures in individual countries and intensifying international cooperation remain fundamental challenges for the European Union.

The dilemma faced by doctors in the face of a pandemic regarding which patients will be treated and refused treatment means introducing a new categorisation of patients. Doctors confirm that such a choice cannot be made with absolute certainty because even a multi-person team cannot determine without any doubt what chances of recovery a patient in the intensive care unit has. Ethics and bioethics will never be able to justify such a decision or ensure the correctness of the classification of a particular patient as one expected to recover or without a chance of survival. The assessment which the granting of the right to intensive treatment to the patient based on age or social status depends on is in opposition to the principles of medical ethics.

Obviously, the actual possibilities of implementing intensive care are also linked to the financial situation of individual countries and determine their self-sufficiency or the increased need to finance, for example, intensive treatment equipment from EU funds. It should also be noted that patients' rights are a category of human rights and respect for them in general, so they cannot be considered solely a value compared to the other rights of the individual under the law. It is a much wider value which results from the inherent and inalienable human dignity.



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