JOURNAL OF PUBLIC GOVERNANCE

2 (64) \ 2023

KRAKOW UNIVERSITY OF ECONOMICS

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The original version of the magazine is its printed version. The magazine is available in the following databases: CEEOL, CEJSH, BazEkon, BazHum, EBSCO (Business Source Corporate Plus, Ultimate Business Source), ERIH Plus, ICI World of Journals/ICI Journals Master List, ProQuest

ISSN 2956-6061
e-ISSN 2956-6398

The journal is co-financed in the years 2022–2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme "Development of Scientific Journals" (RCN) on the basis of agreement no. RCN/SP/0387/2021/1 concluded on December 15, 2022 and being in force until December 14, 2024.

Information for the Authors: formerly 'Zarządzanie Publiczne/Public Governance' [ISSN 1898-3529; e-ISSN 2658-1116]

http://publicgovernance.pl

Cover Design – *Agata Łankowska*

Publisher
Malopolska School of Public Administration
Krakow University of Economics
ul. Rakowicka 27, 31-510 Kraków
phone: + (48) 122 937 560
www.msap.pl

Publishing Partner
Scholar Scientific Publishing Company
ul. Obożna 1, 00-340 Warsaw
phone: + (48) 22 692 41 18, 22 826 59 21, 22 828 93 91; Sales Department: ext. 108
e-mail: info@scholar.com.pl; www.scholar.com.pl

Typesetting: WN Scholar (*Jerzy Łazarski*)
Printed in Poland
Circulation: 110 copies

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doi: 10.15678/PG.2023.64.2.01

Journal of Public Governance
No. 2(64)/2023
ISSN 2956-6061
e-ISSN 2956-6398

Bartolomeo Rafael Bialas

Political Branding: Subterfuge or the New Mode of Governance?

Abstract

Objective: This paper aims to determine whether scholars writing on the subject of political branding and political brands consider political branding to be an artifice or an evolved strategic outlook useful – and necessary – in our current political context.

Research Design & Methods: This is a theoretical paper. The critical review of the literature on political branding research, encompassing articles published between 2016 and 2023, was conducted; seven full-text publications from the EBSCO database were critically analysed.

Findings: My conclusion suggests that the vast majority of scholars writing on the subject of political branding view political branding as a strategic device – both a framework and communication vehicle – useful and necessary in our contemporary political context.

Implications/Recommendations: This paper makes a managerial contribution to the political branding body of knowledge. The analysis of the writings of numerous scholars within the area of political branding indicates that the development of strong and appealing political brands helps political parties and political leaders in effective communication with voters-consumers. Political branding emerges as a necessary tool that should be used by political strategists to ensure that the relationships between politicians/political parties and voters-consumers are deepened and relevant, and the visions and messages communicated by the political actors are cohesive, clearly articulated, concentrated, and well-understood by the voters-consumers.

Contribution/Value Added: This paper is original in showcasing the dominant and overarching approaches and ideas among scholars writing on the subject of political branding.

Article classification: theoretical/review paper

Keywords: political branding, political brand(s), voters-consumers, political marketing

JEL classification: M00, M3, and M38

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Introduction

There is no doubt that political branding has become an essential element of every political campaign in developed and developing democracies across the world. Following the principles of strategic brand management, it can be inferred that the ultimate objective of political branding is to forge a meaningful connection between a political party/politician and the voters-consumers (Panigyrakis & Altinay, 2017, p. 681). The simple formula for winning in electoral politics is fairly uncomplicated – the political contender requires more votes than his/her rival(s). The overarching challenge, however, revolves around the ability of the political message to cut through the media clutter and connect with voters-consumers. Creating a distinct and evocative brand identity seems to be critical to electoral success in today's crowded political marketplace. Political parties – and politicians – are increasingly using the principles of strategic brand management to create political brands; "brands which are not about consumption but about identity. Churches might have similar resonance, and – at least for men – so do sports teams, especially football teams" (Curry, 2015, p. 48). Successful political branding campaigns can "break through the rancor of election season and affect change" (Smith, 2020).

It is a common fact that today's culture is saturated with information, and the amount of information available to every person continues to grow at an ever-increasing rate. The rise of smartphones has created a new generation of consumers attached to high-speed connection to the Internet and all that comes with it. Voters-consumers are now always online, immersing themselves in social media, streaming videos, playing games, and engaging in voyeuristic intemperances. In such a crowded marketplace, it becomes particularly difficult to stand out from the competition. As Kiram Voleti posits, "As the political landscape continues to evolve, it is more important than ever for politicians to understand how to communicate their message and establish a strong brand identity effectively" (Voleti, 2020).

Politics today has become unusually polarising. As Amanda Bowman asserts, "Nearly every race is filled with candidates from multiple parties, and it's tough for candidates to stand out" (Bowman, 2023). Political branding is currently used by a growing number of political actors, vying for electoral success and subsequent privilege to govern and lead. According to Manuel Adolphsen, "Politicians and political communication professionals have come to frequently rely on insights and personnel from the discipline of brand management to improve their external presentation. Political branding seems to be *en vogue* and is pursued as a deliberate strategy by political actors" (Adolphsen, 2009, p. 1). And Chad Milewicz and Mark Milewicz contend – in their elaborate study on the use of political branding by the American politicians – "Political marketing research indicates that brands and branding are a robust aspect of politics… scholars describe political brands as multifaceted constructs and pointedly debate the true impact of political branding on the political process and on society. Political elites and scholars clearly appreciate the political brand construct's rapidly evolving nature…" (Milewicz & Milewicz, 2014, p. 233).

It appears that political branding, as a process by which political actors attempt to define their identities, policies, and even the state of the nations (Torres-Spelliscy, 2022), is here to stay. But how do scholars view political branding? Do they view it as an artifice? A Machiavellian subterfuge aimed at duping gullible voters-consumers? Or do they view it as a necessity? A force for good? A new mode of governance? This paper addresses this question by presenting a critical analysis of the select literature on political branding research, encompassing articles published between 2016 and 2023; seven full-text publications from the EBSCO database were critically

analysed. I adopted several criteria, which I believe are appropriate and sufficient to identify scholarly peer-reviewed literature and select papers for subsequent analysis. The criteria I decided to adopt are as follows: papers written in English, papers located in the EBSCO digital database, papers published between 2016 and 2023, papers containing the keywords "political branding", "political brand(s)". The research yielded 134 literature items. I decided to include only full-text papers exploring the characteristics of the subject area under investigation, namely political branding. After an initial assessment of 134 papers, 16 papers were selected. Additional assessment resulted in the elimination of 9 papers due to the fact that they were written by the same authors, and the ideas offered in them were repeated. I gauged the relevance of the sample of papers by reading the abstract, titles, and keywords of all the articles. If the abstract confirmed relevance to the review, I reviewed the full-text articles in open access.

Literature review

In their comprehensive analysis of the evolution of the political environment in the developed democracies – "The rise of brandidates? A cultural perspective on political candidate brands in postmodern consumer democracies" – Nadia Kaneva and Austin Klemmer introduced a neologism that elegantly captures the essence of political branding: *brandidate.* According to the scholars, "First, brandidates speak to consumers on consumers' terms by honing their messages through research and delivering them in entertaining and interactive formats. Second, brandidates humanise and personalise politics by drawing on their personal stories to create brand narratives that simulate an authentic, yet idealised, leader. Third, brandidates perform emotional labour to meet the affective needs of voter-consumers and, in this way, they link political choice to voter self-expression" (Kaneva & Klemmer, 2016, pp. 299–300). This comprehensive, and yet concise, description of branded political candidates (brandidate = brand + candidate), clearly implies that every political communication that wades into private life, ethnic identity, and beliefs, values, and convictions is, by default, entering the domain of identity and emotion. Political affiliation, as Jason Brooks observes, "encompasses many of the things people care about most (e.g., family, safety, money, fairness, etc.) and it is that which we care about most that arouses our emotions. So we tend to pay attention – consciously or less so – to where others stand in relation to ourselves on the issues that we care about, naturally forming groups around such affiliations. Such affiliations form a key part of our social identity" (Brooks, 2017). Kaneva and Klemmer (2016) clearly recognise that the cultural significance of branded political candidates is squarely located within the context of the contemporary "consumer democracy". Consumer democracy is a complex concept that requires explanation. According to Margaret Scammell, consumer democracy "suggests that politics are sold like commercial products, and that citizens judge, and are invited to judge, politics as commercial products" (Scammell, 2014, p. 1–12). Kaneva and Klemmer posit that the source of the increasing importance of the principles of strategic brand management in politics can be found in "two interrelated cultural trends in postmodern consumer societies …promotionalisation and mediatisation" (2016, p. 302). Promotionalisation in politics refers to how politics is managed as a business of publicity and sensationalism in the broader social and cultural contexts of a routine promotionalism. Mediatisation, as explained by Kaneva and Klemmer (2016), revolves around the increasingly important role of media technologies, formats, and logics in contemporary life. The authors explain the logic behind the increasing importance of political branding by stating that "it is virtually impossible to separate life from the mechanisms

of promotional and media culture […]. These trends are also manifest in the blending of politics with celebrity culture and the increasing prevalence of media spectacle in political life. Hollywood celebrities take up political causes at the same time that politicians entertain media audiences and flirt with Hollywood glamour" (Kaneva & Klemmer, 2016, p. 302). It is worth noting that the promotionalisation and mediatisation phenomena are inextricably linked with the so-called celebritisation of politics. Grace Gageby captures the essence of this phenomenon in the following words: "The proliferation of social media and its increasingly fleeting, bite-sized forms is often at a detriment to substantial debate. Theodor Adorno coined the theory of the 'culture industry', claiming that as popular culture becomes increasingly trivial and sensationalist, we begin to encounter a pseudo-reality rather than reality itself, as we are constantly bombarded with increasingly homogenous subject matter which infiltrates evert sphere of daily life; political debates are game shows, with conversation reduced to a series of prepared one-liners. […] This celebritisation of politics is two-fold: politicians act like celebrities, and celebrities are expected to act as political polemicists. […] The overlap of celebrity culture and politics also results in campaigns being dominated by personalities, rather than operating in a community-led way" (Gageby, 2020). The celebritisation of politics, society, and culture is a process well-recognised and wildly acknowledged by scholars within the academic milieu. As Olivier Driessens posits, "Celebrity has become a defining characteristic of our mediatized societies. It is ever-present in news and entertainment media – boosted by formats such as reality TV – in advertising and activism, and it has deeply affected several social fields, especially the political, but also the gastronomic and even religious fields, for celebrity has become a valued resource to be used in power struggles. Celebrity status, it is argued, renders one discursive power or a voice unable to be neglected, and it is supposed to function as a general token of success. Such is the proliferation of celebrity culture that several authors have discussed its importance for social cohesion and identity formation; or, as Ellis Cashmore phrases it: Like it or loathe it, celebrity culture is with us: it surrounds us and even invades us. It shapes our thought and conduct, style, and manner. It affects and is affected by not just hardcore fans but entire populations" (Driessens, 2013, p. 3-4). The celebritisation of politics leads political actors to adapt strategies, demeanours, and attitudes similar – or even identical – to those adapted by celebrities. According to Johnathan Bradford Long, "In order to gain votes from citizens who only casually follow politics, candidates want people to identity with their personalities and lifestyles as similar to their own, just as …celebrity culture attempts to do. […] celebrity and politician can combine through a 'personality campaign' where politicians eschew party affiliations in favour of politics of stylish individuality and personalized trust, where speeches, events, and debates are home to 'fun' anecdotes and 'soap opera' drama" (Bradford Long, 2009, p. 5).

Kaneva and Klemmer (2016) conclude their deliberations with an unequivocal statement that: "[W]e view the enmeshment of politics with promotional and media culture as an undeniable facet of postmodern political life". It becomes clear that the authors view the use of political branding in politics as a consequence of the evolving postmodern world order. They view political branding as neither something inherently bad – or manipulative – nor as a force for good. Political branding is viewed by the scholars as simply another stage in the metamorphosis of political communication. In this respect, the authors are in agreement with numerous political science scholars – e.g. Jay Blumer and Dennis Kavanagh – who assert that the evolution of political communication in the 21st century can be characterised by narrowcasting, which refers to "direct communication to key groups or segments within the electorate" (Tasente, 2020, p. 80), and the so-called permanent

campaign, which revolves around the idea that political actors – both politicians and political parties – are always in campaign mode, even when they are not. According to Tănase Tasențe, "This stage of development has been differentiated from the other stages [of political communication] by borrowing more aspects of commercial communication, such as political marketing, strategic management, and in the context, the voter-audience was likened …to a 'political consumer'" (Tasențe, 2020, p. 80).

Another illuminating perspective on the use of political branding is presented by Akhmad Farhan, Nor Asiah Omar, Taslima Jannat, and Muhamad Azrin Nazri. In their enthralling analysis titled "The Impact of Political Brand Relationship Quality and Brand Engagement on Voters' Citizenship Behaviour: Evidence from Indonesia", the scholars are outspoken in their support for the use of political branding in electoral politics. According to the scholars, "Brand management strategies increase political parties' competitive advantage by making their political products distinct, attractive, and appealing. They also provide knowledge about voter's choices, preferences and behaviour to the political parties and help them design their political platforms so that they can achieve the desired results" (Farhan et al, 2020, p. 125). They go on to state that "brand engagement forms a strong and enduring connection between the brand and consumers by activating consumers through interactions, shared values, experiential contents and rewards" (Farhan et al, 2020, p. 125). The authors emphasise the advantageous role political branding tends to play in electoral politics by claiming that "Most political parties realise the importance of their brands in building relationships with voters" (Farham et al., 2020, p. 126). According to the scholars, the principles of strategic brand management considerably contribute to the development of meaningful and emotional rapport between branded political candidate(s) and voters-consumers. They also stress the importance of building a strong brand for a political party, "since the party also needs to express its identity to build voters' awareness and loyalty" (Farham et al., 2020, p. 127). The voters-consumers' relationship with a political party and/or politician seems to be one of the most important objectives in politics. The scholars blatantly state that "In politics, the voters' relationship with a political party is crucial for retaining existing voters and for influencing potential voters" (Farham, et al, 2020, p. 127). They draw a parallel between commercial brands and political brands by indicating that "Since the relationship between customer and brand is similar to voters and political brand…, political brand engagement is a potential mediator in the relationship of political brand relationship quality (satisfaction and trust) and voters' citizenship behaviour. The assumption is based on the premise that the stronger the voters' relationship with the political party is, the greater the participation and contribution of the voters toward the political party will be" (Farham, et al., 2020, p. 129). Their study presents solid evidence that "political brand relationship quality can successfully enhance brand engagement and voters' citizenship behaviour in the context of politics" (Farhan, et al., 2020, p. 135). The scholars conclude their deliberations by stressing the benefits that political actors would accrue from leveraging political branding: "Therefore, it is very important for a political party to have frequent active dialogues and interactions with voters as it will improve the engagement process with them as well as create voters' citizenship behaviour" (Farhan, et al., 2020, p. 135).

An elucidating perspective on the evolution and role of political branding is being offered by Jernej Amon Prodnik. In his revealing paper titled "The Instrumentalisation of Politics and Politicians-As-Commodities", the researcher observes that strategic brand management's introduction into the realm of politics has been precipitated by a plethora of changes that have taken place within the political sphere in developed democracies. Political branding – as the author contends –

has emerged in the political context that could be described as "an excruciatingly fast-paced, media-led political sphere where communication is reduced to soundbites, manipulative marketing, and demagoguery. … political communication is described as increasingly professionalised through public relations and political branding, whilst marketing and polling have become normalised and political candidates are often conceived simply as another commodity. … Successful access to the media and promotion of the 'brand' is becoming as important as ever for parties" (Prodnik, 2016, p. 154). The author admits that the political actors have internalised the vernacular of branding and business, and that the political environment has seen an incredible expansion of this tendency in recent years. Prodnik argues that "The tendency towards instrumentalisation can most plainly be observed in how parties construct their public communication and how they perceive their (potential) voters. They have overwhelmingly internalised and naturalised the commodity logic…" (Prodnik, 2016, p. 154). Prodnik, however, is cautious about a full-blown criticism of political branding. He sees the use of political branding as part of a more complex process taking place in capitalistic societies. He argues that "The processes occurring in political communication can be connected to transformations in wider society, especially the extension of capitalist social relations to domains previously not under its control. The expansion of capitalism as a system is depended on commodification, which reduces everything to an exchange value and productivity. These processes have been so overwhelming in recent decades that even social spheres formally based outside of capitalist social relations are now in many ways mimicking its functioning" (Prodnik, 2016, p. 148).

The scholar concludes his analysis by acknowledging the recent discoveries in neuropsychology, and their implications for the political actors. He recognises that political actors started leveraging the principles of strategic brand management "once they recognised that the citizen did not so much vote for the candidate as make a psychological purchase of him. What was projected was what counted, meaning the professionally constructed image of the politician was what mattered. Form (e.g. image, style, personality, and emotional appeal) consequently began to prevail over substance and political communication became increasingly trivialised and oriented toward entertainment" (Prodnik, 2016, p. 148). Prodnik wraps up his analysis by indicating that the entire political sphere is currently being affected by the sensationalism, whose objective – as Alison Dagnes elegantly summed up – revolves around "Amplifying language, trying to use very big words that are exacerbating. Something that invokes …a whole lot of emotion" (Vanacore, 2021). In this respect, Prodnik follows a stream of research that showcases how the digitalisation of media affects the political processes. As Ashleigh L. Haw explains: "While the line between news and entertainment has been arbitrary for many years, the emergence of digital media has led to complex challenges associated with profit decreases, concerns with credibility and audience disengagement. News organizations are said to respond to such demands by producing stories that take on more sensational or 'tabloid-style' characteristics. It is therefore critical to understand, not only how sensationalism is manifested in political news but how this affects audiences' trust and engagement with coverage" (Haw, 2020, p. 125). Both authors – Prodnik and Haw – point at the rising competitiveness within the political context and the difficulty in reaching and engaging with high potential voters-consumers. As Patricia Durántez-Stolle and Raquel Martínez-Sanz explain: "…the rising competitiveness, the proliferation of diverse broadcast and podcast media and formats, and especially the dissolution of boundaries regarding political media content, turn out to be crucial to boost the presence of politicians in hybrid television programmes – either in the form of magazines, interviews, talk-shows, or late-night shows – whose common basis

in that candidates can make politics a permanent show and monopolise the viewers' attention" (Durántez-Stolle & Martínez-Sanz, 2019. p. 112). It should be noted here that a consensus exists among political science scholars regarding the antecedents of the rising sensationalism in politics and the emergence of so-called politainment. Virginia Martín Jiménez, Pablo Berdón Prieto, and Itziar Reguero Sanz briefly and clearly explain the processes and phenomena that gave rise to sensationalism and politainment: "This happened as a result of the multiplication of television offerings, caused by an increase in the number of channels and the resulting competition between them. Information began to be subjected to direct profitability criteria such as those that already marked the development of entertainment content. With this came the triumph of a new hybrid genre: infotainment – attractive for the audience and, as a consequence, profitable in economic and advertising terms – which brings together two traditionally distant, and even opposed, functionalities of media: information and entertainment. […] Information on today's television, rather that providing a better understanding of a citizen's environment, seeks to entertain, to impact, to seduce the viewer into sitting in front of the screen as long as possible" (Martín Jiménez et al., 2022, p. 120). Politainment – as Natalia Quintas-Froufe, Ana González-Neira, and Erica Conde-Vázquez assert – is a "relatively recent term…[that] brings together two functions associated with the media, as are political information and entertainment" (Quintas-Froufe et al., 2020, p. 86). The ultimate objective of politainment is to present political information as a spectacle and performance aimed at attracting viewers' attention.

Prodnik views political branding as a purely tactical activity used by political actors to effectively communicate with contemporary voters-consumers. He acknowledges the impact of media industries on politics and how they orchestrate the public communication. Prodnik observes, however, that political actors must operate within the confines of media environments, ubiquitous promotional and consumer culture, constantly evolving global context, and hyper-competitive capitalist social relations. The political actors, Prodnik says, "are far from autonomous in how they operate in the political sphere and seem *forced* to adapt to it if they want to survive" (Prodnik, 2016, p. 155).

Amit Kumar and Somesh Dhamija offer an eye-opening examination of the role that strategic brand management plays in the context of Indian politics. Their illuminating paper titled "Indian Political Scenario and Scope of Branding" unequivocally states that "a political leader or party could very well be identified as a brand, as the emotional attachment which the voters develop with the party or leader generally supersedes the functional aspect (read manifesto, poll promises) of the political brands. … consumers find it easier to connect with the emotional aspect of brand than its functional/technical aspect. This is so because it is human tendency to avoid new and complex learning. The functional aspect of a brand keeps on getting updated with time. Consumers find it hard to keep up with the same and might get confused (thereby becoming uninterested). Many of them give up in the process. On the other hand, the emotional 'connect' such as values, trust, relatedness, legacy, stories don't change with time, in fact they become even stronger. Such a concept is very much applicable in the field of politics. … Such political leaders and parties which have developed a rapport with the consumer-citizen (read electorate), find it easier to win their trust thereby registering a thumping victory as against those who are new to the field but promise to deliver on their manifesto" (Kumar & Dhamija, 2017, p. 23). The scholars extol the virtues of political branding by indicating that "[p]olitical branding has been instrumental in terms of defining the course of action in such western democracies as US and UK which are leader-oriented. The role played by it in the overall success has been quite significant.

Take as example the stupendous success of brand Obama in the US presidential election, first in 2008 and then again in 2012. He was able to project his image successfully in the minds on the consumer-citizen (read voters) based on his ability to identify with their aspirations" (Kumar & Dhamija, 2017, p. 24).

The authors focus on the advantages that accrue from leveraging the principles of political branding. They investigate these principles and identify the main ones: "Political branding is all about uniformity and consistency of the message and it should convey the same image of the leader and party at all the levels wherever it is required. Hence, a strong political brand acts as the reinforcing and galvanizing agent which brings all the party workers together. In contrast, a weak political brand would always struggle to earn the loyalty of party cadre at all the levels. What is important here is to understand the aspect that for a brand to succeed, it needs to be relatable, approachable, within one's reach, open to access round-the-clock" (Kumar & Dhamija, 2017, p. 25).

The researchers do not attempt to conceal their admiration for political branding. They view it as a positive force in the political context. Political branding is viewed by them as an important strategic philosophy whose contribution to the field of politics cannot be overemphasised. The authors believe that in order for the politicians, and political parties, to succeed, they ought to invest in developing strong brands. They argue that a political brand "needs to be simple, relatable, and down-to-earth. Any political brand with whom the consumer-citizen (read voter) could relate well is bound to do well (having a solid manifesto strengthens its chances further). The trust which results in the process is something which is difficult for the rival brands to emulate" (Kumar & Dhamija, 2017, p. 26).

Another interesting, compelling, and convincing argument for leveraging political branding is made by Lorann Downer. Her paper, titled "It's the Equity Stupid! Protecting the Value of the Partisan Brand", can be considered an outright praise for political branding. Downer argues that "one key to longevity for a contemporary democratic party is attention to partisan brand equity. Brand equity is the voter perception of the value of a political offering. Equity for any brand is built by what consumers "have learnt, felt, seen and heard about the brand as a result of their experiences over time" (Downer, 2016. p. 22). Political brand equity can accrue to a party, its leaders, and policies. Downer is a proponent of the conceptualisation of customer-based brand equity put forth by Kevin Keller: "The power of a brand lies in what resides in the minds of customers. Consumer knowledge of a brand is what creates brand equity or value" (Downer, 2016, p. 23). Similarly to Kumar and Dhamija, Downer zeroes in on the accepted elements of political branding. She acknowledges that by leveraging political branding, political actors can ensure "consistency in messaging and efficiency in launching a new campaign" (Downer, 2016, p. 24). She recognises the importance of political branding and states that "When a party brand strategy fails, however, it may harm candidates or the whole party" (Downer, 2016, p. 24). Downer argues that political branding has transformed politics into a new form of interacting with voters-consumers. She contends that "branding is the new form of political marketing and, further, the new form of the permanent campaign that is a feature of contemporary politics" (Downer, 2016, p. 25). The author proposes the concept of brand-oriented political party. "Such as party undertakes branding deliberately, with an understanding of political branding theory, and a comprehensive approach that encompasses long-term strategy and mid- to short-term tactics designed to build and retain equity. The party uses branding as its organising principle, orienting core values, organisation, leadership, internal culture, external presentation and resources towards a permanent branding campaign throughout the electoral cycle. In doing so, the party actively seeks to create and sustain voter attachment

and support, instead of expecting to be gifted an enduring loyalty. From this, it seeks to create a competitive advantage and achieve electoral success, however that is perceived" (Downer, 2026, p. 25). Of particular significance is Downer's explicit indication that the brand-oriented party's objective is to generate genuine voter attachment and support. Downer's argument is a valid one, since political branding is viewed as a positive force that allows political actors to elicit voters' involvement, attachment, and participation. For Downer, political branding enables political actors to manage political communications. Political branding acts as an organising framework through which the entire scope of brand touchpoints is being filtered and analysed. Political branding helps politicians cultivate their "authenticity, a critical quality that a branded individual 'can reinforce and support through their public performance'" (Downer, 2016, p. 34).

Downer's examination of the logic and role of political branding is a deep dive into the nuts and bolts of contemporary electoral politics. The author recognises the benefits of using the principles of political branding in the current context of highly polarising politics. She praises political branding and asserts that "[t]his concept provides the means to understand, locate, and manage an intangible value that is critical for brand longevity. Embracing the concept requires an ongoing investment of time and resources. It takes time and recourses to craft a brand and to generate and maintain brand equity. Embracing the concept also requires a long-term view of marketing decisions. Each decision should be evaluated for its potential over time to add to or detract from value, as perceived by voters. Further, embracing the concept requires close cooperation between the brand managers – the party in central office and public office – to effectively research and respond to voters' needs and wants" (Downer, 2016, p. 36).

A look at political branding from a slightly different perspective is offered by Andrea Schneiker in her highly comprehensive – and entertaining – paper titled: "Telling the Story of the Superhero and the Anti-Politician as President: Donald Trump's Branding on Twitter". The scholar opens up her study by stating that Donald Trump – the politician – should be regarded "as a political product that is marketed through political branding" (Schneiker, 2019, p. 210). The scholar goes on to describe Donald Trump's political brand as the "superhero anti-politician celebrity" (Schneiker, 2019, p. 211). The author quickly explains that political branding strategies sprung out of the "'mediatised' and 'anti-political' age" (Schneiker, 2019, p. 211). She points out that strategic brand management principles are increasingly being integrated into political science. The scholar indicates that "branding relates both to discourses and to practices. In the context of business, brands can be understood in relation to the perceptions that consumers have of a product and as being related to the product and its producer's 'reputation, identity and image'. In this sense, brands 'function as consumer behaviour heuristics, shortcuts that enable consumers to make faster, simpler choices, their ultimate purpose being to lead consumers to 'identify with a company and encourag[e] them to buy its products and services'" (Schneiker, 2019, p. 212). Schneiker indicates that following the principles of strategic brand management can lead to the development of a distinctive and coherent political brand. Of particular importance in her analysis is the emphasis on political branding's ability to elicit emotional reactions in voters-consumers. By analysing Donald Trumps' political brand, the author refers to other popular – and well-devised – brands, such as Superman, Spiderman, and James Bond. She implies that Donald Trump's political brand is predicated on the 'superhero' archetype brand that plays an important role in the American culture. Schneiker contends that "Just like Superman, Spiderman or James Bond, the superhero that is marketed by Donald Trump is an ordinary citizen that, in case of an emergency, uses his superpowers to save others, that is, his country. She sees a problem, knows

what has to be done in order to solve it, has the ability to fix the situation and does so. According to the branding strategy of Donald Trump…a superhero is needed to solve the problems of ordinary Americans and the nation as such, because politicians are no able to do so. Hence, the superhero per definition is an anti-politician. Due to his celebrity status and his identity as entertainer, Donald Trump can thereby be considered to be allowed to take extraordinary measures and even to break rules" (Schneiker, 2019, p. 218). The political brand of Donald Trump, as the scholar argues, is entirely predicated on a well-developed, articulated, and sound brand strategy.

Schneiker concludes her deliberations by clearly declaring that "The branding of Donald Trump as superhero anti-politician celebrity reflects an understanding of political decision-making as an authoritative setting of 'the truth' by one competent individual instead of a deliberative process based on a pluralism of ideas and interests" (Schneiker, 2019, p. 220). For the author, political branding is a value-neutral strategic instrument aimed at establishing coherent, well-articulated and effectively communicated, and distinctive image that resonates with voters-consumers. The scholar refrains from any hints of criticism of the use of political branding by political actors.

Christopher Pich, Dianne Dean, and Khanyapuss Punjaisri offer a riveting account of the use of political branding strategies by political actors during the 2010 UK General Election campaign. The authors begin their study – "Political Brand Identity: An Examination of the complexities of Conservative Brand and Internal Market Engagement During the 2010 UK General Election Campaign" – by declaring the importance of political branding in electoral politics: "In politics, the consistency of the political party's product offering is crucial to electoral success, and this was exemplified in the 'New Labour' brand and its 'on message' approach to political communication in 1997. Brands are powerful, heuristic devices that encapsulate key values of the product or service…" (Pich et al., 2016, p. 100). The authors expend David Aaker's definition of a brand, and – following Knox's assertions – argue that "a brand is not only distinctive through its name or logo but it provides 'added value based on factors over and above its functional performance'. A brand is a communication device which represents the values, nature and personality of an organisation, product, service or political party" (Pich et al., 2016, p. 101). The scholars recognise that political branding is a communication vehicle that can be used by political actors to forge meaningful relationships with voters-consumers. By dissecting the political branding into its elemental processes and components, the scholars acknowledge the complex nature of it: "Paradoxically, although brands are complex entities, they need to be distilled into a simple, value-based message that must be consistent both internally and externally and integrated in a coherent marketing strategy, hence, a strong brand has a clear identity that resonates with the consumer, stakeholders and the internal market" (Pich et al., 2016, p. 101). Of particular significance in this study is the fact that the authors emphasise the linkage between a brand and competitive advantage: "The competitive nature of today's business environment has rendered tangible, functional benefits of a brand unable to sustain competitive advantage and although a brand is a cluster of functional and emotional benefits, the functional benefits can easily be copied. The skills and knowledge that people possess have been considered as valuable to an organisation. They represent the organisation's operant resources that induce emotional benefits that provide the element of uniqueness and differentiation that a successful brand strives for. Indeed, because employees have direct contact with customers and other external stakeholders, they are the embodiment of the brand in the public's eyes. Therefore, it is necessary that organisations provide their employees with an opportunity to understand their brand to enable them to deliver the brand promise. It is through their demonstration of positive brand-supporting behaviours that the brand can consistently transmit images to stakeholders

which differentiate the organisation in the marketplace. This is crucial in a political marketing context particularly as the internal market members of a political party present the party message to the local community" (Pich et al., 2016, p. 102). The scholars stress the necessity for political actors to embrace – and clearly communicate – a set of values, beliefs, a vision, and a strategy – both internally and externally. Political branding is viewed by the scholars as a framework for devising effective political strategies. The authors assert that "[t]his is where the notion of branding is helpful to political parties as it can provide a framework for presenting their values, vision and strategy for achieving that vision; it short, it can be a very efficient heuristic device" (Pich et al., 2016, p. 104). Political branding's role does not stop at the framework stage though. Pich, Dean, and Punjaisri are of the opinion that "branding can not only be applied to political parties, but it can also be applied to political candidates and leaders which 'build[s] a sense of reassurance and foster[s] identification'" (Pich et al., 2016, p. 104).

The authors give prominence to the benefits that political actors can accrue by leveraging the strategies rooted in political branding. Political branding emerges as an overarching strategic philosophy that should be internalised by political actors to devise, articulate, and communicate a clear message that would resonate with voters-consumers, but also with the internal audience within the party. They criticise those political actors whose inability to leverage political branding renders their electoral efforts ineffective and cause failure: "An ineffective implementation of internal branding inside the party is reflected by the lack of shared vision and resistance to change of some internal audiences. Indeed, the call for a clear message of what the brand stands for further highlights the significant role of internal branding to clearly communicate with the internal market about its brand identity. Without a shared understanding of brand identity, it is unlikely that external audiences receive a coherent brand message at all brand touch points" (Pich et al., 2016, p. 112).

Discussion

By examining the sources – the seven selected papers – it has been possible to take a deep dive into how scholars view the use of political branding by political actors within the political context. Alex Marland, in his riveting paper presented at the 2013 annual meeting of the Canadian Communication Association and the Canadian Political Science Association, elegantly and succinctly summed up the importance of political branding: "Political propaganda and image management have always been present in democracies. George Washington was not defiantly standing in the boat that was crossing the Delaware; Abraham Lincoln's portrait was doctored to elongate his neck; and a polio-stricken Franklin D. Roosevelt avoided being photographed in a wheelchair. So it should come as no surprise that today's political leaders seek to control how they are publicly viewed, whether this is Barack Obama choosing to smoke cigarettes in private… or Stephen Harper cuddling kittens. Projecting a desired public image requires information control. At a minimum, politicians must guard against 'gotcha' politics where a single blunder can damage their career. In his seminal study of public performances, Erving Goffman referred to this as "unmeant gestures" and "faux pas" that are observed during "inopportune intrusions" which lead to a "performance disruption". The need to guard against performance disruption has increased with the growing possibility of inopportune intrusions" (Marland, 2013, p. 2).

Political branding is viewed by scholars as a framework useful for synthesising and communicating core visions, messages, and policies. Moreover, a political brand – according to

numerous scholars – "has increasingly become the main vehicle for cultural expression, superseding, for many, social institutions such as religion, the arts, and education (Smith & Speed, 2011, p. 1309). Political brands are viewed by scholars as cultural signals that have a profound impact upon voting behaviour (Smith & Speed, 2011). A traditional political communication strategy would emphasise the ideological differences between political actors. Instead, political branding strategy emphasises "the 'softer' cultural, social, and psychological functions of the brand as the main sources of brand differentiation and motivation for voters. These functions operate at an emotional level and reflect practitioner and academic evidence that voters are increasingly using emotional intelligence to guide voting decisions" (Smith & French, 2009, p. 218). It has been suggested that commercial brands – and increasingly political brands, such as Barack Obama, Donald Trump, Bernie Sanders, Pete Buttigieg – are imagined "as an almost universal articulation of the infinite particularity of consumer desire, which interpellates consumers in terms of 'cool', 'aspirational' lifestyles" (Manning, 2010, p. 44).

Conclusion

Political branding is neither good nor bad. It is a compelling – and natural – response to the gradual transformation of capitalism and the emergence of consumer culture whose key points revolve around needs, choices, identities, social status, culture, and cultural artefacts. Consumer culture is part of the air people breathe and provides new ways of developing social and political identities due to the fact that it is actively reshaping issues related to uniqueness, inequality, social status, and cultural identity. Voters-consumers evaluate issues through the lens of their association with a specific group. There is virtually an infinite number of different groups with which voters-consumers can identity, ranging from those predicated on ascriptive attributes to those predicated on individual decisions, choices, and circumstances that emerge throughout a person's life, such as group membership, political party, socioeconomic status, geographic location, or religious affiliation. Debbie Millman argues that "branding has become …about belonging to a tribe, to a religion, to a family. Our ability to brand our beliefs gives us that sense of belonging" (Torres-Spelliscy, 2019, p. 87).

As political brands foster identity, voters-consumers often respond in specific ways. They voluntarily and willingly become brand propagators actively proselytising brand's vision and messages. Political branding – like its ideological parents, namely capitalism and consumer culture – is here to stay.

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Funding
This research received no external funding.
Research Ethics Committee
Not applicable.
Conflicts of Interest
The author/autors declare no conflict of interest.

Published by Malopolska School of Public Administration – Krakow University of Economics, Krakow, Poland.
Data Availability Statement
All data will be available and shared upon request.

doi: 10.15678/PG.2023.64.2.02

Journal of Public Governance
No. 2(64)/2023
ISSN 2956-6061
e-ISSN 2956-6398

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Innovative Public Procurement Failure: A Case Analysis from Poland

Abstract

Objectives: The rising popularity of Innovation Public Procurement (IPP) raises questions about its effectiveness as a tool for transformative policies, including governance levels, coordination, and strategic development. The purpose of the article is to explore the failure of governance in a Polish IPP to present how IPP guidelines are implemented empirically.

Research Design & Methods: The research article presents conclusions from the case study of first large-scale trial of public procurement procedure with respect to an innovative partnership in Poland.

Findings: The case is a rarely analysed example of policy failure and shows that ignoring stakeholders' needs, timeline constrains, and market capacity can result in policy failure. Programme history highlights that proper risk analysis and adaptation to the market context can prevent programme failure.

Implications/Recommendations: The article opens up a field for considering what steps are crucial in formulating IPP, especially in country with lower level of innovativeness. The analysis leads to the main conclusion that transformative policy frameworks using demand-pull tools need to be embedded in the market realities and capabilities of national innovation systems.

Contribution/Value Added: The article strives to fill a gap in the literature on implementing transformational innovation policies in peripheral countries, which are less frequently described. The other contributions refer to merging the DARPA's approach and IPP.

Article classification: research article

Keywords: innovation policy, innovation public procurement, policy failure

JEL classification: O380

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Introduction

Innovation policy plays a pivotal role in shaping the relationship between research and development (R&D) and industrial policies, aiming to foster the journey of ideas from inception to market implementation. There are numerous factors that encourage or discourage innovations, so innovation policy involves selecting the right combination of variables that contribute to the development of the innovation process, particularly those that are significant for society and the state (Edler & Fagerberg, 2017). In the new paradigm of innovation policy, which addresses broad societal challenges, policymakers are given a large responsibility for setting or shaping the direction of socio-technical transitions (Bergek et al., 2023). The so-called demand-pull instruments stimulate such a process by creating a market, e.g. using innovative public procurement (IPP), subsidies for consumer purchases of new technologies, or stronger intellectual property protection to increase appropriability (Edquist, 2014; Leibowcz, 2016).

Articulating a demand through public procurement increases the chances of an innovation being accepted and adopted, shaping and legitimising the innovation process (Frenken, 2017; Grillitsch et al., 2019). The IPP could be carried out in a two-stage process, starting with a precommercial procurement where a Research and Development (R&D) service contract is awarded, and followed by a procurement procedure of the already developed innovative solution (construction, services, goods) on a commercial market (Andrecka, 2017). Among them, special attention is currently paid in Europe to Pre-commercial Procurement (PCP; which only includes an R&D phase to prototype), Public Procurement of Innovative Solutions (PPI; includes a purchase of innovative solutions which are not yet available on a large-scale commercial basis), and Innovation Partnerships (IP; which combine an R&D phase with buying results) (Iossa et al., 2022).

The purpose of the article is to explore the failure of programme's governance in a Polish IPP to present how IPP guidelines are implemented empirically. The research problem considers the first application of an IP in the first large-scale initiative in Poland, with the demonstration of the flaws resulting in the failure of the conducted procedure. It should be noted that failure is often embedded in taking risks in such innovative ventures, which is part of the learning process. The selected example is analysed mainly at the level of public governance. The article strives to fill a gap in the literature on implementing transformational innovation policies in peripheral countries, which are less frequently described.

This paper is composed of three parts. The first part analyses the state-of-the-art on innovative procurement and its usage in innovation policy. The second part includes the context and the story behind the case. The third part, in turn, presents an in-depth analysis of the case as well as conclusions, and discusses the potential future dilemmas.

Innovative public procurement as a policy tool

The European Commission decided to stimulate a critical mass of demand for greener goods and services, which otherwise would be difficult to get onto the market, by setting a non-binding target of 50% of public tendering to be compliant with its sustainability requirements by 2010. The rationale behind it was to favour improvements in the environmental, energy, and social performance of products and services (Russ et al., 2009). It means that we can place the innovation procurement among tools for transformative innovation policy, which focuses policy efforts on issues around system change and structural transformations (Schot et al., 2017).

According to 2018 data, IPP investments were concentrated in a few domains of public sector activity: general public services (35%), health care (21%), public transport (10%) and public order, safety, and security (8%). Evidence demonstrates higher levels of IPP expenditure in public sector activity domains where a higher level of competition with the private market exists (e.g. transport and health), under a higher pressure to innovate (security) or where there are clear political ambitions to innovate (e.g. investments in transport focused mainly on 'greening' mobility services) (EC 2021).

Public administration plays a central role in creating an enabling environment for innovation-driven public procurement. By defining needs, shaping the market, engaging stakeholders, and undertaking institutional work, it fosters innovation, drives technological advancement, and contributes to addressing societal challenges and regional development. Successful public procurement-driven innovation requires clear contract specifications that address a consistent set of needs, prioritising quality over price in tenders, providing an assured market for early products with uncertain commercial possibilities, and fostering information-sharing and competition among contractors to stimulate technology diffusion (Geroski, 1990). IPP can effectively address narrower societal challenges if certain factors are considered, such as the type of IPP, market intelligence collection, stakeholder engagement, specifying functional requirements, operational expertise, and balancing competition and cooperation with suppliers (Edquist & Zabala-Iturriagagoitia, 2012). However, regulatory issues may hinder IPP implementation (Wesseling & Edquist, 2018).

Additionally, Uyarra et al. (2019) explore the complexities and institutional work involved in the implementation of IPP across four dimensions: political, regulatory, organisational, and cultural. This institutional work refers to actions taken by actors to create, maintain, or disrupt institutional structures (Lawrence & Suddaby, 2006; Lawrence et al., 2009). Political work involves securing sufficient support for the policy, delineating clear roles and responsibilities, and mobilising resources to address costs and risks. Regulatory work focuses on defining rules and procedures and adapting the existing practices to facilitate adoption. Organisational changes are necessary to support the management, monitoring, and evaluation of the practice, as well as to create intermediation structures to facilitate links across the public sector (Edler & Yeow, 2016). Lastly, cultural changes aim to improve the technical skills and training of procurers and create a critical mass of professionals to institutionalise the practice.

Zabala-Iturriagagoitia's (2022) case study on a Spanish health care agency using IPP to support regional intelligent specialisation (RIS3) in Galicia highlights the importance of public sector capabilities in advancing regional economic development. In peripheral regions, characterised by institutional thinness and the lack of technological capabilities and critical mass, the public sector's role in driving innovation is particularly crucial due to the less dynamic and innovative private sector. The study provides a framework of public sector capabilities required for successful IPP implementation, including knowledge of local players and companies, effective communication of public needs, linking actors to technologies, identifying necessary specifications, designing tenders, and coordination with other policy levels. It emphasises the need for openness and willingness to experiment to effectively implement IPP in such regions.

These papers collectively highlight the significance of clear contract specifications, quality-focused tenders, and stakeholder engagement in public procurement-driven innovation. They also emphasise the importance of institutional work, regulatory considerations, and capacity-building in successfully implementing IPP to address societal challenges and promote regional economic development.

Table 1. The literature review about the IPP's effective implementation

Paper	Main Focus	Key Findings
Geroski (1990)	Successful conditions for IPP implementation	– clear and consistent needs specified in the contract; – emphasis on quality over price in tenders; – assured market for early products with uncertain commercial potential; – forced information sharing and entry of new competitors to stimulate technology diffusion.
Uyarra et al. (2019)	The complexity of IPP implementation and institutional work	Institutional work associated with IPP implementation in four dimensions: – political support and resource mobilisation; – regulatory work needed to define rules and adapt existing practices; – organisational changes to support management, monitoring, and evaluation; – cultural change to improve technical skills and training of procurers and create critical mass of professionals.
Edquist and Zabala-Iturriagagoitia (2012)	IPP for addressing societal challenges	Success factors include type of IPP, market intelligence collection, stakeholder engagement, specifying functional requirements, operational expertise, and balancing competition and cooperation with suppliers.
Zabala-Iturriagagoitia (2022)	IPP for regional economic development	Public sector's capabilities for IPP includes knowledge of local players, effective communication of public needs, linking actors to technologies, specifying necessary requirements, designing tenders, and coordination with other policy levels.

Source: Own elaboration based on Geroski (1990), Uyarra et al. (2019), Edquist & Zabala-Iturriagagoitia (2012)x, Zabala-Iturriagagoitia (2022).

Research methodology

The study applies the qualitative case studies approach to the first large-scale IPP initiative in Poland, where there was a clear link between national strategy and execution level.

The National Centre for Research and Development (NCRD, Polish: NCBR), the governmental executive agency for funding R&D and innovations, has implemented the electromobility research programme "Zero-Emission Public Transport" (ZEPT) by the public procurement procedure of innovative partnership as the first public institution in Poland.

The reason for conducting this case study was exploratory, in particular, because of the need for a deeper understanding of challenge-based innovation policy's complexity in a market context (Eisenhardt, 1989; Yin, 2003). The case study approach also allows the researcher to gather information from a wide range of sources such as documents, interviews, and observations (Bryman & Bell, 2003; Flyvbjerg, 2006). This study relies most on desk research analysis and interviews with NCRD managers. The information gathered on these occasions was documented on an ongoing basis as memory notes. These notes were gradually processed in subsequent contacts with managers, but also elaborated and verified by published articles, interviews, and comments on the NCRD's procurement.

The case study of IPP

In 2016, the IP was entered into the Polish Public Procurement Law (2016) as a mode employed when desired products or services are unavailable in the market. In practice, innovative public procurement has rarely been used in Poland, with only 0,01% of contracts awarded under this mode in 2017 and 2018 (Przetargowa, 2021).

The IP mode has specific stages according to the Polish Public Procurement Law (2016). During the first planning stage, market research is conducted to confirm the absence of the required item in local and international markets. The subsequent analysis explores the potential creation of the product or service through innovative partnerships, with the final stage involving estimating the order's value within this framework.

Article 189(2) defines innovative partnerships as a method allowing all interested bidders to participate. However, the broader verification scope for innovative partnerships, assessing contractors' capabilities in research and development, financial stability, and technical proficiency can pose limitations. The contracting authority invites qualified bidders for negotiations, specifying essential project elements, and bids are later invited for research and development work. This method streamlines the procurement process into a single contract covering both research and development and implementation phases. Consortiums can deliver products or services, allowing specialisation in different project stages. The innovative partnership mode allows for the presence of multiple partners to stimulate competition. However, a given contractor may have concerns in a larger group about securing their interests in the long term, as the contracting authority may choose multiple offers (Czaja, 2022).

The unique aspect of this procedure is the immediate purchase of the developed innovation from the supplier without the need for another tender. R&D financing allows for the clients' strong influence over the final product's appearance and technical parameters. Additionally, the IP procedure provides flexibility in procurement aspects through specific contract agreements, such as intellectual property rights. According to Article 206(2), the contracting authority ensures that the partnership structure reflects the innovation level and necessary timelines and actions for the innovation solution (Dziadecki & Miętek, 2018).

The DARPA's approach

The analysed case of innovation procurement was also a way to test a new innovation financing approach in Poland using the Defense Advanced Research Projects Agency (DARPA) model in the European reality. Governmental support to innovative activities through public procurement (PP) is seen as a fundamental driver for implementing crucial technologies, as it happened in the case of general-purpose technologies, which were driven by defence-related procurement in the USA (Ruttan, 2006). The DARPA was formed in 1958 as a research and development (R&D) agency within the US Department of Defense. It uses an ambitious innovation organisation model, operating as public sector intermediaries between science and industry to pursue mission-oriented, high-risk/high-reward, breakthrough research. Mazzucato (2018) proposed using the DARPA model to boost mission-oriented innovation policies in Europe. According to this idea, the state has an active role in creating innovations, instead of the traditional economist "fixing market" approach. The state has often actively co-shaped markets, and taken high risks, before the private sector was willing or able.

The ZEPT financing model was based on solutions developed by the DARPA. It assumed that the scientific and business community proposed an innovative solution to the problem reported by the public sector contracting authority (NIK, 2019). The NCRD had to cooperate with many potential contractors, because it applied the so-called funnel method, which eliminates competing contractors along with implementing individual stages of public procurement. As part of the IP, the contracting authority sets goals to be achieved after each stage or milestones. If suppliers' deliverables after each stage do not meet the requirements, they are eliminated from the programme. In the final phase, i.e. implementation, only one contractor should be "the winner". This procedure was to ensure a higher product innovation quality at an unchanged proposed purchase price. The advantage of this solution is that several entities, commissioned by the NCRD, work on a given solution simultaneously. These entities then create a portfolio of projects that compete in achieving the assumed goal and mitigate the risk of failure of the entire venture if something goes wrong.

The strategic context

In 2010, the European Commission emphasised "Resource-efficient Europe" as a priority in the "Europe 2020" strategy, focusing on a low-carbon economy and improved transportation. Member States were encouraged to use public procurement and market-based instruments to drive sustainable changes. In 2011, the Commission adopted the "Roadmap to a Single European Transport Area," with a focus on clean urban transport and better commuting options. Poland understood how the future transport has to change and since 2016, the Polish government has been working on a national "Responsible Development Strategy". Within this strategy, one of the flagship projects is the "E-bus" with goals of stimulating the design and production of Polish electric vehicles for the needs of public transport. Its goal is also to build strong entities at all stages of the value chain in the production sector of public transport rolling stock: electric buses and trams. It was a basis for launching the ZEPT.

Polish cities with a population of over 50,000 will require entities providing public transport services to have a 30% share of zero-emission buses in their fleet. The Polish government aimed to explore new methods of managing research and development programmes while preparing the market for this rule. The NCRD Director decided that the outcome of the ZEPT programme would be the production of these buses after discussions with the Minister of Development and the Minister of Science and Higher Education (NIK, 2019). The overall goal of the ZEPT programme was to develop and deliver around 1,000 innovative, emission-free public transport buses to local government units by 2023. It was decided that a bus prototype would be created as a research product, which would provide a competitive advantage on the market for entities interested in participating in the programme.

The planning stage

The IP model required the NCRD to seek programme co-contractors. The call for public partners for the IPP was issued on December 5th, 2016, resulting in 21 cities, the Upper Silesian Industrial District, and three other entities expressing their initial interest in the project. For efficient ZEPT programme management, a specialised e-platform facilitates communication with cities. A crucial platform component was a survey with 169 questions filled out by city representatives, identifying primary needs in modern, emission-free public transport. Initially, cities indicated

the potential purchase of around 430 modern buses. However, the survey did not yield highly innovative solutions for the required R&D phase of the IPP.

In that situation, the NCRD conducted a state-of-the-art diagnosis to find novelty requirements and two innovative features of the final product were defined: (i) the use of interchangeable components (modules) ensuring mutual substitutability of various types of energy storage; and (ii) the ability of the vehicle, at least in the depot area, to drive autonomously at the SAE level 3[1]. As the programme's rules, most intellectual property rights should stay with the NCRD, as this agency, as a co-contracting authority, finances the ZEPT programme in the R&D field.

In the period from June to July 2017, the agreement on the joint implementation of ZEPT was signed by the authorities of 23 cities and the Communications Communal Union of the Upper Silesian Industrial District. The cities declared an intention to purchase six buses in total and 201 buses in the event of obtaining a non-returnable subsidy for the purchase of vehicles in the intensity of at least 60%. They also obtained the right to use the option to purchase 871 buses. The programme implementation period was set at 60 months, until the end of 2023. The total value of the contract comprised:

1. The research part, during which research projects were carried out to develop prototypes of vehicles. For this part, the budget was estimated at 20 million EUR, for which the NCRD obtained funds from the EU budget.
2. The implementation part, during which vehicles should have been purchased. The budget was estimated at over 0.5 billion EUR, such was a response to the demand of the signatory cities for innovative vehicles. The National Fund for Environmental Protection and Water Management had to participate in the co-financing of this stage.

The tender stage

In August 2018, the NCRD published the specification of the electric bus to be built under the tender. Even before the end of 2018, news had begun to circulate that the largest players on the bus market may not be interested in participating in the competition, because it was unacceptable for them that intellectual property rights to the results would be owned by the NCRD, not by them, and in future they would have limited capacity to produce the created solutions.

In November 2018, when the bids were opened, it turned out that no major bus manufacturer has joined the procedure. Bids were submitted only from three consortia: one headed by Polish technology university, one small company, and one larger with financial problems. Additionally, all

[1] The provisions of the Public Procurement Act defining an innovative product required the final product to be innovative. The required innovation of the final product was specified, i.e. the bus should have two necessary innovations:
– the use of interchangeable components (modules) in the field of vehicle power sources that ensure the interchangeability of various types of energy storage: traction batteries and hydrogen fuel cells with a hydrogen reservoir;
– the ability of the vehicle, at least in the depot area, to drive autonomously, i.e. conditional driving automation at SAE level 3 according to the classification of document J3016 Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles of SAE International. Level 3 vehicles have "environmental detection" capabilities and can make informed decisions for themselves, such as accelerating past a slow-moving vehicle. But – they still require human override. The driver must remain alert and ready to take control if the system is unable to execute the task (source: https://www.sae.org/standards/content/j3016_202104, accessed: 4/14/2022).

three have exceeded the budget. However, in the end, the NCRD granted money for the research and development phase to all three entities. Nevertheless, at the beginning of 2019, upon inspection from the Public Procurement Office, the bids of the smaller company and the university were rejected. Only one player remained in the game, but at that time, the company had already fallen into deep financial problems and started the restructuring process.

In June 2019, the NCRD decided to cancel the entire procedure. However, the NCRD announced that the funds would not be lost and that a technical dialogue will begin to allow to re-approach the implementation of the idea to build a Polish electric bus. Thus, in July 2019, the NCRD announced the second procedure of innovative partnership for the supply of new electric buses for Polish cities.

The IP implemented using the EU cohesion funds imposed strict time and financial limits for performing the task. These limits, however, did not correspond to the technology development cycle, which additionally requires ensuring high security standards. As a result, the contractors expected the R&D phase to be extended to a minimum of 24–30 months, which was not considered by the NCRD when drawing up the schedule for the second procedure. In this procedure, the R&D phase was shortened from 30 to 21 months. This reduced the attractiveness of the contract to potential contractors, as it transferred the risk of delayed implementation of the R&D phase to them.

The basic rules have not changed in comparison with the failure of the first competition, but the NCRD added over 90 million EUR to the budget pool. Some suppliers wanted to participate in the new procedure, but it was not possible to complete it either. In April 2020, the second procedure remained invalidated, which was a premise to close the programme, as ZEPT was financed from EU funds, so it was a formal constraint to complete it until the end of 2023. In the context of the order's scale and the time necessary for implementation stages, there was no possibility to reach the programme's goals, and as a result, the ZEPT programme was officially closed.

Lessons learnt

After this story, the agency abandoned IP in favour of the pre-commercial procurement (PCP) mode. The PCP mode differs from IP in that the contracting authority specifies the framework requirements of the innovation to create a demonstrator, but the tender is not immediately connected to the purchase of the produced solutions. Intellectual property rights are shared between the contracting authority and the contractor. The PCP model reduces the risks associated with the implementation to the contractor, but does not immediately create a purchasing market.

Results

The situation being discussed is a rarely studied instance of policy not achieving its intended outcomes. As noted by McConnell (2015), "failure" is seen at the far end of a spectrum between success and failure, characterised by a complete lack of accomplishment. The goal of the ZEPT programme, which was the development and delivery of about 1,000 innovative, emission-free public transport buses to local government units by 2023, was burdened with a high risk of implementation failure. When there is a disconnect between policy goals and the methods put in place, it is referred to as "implementation failure" (Uyarra et al., 2016).

Hudson et al. (2019) identified four main contributors to policy failure: unrealistically high expectations, implementation across various governing bodies, insufficient collaborative policymaking, and the influence of political cycles. It appears that three out of these four factors are present in the case under scrutiny.

Overoptimism

First, all aspects of overoptimism (i.e. unrealistically high expectations) can be seen, e.g. in the area of complexity (underestimating the delivery challenges); in evidence base (insufficient amount of objective, accurate and timely information on costs, timescales, benefits, and risks); misunderstanding the stakeholders (optimism about the ability to align different views); behaviour and incentives (interested parties boosting their own prospects); and challenge and accountability (decision-makers seeking short-term recognition) (Hudson et al., 2019). It appears that these mistakes were made in terms of gathering knowledge of local players, companies, their cultural aspects, and, therefore, their potential to address the particularities of the future (public and private) demand. It eliminated both small entities and key producers from the conducted public procurement, because it required to book productions lines for all period of choosing the best bid.

In addition, the NCRD failed to recognise that companies with the potential to execute the contract quickly have different interests than political decision-makers. When selecting a complex end product in the ZEPT programme (an electric bus) and implementing a programme dedicated to charging infrastructure, the NCRD did not carry out prior reliable analyses verifying the adopted assumptions (regarding, among others: a new formula for running programmes, determining the needs of potential recipients, innovative nature of the applied solutions, risk of multiple stakeholders, expectations and capacity of the producers' market). During the implementation stage of the programme, in turn, an evaluation approach was not used regarding the beneficiary level and external context. Self-learning processes were limited, as the programme did not implement the monitoring and evaluation framework. The lack of due diligence in making key decisions about the shape of the ZEPT programme, in turn, resulted in creating of a very complex and multi-threaded programme, burdened with a significant risk of not being implemented within the assumed time and financial framework. According to Dolfsma and Seo (2013), technologies either develop discretely, independent of what specific knowledge has been developed in the past, or they develop cumulatively, and governments should keep these characteristics in mind when designing policies to support innovation. The issue of the pace of innovation development seems to have been ignored in the case of the public procurement under review (Dolfsma & Seo, 2013).

Inadequate collaborative policymaking

The next factor contributed to policy failure in this case was inadequate collaborative policymaking, i.e. the needs of the participating cities were not sought or heard, which translated into a failure to create a market for the sale of innovations. Ansell et al. (2017) emphasised the need for policies to be designed in a way that "connects actors vertically and horizontally in a process of collaboration and joint deliberation." It seems that the relationship between the NCRD and the cities was not exactly a partnership due to the asymmetries of the negotiating position: the NCRD had the last word in choosing the innovation to be created. This did not meet

Zabala-Iturriagagoitia's (2022) recommendation to skilfully combine technology with the needs of transformation stakeholders.

The mission's focus on zero-emission transport, driven by the EU and national strategies, was determined at the ministry and agency level despite cities being the ultimate recipients of innovations. While centrally supported, the local engagement varied, leading to diverse needs at the city level. The top-down decision-making process, centred around the imposed IP formula, lacked proper dialogue with cities. The mission's defined solution was not universally applicable, as cities had diverse transport needs and expectations for the final product. The adopted technological solutions determined to a large extent the price and costs of vehicle use and could indirectly influence the small number (six units) of orders placed by cities as part of the mandatory purchase. The cities primarily expected an inexpensive, reliable, and low-emission vehicle with charging infrastructure. Adopting the two innovations made the product more expensive and did not have a significant impact on meeting the needs of the cities.

Consequently, it reduced the attractiveness of the ZEPT programme for potential contractors, who would have to put two innovations into production in a short timeframe. This ambitious goal eliminated both small entities and key producers from the conducted public procurement. Because of the low number of purchases guaranteed by cities, in turn, there was a risk that the assumption of guaranteeing a market for producers would not be met.

This conclusion is very close to an observation from Georghiou et al. (2014) that innovation policies' goals are not always well-rooted in governance terms. The goals are often owned by ministries or agencies responsible for innovation policy, while successful implementation depends on the sub-national level. These actors do not necessarily have the same commitment or understanding of innovation, which creates a much bigger challenge to secure the diffusion of the policy.

The political cycle vagaries

The last important contributor to failure is the impact of the political cycle vagaries. The concern here is that policymakers are more likely to get credit for legislation that is passed than for implementation problems that have been avoided. One consequence of this is that decision-makers are too easily attracted to the prospect of short-term results. This can lead to the pushing through of policies as quickly as possible rather than getting involved in the messy, protracted, and frustrating details of how things might work out in practice (Hudson et al., 2019).

It seems that the Ministry and the agency wanted a quicker success without a prior modest pilot with a smaller impact. The case also shows the important dilemmas of transformational policies in the context of delivering rapid change results, i.e. whether there is a willingness to create new product segments through start-ups or small and medium-sized companies, or whether they want to support large companies with the potential for rapid implementation. An important part of designing such policies should be considering designing a roadmap for transformation. The conclusions show that it is important to have a long-term vision of a public investor to creates a new market rather than just trying to place itself on the map of competitive production with the short-term profits.

Conclusions

The NCRD's intermediation between contracting cities and contractors, coupled with project funding provision, appears to have led to excessive opportunism in the utilisation of innovative partnerships. This intervention has also disrupted the planning phase, as per public procurement law, where the Contracting Authority assesses whether the innovation partnership aligns with its requirements. In fact, the lack of adequate preparatory analyses in accordance with legal requirements has been blamed on the NCBR by the National Audit Office (NIK, 2019). The research results revealed that the programme attempted to address three distinct challenges within a very limited timeframe, which turned out to be non-complementary: testing new ways to support R&D activities in the DARPA model, stimulating the demand and supply of a specific solution through public procurement, and promoting the Polish electromobility industry. As a consequence, there was an inconsistency between the actual needs of the co-contractors, the vision of the final innovative product, and the assessment of business risk by the programme participants. Buses were too complex a product to take any risk in purchasing by cities. It is noteworthy that, in accordance with regulations, bidders were rejected if they failed to meet the legal prerequisite of having the potential to implement and sustain the production of the developed innovation.

It seems that it is not the law that is an obstacle to the successful application of innovative partnerships, but, rather, the public sector's aversion to establishing a test market for highly innovative technological solutions. The described case shows that radical innovation is not possible in an innovation partnership, in particular in products that require certification and repeatability. The market is prepared for incremental innovations, and this is also expected by customers who need proven, reliable solutions. Innovative partnership would allow for the creation of radical innovations in areas where the recipient is open to testing new products, perhaps on a much smaller, pilot scale. It would be interesting to ask a question whether the innovations required in the ZEPT programme would have been able to solve any climate issues. It seems that they were rather features that would upgrade the technological frontier of e-buses.

The programme history also shows an extremely important element of programme implementation risk management, e.g. by setting unrealistic implementation assumptions. Properly conducted risk analysis could prevent the failure of the programme, which was also required by law. Additionally, capacity-building investments in skills and competencies will be sustainable in meeting future implementation challenges. Training, peer learning, information, guidance, project management skills, and other such interventions could all have a part to play to prevent possible failures.

This article makes three contributions to the literature. The first aspect pertains to utilising innovative public procurement as a tool for effecting a transitional change in the system. Its second contribution is presenting empirical consequences of when the transition's goal is not embedded into the socio-technical reality. The paper has illustrated different contexts of IPP implementation with the lower public procurement' capabilities. The other contributions refer to merging the DARPA's approach and IPP. It seems that policymakers should assess more carefully whether the targeted market would be attractive to compete in, especially when project risks refer mainly to IPP conditions, i.e. IPR, budget or timeframe, not to R&D works. The article opens up a new field for considering which instruments of transformative innovation policies are legitimate in countries with a lower level of the national innovation system development and what steps are crucial in formulating innovative public procurements.

The study has some limitations in terms of using the single case approach. Moreover, it was concentrated on the tender process, without analysing the capacity on the agency side. One area that requires additional research is the link between public administration capabilities with the designed shape of transformative innovation policies. Another question is to what extent the freedom of stakeholders to shape solutions is important, and to what extent the solutions imposed by the administration are preferred to depend on public administration's capabilities. The analysed case presents the weight of such dilemmas in relation to the success of transformative policies. The identified reasons for failure are relevant to the context of the case study, while their universality should be confirmed by further research, including issues related to needed legislative changes and governance in complex ventures such as IPs.

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Funding

Publication co-funded by the Ph.D. Student Association of Jagiellonian University.

Research Ethics Committee

Not applicable.

Conflicts of Interest

The author/autors declare no conflict of interest.

Published by Malopolska School of Public Administration – Krakow University of Economics, Krakow, Poland.

Data Availability Statement

All data will be available and shared upon request.

doi: 10.15678/PG.2023.64.2.03

Journal of Public Governance
No. 2(64)/2023
ISSN 2956-6061
e-ISSN 2956-6398

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Climate Risk: Reshaping the Energy Sector

Abstract

Objective: Climate risk is one of the major challenges for the energy sector globally. The energy transition and the struggle against climate change are putting increasing pressure on energy entities as well as create a need for action to mitigate climate risks. The purpose of this article is to characterise climate risk in the energy sector, with a focus on the electric power sector, as well as to review their impact on the functioning of energy entities.

Research Design & Methods: This article reviews the literature and uses publicly available data on the operation of the electricity system and the price of CO_2 emission allowances in the EU ETS so as to characterise the impact of climate risk on the energy sector with a particular focus on the Polish electricity sector.

Findings: Climate risk is one of the most important risks determining the functioning of entities in the energy sector and affecting the energy transition. It manifests itself in the form of the emergence of a set of new risks: carbon risk, weather risk, financial risk, regulatory risk, and social risk, all of which directly affect energy operators and reshape the energy sector.

Implications/Recommendations: The above creates the need to adapt and adjust to current market trends as well as the need to mitigate climate risks in order to keep a market position. It is, therefore, necessary to implement climate risk management measures to adapt the company's operations to changing market realities and an increasing exposure to climate risk. The results of the study can be used by policymakers and decision-makers responsible for energy policy and companies' strategy related to energy transition and compliance with the ESG standards.

Contribution/Value added: The research contributes to the field of climate risk in the energy sector. The value added of the paper is the interdisciplinary approach to a broad concept of climate risk, consisting both of transition and physical risks, with a detailed analysis about its influence on the energy sector.

Article classification: theoretical paper

Keywords: climate risk, energy transition, transition risk, energy sector

JEL classification: Q40, Q540, G32

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Introduction

Climate change is one of the greatest challenges facing the economy today. The range of impacts of climate change is remarkably wide and imprints its mark on many areas of life. Tackling climate change requires decisive action to reduce its negative impacts.

Risk in the energy sector is an exceptionally broad concept, referring to the many risks affecting the operation of the industry. This article addresses the climate risk present in the energy sector. This risk is currently one of the biggest challenges facing the sector (Kouloukoui et al., 2019, pp. 1-2). An inadequate mitigation of climate risk can lead energy-based entities to loss of competitive advantage, reduced financial performance, and, ultimately, bankruptcy. Therefore, a key element in the activities of entities in the energy sector is the proper analysis of climate risk exposure and the implementation of climate risk management for its mitigation. The ongoing energy transition will pose challenges to the entire sector, and those who do not participate will see their market position deteriorate over time. This will mainly be due to exposure to climate risk (Kouloukoui et al., 2019; Sobik, 2022).

This article characterises risks in the energy sector, with a particular focus on the Polish electricity sector. The climate risk specifics are then described. Climate risk is presented in the form of connections to the following risks affecting the electricity sector (Sobik, 2022, pp. 148–149):

- carbon risk;
- weather risk;
- financial risk;
- regulatory risk;
- social risk.

The aim of this article is to characterise climate risk in the energy sector, focusing particularly on the electricity sector, as well as to highlight the relationship of climate risk to the above-mentioned risks and to review their impact on the functioning of energy entities in the era of energy transition.

Material and methods

The methods used in this research include literature review and data analysis. This article uses a literature review of risks in the energy sector and climate risk, as well as other types of risks related with the climate risk: carbon risk, weather risk, financial risk, regulatory risk, and social risk. Publicly available data on the operation of the electric power system and the price of CO_2 emission allowances in the EU ETS was also used. The paper refers to economic and technical literature analysing the issue of climate risk in the broadest sense. The used research methods include a qualitative analysis and a comparative analysis of scientific articles and reports relating to the issues addressed in this publication.

Risk in the energy sector

There is no single definition of risk in the literature due to the heterogeneity of this concept (Adamska, 2009, p. 11; Rogowski, 2018, p. 178). Most definitions associate risk with an unfavourable deviation from predicted values (Rogowski, 2018, p. 179). The literature also distinguishes two approaches to risk – it is understood both as the danger of a negative event occurring and incurring a loss (the defensive approach) and as the chance of achieving better

results than expected (the offensive approach) (Rogowski, 2018, pp. 178–179). However, it should also be made clear that risk is not the same as uncertainty, which is a non-measurable concept and the theory of probability calculus does not apply to it.

When it comes to classifying risks, one can distinguish between symmetrical and asymmetrical, short- and long-term, permanent and one-off, as well as specific and systematic risks (Rogowski, 2018, pp. 182–185). The functioning of entities in the energy sector means that they have to deal with many types of risk. The specific nature of energy market activities – and in particular the ongoing energy-climate transition – means that energy companies have to face not only the risk of conducting day-to-day operations, but also the risk of systemic changes aimed at adapting the functioning of energy companies to the new reality resulting from the energy-climate transition. The degree to which they adapt to the market and are active in changing e.g. the energy mix or the economics of electricity production will determine their competitiveness and market position in the future.

In the era of energy transition, taking place basically at all levels of the functioning of energy entities, there is often a situation related to the perception of risk as an opportunity – i.e. a risk that the entity cannot afford not to take. It occurs at breakthrough moments, i.e. those that have a dramatic impact on the economic situation and potential of the company (Karmańska, 2008, p. 30). Failure to take this risk may lead, in the short or long term, to a loss of competitiveness by the enterprise or even to its bankruptcy (Rogowski, 2018, p. 183). The energy sector faces precisely this kind of risk; the failure of energy companies to seize the opportunity may lead to their unprofitability, uncompetitiveness, and, consequently, to their bankruptcy. The adaptation of energy companies to the current market situation is dictated not only by climate issues, but also by the need to adapt to market conditions in order to remain competitive and maintain market share.

Sources of risk in the activities of the company can be generally presented in the form of internal and external sources, which may be divided into those related to the close environment of the business entity (micro-environment) and those related to the further environment (macro-environment), which is beyond the company's control (Figure 1) (Karmańska, 2008, pp. 12–13).

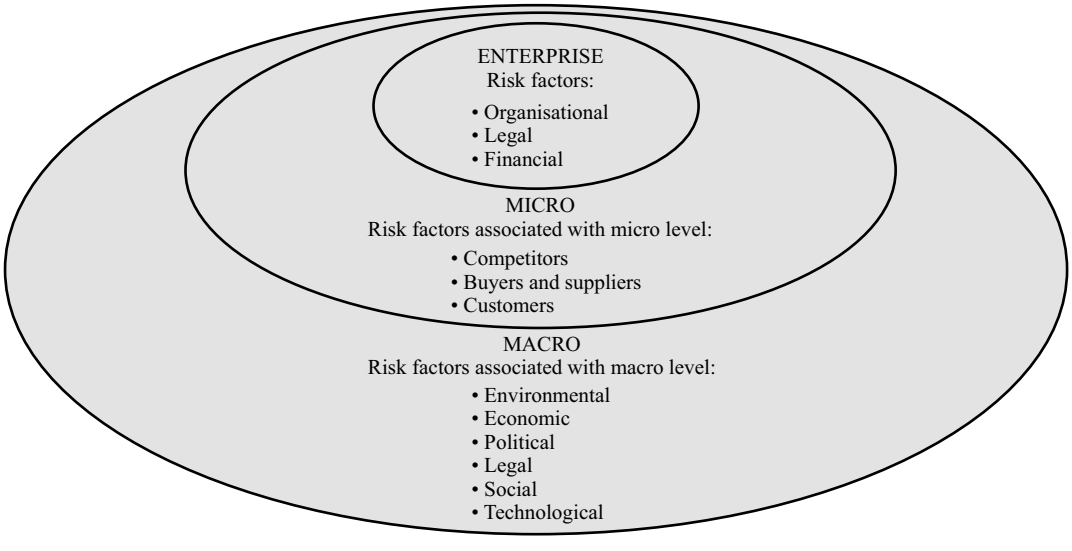

Figure 1. Sources of risk in company performance

Source: Own study based on Karmańska, 2008, pp. 12–13.

Internal risk factors, i.e. those occurring within the company, are related, for example, to organisational issues (work efficiency), legal issues (risks of illegal actions), or financial issues (company's financing structure, profitability, and liquidity).

External risk factors related to the micro-environment, i.e. the close environment of the enterprise, may include aspects related to the activity of competitors on the market, customers and suppliers, as well as customers. These aspects have a significant impact on the financial situation of the enterprise – high competition may lead to the erosion of market shares, while the lack of collection of receivables from customers or delays in payment to suppliers may adversely affect the liquidity of the enterprise and may threaten with bankruptcy.

External factors originating from the further environment of the company (the so-called macro-environment) do not depend on the company and have no influence on them. Hence, it is important to analyse these risk factors in order to be able to optimally mitigate them. These types of risk factors can include the following aspects:

- environmental – climate change, natural disasters, climate and environmental protection;
- economic – economic situation, inflation, interest rates, situation on the capital and currency markets, prices of energy resources;
- political – the implementation of economic, energy and climate policy, favouring specific industries, the implementation of policy at the European level;
- legal – the introduction of new legislation, restrictions, or deregulation;
- social – society's views on energy technologies and the environment, greater awareness of environmental issues;
- technological – the emergence of new technologies, opportunities (higher efficiency, lower cost), threats (capital-intensive investments, decreased competitiveness in relation to other market entities).

These factors are often intertwined to create synergies. An example is the increasing interaction of economic aspects with environmental aspects and political aspects with legal aspects through the use of effective tools to combat climate change.

Climate risk in the energy sector – characteristics

According to the report by the Intergovernmental Panel on Climate Change (IPCC), the impact of human activities on the warming of the atmosphere, land, and oceans is indisputable (IPCC, 2021, p. 4). The impact of global climate fluctuations on the formation of new risk areas is worldwide (Magnan et al., 2021, p. 880). The energy and climate policy pursued by the European Union is part of a global trend of combating and adapting to climate change. Hence the range of actions taken to slow the rate of increase in global average air temperature.

The multiplicity of climate elements affecting the functioning of people and economic entities – alongside the still ongoing scientific research on estimating the magnitude of human influence on the dynamics of climate-forming processes – means that a precise estimate of the risk associated with the impact of climate change is not feasible at this stage. The consequences of climate change vary throughout the world due to geographical factors.

Climate is a general term, it covers the overall meteorological phenomena that occur in a given area in the long term, on the basis of numerous years of observation. The special importance of climate is manifested by the fact that the effects of its changes have significant consequences not only in the ecological element, but also in social, political, and economic dimensions (Trocka,

2021, pp. 178–179). In the context of climate change, the inherent risk associated with the law of large numbers materialises (Burchard-Dziubińska, 2020, p. 161).

Climate risk is a very broad and complex concept, making it difficult both to define precisely and to quantify. Nevertheless, in general terms, climate risk could be defined as a set of risks induced by climate change (Charpentier, 2008, p. 91; Sobik, 2022, p. 148). The IPCC understood it as a climate-related effect of the interaction of hazards, vulnerability, and exposure (Jurgilevich et al., 2017, p. 3). Climate-related risks, which are a subcategory of sustainability risks, could be broken down into transition risks and physical risks, according to some authors (e.g. Hoffart et al., 2022, p. 2). Additionally, climate risk impacts the financial system through climate-related transition risks. Thus, climate risks are transmitted to the financial system and must be mitigated (Hoffart et al., 2022, p. 5). In the following part of the article, a set of new risks caused by the materialisation of climate risk (both transition and physical) will be analysed, as they particularly affect the electricity sector.

Climate risk and carbon risk

A major climate risk factor is the burning of fossil fuels and the resulting carbon dioxide (CO_2) emissions. The use of coal in power generation or other fossil fuels results in pollutants being emitted into the atmosphere, which have a negative impact on the climate. Basing the electricity generation sector on hard coal and lignite (which is still common in Central and Eastern European countries) causes a significant increase in climate risks. As part of its energy and climate policy, the European Union introduced the CO_2 Emission Trading Scheme (EU ETS) in 2005, which is a keystone of the European climate policy designed to help reduce CO_2 emissions and contribute to the implementation of the Kyoto Protocol (Convery, 2009, p. 407). The latest EU ETS reform, introduced in 2018, has meant that the emissions cap is no longer determined by a political decision, but also depends on the surplus of emission allowances and other aggregate variables. Consequently, EU policymakers have lost direct control over long-term cumulative CO_2 emissions (Beck & Kruse-Andersen, 2020, p. 806). Furthermore, between 2020 and 2021, an increased interest in the EU ETS market was observed among investment and hedge funds. Between November 2020 and April 2021, the number of net open positions in the EU ETS futures market increased by 240%. These years also saw a significant inflow of funds into Exchange-Traded Funds (ETFs) (Lizak, 2021, pp. 15–16). The above factors related to the involvement of entities with no obligation to account for emissions in the EU ETS became price impulses influencing the sharp increase in allowance prices in 2020–2021. Starting from November 2020, allowance prices began to grow rapidly – counting up to December 2021, the price increase amounted to as much as 270% (Lizak, 2021, p. 10). The reasons for such a rapid increase, apart from the much greater involvement of investment and hedge funds, include the rebound in demand after lockdown periods in Europe, as well as extremely high prices of energy raw materials in Europe. The increase in natural gas and hard coal prices recorded between November 2020 and December 2021 amounted to approximately 568% and 119%, respectively (Lizak, 2021, p. 11). Such a sharp increase was triggered by greater global demand resulting from the recovery of the world economy after the COVID-19 pandemic. A significant factor in the case of natural gas was the very low level of filling gas storage facilities in Europe. In the case of hard coal, this was due to restrictions in coal supply as well as record demand for this raw material, resulting, among other things, from the energy crisis in China. As a result of such a sharp increase in natural gas prices, energy

entities boosted the production of energy from other energy sources, including hard coal, putting upward pressure on the price of CO_2 emission allowances. The increases were also fuelled by a decline in wind generation in Europe (due to a decrease in windiness), which made it necessary for conventional energy sources to produce. Therefore, the climate factor has had a direct impact on energy commodity prices.

The price level of the EU ETS CO_2 emission allowances is a key element of climate risk for energy companies. Figure 2 on the next page shows the EU ETS Carbon Permits prices from 2020 to August 2023.

CO_2 allowance prices tripled over the period of 2020–2022. In November 2020, prices broke out of their consolidation in the area of 25–30 EUR/tCO_2 and in December 2021, the ceiling of 90 EUR/tCO_2 was reached. Such a sharp increase significantly affected energy companies that use fossil fuels to a large extent. It even exceeded the European Commission's estimate that the 85 EUR/tCO_2 level would not be reached until 2030 (European Commission, 2021, p. 580), as well as the assumptions of Poland's Energy Policy until 2040, which set CO_2 emission allowance prices in 2040 at 40 EUR/t CO_2 (Ministry of Climate and the Environment, 2021, p. 7). The Russian aggression against Ukraine and the related turbulence in energy markets are responsible for the sharp drop in CO_2 allowance prices in February and March 2022. CO_2 allowance prices are currently a large cost component of energy companies using fossil fuels to generate electricity. The energy and geopolitical crisis in Europe as well as the panic in the natural gas market in August 2022 led to record electricity and gas prices on the one hand, but on the other hand, they resulted in a strong fall in the price of CO_2 emission allowances in the EU ETS. However, the correction was only short-term – further down the line, the EU ETS Carbon Permits prices broke through the psychological barrier of 100 EUR/tCO_2 in 2023, consolidating around 90 EUR/tCO_2. Moreover, in connection with the work on the introduction of the „Fit for 55" package, aimed at intensifying the EU climate policy and extending the ETS system to new sectors, an upward trend in the prices of CO_2 emission allowances is likely to continue in the coming years. Rapid increases in the CO_2 market will influence the acceleration of decarbonisation processes due to the decreasing economic efficiency of emission sources. However, the above trend poses a serious threat to companies which base their manufacturing activities on hard coal and lignite.

The climate risk of having coal assets in the generation mix has led to these power plants being called ‚toxic assets'. Owning coal units is viewed poorly by lenders, the market, and – in the face of record high CO_2 allowance prices – it generates ever higher costs. This results in an ever higher Levelised Cost of Electricity (LCOE) and makes it permanently uncompetitive with renewable energy sources (RES)[1].

Basing power generation activities of energy entities on low- and zero-emission energy technologies makes it possible to minimise risks related to price fluctuations on the EU ETS market. Moving away from fossil fuels also mitigates the risks associated with volatile energy commodity prices. Entities that rely on fossil fuels are largely aware that climate policies against CO_2 emissions will have a significant impact on their costs and market position (Kolk et al., 2008, p. 724). Therefore, energy companies are changing their strategy towards the development

[1] However, the dependence of energy systems on conventional energy sources (coal, gas, nuclear power) should be emphasised here in order to balance the functioning of the system in the absence of generation from RES. Therefore, the abandonment of fossil fuels should be carried out in an orderly manner and with energy security in mind. However, this issue will not be discussed further in this article.

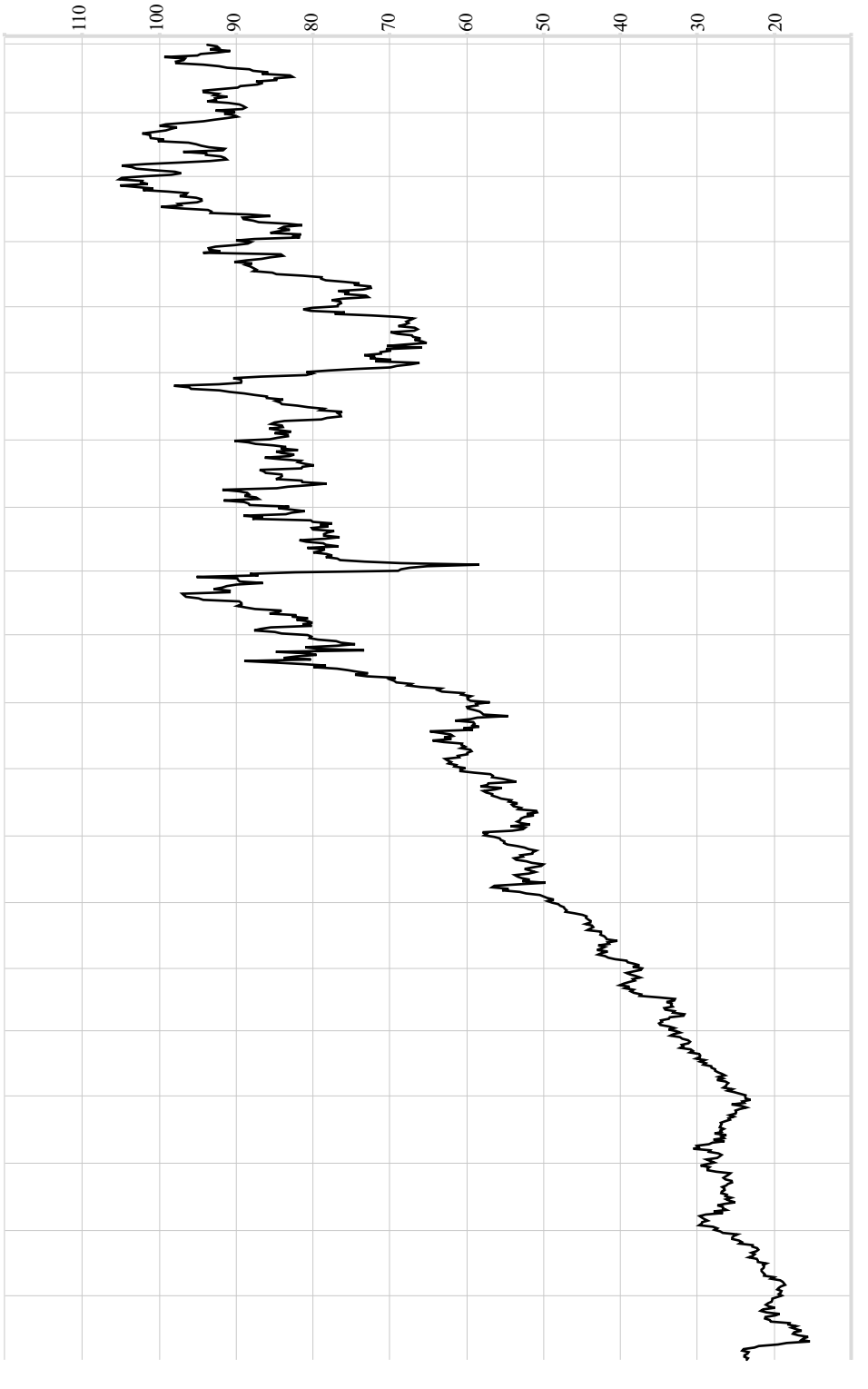

Figure 2. EU ETS Carbon Permits from 2020 to August 2023.

Source: Tradingeconomics database, available at: https://tradingeconomics.com/commodity/carbon [accessed: 31.08.2023].

of green energy technologies and are increasingly guided by sustainable energy development in their operations. An example of this is the decision of the Czech energy group ČEZ to sell its coal assets in Poland (hard coal-fired power plants and CHPs) in order to monetise them and reduce its carbon footprint due to a change in strategy and a shift towards green energy.

The weather risk of climatic anomalies and natural disasters

Weather risk is related to the exposure of an enterprise's activities to meteorological factors. Meteorological phenomena associated with weather risk can be divided into non-catastrophic and catastrophic (Blachowski, 2011, pp. 639–640). Non-catastrophic phenomena are broadly defined climatic anomalies[2]. On the other hand, catastrophic phenomena, as their name suggests, are associated with the occurrence of natural disasters such as floods, droughts, or hurricanes. Distinguishing between these two types of phenomena is important due to the different ways of hedging against them – in the case of catastrophic phenomena, these are insurance, and in the case of non-catastrophic, these are weather derivatives (Blachowski, 2011, pp. 640–641).

One element of climate risk may be the weather risk associated with anomalies that are unusual for particular climate zones. Examples include a drop in wind that is unusual for a given climate zone or season, heat waves, or the occurrence of droughts and very low water levels. They have a direct impact on the functioning of the energy sector, usually affecting the ability to generate electricity. They also affect the behaviour of energy consumers and the entire electric power system. Examples include the increased popularity of air conditioners in Europe during the summer, which translates into a noticeable upward trend in electricity demand. The most effective solution to mitigate such risks is to adequately diversify the structure of electricity generation so that a single meteorological event cannot have a major impact on the generation of a large part of an entity's electricity.

Climate risk is also the risk associated with the occurrence of natural disasters, whose impact on the economy is clearly negative (Fang et al., 2019, pp. 1455–1456). They cause huge financial losses and clearly have a negative impact on energy sector entities. Due to the character of natural disasters, it is not possible to prevent them effectively; the only possibility is to carry out actions aimed at protecting the climate and translating largely into a decrease in the occurrence of climate-induced natural disasters.

The risk of climatic anomalies and natural disasters is reflected in the company's capital market valuation and value. High exposure to this risk or the occurrence of damage to energy infrastructure negatively affects the market perception of the company and may cause the erosion of its value (e.g. in the form of EVA – Economic Value Added). Consequently, it may contribute to a deterioration of the financial situation and an increase in the cost of capital. Thus, the risk of climatic anomalies and natural disasters translates into the materialisation of financial risk.

Climate risk and financial risk

The core of climate risk results in its inextricable integration with financial risk (Giglio et al., 2021, p. 16). The impact of climate risk on the financial aspects of an energy company's

[2] Climatic anomalies constitute a deviation from the norm for a given climatic zone, determined on the basis of long-term meteorological measurements.

operation is steadily increasing. The concepts of sustainability and action to protect the climate have been reflected in finance.

Sustainable financing is understood as financial support for sustainable development at three levels: social, economic, and environmental (Ryszawska, 2016, p. 188). Thus, in general, it is related to financing activities aimed at implementing the idea of sustainable development in practice across many areas of socioeconomic life.

In the literature, there also exists the concept of „climate finance", understood as financing the mitigation of or adaptation to ongoing climate change (Hong et al., 2020, p. 1011). According to this definition, the development of energy and climate policies to address climate change will result in even greater climate pressure on financial and economic aspects. An example of such a relationship can be seen in the impact of dynamic increases in the price of CO_2 emission allowances on the cost structure of energy companies, as presented above.

Another term indicating the intertwining of climate and financial aspects is „green finance", which, however, is not precisely defined – it generally refers to financing investments in green energy, supporting green initiatives, encouraging transformation towards a green economy, and reducing negative environmental pressure (Ryszawska, 2016, p. 188). One example of the implementation of green finance in practice includes green bonds used to finance investments in renewable energy sources.

Climate risk is also associated with the risk of a decline in the credit rating of energy companies and an increase in the cost of raising debt and capital market valuations. Companies exposed to fluctuations in the price of CO_2 emissions allowances – as well as those basing their energy mix on coal – receive a worse credit rating and their costs of raising debt are higher when compared to green companies. Thus, there is a significant relationship between climate risk and credit risk exposure (Seltzer et al., 2021, p. 2). A worse credit rating and a rising cost of capital both act as a negative feedback loop, inhibiting investment in emitting energy technologies. The risks associated with emitting CO_2 and basing electricity generation on coal are also reflected in a company's capital market capitalisation and affect its value. Companies heavily exposed to this risk have lower capitalisation and value.

The investments of energy companies are also exposed to risks related to the forecast of future cash flows, which directly affects the result of the investment efficiency calculation and, consequently, may affect the cost of capital. The possibility of large fluctuations in future cash flows is related to the risk of events such as large price increases in the EU ETS market, demand or supply shocks, deviation of the LCOE from the assumed value, or the need to adapt installations to new environmental requirements (Chen & Silva Gao, 2012, pp. 2–3). The above climate aspects are, therefore, reflected in the financial terms of the investment.

From an economic point of view, investments in emission-intensive energy technologies (especially those using hard coal and lignite) are characterised by high risks related to the economic viability of the investment and are strongly exposed to climate risks. The future financial flows generated by a coal-fired power plant may be even more at risk due to the loss of competitiveness of these energy sources in light of the rising the LCOE of coal-fired power (mainly due to rising the EU ETS prices), as well as the falling the LCOE of RES (Timilsina & Shah, 2020, p. 1). Given the high level of climate risk and, consequently, the significant exposure to financial risk, the world's largest investment banks are withdrawing from financing investments in coal power (Kolk et al., 2008, p. 724). Similarly, investments in gas-fired power plants, due to their carbon intensity, are no longer supported by the European Bank for Reconstruction and Development

(EBRD) or the European Investment Bank (EIB). Moving away from supporting natural gas as a transitional resource to support the energy transition towards green energy can be a challenge especially for CEE countries that are only at the initial stage of the energy transition.

The last investment in a hard coal-fired power plant in the European Union was to be the new Ostrołęka power plant in Poland. From the very beginning, the investment faced difficulties in putting the financial arrangements together. None of the commercial banks wanted to get involved in the project due to the fact that the investment was in contradiction with the current decarbonisation policy and also due to the high degree of climate risk. The efficiency calculation of the investment in the Ostrołęka coal-fired power plant indicated from the outset that it would not meet the basic criteria for economic viability (Krupiński et al., 2019, p. 77). Both the net present value (NPV) and net present value ratio (NPVR) of this investment were negative. The investment encountered serious problems in finding sources of financing and completing the financial assembly. Both commercial banks and international and national financial institutions refused to finance it, which would have forced the Special Purpose Vehicle (SPV) to seek capital at a higher cost. This, in turn, would have implied a further deterioration of the financial projection and could have further worsened the NPV result. Despite the negative result of the investment efficiency account, and without completing the financial assembly, the decision was taken at the end of 2018 to start the construction of the power plant. However, after just over a year, construction was suspended in February 2020. By ignoring the climate risk, which directly exposed the project to financial risk, the result of such an investment was only sunk costs. Design work is currently underway for the construction of a gas-fired power plant in Ostrołęka. The above example shows the consequences of ignoring climate risk in decisions taken by energy companies.

Climate risk and regulatory risk

Regulatory risk, implied by pursuing the energy and climate policy, is a particularly important risk that affects every energy actor. Research by Stroebel and Wurgler found that regulatory risk associated with the implementation of the energy transition is the most significant element of climate risk (2021, p. 489). It can manifest itself in the form of materialising risk for many business models operated in the energy sector, resulting from increased regulation aimed at reducing CO_2 emissions. Regulatory risk materialising in the form of creating legislative solutions to address climate change is the biggest risk for energy companies, both short-term and long-term (Papadis & Tsatsaronis, 2020, p. 9; Stroebel & Wurgler, 2021). The essence of the components of climate risk means that legislative activities related to climate protection (regulatory risk) imply exposure to financial risk – these two risk areas are closely linked due to the interdependence of the law enacted with financial elements. This synergy effect makes for effective action on climate protection. An example of an effective combination of regulatory and financial measures is the implementation of the CO_2 emissions trading scheme – the EU ETS. Moreover, the allocation of the number of allowances will only be linked to administrative decisions, which will be an effective incentive to increase the pace of decarbonisation and influence the decisions made by energy entities.

Regulatory risk manifests itself, *inter alia*, through plans to develop the EU ETS to enable the achievement of more ambitious emission targets contained in the EU's „Fit for 55" package or through the implementation of new regulations that significantly affect the operation of the energy industry, such as the 2016 law completely blocking the development of on-shore wind farms in Poland. From the perspective of energy companies, difficult-to-predict regulations that

seriously affect the profitability of already implemented investments or completely prevent the implementation of new projects are an unfavourable situation. Hence, the lack of effective counteraction to regulatory risk may pose a threat to the profitability of ongoing investment projects and may lead to decisions on new investments being abandoned.

Regulatory risk, associated with the materialising climate risk, results in the exclusion of the development of emission and non-organic energy sources, implying financial risk for energy companies which have a large number of such units in their portfolio of generating assets. Regulations affecting the profitability of these units (such as the EU ETS mechanism) – as well as increasingly stringent environmental standards (including BAT[3] conclusions) – prevent the implementation of new investment projects in EU countries using emission-intensive energy technologies and exacerbate the uncompetitiveness of outdated emission technologies. Environmental regulations are, therefore, an effective tool of climate policy, acting especially on the financial sphere of energy companies and visibly influencing their decisions.

Climate risk and social risk

Climate risk affects the emergence of social risk. The aspect of climate risk can be perceived by society in the form of a social problem – a situation defined by one social group can be perceived negatively and by another social group neutrally or even positively (Wrochna, 2018, pp. 205–206). Such an issue may be the question of ecology, environmental protection, and climate. Public awareness related to ecological and environmental topics is constantly growing, especially in developed countries. In the countries of the European Union, more and more emphasis is placed on promoting pro-ecological and pro-climate attitudes. This does not remain without influence on consumer behaviour. Basing one's activity on fossil fuels, high emission levels of industrial plants, or having a negative impact on the environment is perceived by society in a negative way and adversely affects the image of the entire company. This trend is a particular challenge for energy companies. Changing public attitudes and the legal and financial environment resulting from the materialisation of climate risks is putting increasing pressure on energy companies – resulting in accelerated decarbonisation and the development of renewable energy sources. This is clearly visible in the strategies of energy companies, which emphasise the drive towards decarbonisation, environmental performance, and care for the environment. Such an approach is also important from the point of view of company shareholders, as the market negatively values entities that do not care about the environment, as well as those generating electricity from fossil fuels. Changing social behaviour, which is a materialisation of climate and social risks, also influences the growing popularity of Power Purchase Agreements (PPAs) for purchasing energy generated from renewable sources. Consumer awareness is growing to the extent that more and more attention is being paid to the origin of electricity, naturally favouring those generating electricity from RES.

The lack of the consideration of social risks by energy companies may also affect the implementation of investments, especially in infrastructure extracting fossil fuels or generating electricity from fossil fuels. Ignoring social factors may lead to social conflicts, delay the investment, or decrease its profitability, and in extreme cases may lead to its blocking (Rogowski, 2018, p. 191). Examples of social conflicts affecting the activities of energy companies include the exploitation

[3] BAT – Best Available Technics / Best Available Technologies.

of lignite deposits and plans to build new open-pit mines, the exploitation and construction of new nuclear power plants, or the construction of new coal-fired power plants.

Discussion – managing climate risk

As was presented in the paper, climate risk can seriously affect the operations of energy entities, requiring them to adopt a proactive attitude and implement measures to mitigate these risks (Kouloukoui et al., 2019, p. 2). Therefore, there has been a need to implement corporate Management of Climate Risk (MCR) as an integral part of conducting business in the energy sector. MCR is defined as a set of actions taken by a business entity to address the potential negative impacts of climate change affecting business operations (Weinhofer & Busch, 2012, p. 127). However, following the definition proposed by Weinhofer and Busch, in the case of the energy sector, there is a need to extend it, as not only the physical effects resulting from climate change affect the operation of the sector, but especially the economic effects resulting from climate policies aimed at climate protection are exerting influence. The process of implementing the MCR consists of three stages (Kouloukoui et al., 2019, p. 2):

- identifying climate risks affecting the energy company's activities;
- assessing exposure to the risk based on determining the degree of probability and potential consequences of its materialisation;
- taking action to mitigate the identified risk – an indication of the identified risk together with the actions developed to avoid, mitigate, or transfer that risk.

Only by taking a proactive attitude and responding to climate risk can energy entities protect themselves from the negative impact of such risks on their activities in the sector. Ignoring climate risk will pose an increasing threat to energy companies, as exemplified by the collapse of the Ostrołęka investment, among other things.

Concluding remarks

The article highlighted the crucial role of climate risk in the energy sector. The broad impact of climate risk resulting in the emergence of a number of new risks in the form of carbon risk, weather risk, financial risk, regulatory risk, and social risk makes it necessary to take proactive measures to adapt the functioning of energy entities to the new market reality. Failure to adapt can lead to a loss of competitive advantage, a deterioration of the financial situation and, as a consequence, even bankruptcy.

Climate risk will increasingly affect the operation of the energy sector also due to the increasing implementation of non-financial reporting, ESG[4] standards, and green finance instruments. This is another reason for energy entities to revise their strategy and take measures to adapt to the current market situation and mitigate climate risks.

Research presented in the article was focused mostly on the electric power sector. The analysis of climate risk can be extended to sectors such as mining or oil and gas drilling. However, in these cases, the impact of climate risk will lead to a decline in the importance of these industries over the next few decades. The electricity sector is currently facing a progressive energy transition, so the impact of climate risk is now a key issue that is reflected in the shape of the energy transition associated with the development of low- and zero-carbon energy technologies.

[4] ESG – Environmental, Social, and Corporate Governance.

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Funding

This research received no external funding.

Research Ethics Committee

Not applicable.

Conflicts of Interest

The author/autors declare no conflict of interest.

Published by Malopolska School of Public Administration – Krakow University of Economics, Krakow, Poland.

Data Availability Statement

All data will be available and shared upon request.

doi: 10.15678/PG.2023.64.2.04

Journal of Public Governance
No. 2(64)/2023
ISSN 2956-6061
e-ISSN 2956-6398

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E-Government Solutions in Poland: The State of E-Services Provided by a Selected Local Government Unit

Abstract

Objective: The subject of the article is an attempt to determine the state of e-government development in local government units in Poland based on the example of the selected Piekary Śląskie City Hall, operating in the Śląskie voivodeship. The aim of the paper is to explain the state of e-government, then to present the applied IT tools and solutions in local government units in Poland, and make an attempt to assess the state of application of e-government solutions at the local level in a selected local government unit through the perspective of e-service provision according to the maturity model.

Research Design & Methods: In this study, the method of deduction was used as well as auxiliary methods and techniques such as logical analysis, analysis and study of literature, and classification and scientific description. In order to perform the research task, the applied empirical procedure was supported by a critical review of the literature on the subject in Polish and English, and practical cooperation with a selected local government unit. The research part of the study used non-participant observation, a case study and a face-to-face interview. In order to obtain information, the Polish electronic platform for public administration services (ePUAP) of the Piekary Śląskie City Hall was analysed and an interview with an employee of this unit was conducted in July 2023.

Findings: The results of the conducted scientific analysis show that IT and technological solutions and tools have a significant impact on the effective e-government functioning. In addition, these factors reflect access to e-services provided by public administration, as well as employee and customer competence with regard to e-government.

Implications/Recommendations: The results of the scientific analysis and its findings contribute to existing research by providing knowledge on the state, progress, and development of e-government through the provision of e-services provided by public administration in a selected local government unit in the Śląskie voivodeship.

Contribution/Value Added: The research shows that the interest in the development of e-government among researchers is great, because the topic is still up-to-date and has utilitarian values. The assessment of public e-services in a selected local government unit (i.e. the Piekary Śląskie City Hall) makes it possible to determine the level of the maturity at which the examined unit is located. The study may also serve as a introduction to and a basis for a comprehensive diagnosis of the state of application of IT and technological tools and e-government development in all local government units in Poland.

Article classification: empirical article

Keywords: e-government, e-services, local government unit, public administration, information and technology solutions

JEL classification: *H83, D73, L86*

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Introduction

One of the most important elements of effective operation of local government units in Poland is the development of e-government at the local level. Local government units (at the level of the municipality [Pol. *gmina*], poviat [Pol. *powiat*] or voivodeship [Pol. *województwo*]) deal first of all with a customer – an applicant – a citizen, who most often has a matter to be disposed of in an office appropriate for him/her. On the other hand, however, the Office provides a service to the Citizen, i.e. serves him/her within the scope it is established for in accordance with the purpose of its functioning. According to the definition in the *Encyclopaedia of Public Administration*, the term 'administration' itself comes from the Latin word '*ministrare*', which means, among other things, to serve, to perform. It is worth emphasising that the servant function of administration supported by modern information and communication technologies undoubtedly improves contact between the citizen and the Office, which contributes to faster and more efficient handling of cases and customer service. In online communication, the main goal is for the citizen to complete the selected case entirely via the Internet. Therefore, the development of e-government at the level of local government units will rely on the increasing possibility of citizens to benefit from public e-services. Online public administration services are becoming increasingly important due to, *inter alia*, the growing mobility of societies, demographic changes related to the ageing of the population, growing expectations of citizens towards public services, and the reduction of public administration costs (Drobiazgiewicz, 2012). The process of implementing e-services in local government units accelerated due to circumstances related to the introduction of restrictions on visits to public offices and institutions caused by the pandemic. The pandemic situation has also influenced the interest in remote dealing with cases on the part of both citizens and decision-makers (Kwaśny, 2022). The development of e-government is also in line with the assumptions of the concept and reform of public administration called New Public Management (Mlodzik, 2015), which aims to improve the quality of management in the public sector and is an alternative to traditional public administration (Czarnecki, 2011).

The aim of the paper is to explain the state of e-government, then to present the applied IT tools and solutions in local government units in Poland, and to make an attempt to assess the state of application of e-government solutions at the local level in a selected local government unit through the perspective of e-service provision according to the maturity model. The research questions are as follows:

– Has the Municipality implemented a development strategy for IT or digitisation?
– What is the state of e-government in the selected local government unit?
– At what level of maturity are e-services provided?

This study used the deductive method as well as auxiliary methods and techniques, such as logical analysis, literature analysis and research, and classification and scientific description. In order to perform the research task, the applied empirical procedure was supported by a critical review of the literature on the subject in Polish and English, and practical cooperation with a selected local government unit. The research part of the study used non-participant observation, a case study, and a face-to-face interview

The results of the conducted scientific analysis show that IT and technological solutions and tools have a significant impact on the effective e-government functioning. In addition, these factors reflect access to e-services provided by public administration, as well as employee and customer

competence with regard to e-government. The research findings may aid in the implementation of e-government initiatives at both national and regional level.

The article consists of five parts: introduction, literature review, research methodology, discussion of the results, and conclusions. The second part of the article explains in subsection 2.1 the concept and importance of e-government, then reviews selected e-service maturity models (subsection 2.2), and presents the status of e-services in Polish local government units in the light of the results of surveys (subsection 2.3).

Literature review

The concept and significance of e-government

The term 'e-government' is not easy to define. Problems related to the unambiguous explanation of the term arise from the fact that it is within the scope of interest of many areas of life, such as legal and administrative sciences, computer science, economics, management, and social sciences. The concept is identified with administration directly using the development of telecommunications and information technology to facilitate contact between citizens and entrepreneurs and public administration bodies (Mikulski, 2008).

The issue of e-government, in other words electronic government (Kępa, 2020) at the central, governmental or, finally, local level has already received much attention. E-government has become an inherent „part of the practice of governments at the local as well as the central level. They use the Internet and information and communication technologies to deliver services, disseminate information and enable a more open dialogue between administrative entities and Citizens" (Walencik, 2018). E-government also involves increasing the efficiency of public administration and the quality of services provided, simplifying the disposing of matters, and obtaining comprehensive information about them (Wlodyka, 2021).

E-government has been studied in terms of, for example, electronic documents in local government units (Szymczuk, 2018), the identification of e-government success factors (Ziemba et al., 2015), the challenges faced by local government units in this regard, as well as barriers to implementing e-government at the local level (Kwaśny, 2022). Moreover, the use of cloud computing technologies in e-government has also been investigated (Niewiadomska, 2012), or the possibilities of providing services electronically, and online resources including official websites of offices and their public information bulletins have been assessed (Papaj, 2012). The research showed that e-participation is one of the most important success criteria of e-government, and its form changing in line with ICTs' evolution, so there is a significant need for more ongoing investigation broad field (Adnan et al., 2022). Opportunities and risks associated with the automation and robotisation of processes have already been identified in the development of public services (Baran et al., 2020). A scientific study was also conducted to try to synthesise the determinants of e-government implementation by local governments (Dias, 2020). Another study conducted by researchers looked at the role of trust in the context of e-government (Hooda, 2022). On the other hand, when it comes to research on innovation in the public sector as one of the reform mechanisms, it turns out that it is not something new. They have been widely studied in modern public administration. Most publications on public innovation are relatively new, as they were published between 2009 and 2014 and focused on the US-Anglo perspective. In addition, regional studies and the international perspective tend to emphasise a metric, index, and measurement

instrument for public sector innovation, and take place mainly in the Western context. There are previous studies which assessed the effectiveness and efficiency of public services provided by regional governments (Muksin & Avianto, 2021)

The concept of e-government is defined as the provision of public services using electronic forms of communication (ICTs, Information and Communications Technologies), resulting in an increase in the efficiency of public administration activities. A well-functioning administration should first and foremost perform the function of connecting different social groups, e-government customers, and undertake such activities aimed at adapting its services to the existing needs and conditions (Wilk, 2014). The goal of e-government is, therefore, to improve the quality of life of those using its services (e.g. through the implementation of e-services), improve efficiency, and increase the transparency of public administration activities. The development of information and communication technology mechanisms simplifies the process of trying to resolve and handle a given case for a citizen; it also shortens the time needed to resolve a case and provides the possibility to access services offered by local government units regardless of the time and place of the person concerned. E-government provides many opportunities between the Citizen (Applicant, Customer) and the office. Progress in the development of e-government is expected to ensure that cooperation between the Citizen and the office is not limited to providing downloadable documents with which, once completed, the applicant will have to go to the office to submit them in the traditional way (Werenowska, 2018).

E-government is primarily associated with the provision of e-services (Ziemba, 2012) at different levels of maturity. Both of these categories (e-government and e-services) play a part, alongside the concepts of e-democracy and e-governance, in shaping the conceptualisation of the e-government dimensions (Papaj & Ziemba, 2012).

A review of selected e-service maturity models

In the literature on the subject, one can find a number of classifications of the maturity levels (degrees) of services provided by the broadly understood administration[1]. The simplest three-level classification of types of activity, which reflect the degree of e-service maturity in administration, is considered. We can identify:

– searching for information on government websites;
– downloading official forms;
– sending completed official forms or completing them online (Jedlińska & Rogowska, 2016).

However, the article adopts a more elaborate e-service maturity model consisting of four levels due to the fact that it is one of the most frequently mentioned models in the literature.

If this interaction does not exist (none), it means that the Office only provides information in the Public Information Bulletin (BIP) on how to deal with a particular matter. This is an information-only service. One-way interaction occurs when the office additionally provides forms

[1] Fath-Allah et al. (2014) descrive as many as 25 e-government maturity models: only 1 model consists of two maturity levels (the Reddick model), four of these models consist of 3 maturity levels (Cisco, World Bank, Howard and Chen); eight models are based on four maturity levels (Layne and Lee, Andersen and Henriksen, United Nations, Alhomod, Gartner, West, Chandler, and Emanuel and Windley); nine models are based on five maturity levels (Hiller and Belanger, Moon, Shahkooh, Lee and Kwak, Siau and Long, Kim and Grant, Accenture, The UK National Audit, and Netchaeva), three models are based on six maturity levels (Almazan and Gil-Garcia, Deloitte and Touche, and Wescott).

to be filled in manually, which are used to initiate proceedings, without the possibility to send it to the office electronically. Two-way interaction occurs when interactive forms are made available with the possibility of sending them electronically to the office in order to initiate proceedings.

The third level of maturity, called the transaction level, enables two-way electronic communication in order to perform the actions necessary to dispose of a matter. In order to dispose of a matter, the applicant submits an electronic application with the necessary attachments (he/she also makes a payment), and the decision/order on the matter is sent to the applicant electronically (Kotyla, 2020).

The basic level of maturity distinguished in the literature is the information level, meaning that government offices make public information available to Citizens and Entrepreneurs on office web portals. In the case of public e-services, at the interaction level, stakeholders communicate electronically with individual offices, but a complete disposing of a matter requires a personal visit to an office. The third level, referred to as the transaction level, is connected with the possibility of completing all the activities necessary for disposing of a given matter completely electronically, but only in a single office. The last, fourth level of maturity, referred to as the integration level, ensures the integration of various e-services in the area of the whole public administration and not only individual offices (Ziemba, 2012).

This was to be facilitated by the introduction of an electronic sub-box, which provides the possibility of online correspondence between the customer and the office. Internet platforms have also been introduced, e.g. the ePUAP platform and regional platforms (e.g. SEKAP in the Śląskie voivodeship)[2]. The former government platform called ePUAP also allows electronic communication and exchange of information between public institutions.

Yet another four-stage maturity model of public e-services mentioned in the literature, which also distinguishes between one-way and two-way interaction, assumes the following levels:

– the first one (this is the so-called online information), where it is possible to search for information about a given office and the services provided there on its website;
– the second one (so-called one-way interaction), characterised by the possibility to search for information and download official forms from the office's website;
– the third one (so-called two-way interaction), with the possibility not only to search for information, but also to download and return to the office the completed forms via the Internet;
– the fourth one (the so-called transaction) consisting in the full handling of the process, i.e. the possibility to perform all the actions necessary to handle a case electronically: from obtaining information, through downloading relevant forms and sending them back after completing and affixing an electronic signature, to paying required fees and receiving an official permit, certificate, or other document requested by a given person/company (Stec, 2011).

In addition to the above-mentioned degrees of e-services, a fifth level of maturity is distinguished in the Polish literature, namely the so-called personalisation, i.e. the ability to identify the Customer in the electronic data system of the administration, which gives the opportunity to remind the Customer of the need to perform certain official activities and to provide automatically certain services that do not require the Customer's intervention (Drobiazgiewicz, 2015).

On the other hand, the classification of e-service levels adopted in the Operational Programme Digital Poland (Andrzejewska et al., 2018) is based on the methodology developed at the request

[2] In accordance with Resolution no. 2934/196/VI/2020 of the Śląskie voivodeship Executive Board of 16th December, 2020, a decision was taken to terminate the operation of the SEKAP platform on 31st December, 2021.

of the European Commission, used for the purpose of studying the maturity of e-government in individual Member States. This classification also includes a five-stage maturity scale, which reflects the range of activities that can be facilitated electronically within a given service. The maturity levels of electronic services are as follows:

– the first level – information; at this level of maturity, no forms are required to be published on the public website. It is sufficient to provide only the necessary information about the process or the required documents;
– the second level – one-way interaction; this level of maturity can be referred to in the case of services, if on a publicly available website there is the possibility of downloading forms necessary to initiate a procedure (e.g. an available application for a document, which a Citizen or Entrepreneur can download, fill in and print out). The matter itself (service) in the case of this level of maturity may be handled by traditional means, and thus will involve the necessity of coming to the Office in person;
– the third level – two-way interaction; to meet the requirements for this level of maturity, it is necessary to:
– make available on a publicly accessible website the forms to be filled in,
– ensure authentication in the ICT system of the Citizen or Entrepreneur,
– enable the initiation of an electronic service, understood as submitting an application in electronic form with the required attachments.

This level of maturity allows documents or other physical objects to be delivered by traditional means, including the personal appearance of the Citizen or Entrepreneur at the government office. It is also permissible for payments to be made electronically.

In this case, when an electronic form is used to order a non-electronic (paper) form, it is considered as the second level of maturity.

– the fourth level – transaction; this maturity level assumes that the entire service is provided electronically, in particular:
– delivery of all documents and service in electronic form,
– the absence of actions that a Citizen or Entrepreneur would have to perform in paper form,
– if a payment is required, there is the possibility to make this payment in electronic form.
– the fifth level of maturity – personalisation (individualisation); this highest level of maturity of an electronic public service assumes that:
– the electronic application forms will be pre-filled with the data of the Citizen or Entrepreneur (e.g. first and last name, address data, Personal Id. Number (PESEL), National Business Registry Number (REGON), etc.) in the possession of the entity providing the service,
– in the case of services where there is no need to submit an application, the office automatically handles the case (provides the service) to the extent appropriate to the situation of the service recipient,
– where there is a need to make a payment in the procedure, the service provider ensures that the recipient is redirected to the relevant intermediary for payment (the redirection operation must ensure that the context of the event is preserved, i.e. all the fields necessary to define and execute the payment, e.g. transfer, are filled in automatically by the service provider's system).

The state of e-service provision in Polish local government units in the light of research results

The report concerning the results of research related to the impact of digitisation on the operation of public administration offices in Poland in 2015, prepared by the ASM-Centre of Research and Market Analysis on behalf of the Ministry of Digitisation, shows that the highest percentage of local government units providing electronic services other than those based on the so-called 'general letter template' was in the Śląskie voivodeship, at 79.7%, followed by the Łódzkie voivodeship with 65%, and in the third place – the Małopolskie voivodeship at 64.8% (Walencik, 2018; Report, 2015). On the other hand, the highest number

Table 1. The part of the ranking of the municipalities distinguished in the years 2022–2023 with the 'Golden municipality for 5' award (yellow) and with the 'Municipality for 5' award including the Municipality of Piekary Śląskie

Municipality name	Voivodeship	Class	Ranking of websites	Ranking of e-mail messages in Polish	Ranking of e-mail messages in English	Total ranking
			15 points	15 points	15 points	45 points
Człuchów (1)	pomorskie	A	14	13	11	38
Rybnik (1)	śląskie	A	7	13	11	31
Płock (1)	mazowieckie	A	8	13	9	30
Żoliborz (8)	mazowieckie	A	9.5	9	11	29.5
Rydułtowy (1)	śląskie	A	12	11	5	28
Kraków (1)	małopolskie	A	5	9	13	27
Ochota (8)	mazowieckie	A	7	9	11	27
Sosnowiec (1)	śląskie	A	5	9	13	27
Zgorzelec (1)	dolnośląskie	A	12	13	0	25
Bytom (1)	śląskie	A	12	7	5	24
Lubartów (1)	lubelskie	A	11	13	0	24
Suwałki (1)	podlaskie	A	13.5	11	11	35.5
Sochaczew (1)	mazowieckie	B	13	11	11	35
Racibórz (1)	śląskie	A	9	13	11	33
Tczew (1)	pomorskie	A	10.5	15	7	32.5
Konin (1)	wielkopolskie	A	9	11	11	31
Godów (2)	śląskie	B	9	13	9	31
Bielany (8)	mazowieckie	A	10	9	11	30
Aleksandrów Łódzki	łódzkie	A	7.5	15	7	29.5
Piekary Śląskie (1)	śląskie	A	11	9	9	29
Praga-Północ (8)	mazowieckie	A	7	11	11	29

Legend: (1) urban municipality; (2) rural municipality; (3) urban and rural municipality; (8) the district of the capital of Warsaw.

Source: https://ssl-kolegia.sgh.waw.pl/pl/KNoP/struktura/IP/struktura/zpiob/forum_gmin_na_5/Documents/Raport_Gmina_na_5_2022_23.pdf [accessed: 03.06.2023].

of electronic services is provided by offices located in the Śląskie (80%), Łódzkie (65%), and Małopolskie (65%) voivodeships. The lowest number is in Świętokrzyskie (31%) and Warmińsko-Mazurskie (40%) voivodeship. At the same time, in each voivodeship, there was an increase in the percentage of offices offering this type of service between 2012 and 2015 (Report, 2015). The provision by offices of access to their services using the Trusted Profile (Profil Zaufany) in 2015 was also investigated. It turned out that in the Śląskie, Dolnośląskie, Małopolskie, and Opolskie voivodeships, the percentage of such offices exceeds 90% and even approaches 100%. Meanwhile, the evaluation of the quality of services provided to potential investors and entrepreneurs by local government units at the municipality level was carried out by a research team operating at the Enterprise Department, College of Business Administration, Warsaw School of Economics (SGH). The electronic way of contact was studied – one-way communication, i.e. access to information using the Official Website (OWI), and two-way communication, i.e. contact via e-mail (Report, 2023). The survey focused primarily on the types of municipalities' stakeholders, i.e. potential investors and entrepreneurs. The survey covered 714 municipalities, including 18 districts of the capital city of Warsaw. The willingness of officials to interact and the readiness to engage with stakeholders were also taken into account in the survey. The report shows that the most awarded municipalities are located in the Mazowieckie (10) and Śląskie (9) voivodeships. The Municipality of Piekary Śląskie was highly ranked in terms of the evaluation of its website (11 points), the evaluation of e-mails in Polish (9 points), and the evaluation of e-mails in English (9 points), which amounted to a total of 29 points. This result allowed the Municipality of Piekary Śląskie to take 9th place among the awarded in the '*Gmina na piątkę*' (Municipality for 5) category and 20th place among all the '*Złota na piątkę*' (Golden for 5) and '*Na piątkę*' (For 5) municipalities (cf. Table 1).

Among the municipalities in the Śląskie voivodeship which were ranked highest (awarded the title of "*Złota Gmina na piątkę!*" / "Golden Municipality for 5") in terms of the evaluation of their Websites and e-mails in English and Polish were the following municipalities: Rybnik (31 points), Rydułtowy (28 points), Sosnowiec (27 points), Bytom (24 points). However, among the municipalities from the Śląskie voivodeship which were awarded the "*Na piątkę!*" / "For 5" municipality prize and ranked higher than Piekary Śląskie were the municipalities of Racibórz (33 points) and Godów (31 points).

Research methodology

The aim of the study was to assess the development of e-government in the Municipality of Piekary Śląskie, including e-services provided to citizens, and to determine their degree (level) of maturity. An analysis was carried out of the e-PUAP platform (i.e. the Platform of Electronic Services), on which the Municipality of Piekary Śląskie, in accordance with the Act of 17th February, 2005, on Informatisation of the Activities of Entities Performing Public Tasks (Journal of Laws 2005, No. 64, item 565), makes available e-services, owing to which it is possible to dispose of matters over the Internet without leaving home (cf. Figure 1). The ePUAP platform is dedicated to public entities, which acquire the necessary rights on the basis of, respectively: a positive application for granting functionality to a public entity on ePUAP, an agreement concluded with the Minister, or the Minister's approval. In the described case, the ePUAP platform replaced the previously functioning regional SEKAP platform, operating at the Piekary Śląskie City Hall until 14th November, 2021 (Maćkowski, 2012).

Figure 1. The public e-services (PeUP) platform

Source: https://eurzad.piekary.pl/#!/katalog/wszystkie/priorytet

The analysis carried out made it possible to conclude that the ePUAP platform of the Piekary Śląskie City Hall divided services into 16 areas, including (cf. Figure 2):

- construction, architecture, urban planning, protection of monuments – this area contains 32 cases, including 4 cases to be completed in person at the Office or by post. One of the services, entitled 'issuance of a certificate confirming the usable area and technical equipment of a single-family house', bears the information that 'the service card is under editing. The content may be incomplete";
- identity cards, registrations, elections – 39 service cards were included in this area, of which 1 matter concerning the notification of the finding of an identity card can only be performed in person at the City Hall;
- economic activity – 12 services provided entirely electronically;
- geodesy, cartography – 11 services completely electronically;
- public utilities – 9 services completely electronically;
- communication, road construction, and transport – 99 cases, including 1 service entitled: delivery of a certificate of attendance of a professional development workshop by an instructor and/or lecturer, in person or by post;
- culture, sport, tourism and education – 18 services provided entirely by electronic means; no service card was placed in the Education and Training sub-directory;
- immovable properties, residential and business premises – 55 cases were placed in this area, of which 10 cases in the field of housing and commercial premises management can be handled only in person at the Office or by post);
- the protection of consumer rights – 1 case to be handled entirely electronically;
- the preservation of environment – 21 cases, including 6 cases to be handled traditionally in person at the Office or by post;
- taxes and duties – 39 cases to be handled entirely electronically;
- agriculture, forestry, hunting, and fishing – 17 cases, including 5 cases handled in the traditional way, i.e. in person at the Office or by post;

– civil affairs – 15 cases, including 4 cases to be disposed of in the traditional way, i.e. in person at the Office or by post;
– births, marriages, deceases – 22 cases, including 9 cases to be handled in the traditional way, i.e. in person at the Office or by post;
– promotion and information about region – 1 case processed entirely by electronic means;
– other – 14 cases processed entirely electronically.

Figure 2. The menu of the ePUAP electronic platform

Source: https://eurzad.piekary.pl/#!/katalog/wszystkie/priorytet [accessed: 15.06.2023].

Table 1. Examples of public e-services for citizens and business people made available to citizens at particular maturity levels by Piekary Śląskie City Hall

Area of operation of the City Hall	Maturity levels of e-services			
	Information	**One-way interaction**	**Two-way interaction**	**Transaction**
Citizen affairs		– drawing up of a will; – procedure for awarding grants to non-governmental organisations; – organising visits to residents celebrating 90th, 100th and subsequent birthdays; – recognition of a foreign court decision commenced and finalised after 1st July, 2009 (countries outside the European Union) – notification of the establishment of a field organisational unit of an association registered with the National Court Register.	– Piekary Śląskie-Public consultation on part of the expenses of the Piekary Śląskie municipal budget.	– issuing permits for bringing bodies and remains from abroad for burial; – carrying out a public task as part of a local initiative; – recognising a person who has been served with a draft card for compulsory military service and a soldier in compulsory military service as having dependant family members; – recognising a person served with a draft card for compulsory military service and a soldier in compulsory military service as a soldier living alone; – issuing a decision concerning the payment of housing dues and fees to a soldier recognised as having dependant family members or as a soldier living alone; – payment of cash benefits for military exercises served; – issuing a permit to organise a mass event; – issuing a Big Family Card [Pol. *Karta Dużej Rodziny*]; – notification of entry in the register of ordinary associations;
Births, marriages and deaths	– notification (registration) of death; – change of name(s) of a child; – renaming a child after his/her mother's husband or father's wife.	– issuing a certificate stating that a marriage may be contracted (abroad) in accordance with Polish law; – contracting a marriage before the head of the register office (civil wedding); – contracting a religious marriage with civil effects (concordat wedding); – the acknowledgment of paternity; – acceptance of a declaration of return of a divorced person to the surname he/she used before marriage;		– the restoration of a civil status record made abroad; – the restoration of the content of a Polish civil status record; – correction of a civil status record; – transcription of a civil status record (transfer of a foreign civil status document to the civil status register); – the completion of a civil status record; – issuing certified copies and certificates of the civil status record;

Table 1 – continuation

Area of operation of the City Hall	Maturity levels of e-services			
	Information	**One-way interaction**	**Two-way interaction**	**Transaction**
		– issuing multilingual forms; – notification of birth of a child; – issuing a certificate of civil status.		– entry of a divorce decree made abroad in EU countries after 1st May, 2004; – issuing a permit to reduce the one-month waiting period for the celebration of a marriage; – golden jubilee; – decision to change name or surname; – certificate of not having a civil-status registry.
Business				– notification of entry in the central registration and information on business (CEiDG); – amendments to the entry in the central register and information on business (CEiDG); – notification on suspension of business activity; – notification on resumption of business activity; – notification of cessation of business activity; – issuing a licence to sell alcoholic beverages; – issuing a one-off permit to sell alcoholic beverages; – issuing a licence to sell alcoholic beverages; – issuing duplicate permits to sell alcoholic beverages, decisions and certificates; – issuing permits for sale of alcoholic beverages to entrepreneurs whose activity consists in supplying food for closed events organised at the time and place designated by the customer, based on the concluded contract; – paying for the use of permits for the sale of alcoholic beverages.

Source: Own elaboration.

The study used a four-stage maturity model for e-services in public administration, which includes the following stages: information, one-way interaction, two-way interaction, and transaction.

Examples of public e-services for citizens and entrepreneurs made available at different levels of maturity by the Piekary Śląskie City Hall are shown in Table 1. Three areas of activities and services provided by the City Hall were analysed: citizen affairs, births, deaths and marriages, and business.

The areas surveyed included a total of 49 cases and were divided according to the degree (level) of maturity they fulfil.

Scientific discussion

The benefits that arise from the provision of e-services in local government units include: a reduction in service delivery time, an increase in the number of services provided electronically, the simplification of customer service procedures, an increase in customer satisfaction with service observed by Employees, the elimination of the need for Customers to provide data that is already in the office's resources, and a reduction in the cost of customer service (Ejdys, 2018). In addition, benefits also accrue from the implementation of a properly formulated digitalisation strategy, the support of activities with own regional intellectual potential, and consistency in action (Baj-Rogowska & Zamiar, 2017). Research also shows that the use of ICTs in offices has saved time and reduced the financial effort as well as workload of officials (Budziewicz-Guźlecka, 2010).

The studies conducted after 2000 show that all over the world, it appeared that the maturity stage of e-government could be defined as formative or early transaction using M. Wimmer's typology[3] (Hawrysz, 2015). Some twenty years after the research had been conducted in this area, it can be assumed that the early transaction stage in local government units has been superseded by the transaction stage of the e-services maturity model.

A small percentage of local government offices declare the fact that they have a development strategy document for IT or digitisation (Walencik, 2018). The municipality of Piekary Śląskie also falls into this group, as it has not adopted a development strategy for IT or digitisation. From the analysis, it can be concluded that no digitisation strategy and/or IT strategy, directed at the expectations of the environment prior to the implementation of ICT solutions, has been formulated in the studied entity. The e-services implemented by the City Hall are a result of the introduced government initiative, i.e. the ePUAP platform, which was included for the first time in the State Informatisation Plan for 2007–2010 as one of the main IT projects aimed at building electronic administration in Poland. The electronic services platform of the Piekary Śląskie City Hall includes 393 service cards (cases), of which 42 service cards (which constitutes 10.69% of all cases posted on the ePUAP platform) are to be completed in a traditional manner, i.e. by traditional post or in person. The description of the remaining 351 service cards (representing 89.31% of all cases posted on the ePUAP platform) shows that they can be completed entirely electronically (marked with @ symbols). They can be classified in the fourth level of maturity of e-services, i.e. the transaction level. The area concerning the implementation of cases related

[3] The e-government maturity model proposed by M. Wimmer contains two stages (levels): the first one – formative, informational in nature, with downloadable forms, and the second one – transaction level, allowing users to complete a limited number of transactions via websites.

to business activity was covered by the fully electronic form (12 cases). The situation is different in the case of the area of citizen affairs and the area of births, marriages, and deaths, where there are services assigned to the information level (3 services), some of them to the maturity level of one-way interaction (13 services), two-way interaction (1 service), or, finally, the transaction level (20 services).

Some of the cases carried out between the office and the customer within the framework of the Piekary Śląskie City Hall will have the character of obligatory direct contact between the citizen and the employee of the office, e.g. the exchange of an ID card, where the citizen has to go to the office with an application which can be downloaded from the website. Some of the services provided by the office, due to their nature, will not be able to be provided electronically (e.g. arranging visits to city residents celebrating 90th, 100th, and subsequent birthdays, getting married). On the other hand, some of the services are provided by officials without the participation of the citizen in the process of case handling, after sending, e.g., a notice on the establishment of a field organisational unit of an association registered in the National Court Register (after submitting an appropriate application, within 1 month from the submission of a complete notice, an entry is made in the internal register of field organisational units of associations).

Previous studies on e-government solutions in local governments have addressed, among other things, the SEKAP platform operating in the Silesian province and its empirical and pragmatic dimensions. These studies concluded that the goal of e-government construction projects should be to make public e-services available to citizens, business representatives, and within public administration offices at least at the third level of maturity. The construction and development of e-government requires building awareness and improving the competence of citizens, businesses, and public administration offices in the field of public e-services. It is necessary to promote e-government projects among citizens, businesses, and public administration offices. In addition, the construction and development of e-government absolutely requires the involvement and close and constructive cooperation of central and regional authorities. Currently, local government units should focus on increasing the number of available public e-services, including more and more e-services at the fourth maturity level, as well as the number of public administration institutions providing e-services. Efforts should also be made to implement e-government in local government units at the fifth level of maturity, i.e. the so-called personalisation of public services.

Conclusions

The research shows that the interest in the development of e-government among researchers is great, because the topic is still up-to-date and has utilitarian values. Finally, taking into account the development of electronic communication technology, it should be pointed out that local government managers should continue to work on portals and, above all, the number of available public e-services should be increased, including more and more e-services at the fourth maturity level and the number of public administration institutions providing e-services. It is also necessary to strive for the implementation of e-government in local government units at the fifth level of maturity, which is the personalisation of public services, giving the possibility to remind the Citizen about the need to perform certain official activities and to provide certain services automatically, which do not require the Customer's intervention. It is also important to pay attention to the implementation and execution of digitisation and/or computerisation strategies in local

government units, directed at the expectations of the environment and considering the analysis and reorganisation of processes prior to the implementation of electronic communication solutions.

The study has limitations, as it only looked at the Polish electronic platform for public administration services (ePUAP) in one selected local government unit. Therefore, it can only be an introduction to further research. The survey can also be a prelude and a basis for a comprehensive diagnosis of the state of use of IT and technological tools and e-government development in all local government units in Poland, including the determination of the level of maturity at which they are. In future studies, statistical tools should be used to assess the information obtained. This will enable reliable conclusions to be drawn, supported by data.

In addition, future research can focus on the tangible benefits of e-services provided by local government in Poland for stakeholders such as citizens, municipalities, policymakers, and employees.

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Funding
This research received no external funding.
Research Ethics Committee
Not applicable.
Conflicts of Interest
The author/autors declare no conflict of interest.

Published by Malopolska School of Public Administration – Krakow University of Economics, Krakow, Poland.
Data Availability Statement
All data will be available and shared upon request.

doi: 10.15678/PG.2023.64.2.05

Journal of Public Governance
No. 2(64)/2023
ISSN 2956-6061
e-ISSN 2956-6398

Katarzyna Brożek

Innovative Activities of Public Sector Enterprises in the Context of Poland's Economic Growth in 2012–2021

Abstract

Objectives: The principal aim of the paper is to analyse and assess the impact of the innovative activities of public sector enterprises on the change in GDP per capita in Poland. The object of the research turned out to be public sector enterprises, but the analysis was extended to include NUTS2 units. Therefore, 16 Polish Provinces were examined in this respect. The research period covered the years 2012–2021.

Research Design & Methodology: In the theoretical part, a critical analysis of the literature on the subject was used, while in the empirical part, statistical analysis was provided. The empirical analysis included the characterisation of the selected features, an analysis of basic descriptive statistics, and an analysis of the obtained results. The collected data was prepared using descriptive statistics – mean values, median, minimum and maximum values, first and third quartiles, and distance from the average value, as well as changes in relation to the base year. Several predictors were identified and determined in an arbitrary manner, allowing research to be conducted and conclusions to be drawn. Pearson correlation analysis was also used, the results of which made it possible to determine the strength of the relationship between the examined measures in the field of innovative activities of public sector enterprises and Poland's economic growth.

Findings: The main conclusions at the national level include, firstly, that in the analysed period in the Polish economy, on average 26% of public sector enterprises were innovative industrial entities.Secondly, the most frequently introduced type of innovation in the surveyed sector were new or improved processes; the average percentage of enterprises generating this type of activity was 24%. Thirdly, on average, 19.4% of public sector enterprises incurred expenditure on innovation activities, but in 2021, this percentage increased by slightly over 3 percentage points.However, at the regional level, the following regularities can be formulated. Firstly, both in terms of the highest average percentage of innovative industrial enterprises and the highest average expenditure on innovative activities, the Silesian Province was the leader, followed closely by the Masovian Province. A completely different situation concerned the regions for which the percentages of these predictors turned out to be the lowest, i.e. the Lubusz Province and the Warmian-Masurian Province. Secondly, the average share of net revenues from the sale of innovative products in total net revenues from sales in three Provinces, i.e. Pomeranian, Sub-Carpathian, and Łódź, turned out to be higher than the average share for Poland.

Implications/Recommendations: The practical implication of the study may be the identification of several predictors of innovative activity of the public sector that influences Poland's economic growth (measured by the growth dynamics of GDP per capita); the obtained results provide some scope for applying a targeted policy aimed at developing the innovativeness of public sector enterprises in Poland on the one hand, and at improving the attractiveness and competitiveness of the economy on the international arena on the other.

Contribution/Value Added: The practical implication of the study may be the identification of several predictors of innovative activity of the public sector that influences Poland's economic growth (measured by the growth dynamics of GDP per capita); the obtained results provide some scope for applying a targeted policy aimed at developing the innovativeness of public sector enterprises in Poland on the one hand, and at improving the attractiveness and competitiveness of the economy on the international arena on the other.

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Keywords: innovations, enterprises, public sector, Poland, NUTS 2 regions

Article classification: research article

JEL classification: O32, O47, R11

Introduction

The complex interconnections between innovation activities and economic growth have long been the subject of multidisciplinary research, the consequences of which extend to various sectors. Within this connection, the role of innovative activities of the public sector appears as a key factor that shapes not only the employment landscape, but also economic efficiency. In Poland, a country characterised by dynamic economic growth, examining the evolution of innovative activities of the public sector in the context of economic growth, measured by the change in Gross Domestic Product (GDP) per capita, is of profound scientific and practical importance. The paper discusses the theoretical and empirical bases of various connections in which the development of innovative activities of the examined sector may affect the dynamics of GDP per capita both in Poland and in NUTS2 regions. The aim of these considerations is to analyse and assess the impact of the innovative activities of public sector enterprises on the change in GDP per capita in Poland.

The research problem:

An analysis of the impact of the determinants of innovation in public sector enterprises on Poland's economic growth

The research questions:

1. Can there be found any relationship between the percentage of innovative enterprises in the public sector and GDP per capita?
2. Is there a relationship between the percentage of public sector enterprises incurring expenditure on innovative activities and GDP per capita?
3. Does the percentage of net revenues of enterprises from the sale of innovative products affect the dynamics of GDP growth, and to what extent?

The research hypotheses:

1. There is a relationship between the percentage of innovative enterprises in the public sector and economic growth measured by GDP per capita.
2. There is a relationship between the percentage of public sector enterprises incurring expenditure on innovative activities and GDP per capita.
3. The percentage of net revenues of enterprises from the sale of innovative products moderately shapes the value of GDP per capita, contributing to economic growth.

In the theoretical part, a critical analysis of the literature on the subject was used, while in the empirical part, statistical analysis was provided. The necessary statistical data was taken from the Local Data Bank (GUS, BDL, 2023). The empirical analysis included the characterisation of the selected features, an analysis of basic descriptive statistics, and an analysis of the obtained results. The collected data was prepared using descriptive statistics – mean values, median, minimum and maximum values, first and third quartiles, and distance from the average value, as well as changes in relation to the base year. Several predictors were identified and determined in an arbitrary manner, allowing research to be conducted and conclusions to be drawn. Pearson correlation analysis was also used, the results of which made it possible to determine the strength of the relationship between the examined measures in the field of innovative activities of public sector enterprises and Poland's economic growth.The latter was divided into two parts. The first one discussed the conclusions at the national level, while the second one presented its results obtained at the regional level.

The practical implication of the study may be the identification of several predictors of innovative activity of the public sector that influences Poland's economic growth (measured by

the growth dynamics of GDP per capita); the obtained results provide some scope for applying a targeted policy aimed at developing the innovativeness of public sector enterprises in Poland on the one hand, and at improving the attractiveness and competitiveness of the economy on the international arena on the other.

The innovative activity of the public sector enterprises – theoretical analysis

Innovations are widely recognised as a source of economic growth and competitiveness. Macroeconomists focus primarily on the innovativeness of national economies and the innovativeness of regions. However, entrepreneurs and managers are looking for new solutions relating to products and production processes that allow achieving and maintaining a lasting competitive advantage (Weresa, 2014, p. 11). Due to the high complexity of innovation processes taking place in enterprises and the variety of their forms, it is worth presenting several definitions and basic types of innovations (Table 1).

In the 1930s, the concept of innovation was one of the first to be formulated by J. Schumpeter (1934); The scholar defined it as the activity of entrepreneurs based on "[…]creating new combinations of existing production factors in conditions where the result of this process cannot be easily predicted" (Marciniec, 2009, pp. 3–4). However, the definition of innovation according to the OECD and the European Commission describes innovation as the use in economic practice of new or significantly improved products (goods or services), processes, marketing and organisational methods, changes in work organisation, and relations with the environment (OECD, 2005, p. 46). Most definitions of innovation emphasise the novelty of the proposed solution. S. Kuznets, for example, considers the originality and uniqueness of a new solution as a criterion for innovative activity. Following Kuznets (1959), innovations constitute, therefore, a new application of knowledge to the production process (or these that initiate the use of inventions). Nevertheless, according to most researchers, innovation does not have to be a breakthrough discovery on a global scale.

Innovative activity is the entirety of scientific, technical, organisational, financial, and commercial activities that actually lead or are intended to lead to the implementation of innovations. Some of these activities are innovative in themselves, while others are not new but are necessary to implement innovation. Innovative activities also include research and development (R&D) activities that are not directly related to the creation of a specific innovation (OECD & Eurostat, 2005, p. 49).

Polish topical literature is rich in various works dealing with different innovative activities. Wolnyet et al. (2016), Kuś (2020), or Kosała et al. (2021), for example, offer the following lists of authors dealing with this issue: M. Kosała, K. Zieliński, I. Czaja, Z. Michalik, M. Urbaniec, B. Rogoda, A. Kuś, R. Wolny, A. Dąbrowska, M. Jaciow, L. Kuczewska, S. Tajer, K. Wasilik, U. Kłosiewicz-Górecka, R. Nowacki, and many others.

According to A. Krzepicka and J. Tarapata (2012, p. 168) innovative activity is understood as the conscious and purposeful introduction of a variety of changes that cause positive economic, technical, social, and ecological effects, being also observed in the sphere of management. It requires the company's inclination and ability to develop and adopt new and improved products, provided services, or technologies to be used. Another definition of innovative activity is proposed by L. Białoń (2008, p. 16), who explains that this activity refers to the development and introduction of new (or the modernisation of existing) products and services; it can also refer to

the application of technological processes, organisational systems, entry into new markets, and orvarious changes in production factors, or methods obtaining them.

Table 1. Types of innovations according to selected authors

Author/s/	Types of innovation
Oslo Manual	• product – changes in the offer of products and services. They involve introducing a completely new offer or improving already manufactured products to best meet customer needs; • process – changes in the way products and services are created and distributed. They concern the implementation of new and improvement of existing production methods and supply chains; • marketing – changes regarding, e.g. new communication strategies, prices, promotions, target groups and distribution models; • organisational – changes in the field of new methods and principles of operation, or these of human resources management system. The main goal of these innovations is to improve work efficiency and employee satisfaction.
R. A. Webber	• routine – minor changes to the product, primarily aimed at maintaining its attractiveness; • forced – carried out when problems occur to get the company out of the crisis; • resulting from opportunities when prosperous companies can afford to invest in changing their offer or supplementing it with new products.
D. Smith	• product – innovative products are visible and have a physical form, e.g. a smartphone; • service – innovative services are usually invisible things, such as the health care system or education, where consumers use the services but do not actually purchase a specific item; • process – innovation in the form of new equipment, new methods or systems.
R. M. Henderson & K. B. Clark	• incremental – improve products existing on the market by modifying their components, but these components are not radically changed and the system remains unchanged; • radical – establishes a new dominant design and therefore the core part of the design concept is embodied in components that are combined into a new architecture; • modular – they use the architecture and configuration combined with the existing system of the adopted product, but introduce new components to create a different design concept; • architectural – components remain unchanged but the system configuration changes as soon as new connections are established.
J. Tidd & Bessant	• product – mean changes in products (products or services) that a given organisation offers on the market; • process – changes in the way products are manufactured and delivered to the market; • positioning – any changes in the context in which products or services are introduced; • paradigm – changes in basic mental models (imaginations) that formulate and define what a given organisation does.

Source: Own elaboration after: OECD & Eurostat, 2005; Godyń, 2023; Webber, 1996; Smith, 2009, p. 25; Henderson & Clark, 1990, pp. 9–30; Christensen, 1997, p. 35; Tidd & Bessant, 2013, pp. 24–29.

Innovative activity can take various forms. Following the data given by the Central Statistical Office (2015, p. 3); OECD & Eurostat (2005, pp. 96–102), and/or Zastempowski (2016, pp. 60–61), such possible types of innovative activity of enterprises may include:

- the acquisition of technologically-advanced machines and devices, means of transport, tools, instruments, movable property, and equipment in order to produce new or significantly improved products or processes;
- the acquisition of knowledge from external sources (patents, unpatented inventions, know-how, and other types of knowledge from subsequent enterprises or organisations) for the implementation of product and process innovations;
- the acquisition of software related to the introduction of product and process innovations;
- R&D work acquired externally;

- internal R&D work performed in the enterprise;
- staff training directly related to the introduction of new or significantly improved products and processes;
- activities related to the design, improvement, and change of the form or appearance of new or significantly improved products;
- marketing related to the introduction of new or significantly improved products;
- other preparations for the introduction of new or significantly improved products or processes.

It is also worth noting here that – in a less precise way – public sector enterprises (PSE) are also referred to as state-owned enterprises. Isolating and defining these entities is problematic (Christiansen, 2011) due to the fact that there is a whole spectrum of enterprises with mixed state-private ownership. M. Bałtowski and P. Kozarzewski (2016, p. 7) emphasise that the constitutive feature of public sector enterprises actually means their corporate control by the state, which can be exercised not only through ownership tools. In such a case, the state has the actual ability to influence any decision regarding this type of entities, what may include: appointing company bodies, dividing profits, or building a development strategy, to name but few.

A review of Polish and international literature on the subject clearly shows that the category of a state-owned enterprise (SOE) seems to be one of the most imprecisely defined items in economic sciences. In the topical English-language literature, in addition to the commonly used term *state owned enterprises*, one can also find terms such as: state controlled enterprises, public sector enterprises, state companies, public corporations, public enterprises, government-controlled companies, government companies, etc. The OECD defines public enterprises as economic entities in which the state, directly and indirectly, has 100% or majority ownership shares (OECD, 2010).

Authors such as D. Shapiro, S. Globerman, A. Cuervo-Cazurra, A. Inkpen, A. Musacchio, K. Ramaswamy include the term *state-owned enterprise* only in entities controlled by the state, without majority ownership shares (cf. Shapiro & Globerman, 2009; Cuervo-Cazurra et al., 2014). However, for example, A. Musacchio and S.G. Lazzarini (2014) use the terms *majority SOEs* (when state ownership is full or majority) or *minority SOEs* (when state ownership is minority).

The innovative activity of public sector enterprises – statistical analysis

Innovative enterprises

It was decided that the empirical part of the study should begin with the examination of the percentage of innovative enterprises in the public sector. Innovative industrial enterprises are industrial enterprises that have introduced at least one product or business process innovation (a new or improved product or a new or improved business process) to the market during the period under review. Statistical data and calculations of basic descriptive statistics are presented in Table 2.

Analysing the data in Table 2, it can be seen that in the years 2012–2021, the percentage of innovative industrial enterprises in the Polish public sector was characterised by a variable trend. This can be best observed by analysing the last three periods examined. Namely, 2019 was the least favourable in this respect, as a minimum value of 22.1% was recorded. However, only two years later, the maximum value for the examined period was obtained, i.e. 34.4%. Consequently, comparing the base year (2012) with the current period (2021), an increase of almost 11 percentage points can be noted. In the Polish economy in 2012–2021, on average, 26.32% of innovative industrial enterprises operated in the public sector.

Table 2. Innovative industrial enterprises in Poland and NUTS 2 regions in 2012–2021 [%]

Name	All together										Changes compared to 2012	Distance from the 2021 average size
	Public sector											
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[p.p.]	[p.p.]
Poland	23.49	23.84	24.79	25.30	28.13	26.17	26.8	22.1	28.2	34.4	10.91	–
Lower Silesian	22.41	24.60	25.38	24.60	30.58	26.83	26.6	17.6	25.8	28.7	6.29	–5.7
Kuyavian-Pomeranian	27.50	24.69	24.05	22.62	28.38	29.33	27.9	24.4	32.9	31.0	3.50	–3.4
Lublin	20.00	31.17	22.97	32.39	34.29	31.94	30.8	20.0	26.7	39.7	19.70	5.3
Lubusz	15.56	8.89	8.33	6.12	13.04	14.89	29.2	26.1	25.0	28.6	13.04	–5.8
Łódź	14.10	18.52	19.72	19.12	24.19	27.87	24.6	18.6	21.7	32.2	18.10	–2.2
Little Poland	31.73	20.00	24.27	25.77	25.00	22.45	26.5	25.5	30.8	41.3	9.57	6.9
Masovian	25.32	28.21	26.85	28.86	31.01	32.33	33.8	26.4	31.8	38.6	13.28	4.2
Opole	22.22	18.18	24.53	26.42	38.00	26.42	18.9	17.0	26.4	25.0	2.78	–9.4
Sub-Carpathian	28.57	26.09	26.83	24.39	24.36	22.22	22.2	17.7	24.4	34.1	5.53	–0.3
Podlasie	14.29	16.67	9.76	13.95	26.19	27.91	30.2	26.8	32.6	35.6	21.31	1.2
Pomeranian	18.60	19.78	29.89	26.37	25.30	19.28	23.3	15.6	27.1	41.1	22.50	6.7
Silesian	35.80	36.25	41.96	39.58	40.00	35.88	37.3	35.3	36.1	49.3	13.50	14.9
HolyCross	31.71	23.91	25.58	30.23	30.95	27.27	23.3	23.3	31.1	26.8	–4.91	–7.6
Warmian-Masurian	18.18	18.87	17.48	20.95	16.00	17.17	14.0	18.2	21.7	21.1	2.92	–13.3
Greater Poland	20.27	18.67	21.53	22.08	26.06	23.65	26.9	19.6	28.2	34.2	13.93	–0.2
West Pomeranian	14.29	22.86	21.79	20.83	25.68	24.66	23.2	20.9	23.2	19.4	5.11	–15.0

Table 2 – continuation

	Positional measures of statistical description					
	Average	**MIN**	**Q_1**	**Me**	**Q_3**	**MAX**
Poland	26.32	22.10	24.08	25.74	27.80	34.40
Lower Silesian	25.31	17.60	24.60	25.59	26.77	30.58
Kuyavian-Pomeranian	27.28	22.62	24.47	27.70	29.09	32.90
Lublin	29.00	20.00	23.90	30.99	32.28	39.70
Lubusz	17.57	6.12	9.93	15.23	25.83	29.20
Łódź	22.06	14.10	18.73	20.71	24.50	32.20
Little Poland	27.33	20.00	24.45	25.64	29.73	41.30
Masovian	30.32	25.32	27.19	29.94	32.20	38.60
Opole	24.31	17.00	19.73	24.77	26.42	38.00
Sub-Carpathian	25.09	17.70	22.76	24.40	26.65	34.10
Podlasie	23.40	9.760	14.89	26.50	29.63	35.60
Pomeranian	24.63	15.60	19.41	24.30	26.92	41.10
Silesian	38.75	35.30	35.94	36.78	39.90	49.30
HolyCross	27.42	23.30	24.33	27.04	30.77	31.71
Varmian-Masurian	18.37	14.00	17.25	18.19	20.43	21.70
Greater Poland	24.12	18.67	20.59	22.87	26.69	34.20
West Pomeranian	21.68	14.29	20.85	22.33	23.20	25.68

Source: Own elaboration and calculations after: GUS, BDL, 2023.

Moving on to the regional (provincial) system, it should be observed that on average in the years 2012–2021, the majority of innovative industrial enterprises were located in the Silesian Province (38.75%). The second place belonged to the Masovian Province (30.32%), while the last place on the podium belonged to the Lublin Province (29%). A completely different situation occurred in the regions where the lowest average percentages were recorded. This group includes the following NUTS 2 regions – Lubusz (17.57%), the Warmian-Masurian Province (18.37%), and the West Pomeranian Province (21.68%).

An interesting aspect may be the question whether the regional classification will look completely different when only the last year examined is taken into account? Comparing the results of individual provinces to the average percentage of Poland in 2021, one can get the right impression that once again it was the Silesian Province that reigned supreme in terms of the percentage of innovative industrial enterprises. This province gained an advantage of almost 15 percentage points over Poland in general. The remaining provinces that achieved a positive distance from the average value recorded several times worse results. For example, the second place belonged to the Lesser Poland Province(less than 7%), followed by the Pomeranian Province, the Lublin Province, and the Masovian Province. In 2021, in the Podlasie Province, the percentage of operating innovative industrial entities was also higher than the average percentage describing the entire Polish economy; this difference, however, was not clear, as it amounted to just over 1 percentage point.

In terms of the number of innovative enterprises in the public sector, 2021 was the year in which ten Polish provinces got worse results than the average value of 34.4%. Three of all regions definitely had the most to make up for compared to the Polish average. These were: the West Pomeranian Province (-15 percentage points), the Warmian-Masurian Province (-13.3%), and the Opole Province (-9.4%). The Greater Poland Province (-0.2 p.p.) and the Sub-CarpathianProvince (-0.3 p.p.) lost the least compared to the average value.

Subsequently, it was decided that the percentage of innovative industrial enterprises in the Polish public sector should be looked at according to the types of innovations introduced; the data is presented in Figure 1.

In Poland, in the years 2012–2021, innovative industrial enterprises in the public sector were most likely to introduce new or improved processes; the average percentage of enterprises generating this type of activity was 24%. The second most commonly observed issues were new or improved products; in this case, the average was 8.75% of enterprises introducing this type of innovations. The third, the least common type of innovation included new or improved products for the market, with an average of 3.48%.

Process innovations dominated among the surveyed enterprises. For example, in 2021, the maximum value was obtained, which meant that less than every third entity in the public sector introduced this type of innovation. The minimum value described the initial year and then public sector enterprises introducing this type of innovations accounted for 20.08%. A value similar to the one found in the base year was obtained in 2019; then this percentage was 0.82 percentage points higher more.

In the years 2012–2021, the percentage of enterprises from the analysed sector introducing product innovations fluctuated in the range of ≤7.48; 9.9≥. This means, for example, that in the best year for product innovations, i.e. 2018, approximately every tenth public sector enterprise introduced new or improved products. In the case of new or improved products for the market, a very clear and annoying pattern should be observed; namely,it could be seen that from year to year this type

of innovative activity loses importance. This is evidenced by the continuous downward trend from the base year to 2020. Although a slight increase of 0.1 percentage points was recorded in 2021, this still can be considered insignificant.

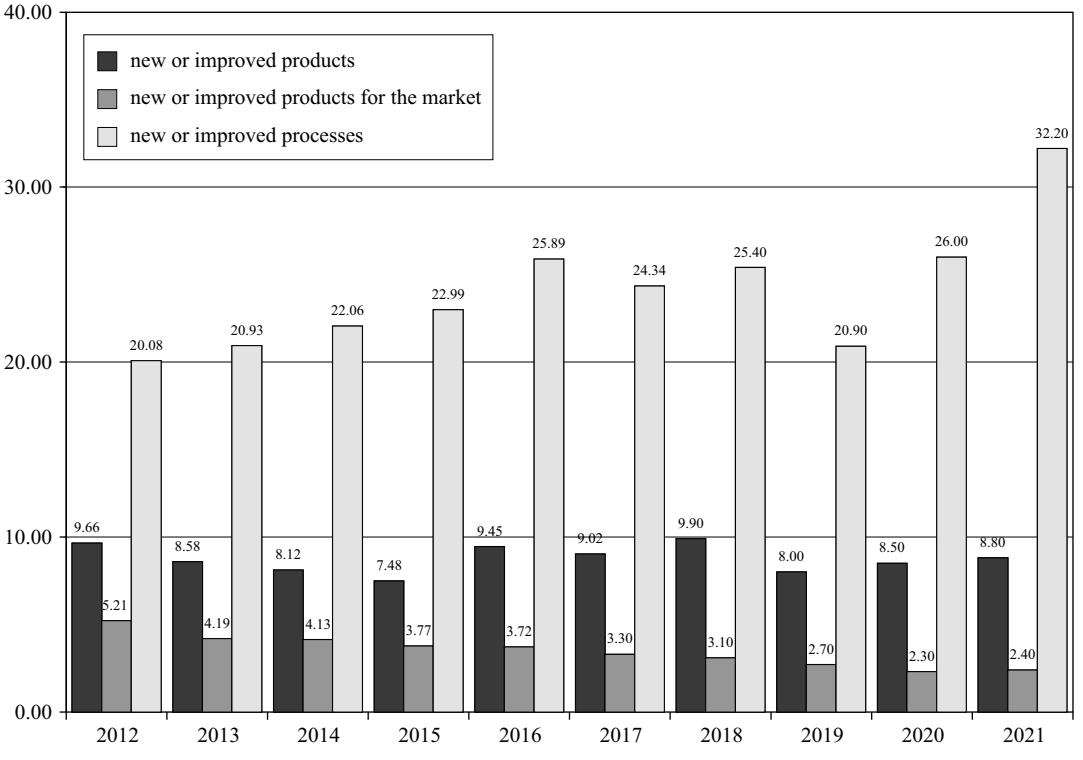

Figure 1. Innovative industrial enterprises in the public sector by types of innovations introduced in Poland in 2012–2021 [in %]

Source: Own elaboration after: GUS, BDL, 2023.

Enterprises incurring expenditure on innovative activities

The following part of the considerations was devoted to verifying the percentage of industrial enterprises from the public sector that incurred expenditure on innovative activities. Table 3 collects the necessary data and calculates basic statistical measures.

Analysing the data in Table 3, it can be seen that the percentage of industrial enterprises from the public sector that incurred expenditure on innovative activities in the years 2012–2021 changed. Initially, from 2012, there was an upward trend for the next few years, but in 2017–2020, there was a downward trend. However, this trend was stopped, because in the following year (2021), a record increase was observed and it was in the last of the analysed periods that the maximum value was achieved. This means that 22.5% of industrial enterprises in the public sector allocated expenditure on innovative activities. Comparing the base year with the current period, we can talk about an increase of 2.83 percentage points, while comparing 2021 with 2020, we can talk about a much higher increase in this percentage, and the difference was as much as 7 percentage points.

Table 3. Industrial enterprises that incurred expenditure on innovative activities in Poland and NUTS 2 regions in 2012–2021 [%]

Name	Enterprises										Changes compared to 2012	Distance from the 2021 average size
	Public sector											
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	p.p.	p.p.
Poland	19.67	19.78	20.59	20.34	21.80	19.72	17.6	16.1	15.5	22.5	2.83	–
Lower Silesian	18.97	16.67	16.15	17.46	22.31	20.33	15.6	9.2	12.5	17.8	–1.17	–4.7
Kuyavian-Pomeranian	21.25	22.22	24.05	19.05	24.32	24.00	17.7	18.0	20.3	28.2	6.95	5.7
Lublin	18.57	23.38	17.57	18.31	18.57	12.50	18.0	13.3	0.0	14.7	–3.87	–7.8
Lubusz	13.33	8.89	8.33	6.12	10.87	8.51	10.4	8.7	14.6	22.4	9.07	–0.1
Łódź	11.54	14.81	12.68	8.82	17.74	19.67	19.3	15.3	15.0	22.0	10.46	–0.5
Little Poland	21.15	14.29	22.33	20.62	15.63	17.35	16.7	21.3	15.4	20.2	–0.95	–2.3
Maasovian	21.43	24.36	23.49	28.19	31.01	28.57	27.8	21.4	22.7	31.1	9.67	8.6
Opole	20.37	20.00	28.30	24.53	28.00	18.87	17.0	17.0	15.1	14.6	–5.77	–7.9
Sub-Carpathian	23.81	23.91	24.39	15.85	21.79	22.22	14.8	13.9	0.0	29.4	5.59	6.9
Podlasie	9.52	14.29	9.76	11.63	19.05	11.63	11.6	4.9	9.3	24.4	14.88	1.9
Pomeranian	15.12	16.48	22.99	19.78	20.48	18.07	18.9	16.7	16.5	27.8	12.68	5.3
Silesian	38.27	32.50	35.66	37.50	37.04	29.77	27.0	32.8	24.8	32.9	–5.37	10.4
Holy Cross	19.51	19.57	23.26	23.26	21.43	18.18	20.9	16.3	0.0	19.5	–0.01	–3.0
Warmian-Masurian	12.12	15.09	13.59	14.29	10.00	12.12	7.0	8.1	12.4	12.6	0.48	–9.9
Greater Poland	16.22	15.33	15.28	18.83	19.72	18.92	14.5	15.5	12.8	18.1	1.88	–4.4
West Pomeranian	9.09	20.00	17.95	16.67	13.51	12.33	15.9	11.9	8.7	12.5	3.41	–10.0

Table 3 – continuation

	Positional measures of statistical description					
	Average	**MIN**	**Q_1**	**Me**	**Q_3**	**MAX**
Poland	19.4	15.50	18.12	19.75	20,53	22.50
Lower Silesian	16.7	9.20	15.74	17.07	18.68	22.31
Kuyavian-Pomeranian	21.9	17.70	19.36	21.74	24.04	28.20
Lublin	15.5	0.00	13.65	17.79	18.51	23.38
Lubusz	11.2	6.12	8.56	9.65	12.72	22.40
Łódź	15.7	8.82	13.21	15.15	18.91	22.00
Little Poland	18.5	14.29	15.90	18.78	21.02	22.33
Maasovian	26.0	21.40	22.90	26.08	28.48	31.10
Opole	20.4	14.60	17.00	19.44	23.49	28.30
Sub-Carpathian	19.0	0.00	15.06	22.01	23.89	29.40
Podlasie	12.6	4.90	9.58	11.62	13.63	24.40
Pomeranian	19.3	15.12	16.55	18.49	20.31	27.80
Silesian	32.8	24.80	30.45	32.85	36.70	38.27
HolyCross	18.2	0.00	18.51	19.54	21.30	23.26
Warmian-Masurian	11.7	7.00	10.53	12.26	13.34	15.09
Greater Poland	16.5	12.8	15.29	15.86	18.65	19.72
West Pomeranian	13.9	8.7	12.01	13.01	16.48	20.00

Legend: 0 – no information, the need to maintain statistical confidentiality, or it was impossible to complete the item.

Source: Own elaboration and calculations after GUS, BDL,2023.

The median for the percentage of industrial enterprises in the public sector allocating expenditure on innovative activities in the period under study in Poland was 19.75%, which means that 50% of the examined observations were characterised by a percentage of enterprises allocating more than this amount for this purpose, and the remaining 50% – below.

Analysing the average percentage of public sector enterprises providing funds for innovative activities, by territorial division, it should be noted that the Silesian Province took the lead again. It was in this region that in the years 2011–2021, on average, less than every third industrial enterprise from the examined sector allocated expenditure on innovative activities(more precisely, it was 32.8% of all enterprises). The Masovian Province came second in the ranking, but was already 6.8 percentage points behind the leading region; the third place was taken by the Kuyavian-Pomeranian Province, with a loss of 10.9 percentage points to the leader. The lowest percentage of enterprises allocating expenditure on innovative activities belonged to the Lubusz Province (11.2%) and the Warmian-MasurianProvince (11.7%), which were 21.6 and 21.1 percentage points, respectively, behind the Silesian Province.

It can be observed that when examining the regional values from 2021 in relation to the average one describing whole Poland, only six provinces managed to record higher results. As was the case with the previous measure, here too, the group of provinces with higher results than the Polish average included: Silesia, Masovia, Pomerania, Podlasie; in this case, they were also joined by the Sub-Carpathian and Kuyavian-Pomeranian Provinces. The leading province was again the Silesian Province. The province that lost the least to the Polish average was the Lubusz Province (only 0.1 p.p.), followed by the Łódź Province with a loss of 0.5 p.p. By far the smallest percentage of enterprises allocating expenditure on innovative activities occurred in the West Pomeranian Province and the Warmian-Masurian Province (the distance from the average value ~ 10 percentage points).

Once again, the Silesian Province deserves special attention, as it achieved the maximum value in the analysed period in the base year (at that time it was 38.27% of public sector enterprises providing funds for innovative activities). The minimum value for this province concerned 2020, in which a percentage of 24.8% was obtained. At the same time, the Podlasie Province, with the minimum value for the entire set (4.9%), was placed on the opposite continuum. For this NUTS 2 region, the worst period was definitely 2019, when only every twentieth entity from the analysed sector allocated expenditure on activities related to innovation.

2.3. Revenues of industrial enterprises from the sale of innovative products

The last part of the research was devoted to analysing net revenues from the sale of innovative products of the analysed sector to enterprises. The necessary data describing this measure, together with the calculations of positional measures of statistical description, are presented in tabular form(Table. 4).

When examining the share of net revenues from the sale of innovative products in total net revenues from sales in the years 2012–2021 in the Polish public sector, it should be noted that the average share was 6.47%. When it comes to an extended analysis of this measure, one can certainly notice a relatively large spread of values from the average value, which indicates a large range of values. For example, the range in this case was 14.78, which can be interpreted as a significant dispersion of the values of statistical features in the analysed population. This means that in the base year, the share of net revenues from the sale of innovative products in total net

Table 4. Net revenues from the sale of products of innovative industrial enterprises in Poland and NUTS 2 regions in 2012–2021 [%]

Name	Share of net revenues from the sale of innovative products in total net revenues from sales										Changes compared to 2012	Distance from the 2021 average size
	Public sector											
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	p.p.	p.p.
Poland	16.78	7.99	12.31	7.72	4.11	4.63	3.9	2.7	2.6	2.0	–14.78	–
Lower Silesian	6.17	4.06	2.86	0.70	1.16	1.83	0.8	0.6	0.5	0.3	–5.87	–1.7
Kuyavian-Pomeranian	1.19	1.92	1.98	2.50	2.68	3.97	1.0	5.6	3.2	0.0	–1.19	–2.0
Lublin	1.53	0.71	0.41	0.00	1.04	0.86	1.1	0.5	0.8	0.0	–1.53	–2.0
Lubusz	3.56	3.94	3.82	3.87	4.05	4.40	0.9	1.1	0.0	0.0	–3.56	–2.0
Łódź	7.95	11.13	12.62	9.41	4.18	6.12	7.0	7.3	0.0	0.0	–7.95	–2.0
Little Poland	0.25	0.39	0.75	1.40	2.62	4.51	15.7	16.1	0.8	0.6	0.35	–1.4
Maasovian	1.28	0.60	0.92	1.13	0.83	0.85	1.2	1.7	1.6	0.6	–0.68	–1.4
Opole	1.27	1.13	0.93	1.14	1.00	2.80	1.8	2.8	0.0	0.0	–1.27	–2.0
Sub-Carpathian	15.51	10.74	11.29	7.77	18.63	25.72	28.1	24.7	0.0	0.0	–15.51	–2.0
Podlasie	0.27	0.14	0.01	0.00	4.57	2.39	2.6	0.1	0.2	0.0	–0.27	–2.0
Pomeranian	61.38	25.24	43.50	28.38	12.81	13.33	7.9	0.5	0.0	0.0	–61.38	–2.0
Silesian	0.69	0.51	0.61	0.67	1.26	1.36	1.1	1.6	2.6	1.9	1.21	–0.1
Holy Cross	1.08	3.74	2.39	3.56	2.03	0.48	2.9	3.4	0.0	0.2	–0.88	–1.8
Warmian-Masurian	0.76	1.06	1.31	0.68	0.10	0.00	0.4	0.4	0.0	0.0	–0.76	–2.0
Greater Poland	0.16	0.54	0.15	1.06	0.27	1.13	1.6	2.7	0.5	0.3	0.14	–1.7
West Pomeranian	0.32	0.19	0.29	0.35	0.27	0.28	2.0	3.6	0.1	0.0	–0.32	–2.0

Table 4 – continuation

	Positional measures of statistical description					
	Aversge	**MIN**	**Q_1**	**Me**	**Q_3**	**MAX**
Poland	6.47	2.00	3.00	4.37	7.92	16.78
Lower Silesian	1.90	0.30	0.63	0.98	2.60	6.17
Kuyavian-Pomeranian	2.40	0.00	1.37	2.24	3.07	5.60
Lublin	0.70	0.00	0.43	0.76	1.00	1.53
Lubusz	2.56	0.00	0.95	3.69	3.92	4.40
Łódź	6.57	0.00	4.67	7.15	9.05	12.62
Little Poland	4.31	0.25	0.64	1.10	4.04	16.10
Maasovian	1.07	0.60	0.84	1.03	1.26	1.70
Opole	1.29	0.00	0.95	1.14	1.67	2.80
Sub-Carpathian	14.25	0.00	8.51	13.40	23.18	28.10
Podlasie	1.03	0.00	0.03	0.17	1.86	4.57
Pomeranian	19.30	0.00	2.35	13.07	27.60	61.38
Silesian	1.23	0.51	0.68	1.18	1.54	2.60
Holy Cross	1.98	0.00	0.63	2.21	3.28	3.74
Warmian-Masurian	0.47	0.00	0.03	0.40	0.74	1.31
Greatrer Poland	0.84	0.15	0.28	0.52	1.11	2.70
West Pomeranian	0.74	0.00	0.21	0.29	0.34	3.60

Legend: 0 – no information, the need to maintain statistical confidentiality, or it was impossible to complete the item.

Source: Own elaboration and calculations after GUS, BDL,2023.

revenues from sales was 16.78%, and in the last comparable year, this percentage was only 2%. The highest share was recorded in the years 2012–2015, when values in the range ≤7.72 were obtained; 16.78≥. In the following years, this share was much lower, as it was in the range of ≤4.63; 2.0≥.

The first quartile value of 3 obtained for Poland meant that 25% of observations were lower or equal to the value of the first quartile, while 75% of observations were equal to or greater than the value of Q1. Interpreting the value of the third quartile, it can be stated that 75% of observations had a percentage lower than or equal to 7.92%, and 25% of observations had a percentage equal to or higher than the Q3 value.

Moving on to the regional analysis, it should be noted that in the years 2012–2021, only three provinces managed to obtain an average value higher than that describing Poland. Namely, this concerned, first of all, the Pomeranian Province, which obtained an average percentage of 19.30%. In addition, it is also worth paying attention to the base year in which the Pomeranian Province received the maximum value in the entire regional ranking. At that time, it was 61.38%, which meant that the vast majority of enterprises received net revenues from the sale of innovative products. Apart from the Pomeranian Province, the Sub-Carpathian Province also received a higher average percentage(14.25% to be exact). It is also worth noticing that this region recorded the highest result in 2018 (it was 28.1% at that time). The adjacent years were also successful, because the percentage in question for 2017 was 25.72%(and for 2019, it was 24.7%).

The third and last province that recorded a higher percentage in the analysed period was the Łódź Province. However, in this case, the difference from the Polish average was not significant; on the contrary, it oscillated around the said indicator, exceeding it by only 0.1 percentage points. In this province, the highest share of net revenues from the sale of innovative products in total net revenues from sales occurred in 2014 and it was 12.62%. The remaining thirteen provinces received an average much lower than that described by the indicator for Poland. The worst results were achieved by four regions in which the share of net revenues from the sale of innovative products in total net revenues from sales was less than 1%. These were the following provinces: the Warmian-Masurian Province (0.47%), the Lublin Province (0.70%), the West Pomeranian Province (0.74%), and the Greater Poland Province (0.84%).

An analysis of the correlation of selected indicators of innovative activity of public sector enterprises with the dynamics of regional GDP growth

After analysing the statistical data on selected factors in the area of public sector innovation in Poland and the NUTS2 regions, it was decided that the considerations should be expanded by combining previously studied predictors with a selected macroeconomic measure describing economic growth. The main aim of the work was defined as follows: an analysis and assessment of the impact of innovative activities of the public sector enterprises on the change in GDP per capita in Poland. Therefore, in the next stage, it was necessary to recall and discuss the development of the value of Gross Domestic Product per capita in Poland and its individual regions. The necessary data in this area is included in Table 5.

Analysing the data included in the upper part of Table 5, it can be observed that in the examined period only a few provinces managed to achieve a GDP per capita value higher than that describing the Polish economy. Assuming that Poland = 100%, then the highest positive distance from the base value concerned the Masovian P rovince (average for the examined period 159.03%), then Lower Silesian (110.85%), Greater Poland (108.09%), to be followed by the Silesian

Table 5. GDP per capita and GDP per capita dynamics in Poland and NUTS 2 regions in 2012–2021 [%]

Name	Gross domestic product per capita, Poland = 100									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Poland	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Lower Silesian	113.2	111.5	112.0	111.5	110.8	110.5	109.3	109.3	109.6	110.8
Kuyavian-Pomeranian	81.3	82.1	81.6	81.6	81.6	81.0	81.2	79.6	82.1	82.0
Lublin	70.4	71.1	70.4	69.0	69.4	69.6	68.2	68.4	69.2	68.7
Lubusz	83.3	83.6	85.0	83.6	84.1	82.7	82.0	81.1	82.0	81.9
Łódź	94.0	93.7	94.2	93.9	93.6	93.5	93.1	94.1	97.2	95.9
Little Poland	88.3	88.4	88.8	90.0	90.5	91.2	91.9	91.2	90.0	90.8
Maasovian	158.6	159.9	158.9	158.8	158.4	159.3	160.4	161.9	158.6	155.5
Opole	80.9	80.7	81.6	81.0	79.9	79.5	79.3	79.1	79.8	81.8
Sub-Carpathian	70.0	71.1	71.0	70.9	70.6	69.8	70.5	70.5	69.4	70.1
Podlasie	72.1	73.5	73.2	71.6	71.4	72.3	71.8	72.2	74.1	73.1
Pomeranian	97.8	96.3	95.3	96.1	96.9	96.5	97.2	97.3	94.2	96.6
Silesian	105.8	103.8	103.8	103.9	103.7	103.6	103.8	102.5	100.7	103.4
Holy Cross	75.2	73.5	73.7	72.9	72.2	72.0	72.5	71.5	73.1	73.1
Warmian-Masurian	71.8	71.9	72.4	71.3	71.7	70.6	69.1	68.5	71.3	70.9
Greater Poland	105.9	107.3	107.6	108.7	109.4	109.4	108.1	108.7	108.6	107.2
West Pomeranian	84.3	84.0	84.7	85.1	84.3	84.0	83.9	83.2	84.6	84.2
	Dynamics of gross domestic product per capita, previous year = 100									
Poland	103.8	101.2	104.4	105.8	103.1	107.0	107.3	107.7	102.2	113.1
Lower Silesian	103.2	99.6	104.8	105.4	102.5	106.6	106.1	107.7	103.6	114.4
Kuyavian-Pomeranian	103.1	102.2	103.7	105.9	103.1	106.2	107.6	105.5	104.4	113.0
Lublin	104.7	102.1	103.3	103.7	103.7	107.4	105.1	108.0	102.0	112.4
Lubusz	103.7	101.5	106.1	104.2	103.7	105.3	106.3	106.5	102.4	112.9
Łódź	104.8	100.9	104.9	105.5	102.9	106.8	106.9	108.8	105.1	111.5
Little Poland	103.1	101.3	104.9	107.2	103.7	107.8	108.1	106.9	102.1	114.1
Maasovian	104.5	102.0	103.7	105.8	102.9	107.6	108.0	108.7	102.3	110.9
Opole	102.7	100.8	105.6	105.0	101.7	106.6	107.0	107.4	101.4	116.1
Sub-Carpathian	103.1	102.9	104.2	105.7	102.7	105.8	108.3	107.8	99.9	114.2
Podlasie	101.7	103.2	104.0	103.5	102.8	108.3	106.6	108.3	103.8	111.7
Pomeranian	105.7	99.5	103.3	106.8	104.0	106.5	108.1	107.8	100.0	116.0
Silesian	102.5	99.2	104.4	105.9	103.0	106.9	107.5	106.4	99.0	116.1
Holy Cross	102.0	98.8	104.7	104.7	102.2	106.6	108.1	106.2	103.0	113.0
Warmian-Masurian	103.1	101.3	105.0	104.3	103.6	105.5	105.0	106.6	104.7	112.5
Greater Poland	104.4	102.5	104.6	106.9	103.8	107.0	106.1	108.2	102.9	111.6
West Pomeranian	103.9	100.7	105.3	106.3	102.2	106.6	107.1	106.7	102.8	112.6

Source: Own study based on the data found in Central Statistical Office.

Province(103.5%). However, when it comes to the region that fared the worst in the context of the entire economy, undoubtedly the Lublin Province should be mentioned (with an average result for the examined period of 69.44%). Moving to the lower part of Table 5, and specifically to the dynamics of changes in GDP per capita (assuming that the previous year = 100%), it can be seen that the most significant increase in this measure (y/y) both at the national and province level took place in 2021.

The culmination of the analysis was a Pearson correlation analysis, which allowed for the identification and quantification of the strength of the relationship between the examined measures of public sector innovation and the macroeconomic predictor, which turned out to be GDP per capita. The results of the analysis are included in Table 6. For the sake of order, it is worth emphasising that correlation has been perceived as a statistical tool that allows one to determine the degree of relationship between two variables. Correlation values range from –1 to 1, where a score close to 1 indicates a strong positive correlation, a score close to –1 indicates a strong negative correlation, and a score close to 0 indicates no relationship between the variables.

Table 6. An analysis of the strength of the relationship between selected measures for 2021

Dependency	Results of correlation
The percentage of innovative enterprises in the public sector and GDP per capita	0.340296
The percentage of public sector enterprises that incurred expenditure on innovative activities and GDP per capita	0.400143
Percentage of net revenues from the sale of products of innovative industrial enterprises in total net revenues from sales and GDP per capita	0.400421
The percentage of innovative enterprises in the public sector and the dynamics of GDP per capita	0.231853
The percentage of public sector enterprises that incurred expenditure on innovative activities and the dynamics of GDP per capita	0.15734
The percentage of net revenues from the sale of products of innovative industrial enterprises in total net revenues from sales and the dynamics of GDP per capita	0.22404

Source: Own calculation.

Analysing the correlation results included in Table 6, it can be seen that there are different levels of relationship between the examined measures and GDP per capita. In two analysed cases, a moderate positive correlation was obtained. Firstly, there is the relationship between the percentage of public sector enterprises that incur expenditure on innovative activities with GDP per capita. Secondly, the relationship describing the percentage of net revenues from sales of products of innovative industrial enterprises in total net revenues from sales of GDP per capita ought to be mentioned. In both cases, the correlation coefficient was approximately 0.40. In both situations, the increase can be noticed of GDP per capita with simultaneous increase of the percentage of public sector enterprises incurring expenditure on innovative activities increases, and similarly vice versa. Similar conclusions can be reached when taking into account the correlation coefficient for the percentage of innovative public sector enterprises and GDP per capita (0.34), as the obtained result also indicates a relatively moderate positive correlation.

However, the correlation between the examined measures of innovation in public sector enterprises and the dynamics of changes in GDP per capita turned out to be low, with values ranging from <0.157;0.232>, which suggests the lack of significant relationships between these variables.

Research results and their discussion

The nature of the considerations is overwhelmingly empirical. The results of the analysis were presented in a tabular, graphical, and descriptive form. The main conclusions at the national level claim, firstly, that in the analysed period in the Polish economy, on average 26% of public sector enterprises were innovative industrial entities. Secondly, the most frequently introduced type of innovation in the surveyed sector were new or improved processes; the average percentage of enterprises generating this type of activity was 24%. Finally, thirdly, on average, 19.4% of public sector enterprises incurred expenditure on innovation activities, but in 2021, this percentage increased by slightly over 3 percentage points.

However, at the regional level, the following regularities could be formulated. Firstly, both in terms of the highest average percentage of innovative industrial enterprises and the highest average expenditure on innovative activities, the leading province is the Silesian one, followed closely by the Masovian Province. A completely different situation concerned the regions for which the percentages of these predictors turned out to be the lowest, i.e. the Lubusz Province and the Warmian-Masurian Province. Secondly, the average share of net revenues from the sale of innovative products in total net revenues from sales in three Provinces, i.e. Pomeranian, Sub-Carpathian, and Łódź, turned out to be higher than the average share for Poland. However, the lowest share of net revenues from the sale of innovative products in total net revenues from sales, in some Polish NUTS 2, did not exceed 1% (e.g. the Warmian-Masurian Province).

Conclusions

The considerations were divided disproportionately, i.e. into an elementary theoretical part explaining the basic aspects of the issue and a much more extensive empirical part. In the research part, the analysis was based on arbitrarily selected predictors in the field of innovative activities of the public sector, after which an analysis of changes in the GDP growth dynamics of Polish regions was carried out. The culmination of the analysis was a Pearson correlation analysis between the examined measures. Based on the obtained results, a moderate relationship was shown between the examined variables in the area of the innovation of public sector enterprises and economic growth measured by the value of GDP per capita. The nature of the considerations is overwhelmingly empirical. The results of the analysis were presented in tabular, graphical, and descriptive form.

The presented considerations, including the presentation of the results of the analysis in the field of innovative activities of public sector enterprises in Poland, allowed for the formulation of the following conclusions:

a) at the national level:
   - the average percentage of innovative industrial enterprises in the public sector in 2012–2021 was 26.32%. In the last year under review, there was an increase in innovative enterprises, ultimately to the level of 34.4%;
   - most often, enterprises from the surveyed sector introduced new or improved processes.The average percentage of enterprises generating this type of activity was 24%, second in order were new or improved products, with an average of 8.75%, and third were new or improved products for the market (3.48%);
   - on average, 19.4% of public sector enterprises incurred expenditure on innovative activities, but in 2021, this percentage was 22.5%;

- the average share of net revenues from the sale of innovative products in total net revenues from sales was 6.47%.However, this percentage in 2021 turned out to be lower by 4.47 percentage points;

b) at the regional level:

- the highest average percentage of innovative industrial enterprises in the public sector was located in the Silesian Province (38.75%), to be followed by the Masovian Province (30.32%) and the Lublin Province (29%). The regions with the lowest average percentage of this type of enterprises included the Lubusz Province (17.57%), the Warmian-Masurian Province (18.37%), and the West Pomeranian Province (21.68%);
- the highest average percentage of enterprises allocating expenditure on innovative activities was once more recorded in the Silesian Province (32.8%), the second largest being the Masovian Province (26%), followed by the Kuyavian-Pomeranian Province (21.9%). The smallest percentage of enterprises allocating expenditure on innovative activities included enterprises operating in the Lubusz Province (11.2%) and the Warmian-Masurian Province (11.7%);
- the average share of net revenues from the sale of innovative products in total net revenues from sales in three provinces was higher than the average share in Poland. These were: the Pomeranian Province (19.3%), the Sub-CarpathianProvince (14.25%), and the Łódź Province (6.57%). The lowest share of net revenues from the sale of innovative products in total net revenues from sales occurred when this percentage did not exceed 1%. This was the case for the following NUTS 2 regions – Warmian-Masurian, Lublin, West Pomeranian, and Greater Poland.

Summing up, the paper analyses several measures related to the innovative activities of public sector enterprises in Poland and NUTS 2 regions in 2012–2021. The analyses of the percentage of innovative enterprises in the public sector, as well as those incurring expenditure on innovative activities, and the percentage of net revenues from the sale of innovative products in total net revenues from sales, showed differences in their dynamics of changes.

The relatively moderate strength of the relationship between selected predictors in the field of innovative activities of public sector enterprises and GDP suggests the existence of a certain economic relationships; it has to be mentioned, however, that different correlation results indicate the complexity of these relationships. This suggests that Gross Domestic Product is, to a varying extent, related to the examined measures of innovative activity, which may result from many economic, political, and/or social factors.

Correlation analysis allows for positive verification of all three research hypotheses, and thus for drawing the following conclusions:

1. A moderate positive correlation between the number of innovative public sector enterprises and GDP per capita suggests that a decline in the percentage of these enterprises may have a negative impact on economic growth.
2. The increase in the number of enterprises incurring expenditure on innovative activities in the public sector has a moderate impact on economic growth measured by GDP per capita.
3. The percentage of net revenues of enterprises from the sale of innovative products has a moderate impact on the value of GDP per capita, indirectly contributing to economic growth.
4. The identified and quantified relationship between GDP and the examined measures indicates that the dynamics of GDP per capita is not a clear indicator of the development of innovative activities in the public sector.

In the spectrum of economic interactions, the symbiosis between the innovative activities of the public sector and GDP dynamics is complex and multi-faceted. Drawing on the insights of outstanding economists and political scientists, the paper attempts to highlight the potential that appears when investments in innovative activities of the public sector intersect with GDP per capita. Theoretical research explains the likely mechanisms by which such investments can influence economic growth. Undertaking the processes aimed at the clarification of these fundamentals has profound implications for policymakers, practitioners, and other stakeholders, in this way helping them leverage the synergies between public sector enterprise innovation and economic flourishing in a turbulent environment. The identification and demonstrated strength of the relationship between the examined dependencies may, at least partially, contribute to targeting those activities that have the greatest impact on economic growth. Further analysis of this research problem will attempt to develop main recommendations and demonstrate well-established practical implications.

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Funding
This research received no external funding.

Research Ethics Committee
Not applicable.

Conflicts of Interest
The author/autors declare no conflict of interest.

Published by Malopolska School of Public Administration – Krakow University of Economics, Krakow, Poland.

Data Availability Statement
All data will be available and shared upon request.

Journal of Public Governance

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