

# Reform of the science and higher education sector in Poland in the context of innovation and social responsibility of science

## Authors' Contribution:

- ✍ **A** Study Design
- 📁 **B** Data Collection
- 📊 **C** Statistical Analysis
- 📄 **D** Manuscript Preparation
- 🏠 **E** Funds Collection

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## Abstract

This scientific essay aims to broaden our understanding of the reform process within the science and higher education sector in Poland. The adoption of the New Public Management concept has been pursued with the intention of enhancing the efficiency and effectiveness of scientific institutions. Additionally, the Third Generation University concept has been employed to strengthen collaboration among researchers, businesses, and local communities in tackling critical issues. The Polish government has embraced several strategic documents, led by the "Responsible Development Plan" which emphasizes the need for higher education reform as the success of the country's development and economy hinges on knowledge and social competence, inseparable from the science and higher education sector. The Polish Ministry of Science and Higher Education was entrusted with the implementation, presenting the "Strategy for the Development of Polish Science and Higher Education" based on three pillars: (1) systemic changes in higher education and research, (2) innovations for the economy, combining research commercialization and business partnerships, (3) a program for social responsibility in science. These actions resulted in laws promoting innovation, creating a more favourable legal and institutional environment for innovative activities. The overall aim of these changes was also to improve Poland's economic standing in terms of innovation, as measured by the "European Innovation Scoreboard". Nonetheless, further efforts are needed, as Poland's innovation indicators continue to remain low, and collaboration between the scientific sector, administration, and businesses requires continuous support and encouragement. Although the reform of the science and higher education sector is an important step towards stimulating the development of science and innovation in Poland, it has not achieved its original goals.

**Keywords:** European innovation scoreboard • innovation indicators • New Public Management • R&D indicators • Third Generation University

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**New Public Management**

– summary description of a way of reorganising public sector bodies to bring their management, reporting, and accounting approaches closer to (a particular perception of) business methods [25].

**Third Generation University (or entrepreneurial university)**

– a modern approach to the functioning of universities, which assumes that universities should be open to the needs of the job market and society, and their actions should be based on close collaboration between researchers, businesses, and the local community to address critical issues in the world.

**Frascati Manual** – it was developed by the Organization for Economic Cooperation and Development (OECD) and published in 1963. Currently, it is the most recognized international standard defining the scope and methodology for measuring R&D activity, used for years by the Central Statistical Office. It defines research and development activities and provides guidelines for collecting and interpreting data on R&D expenditures, personnel, and activities [26].

**Gross Expenditure on Research and Development (GERD)**

– the total amount of internal expenditures on R&D activities carried out within the territory of a country and financed from abroad, excluding the funding for R&D activities conducted abroad. It includes the following components: **BERD** – Business Expenditure on R&D; **GOVERD** – Government Expenditure on R&D; **HERD** – Higher Education Expenditure on R&D; **PNPERD** – Private Non-Profit Expenditure on R&D [27].

**Research and Development (R&D) intensity indicator**

– the share of internal expenditures on research and development activities in the gross domestic product (GDP).

**INTRODUCTION**

The social mission of science in the contemporary world becomes of particular importance due to economic development, technological progress, and global challenges. The concept of the knowledge society sees science as playing a crucial role in social advancement. This mission goes beyond merely providing knowledge, but requires responsibility for sustainable and balanced development. Science serves to address various global issues such as climate change, pandemics, energy crises, etc. Scientific and technological innovations become the driving force of social and economic progress, contributing to improving people's quality of life and enhancing education and health standards. With the influence that science has on society and the economy, there are also dangers, such as the misuse of technology for military purposes or manipulating public opinion through false information. Therefore, the responsibility of scientists is critical in maintaining ethical standards and preventing the use of science for harmful purposes. This awareness translates into their engagement in adapting legal regulations to the ongoing changes and challenges. The aim of this scientific essay is to broaden knowledge about the reform of the science and higher education sector in Poland.

**The concept of New Public Management**

The concept of New Public Management (NPM) is an approach to public sector management that combines two streams:

- “new institutional economics” based on public choice theory, agency theory, transaction cost theory, stakeholder theory [1];
- “managerialism” includes distinct elements derived from business practices: budgeting and accounting, aligning public programs with citizens' needs, privatization and contracting out, performance management and measurement, information technology [2].

The introduction of the NPM concept in the science policy of the Polish state aimed to increase the efficiency and effectiveness of national scientific and higher education entities. This was evident, for example, in strengthening the role of rectors in higher education institutions (defining and implementing strategies, as well as acquiring and allocating financial resources), introducing performance-based funding (instead of

input-based funding), involving stakeholders in the decision-making process (university councils). “Another trend is the concentration of financial resources in the best academic centres, leading to increasing differentiation between universities [Initiative of Excellence – research university]. The evaluation of their activities is becoming more formalized. Independent accreditation bodies [e.g., the Science Evaluation Commission] are responsible for conducting evaluations, which are intended to positively influence the actions of agents aimed at improving the quality of management, teaching, and research” [3]. Information technology supports this formalization. According to Lohman et al. [4], it can be understood as a system (software, databases, procedures) designed to measure achievements in an organized and comprehensive manner. The performance measurement system, according to Chalmers et al. [5], should provide relevant information to measure the efficiency and effectiveness of managerial decisions.

**THE CONCEPT OF THE THIRD GENERATION UNIVERSITY**

The concept of the Third Generation University (or entrepreneurial university) is a modern approach to the functioning of universities, which assumes that universities should be open to the needs of the job market and society. Their actions should be based on close collaboration between researchers, businesses, and the local community to address critical problems. “The added value of the Third Generation University model lies in the consistent construction of a network structure, breaking with traditional organizational solutions, using new management methods, and finally, commercializing research results” [6]. By utilizing new management methods, the Third Generation University draws from the concept of New Public Management, aiming for efficient and effective actions in changing conditions, with the university rector playing a crucial role in the management process, drawing from managerialism.

The concept of the Third Generation University also emphasizes close collaboration between the university, entrepreneurs, and the local community. This is because scientific research requires substantial financial investments that the government may not be able to guarantee. Universities should function as centres of knowledge, technology, and

innovation, supporting local, regional, national, and global development by conducting research projects, development work, and innovations. They should actively participate in shaping public policies and socio-economic development plans.

Scientific entities are undergoing a transformation from institutions based on research and funded by public resources to international communities of scholars. They are increasingly playing a more effective role as incubators for new commercial activities based on science or technology and actively utilize knowledge. Given the progress made by scientific entities in the field of science and technology, their potential should be directed towards improving economic growth indicators and supporting entrepreneurship [7].

### STRATEGY FOR THE DEVELOPMENT OF SCIENCE AND HIGHER EDUCATION IN POLAND

The consequence of introducing the NPM and Third Generation University concepts was the adoption of the “Action plan for responsible development of Poland” by the Polish government in 2016 [8], which identified five barriers to economic growth in Poland, for which five pillars of the new development model were adopted (Table 1).

The expansion and operationalization of the “Action plan for responsible development of Poland” resulted in the adoption of the “Strategy for Responsible Development” in 2017, which included the reform of higher education [9]. This is because the development of the state and its key sectors, based on knowledge and social competencies, cannot succeed without the science and higher education sector. The task was entrusted to the Ministry of Science and Higher Education, which developed the “Strategy for the Development of Polish Science and Higher Education” based on three pillars:

1. systemic changes in higher education and science (reform known as “Law 2.0”),
2. innovations for the economy, combining the commercialization of research and partnership with businesses,
3. a program of social responsibility in science.

The effectiveness of the reform of the science and higher education sector required the support of an international group of experts. The Ministry of Science and Higher Education followed the path previously taken by several countries in our region and, on September 6, 2016, requested the European Commission to “provide external advice and recommendations on the

**Table 1.** Five barriers to the growth of the Polish economy vs. five pillars of the new development model.

Barriers to the growth of the Polish economy	Pillars of Poland's development
middle income trap (previous sources of growth have been exhausted – it is necessary to find new engines of development, build global specialization, and increase Polish wages)	reindustrialization (supporting existing and developing new competitive advantages and specializations of the Polish economy)
excessive reliance on external financing (foreign capital is still desirable, but domestic capital requires strengthening as it forms the basis of developed economies' stability)	development of innovative companies (creating a friendly environment for businesses and an innovation support system, reforming research institutes)
low innovative potential of the economy (the state must support companies in increasing innovation, as well as become a technologically demanding customer in public investments)	capital for development (increasing the level of investments, expanding financial instruments offered by the state, efficient utilization of EU funds, fostering savings among Poles)
demographics (aging society, emigration of young people for work, and very low fertility rates – require tackling these processes)	foreign expansion (supporting exports and foreign investments of Polish companies, reforming economic diplomacy, promoting Polish brands)
weak institutions (lack of a comprehensive and long-term vision for Poland's development and increasing operational costs of administration not aligned with the growth of its effectiveness)	social and regional development (including vocational education reform, incorporating rural areas and small towns into development processes)

Source: Own elaboration based on government materials [8].

restructuring of Polish science and higher education systems to support innovation, and, in particular, to prepare new legislation on science and higher education by 2019” [10].

An important instrument of support was the “Horizon 2020 Policy Support Facility” (PSF) [11], which “aims to support countries in improving their research and innovation systems. It provides them with access to the most relevant specialized knowledge and experiences of others in the field of research and innovation policy reforms across the European Research Area” [12].

Using the PSF, the European Commission commissioned selected international experts to conduct an assessment of the science and higher education sector in Poland. Based on two meetings with stakeholders, conducted interviews, and document analysis, the PSF panel presented the report “Peer Review of Poland’s Higher Education and Science System” [10]. The document formulated a series of postulates in the areas of cross-cutting reform of science and higher education, development of management, financing, human capital, and career structure, ensuring quality and evaluation, cooperation with the socio-economic environment, internationalization of science and innovation – with the aim of eliminating structural deficiencies in the Polish system of science and higher education and stimulating the development of existing and potential system advantages.

The recommendations contained in the report “Peer Review of Poland’s Higher Education and Science System” [10] reflected both the concepts of New Public Management and the Third Generation University, providing a basis for the reform of science and higher education as seen, among others, in the Law of July 20, 2018, on Higher Education and Science [13].

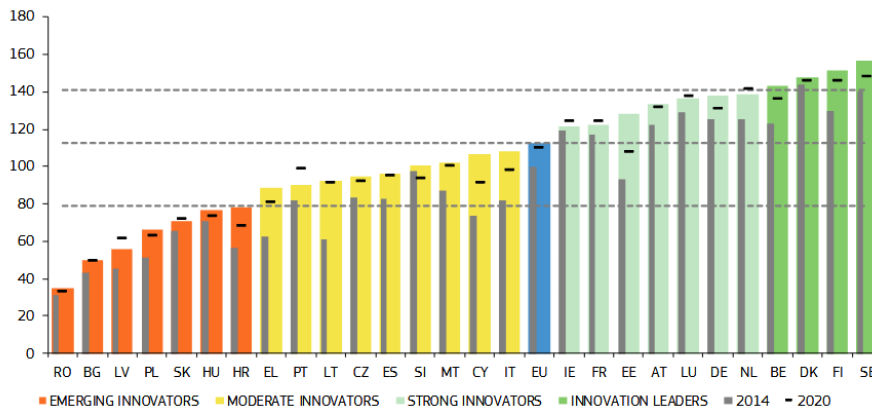
## DEVELOPMENT OF INNOVATION IN POLAND

The “Strategy for Responsible Development” pointed out the limited innovative capabilities of the Polish economy as one of the main barriers to growth in Poland, and the outlined pillars aimed to push the economy and the country towards modern technologies and rapid development.

The measures prescribed in the “Strategy for Responsible Development by 2020 (with a perspective towards 2030)” aimed to eliminate or reduce barriers hindering innovative activity and promote the growth of innovative enterprises, while strengthening their legal and institutional environment to stimulate processes leading to the creation and development of innovations. Several actions were taken, including systemic measures, to facilitate business operations and focus thematic investments in research and development through prioritizing national and regional smart specializations. From the perspective of the science and higher education sector, the most significant points were:

- “Promoting an entrepreneurial culture at universities, strengthening research potential, and further involving them in the innovation creation system.
- Increasing the engagement of entrepreneurs in the education system for knowledge and technology-intensive sectors (including internships for scientific employees in companies and representatives of companies in research institutions).
- Developing methods/initiatives to promote the ability to combine knowledge and skills from various scientific fields and spheres of activity (including activities within social organizations and NGOs) in the education system and at later stages of development.
- Building a culture of innovation and a learning organization in public administration, including strengthening pro-innovation competencies and capabilities to stimulate innovative initiatives involving other participants in the national innovation system” [9].

In response to the above actions related to strengthening human and social capital in the national innovation system, efforts were directed towards strengthening the legal and institutional environment for innovative enterprises, with the Ministry of Science and Higher Education playing a key role in creating policies for innovation (coordinating inter-ministerial and inter-institutional cooperation, as well as central and regional cooperation). These actions led to the adoption of two laws on innovation, aiming to



**Figure 1.** The innovation indicator for the countries belonging to the European Union.

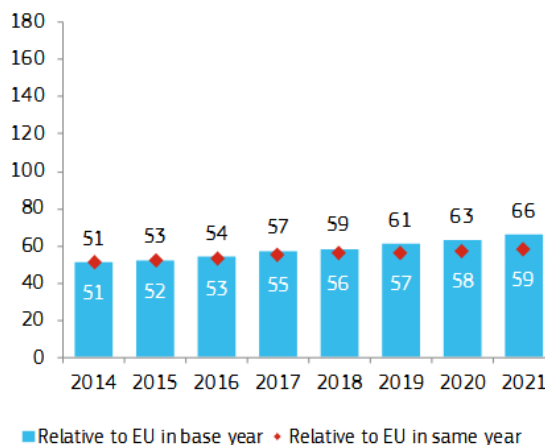
Source: European innovation scoreboard 2021 [17, p. 6].

create a legal and institutional environment more conducive to innovative activities, particularly by eliminating barriers identified in the “White Paper on Innovation” [14].

The “First Law on Innovation” (2016) opened the door to good law for innovative activities, providing financial incentives and deregulatory solutions in the tax area [15]. The “Second Law on Innovation” (2017) had a horizontal character (changing regulations limiting innovation in various laws) and eliminated major barriers to innovative activities while introducing conditions conducive to improving the attractiveness of tax support instruments for innovative activities in Poland [16].

The changes also aimed to improve Poland’s position in terms of innovation indicators. The indicators positioned the Polish economy as an “Emerging Innovator” in the “European Innovation Scoreboard” with this being the lowest rating in a four-stage scale (Emerging Innovator, Moderate Innovator, Strong Innovator, Innovation Leader; Figure 1).

Despite the growing trend of the innovation index for the years 2015-2021, with results reaching 65.9% of the EU average, Poland is still classified as an Emerging Innovator (Figure 2). On the positive side, Poland’s results are above the average within this group, increasing by 11.3% annually, at a rate higher than the EU average of 9.9%.



**Figure 2.** The innovation indicator for Poland.

Source: European innovation scoreboard 2021 [17, p. 60].

The indicators of innovation are related to the indicators of the intensity of R&D activities calculated by the Polish Central Statistical Office (GUS), which represents the share of internal expenditures on research and development in gross domestic product (GDP) (Table 2). If we compare the current values with the level of R&D expenditures assumed in the “Strategy for Responsible Development”, which was to reach 1.7% of GDP in 2020 [9], it is still lower than the average for the European Union [18].

Although gross domestic expenditure on research and development (GERD) in Poland has been consistently increasing, according to data from GUS, in 2021, the largest share was allocated by enterprises (63.1%), while the higher education sector accounted for 34.7% of internal funds. Similar shares were observed in the years 2016-2020 (Table 3).

The relationship of internal expenditure on R&D incurred by the two leading executive sectors (Figure 3) indicates a still low efficiency of cooperation between the higher education, administration, and business enterprise sectors. Although the government made the announced changes in the regulations concerning innovation, it did not achieve the intended effect stated in the “Strategy for Responsible Development”. It can be presumed that entrepreneurs primarily focused on fiscal benefits. The innovation indicators from the “European Innovation Scoreboard” confirm the persistently low innovativeness of the Polish economy, as well as the low demand for new technologies. On the other hand, the higher education sector still exhibits a low level of commercialization of R&D results, lack of a cooperation culture, and bureaucratization.

**Table 2.** The most important indicators in the field of research and development activities according to the GUS.

SPECIFICATION	2015	2016	2017	2018	2019	2020	2021
Number of entities in R&D activity	4 427	4 871	5 102	5 779	5 863	6 381	7 370
Gross domestic expenditure on research and development (GERD) in million PLN	18 061	17 943	20 578	25 648	30 285	32 402	37 676
Gross domestic expenditure on research and development (GERD) as a percentage of GDP	1.00	0.97	1.03	1.21	1.32	1.39	1.44
Year-on-year growth of gross domestic expenditure on research and development (GERD) as a percentage	11.7	-0.7	14.7	24.6	18.1	7.0	16.3

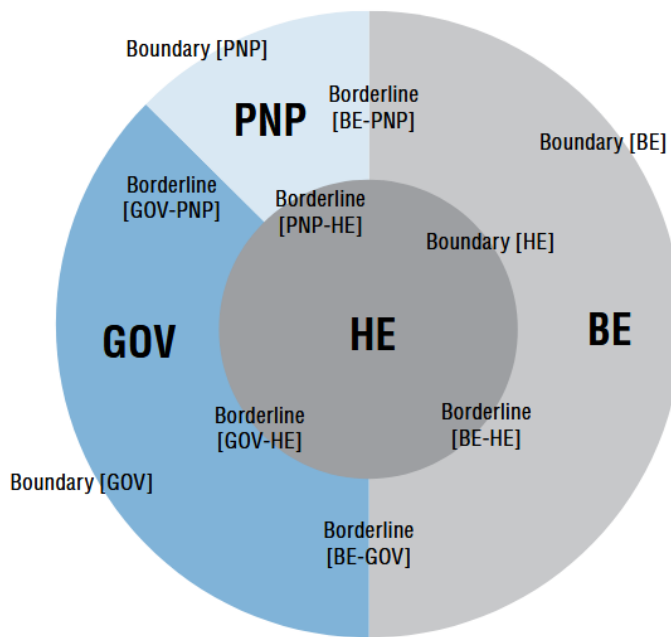
Source: Own elaboration based on GUS data [19, 20].

**Table 3.** The structure of total internal expenditure on research and development (R&D) by performing sectors, in the years 2015-2021, according to GUS.

SPECIFICATION	2015	2016	2017	2018	2019	2020	2021
Gross domestic expenditure on research and development (GERD) in million PLN, including:	18 061	17 943	20 578	25 648	30 285	32 402	37 676
• Business enterprise sector (%)	46.6	65.7	64.5	66.1	62.8	62.8	63.1
• Higher education sector (%)	28.9	31.4	32.9	31.7	35.6	35.0	34.7
• Government sector (%)	24.4	2.5	2.3	1.9	1.3	2.0	2.0
• Private non-profit sector (%)	0.2	0.4	0.3	0.3	0.3	0.2	0.2

Source: Own elaboration based on GUS data.





**Key:**  
**BE** Business enterprise sector  
**HE** Higher education sector  
**GOV** Government sector  
**PNP** Private non-profit sector

**Figure 3.** Stylised representation of domestic Frascati institutional sectors and their borderlines.  
 Source: Frascati Manual [21].

### REFORM OF SCIENCE AND HIGHER EDUCATION IN POLAND

The reform of science and higher education in Poland was carried out between February 2016 and August 2018. In the process of shaping the new state policy, wide-ranging consultations with stakeholders played a significant role, supported by the advisory voice of international experts recommended by the European Commission. The main goal of the reform was to enhance the quality of science and strengthen the global significance of research outcomes, based on the concept of an entrepreneurial university rooted in the principles of New Public Management.

Law of July 20, 2018, on Higher Education and Science [13] (also known as Law 2.0) came into force on October 1, 2018, consolidating the previous four acts and introducing changes in over 160 other legal acts. These changes aimed to establish new legal provisions that would facilitate the

better functioning of science entities by providing them with institutional and financial autonomy, promoting high-quality education and scientific research, securing better funding for research based on quality evaluation of scientific activities, and fostering an innovation-driven economy.

Aligned with the principles of NPM, Law 2.0 introduced the principle of accountability for scientific results. Evaluation of the quality of scientific activities became a key instrument of science policy, influencing the allocation of financial resources for the maintenance and development of research potential within higher education and science institutions. It also determined the granting or retention of the right to confer doctoral and post-doctoral degrees in specific scientific or artistic disciplines, as well as the permission to establish studies in particular fields, levels, and profiles, run doctoral schools, and participate in programs such as “Excellence Initiative – Research University” or “Regional Excellence Initiative”.

The evaluation process is regulated by the Regulation on the Evaluation of the quality of scientific activity [22], which defines the types of scientific and artistic achievements taken into account and the detailed criteria and methods of evaluation. These criteria draw from widely used international measures and indicators related to publications, patents, research quality, innovation, technology transfer, and socio-economic impact. These shared features bring the Polish evaluation system closer to the British “Research Excellence Framework” (REF) and are based on international standards, including the Frascati Manual [21]. However, there are differences between the principles of evaluating the quality of scientific activity in Poland and the guidelines of the Frascati Manual, resulting from the country’s realities, legal frameworks, adopted development goals, state science policy, and historical context.

As Antonowicz et al. [23] state – those involved in the work on the reform of science and higher education in Poland – Law 2.0 “(...) was an experiment that, in the short term, did not meet its goals because it failed to earn legitimacy and support for the draft legislation when it entered Parliament” [23, p. 402].

## CONCLUSIONS

The reform of the science and higher education sector in Poland aimed to increase the efficiency and effectiveness of scientific entities and stimulate innovation. The Law 2.0 introduced in

2018 initiated an important process of change in the science and higher education sector. The reform represents a significant step towards developing Poland’s scientific and innovative potential, although further actions are necessary to accelerate innovation and efficiency in the science sector and enhance cooperation between the scientific community, businesses, and society. Legal instruments such as laws on innovation or regulations on the evaluation of the quality of scientific activities provided important legal solutions, setting directions for actions for scientific entities while also highlighting to society and industry that the social mission of science is of particular importance in the face of economic development, technological progress, and global challenges such as the COVID-19 pandemic [24].

Although the reform removed numerous institutional and legal barriers, it did not lead to deepening cooperation between the science sector and industry, as reflected in Poland’s low innovation index. In the long term, universities have a crucial role to play by contributing to building a culture of innovation through their educational mission, strengthening pro-innovation competencies, and fostering the ability to promote innovative initiatives. In the short term, the reform allowed universities to freely and flexibly create new study programs, resulting in a greater orientation towards the needs of the job market and collaboration with local governments and entrepreneurs. This reflects the actual needs of the market and local communities, supporting innovation and sustainable development.

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