Forecasting the Effectiveness of Collaboration Between Businesses and Academic Institutions Using the Method of Cultural Forecasting

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Introduction

This monograph has been written with the intention of disseminating knowledge about a method developed as part of a scientific research project funded under the governmental program "Science for Innovation" for predicting the effectiveness of academic-business cooperation. This method is based on an original approach devised by one of the authors of this monograph for forecasting the international decision-making process in the realm of international security. Given the relatively high accuracy of the forecasts generated by this developed method, the authors are convinced that the "know-how" of this technique could also be utilized in predicting the effectiveness of potential cooperation between two entities: academic and business. The results of the research, which are detailed in this book, have led to the development of a variant of "cultural forecasting" with an acceptable effectiveness indicator for predicting the course of cooperation between arbitrarily selected academic and business entities.

The method of cultural forecasting of decision-making processes stemming from the cultural programming of social groups was developed by M. Górnikiewicz in 2018. The authors of the textbook were motivated by the desire to use this method to influence scientific-economic relations so that such cooperation would prove optimally effective. The classic form of the cultural forecasting method was modified to study the effectiveness of academic-business cooperation, enabling an objective evaluation of the effectiveness of the

forecasted decision-making processes of arbitrarily chosen scientific units and business entities so that the discussed method could be applied in various regions of the world regardless of cultural differences among the managerial staff of the institutions involved.

Both scientific units and business entities engage in cooperation to build and develop their own potential. For scientific units, this potential is academic, pedagogical, and research-development-oriented. For business entities, it is market potential the tangible indicator of which is the profit generated from business activities. The method for forecasting the effectiveness of the decision-making process in the area of scientific-economic relations is intended to identify, with appropriate advance notice, the strengths and weaknesses of this process so that adjustments can be made to optimize the planned actions in terms of achieving goals relevant to both scientific units and business entities.

The authors assumed that effective forecasting of decision content (concerning scientific-economic cooperation) before they are formulated and implemented would allow for an assessment of their real effectiveness in building stable and developmental scientific-economic cooperation. This would serve the progression of the research-development potential of universities on the one hand, and strengthen the market potential of the economic entities involved in the process on the other. The knowledge gained during forecasting would enable prior adjustments to be made in the planned decision-making process so that both parties (scientific units and business entities) would achieve optimal benefits from future cooperation, thereby building a joint scientific-market potential resulting from the discussed cooperation. A strong and internally coherent scientific-economic environment forms the foundation of contemporary free-market economies of the post-industrial-information era, directly influencing the actual potential of a society. The research preceding the writing of this monograph was divided into four stages: Stage 1: Conducting expert assessments containing empirical data allowing

for the processing of this data in accordance with the research objective (empirical methods). Stage 2: Processing of empirical data obtained during the conduct of expert assessments and supplementing these assessments with the results obtained (theoretical methods). Stage 3: Using the processed data obtained in Stage 2 to develop the structure of the monograph, the initial version of the method for forecasting and managing scientific-economic relations based on culturally conditioned decision-making processes. Stage 4: Conducting an experiment to verify the cognitive value of the research findings, making possible corrections, and developing the final version of the method for forecasting and managing scientific-economic relations.

The authors of the developed prognostic method intend it to support the optimization of the decision-making process in the area of cooperation between arbitrarily selected business and academic entities by performing a forecast of the effectiveness of this cooperation based on current cultural conditioning, and then identifying those values which, by influencing, could raise the initial level of previously studied effectiveness.

1. Terminological Clarifications

Forecasting

First, it is worth considering what is meant by the term "forecasting." According to the electronic version of the PWN Polish Language Dictionary, it refers to:[1] *predicting future phenomena or events; predicting the future based on a horoscope; predicting the future course of a disease*. Meanwhile, the term "social forecasting" in the PWN Encyclopedia is defined as: *formulating predictions of future states, processes, and events – forecasts – based on scientifically justified premises [from Greek prognosis: 'intuition', 'prediction']*.

These definitions may seem somewhat concise, so it is worth referring to other interpretations that give more space to these terms, such as the Encyclopedia of Management. In its electronic version, forecasting is defined as:[2] *rational, scientific prediction of future events, i.e., inferring about unknown events based on known ones. Several types of predictions can be distinguished: rational, common-sense, scientific, and irrational.*

Thus, what do the authors of these definitions understand by these different types of forecasting? They state:

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[1] *Słownik języka polskiego PWN*, *„prognoza"*, https://sjp.pwn.pl/sjp/prognoza;2572573.html, 10.01.2024.

[2] *Encyklopedia zarządzania*, *„prognozowanie"*, https://mfiles.pl/pl/index.php/Prognozowanie, 10.01.2024.

- "We talk about rational predictions when reasoning is a logical process proceeding from a set of facts from the past. If these premises are based on experience, we deal with rational, common-sense predictions. Meanwhile, scientific, rational predictions involve the use of scientific methods in the reasoning process. Irrational predictions occur when no facts are provided, and there is no connection between premises and conclusions" (I. Penc-Pietrzak, *Strategic Planning in a Modern Company*, JAK Publishing).

Therefore, forecasting the effectiveness of collaboration between entities meets the criterion of "scientific rationality" outlined above. The definitions make it clear that a forecast involves predicting future phenomena or events, while scientific forecasting uses scientific methods to provide an objective approach.

Mental Programming, Culture, and Its Dimensions: Cultural Codes

Over time, the term "culture" has been used in various and often contrasting contexts, leading to ambiguity in its interpretation and definitions. In ethnography, stemming from sociocultural anthropology, physical objects are as much a part of culture as human behaviors in a given community. Ethnographers study people, ethnic groups, ethnic formations, and the correlation between material and spiritual culture, mainly using qualitative methods to understand perceptual and decision-making processes in culturally diverse groups.

In sociology, culture is understood as a broad area of life and activity of human groups, encompassing both material and non-material achievements developed and cultivated through the evolution of social (civilizational) life. Sociologists give culture a descriptive sense, referring to its broad conceptual understanding (including both the creations of human hands and minds, and activities fulfilling physical and spiritual needs). Culture is also seen as a general set of values

and related beliefs about conduct, which, through the socialization of a group's members, forms specific principles to best satisfy needs. In sum, culture is a form of regulation governing the functioning of a social group (A. Kłoskowska, *Sociology of Culture*, 3rd ed., PWN; M. Golka, *Sociology of Culture*, Scholar Publishing).

In psychology, the subject of study includes the thoughts, feelings, reactions, and motivations driving certain behaviors, along with how people function in their communities according to social coexistence principles (Z.W. Dudek, A. Pankalla, *Psychology of Culture: Borderline and Transcultural Experiences*, Eneteia). Anthropologists view reality more broadly and comprehensively than psychologists or sociologists, making the discipline interdisciplinary, bridging the humanities, social sciences, and natural sciences to describe and understand people as part of a social structure. Two main branches have emerged: physical anthropology and cultural anthropology. The former focuses on biological and physiological variations in humans, while the latter deals with their evolution within societal structures, examining both changes in the organism and societal transformations and their consequences (A. Barnard, *Anthropology: Outline of Theory and History*, PWN; E. Krawczak, *Cultural Anthropology: Classic Directions, Schools, and Trends*, UMCS).

Mental Programming

Discussing mental programming requires referencing one of its proponents, Geert Hofstede, who popularized the term beyond academic circles. He views culture as a form of mental programming: "Every person carries a pattern of thinking, feeling, and behavior acquired throughout life. Our programming is shaped by our social environment, starting with family, then developing through school, peer groups, workplaces, and residential communities." According to Hofstede, mental programming is synonymous with culture, defined

as a system of thought patterns, feelings, and responses – a view shared by sociologists and anthropologists. Hofstede also emphasizes that culture is always a social phenomenon, common to those living in a specific social environment, representing a "collection of social rules" (G. Hofstede, G.J. Hofstede, *Cultures and Organizations*, PWE).

Thus, a dimension of culture is a trait acquired through upbringing in a specific social group. M. Górnikiewicz, one of the authors of this monograph, describes it as a "code determining a specific way of perceiving and functioning within an individual's reality," covering the entire decision-making process, actions, behaviors, and reactions to external and internal stimuli. This "mental programming" involves creating codes defining each person's perception and functioning, a topic studied by many authorities across various disciplines.

Hofstede's definition of culture succinctly encapsulates this concept: "Culture is the collective programming of the mind that distinguishes members of one group from another."

In summary, M. Górnikiewicz offers this definition in his monograph, *Cultural Forecasting of National and International Security Threats*:

- "Codes are patterns shaping perceptual, decision-making, action, and reaction processes, determining the comprehensive functioning of a person in a given environment.
- Mental programming is the current state of all codes determining the comprehensive functioning of a person.
- Mental programming is the process of creating codes determining comprehensive human functioning.
- Cultural programming is the current state of all cultural codes determining comprehensive human functioning.
- Cultural forecasting is a purely scientific form of predicting the decision-making process of social groups based on understanding their cultural programming.

In the adopted method of cultural forecasting, appropriate definitions for cultural codes and their values are also provided" (M. Górnikiewicz, *Cultural Forecasting of National and International Security Threats*, WAT).

2. Methodological Assumptions

At the initial stage of the considerations presented in this monograph, the authors assumed that the success or failure of collaboration between any social groups (such as a company's management or a university's administration) would be determined by the mental programming of the individuals involved.

Thus, a key research question was formulated: ***"Can the effectiveness of collaboration between academic and business entities be predicted based on cultural values through the cultural forecasting method?"***

It was hypothesized that the quality of future cooperation would fundamentally depend on the synchronization or desynchronization of the perceptual and decision-making processes of those seeking collaboration. Shared cultural values would make communication and understanding between both parties much easier than if individuals were raised in different cultures. However, even individuals from the same culture can experience communication misunderstandings due to the mind being a type of software, containing both personal codes specific to an individual's experiences and cultural codes common to those raised in a given social group. Thus, if personal codes drive the perceptual and decision-making process in collaboration, a shared culture may not guarantee success. On the other hand, individuals from different cultures may establish effective cooperation if their cultural differences sufficiently synchronize the cooperation process,

contributing to its success. Therefore, identifying the cultural values and their influence on the perceptual and decision-making processes of both the academic institution and the business entity is crucial.

Thus, the authors decided to use the existing cultural forecasting method developed by one of the study's authors, M. Górnikiewicz. The study aimed to determine if this method could be used in its original form, modified for forecasting the effectiveness of academic-business collaboration, or discarded. This relatively innovative method was designed for forecasting changes in international relations. Tests evaluating its usefulness confirmed that its predictions had an 80–90% accuracy rate, forecasting decisions by governments in specific international situations.

The study aimed to test if the method would work, possibly with some modification, in a completely different area of human activity, where the decision-making process is also shaped by cultural values. Interestingly, societies with high prediction accuracy, including Russian and Chinese societies, had similar values.

Thus, a representative sample of academic institutions in Poland was chosen, focusing on their current approach to collaboration and how this cooperation between academic and economic entities developed. The study examined the cultural values shaping this cooperation on both the academic and economic sides. These values were identified by examining the decision-making processes at each entity, confirming and identifying specific cultural codes, and studying how these values influenced collaboration. This allowed the researchers to identify patterns that positively or negatively impacted the collaboration, leading to a forecast of how this cooperation might develop. The study included 20 academic entities and their business environments. The selection considered representativeness, including both private and public universities, comprehensive institutions, and technical universities. The second aspect was the experience and nature of cooperation with the business environment, from the lowest to the highest levels. Thus, the 20 academic entities in the study repre-

sented the spectrum of Polish academic institutions in all scientific disciplines.

The second stage involved verifying the cultural forecasting method by studying the cooperation process between an institution familiar to the authors and three economic entities. This confirmed the method's effectiveness, concluding the research.

The study utilized theoretical methods, including analysis, synthesis, and comparison, and empirical methods, such as literature review (including online sources) to gather information on the decision-making processes and identify the cultural values shaping the processes of academic institutions and their business environments, observation (of ongoing collaboration), and experiment (with one academic entity and three economic entities with extensive information from publicly available sources).

The authors note that only publicly available written and online sources were used, making the study "open source." No diagnostic survey methods were used, so neither direct nor indirect inquiries were made to representatives of the studied social groups (academic or economic entities), as the study aimed to identify cultural values only through analyzing the perceptual and decision-making process outcomes. This allowed the authors to examine the impact of these values on the decision-making process of the entities, leading to a forecast of the effectiveness of collaboration.

3. Research Process

In this section dedicated to presenting the conducted empirical research, the course of the study and the results obtained for research on the effectiveness of cooperation between the examined academic entities and business entities are described over the next 20 sub-chapters. The conducted study allowed us to identify cultural code values according to the Cultural Code Matrix based on the decision-making process previously carried out by the subject entity in the area of relations and cooperation with business entities.

3.1. Cooperation of Banking Higher Education Institutions with Business Entities

Concerns: Assessment of the effectiveness of academic-business cooperation between the group of Banking Higher Education Institutions (Pol. Wyższa Szkoła Bankowa – WSB) and the businesses collaborating with this group: a case study using the adopted method of cultural forecasting.

Rationale for choosing the WSB as the subject of research and the adopted profile of academic-business cooperation at the WSB: Banking Higher Education Institutions are a group of private academic entities that have embedded cooperation with business entities into their mission of development. This is unsurprising given the

profile of academic activity adopted by these institutions. In 1994, initiated by the Banking Education Society, the School of Banking in Poznań was established. Over the years, the institution successfully expanded by creating several branch faculties, which eventually became independent schools within the group. From the outset, the school has closely collaborated with business entities, gaining, among other things, accreditation from the Business Centre Club. Given this background, it was an ideal subject for research into the forecasting of the effectiveness of academic-business cooperation.

The Banking Higher Education Institutions have oriented their cooperation with the business world towards preparing their graduates well for the realities of a dynamically changing market, which would be impossible without ongoing cooperation with potential employers. Current partners of the institution include well-known brands such as openNexus, Wielkopolski Employers' Association LEWIATAN, Cortland, Grant Thornton, Rainbow, Man, Vector, Intraservis, Volkswagen, Komputronik, ZUS, Raben, Bank Polski PKO, as well as law firms, hotels, and public administration and local government entities. The tangible effect of the high activity of the institution in this area, facilitated by the employment of 14 business coordinators active throughout Poland for establishing and developing cooperation with entrepreneurs, is the signing of 82 holding agreements with business partners and a rich educational offering manifested in seven hundred and twenty postgraduate study programs, many of which are directed at entrepreneurs.

The Banking Higher Education Institutions aim for further development with business partners by offering various forms of cooperation, including: special discounts for companies on studies and training, enabling business patronage of a field of study or, more narrowly, specializations; facilitating support in building a trustworthy employer image through joint organization of internships and practice placements, and enabling presentations of the company's image and offers during lectures organized at the institution's premises.

In summary, the activity of the Banking Higher Education Institutions in the field of academic-business cooperation is strongly oriented towards education aimed at providing entrepreneurs with adequately qualified staff through cooperation with interested partners in creating and developing study programs. The adopted model seems well-thought-out, given the benefit that students gain by tailoring education to the needs of future employers, ensuring their employment after graduation, and providing entrepreneurs with well-educated employees, contributing to quicker and more effective integration into the realities of the job. However, it is surprising that despite such a long tradition and presence in the Polish academic services market, the Banking Higher Education Institutions have not expanded the cooperation model to include non-didactic elements, at least not to the extent needed by the market (also limited to the regions of their activity).

The Banking Higher Education Institutions offer bachelor's degrees in the field of social sciences (administration, security studies, management, dietetics, economics, language studies, finance and accounting, cosmetology, economics – international trade), as well as engineering degrees in technical sciences (computer science, information technology, engineering management, logistics). In social sciences, where education is conducted, it is possible to develop innovative know-how as is done in many Western universities. Interdisciplinary projects can also be carried out, for example, combining IT with management and security studies or economics. The possibilities are vast, suitable to the rapidly changing nature of the market, to offer not only cooperation in the field of broadly understood teaching, but also the development of ready-made solutions that could improve existing business functionalities. Thus, it can be assumed that part of the developmental potential of students and future graduates is somehow unnoticed and, consequently, unutilized. In social sciences, numerous and various studies can be conducted that could yield a tangible financial effect, which is very interesting and attractive as an added value for entrepreneurs.

SWOT ANALYSIS

Strengths:

- A comprehensive and professional educational offering targeted at businesses, aimed at enhancing the qualifications, knowledge, and skills of employees at all levels as well as business owners.

Weaknesses:

- Lack of research, research and development, and implementation cooperation.

Opportunities:

- The potential to provide services in performing basic activities necessary for the proper functioning of companies in various industries (primarily legal, financial, logistical, informational, and tourism), which would allow students to gain real professional experience and additional income, and companies to reduce employment costs or redirect resources previously tied to the necessity of performing basic tasks towards more serious goals and tasks.
- The opportunity to launch a support form for innovative business ideas of students with market potential, through the mediation of the institution in representing these ideas in the business community and support in finding potential investors.

Threats:

- The risk of not standing out significantly among other institutions as a particularly attractive, and therefore unique, academic partner due to maintaining cooperation only focused on educational services.
- The risk of the emergence of new entities with a much more creative vision for developing cooperation with entrepreneurs.

Influence of Cultural Code Values on the Effectiveness of Cooperation Between Academic and Business Entities:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	**WS/ NS**
The researched economic entity	WR	SM/ KO	ST	KT	SL	WN	NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	Both the universities within the WSB group and the entrepreneurs collaborating with these universities exhibit a similar set of values determining the decision-making process, with one difference: the decision-making process within the WSB is characterized by a value that lies intermediate between independence and cooperation, as well as a commitment to stabilizing and developing mutual cooperation through the WSB, as opposed to entrepreneurs, who view the WSB similarly to other economic entities. This difference in cultural code values makes the WSB more willing to make concessions for further cooperation development. On the other hand, other directions of cooperation (research, research and development, and implementation) have not been opened so far, partly due to a lack of conviction and concerns about the future of such direction on the part of WSB decision-makers, as well as complete distrust of such cooperation from entrepreneurs.						

Ad. 1. Both the institutions in the Banking Higher Education Institutions (WSB) group and the entrepreneurs cooperating with them operate with High Discernment, thereby identifying the stability and perspective of cooperation through the market position of the partners involved.

Ad. 2. On the one hand, institutions in the WSB group are culturally oriented towards autonomous operations, especially in relation to competitors in the academic services market. On the other hand, in relation to entrepreneurs from other sectors, they show a greater willingness to compromise and negotiate to maintain and further develop cooperation. Entrepreneurs, meanwhile, view the WSB as another market entity, sometimes even as a competitor, which benefits from offering them dedicated postgraduate, MBA, and EMBA programs, while also interested in sending students for internships. In other words, from the entrepreneurs' perspective, WSB gains more in this relationship, as entrepreneurs do not earn quantifiable values from this cooperation. Certainly, gaining well-educated employees tailored to the company's needs may bring them specific benefits in the future, but most entrepreneurs still operate in a "here and now" system, not in a few months ahead or even more so in years. This causes entrepreneurs to adopt a much more cautious and conservative approach, and what could induce them to expand cooperation is the vision of tangible and quick benefits (possibly in a longer time perspective but stable, thus almost certain).

Ad. 3. Institutions in the WSB group are interested in stabilizing cooperation with entrepreneurs due to the adopted profile of the former and the benefits arising from such cooperation through acquiring participants for postgraduate, MBA, and EMBA studies. Entrepreneurs, on the other hand, approach cooperation with the WSB conservatively, treating the institutions like any other business partner, the relationship with which, due to limited trust, must maintain far-reaching caution. Thus, entrepreneurs are very skeptical of new forms of cooperation with a vision of future profits that are difficult to clearly identify.

Ad. 4. Both the WSB and entrepreneurs are culturally unaccustomed to planning their activities in a very long-term perspective, thus anticipating the consequences of their actions. Therefore, any cooperation should develop gradually and with short-term defined goals.

Ad. 5. Both the WSB and entrepreneurs, when planning and developing their activities, fail to perceive market reality in a broader, international spectrum, in order to generate maximum benefits from a given situation. As a result, in order for cooperation between the WSB and entrepreneurs to be effective, it should be determined by the closest elements of market reality.

Ad. 6. Both the WSB and entrepreneurs are not inclined to take unnecessary risks.

Ad. 7. Both the WSB and entrepreneurs are unable to utilize all their assets and opportunities that could indirectly be generated from the current market potential. Striving to enhance the efficiency of cooperation, both parties should therefore focus on assets and opportunities directly available in a limited manner supporting the main activity, reaching out to indirectly resulting possibilities for strengthening market position.

CONCLUSIONS

The existing cooperation between the WSB and entrepreneurs is proceeding successfully, continues to be developed and deepened, but mainly in the area of the expanded educational offer for entrepreneurs through offering market-oriented postgraduate, MBA, and EMBA programs. The potential opportunity to undertake a doctoral program enhances the existing cooperation and strengthens WSB's image as a credible partner. Expanding into other forms of cooperation based on existing tradition and pragmatism of mutual relations between the WSB and companies would make it possible to the offer to include research, research-development, implementation, or investment in innovative start-ups. However, this would require the institutions to prepare an offer the effects of which would be as safe

as possible for both parties and not generate excessive risk. In conclusion, if entrepreneurs saw obvious benefits in such an offer with minimized risk, considering the WSB's credibility, they might also be inclined to seriously consider such cooperation. At the same time, considering existing experience, good practices, and the influence of cultural code values, cooperation should be expanded very slowly and gradually, so that any problems can be continuously identified and solved during the course of a new cooperation project. Starting collaboration on a large scale with evaluated cultural values would likely end negatively for both parties, and instead of further strengthening cooperation and market position of the involved entities, it would lead to a completely opposite situation.

3.2. Collaboration of the University of Warsaw with Business Entities

Concerns: Assessment of the effectiveness of academic-business cooperation between the University of Warsaw (Pol. Uniwersytet Warszawski – UW) and collaborating business entities: a case study using the adopted method of cultural forecasting.

Rationale for choosing the UW as a research subject and the adopted profile of academic-business cooperation at the UW: The University of Warsaw is one of the oldest Polish universities, founded in 1816 as the Royal University of Warsaw. In 1830, following the November Uprising in which many students participated, the university was renamed to the Royal Alexandrian University and subsequently dissolved, with much of its collections transported to Petersburg. The Main School of Warsaw was established in 1862 but was closed five years after the January Uprising in 1869. In 1870, the Imperial University of Warsaw was established, and during World War I, in 1915, the university was relocated to Rostov-on-Don (Russia), where it operated as the Imperial University of Warsaw in Rostov-on-Don until it was

transformed into the Don which University in the new political reality of 1917. A Polish-language University of Warsaw was founded in 1915 and has continued to this day. The name was changed to the Józef Piłsudski University of Warsaw in 1935. During World War II, the Germans closed the university, and the collections were transported to the Reich. Classes were held secretly in private homes. After the war ended, the University of Warsaw was reactivated on December 16, 1945. The period from 1816 to 1915 cannot be unequivocally dismissed, as during this time under various names, the foundations of the future University of Warsaw evolved not only in the administrative-organizational sphere but primarily in the cultural, social, and mental spheres. Thus, the University of Warsaw established in 1915 benefited from the evolving Warsaw student body and the developing academic community of the capital. This historical introduction seems justified to substantiate the choice of the University of Warsaw as a research subject in terms of the adopted profile of academic-business cooperation.

In 2012, the UW Senate Resolution established UWRC Sp. z o.o., a special-purpose company for the commercialization of research and development results conducted at UW. The company's scope of activity includes shares in business entities founded by researchers, doctoral students, and students of the university. Currently, the number of spin-off companies established on this basis has reached thirty:

1. Amerlab (medical and veterinary diagnostics).
2. BACTrem (bioremediation, biodegradation).
3. Biotemist (technologies developed as a result of research on biochemical processes occurring in selected strains of Antarctic bacteria).
4. Information Refinement Center (Big Data analysis).
5. DDG Bioinformatics (microbial genomics).
6. Edugram.
7. EIT Food CLC North-East (center coordinating the consortium partners of EIT Food).
8. ExPLoRNA Therapeutics (therapeutic mRNA research).

9. GeoLearning (educational workshops for children and youth at the European Center for Geological Education in Chęciny).
10. GeoPulse (satellite crop monitoring).
11. Green for You.
12. InArcheo (research, conservation, expert opinions).
13. InnBAT (battery technology development used in energy storage based on innovative carbon and acid-lead cells. The solution is patent-protected).
14. Inelco (galvanic coating technology).
15. Innter (radiopharmaceutical markers and new types of cell storage technologies).
16. Lecturus (services for scientists aiming to promote their research).
17. Matariki Bioscience (commercialization of compounds that may become new drugs).
18. Meteo (weather service meteo.pl).
19. Microanalysis (monitoring of hemodialysis procedures).
20. MIM Solutions (personalization and recommendations on www services).
21. Oncoboost (research on combining anticancer drugs with natural substances).
22. Nephrolab Plus (diagnostic solutions for diseases with proteinuria).
23. Project42 (tools and solutions utilizing data science, artificial intelligence, and machine learning).
24. QUANT_KIT (building a platform to support investment decisions).
25. RDLS (environmental monitoring, bioremediation, biodegradation).
26. Smarter Diagnostics (support for sports injury therapy).
27. Spektrino (data analysis for science).
28. UpGrow (scientific research and development work in biotechnology).

29. Wahaf Farma (early detection of cancer symptoms).
30. Warsaw Genomics (genetic research).

Additionally, the University of Warsaw hosts expert centers and laboratories such as:

1. Center for Biological and Chemical Sciences (research services accredited for research funds, public sector, chemical industry, agri-food, medical, pharmaceutical, fuel-energy sector).
2. Digital Economy Lab – a laboratory established jointly with Google (research and expertise of a social, economic, and legal nature for public institutions, administration, NGOs, enterprises).
3. Center for Forensic Sciences (forensic expertise, opinions, and advice, e.g., on the identification of perpetrators of crimes and document forgeries).
4. Center for Political Analysis (reports, expertise, and analyses on issues related to political functioning).

Furthermore, the university operates the University Technology Transfer Office, which on its website features tabs dedicated to three different groups of stakeholders. The UOTT's task is to identify common areas of cooperation that consider their interests and needs. The tab dedicated to scientists provides information on types of intellectual property, its protection at the university, describes the patent process within the university, as well as the commercialization process and the mode of establishing spin-off companies. In other words, a scientist wanting to explore the commercialization possibilities of their research findings can turn to UOTT as a place designed to support the process of recognizing the market potential of an idea/research results, and also to protect the interests of the scientist and the university. Another tab dedicated to entrepreneurs allows them to familiarize themselves with the conditions for establishing cooperation with the university and its researchers and to learn about the university's capabilities and offerings. The tab dedicated to students provides information on competitions for diploma theses, which

could result in future beneficial cooperation with an entrepreneur interested in the topics, internship programs, and the recruitment process for the Student INIT Circle aimed at popularizing the topic of commercialization among students and promoting innovation and entrepreneurship. The circle also aims to support works related to the commercialization of technology. What deserves particular attention is the initiative related to the establishment of the UW Incubator, the goal of which is to inspire young people and university employees to realize their dreams of running their own business. Despite being established only in 2017, the Incubator actively develops its activities by utilizing expert backgrounds, allowing those who decide to start a business to benefit from the advice and suggestions of experienced entrepreneurs in various industries. Moreover, the UW Incubator also provides support during the initial stage of conducting business, so as not to only inspire and assist but also to continue to provide support for some time, especially since this period in any business is not the easiest. An additional advantage of such an approach is the active support of people, at least some of whom will open and develop a business, thus feeling a bond with their alma mater, which allows mutually beneficial cooperation to develop with much greater trust than in the case of establishing relationships between the university and completely foreign entrepreneurs. The UW Incubator conducts a range of activities aimed at inspiring, creative thinking, and preparing for the hardships of running one's own business. In addition to a wide offer of various courses and training, there is an opportunity to test a business idea, expert mentoring, acquiring knowledge and experience through practice, and programs aimed at developing creativity useful in the market. Within the mentioned business idea test, interested parties can subject their idea to pre-incubation, meaning that within the above-mentioned special-purpose company UWRC, without the need to establish their own business, they can conduct this activity under the company's banner with formalities reduced to a necessary minimum, and additionally with professional accounting,

legal, and of course, substantive (business) support. The website provides information on what an interested party can gain:

- The service is free, and settlement occurs at the moment of revenue recording, as a determined percentage of that revenue.
- Accounting services.
- Legal services.
- Leveraging the UW brand in conducted activities. Moreover, the university also offers expert and laboratory services, the list of which is continuously updated at: www.oferta.uw.edu.pl. These services are directed to private and public entities, including scientific centers, public institutions, and business entities. In 2021, 22 filings were made to the Polish Patent Office and 31 filings in the international procedure. By 2021, the Polish Patent Office had granted patents to 25 inventions (from four faculties of the university: Faculty of Chemistry, Faculty of Biology, Faculty of Physics, and CeNT). Meanwhile, foreign patent offices granted a total of 63 patents.

SWOT ANALYSIS

Strengths:

- A relatively well-defined educational offer targeted at businesses aimed at enhancing the qualifications, knowledge, and skills of employees and business owners.
- The operation of the UWRC Sp. z o.o., a special-purpose company, and the UW Incubator, both established with the goal of inspiring and developing entrepreneurship among students and university staff, as well as identifying and creating platforms for business-academic cooperation leveraging the scientific potential of the university—both initiatives have proven successful in practice, evidenced by the establishment of 30 spin-off companies focused on technology transfer including business-directed initiatives, and 18 student projects.

Weaknesses:

- Cooperation in technology transfer and research and development is largely focused on business entities active within Poland, although the number of international entities has been increasing over the years.

Opportunities:

- The initiation of a business infrastructure shaped within the UW Incubator, which should lead to an increasing number of entrepreneurs identifying with the university in the future; this, in turn, should contribute to the development of a business environment conducive to further evolution of the university.

Threats:

- The multitude of entities involved in collaboration with business and technology transfer, unclear competency scopes, which in the future could lead to management difficulties as new institutions are established and existing ones expand; this, in turn, could affect the current level of effectiveness in building lasting ties between the university and the business community based on a progressively expanded system of mutual benefits.

Cultural Code Values Influencing the Effectiveness of Cooperation Between Academic and Economic Entities:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	**WN/ NN**	**WS/ NS**
The researched economic entity	WR/ NR	SM/ KO	RW/ST	DT/KT	SL	NN	NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	**WN/ NN**	**WS/ NS**
Description of the impact of averaged values on decision-making	The vast majority of values (WR/NR, SM.KO, RW/ST, DT/KT, WN/NN) favor the effective development of collaboration between the university and businesses. Values that generate limitations in this regard may not necessarily have a negative impact on this development, but rather may slow down the pace and reduce the level of effectiveness in utilizing available resources for mutual benefits (SL, NS). In conclusion, the comparison of cultural values between the university and businesses indicates that the current pace of development will be maintained, although it could be slightly faster and more effective.						

Ad. 1. Interestingly, the University of Warsaw does not primarily adhere to the dominant value of High Recognition (HR) but balances between HR and Normal Recognition (NR). Entrepreneurs, who mostly operate under High Recognition, view the University of Warsaw as a business partner with a very strong position and high authority, which causes them to take initiatives for cooperation from the university very seriously. On the other hand, the university's average positioning between HR/NR leads to a serious consideration of entrepreneurs, where their market position is not paramount. This influences a great openness on both sides to establish and develop cooperation, which is further strengthened by a rich educational offer and significantly more interesting in terms of technology transfer.

Ad. 2. The University of Warsaw navigates an average value between Self-Management (SM) and Cooperation (KO). This means that the university, while developing cooperation with both academic and economic entities, strives for benefits but also in a format of stable and long-lasting, even structured collaboration. Entrepreneurs, predominantly guided by Self-Management, are focused on ensuring profits, but, the university's extensive offer of cooperation provides a sufficiently positive response that also this combination of values positively influences the prospects of collaboration.

- Lack of real and structured development of cooperation with academic centers and entrepreneurs outside of Mazovia to

a degree comparable to activities in Warsaw and its surroundings.

Ad. 3. In its interactions with entrepreneurs, the University of Warsaw is not interested in competing as seen with other, competitive academic centers. Entrepreneurs are seen as an economic environment the developing cooperation with which can only bring benefits, from potential interest in the educational offer (at the UW, this is not the main axis of cooperation development), and primarily the transfer of services and technologies through entities established by the university. It can be assumed that by creating strong and stable foundations for this cooperation, the University of Warsaw enhances its competitiveness against antagonistic academic centers, especially those with the strongest position in the Polish, particularly the Mazovian market. Entrepreneurs, depending on the industry, may partially view universities as competition, but due to the status and prestige of the University of Warsaw, only to a limited extent. In summary, here too, the convergence of values favors the further development of cooperation, which has a very strong foundation in the meticulously built infrastructure serving the technology transfer between the university and business.

Ad. 4. The initiatives undertaken by the University of Warsaw in terms of technology transfer aimed at building a long-term process of establishing a stable and favorable business environment for the university indicate medium-term planning, which, after many years of activity in this area, is being realized successfully. This long-term perspective adopted by the University of Warsaw, despite the short-term nature of entrepreneurs, also bodes well for the further development of cooperation.

Ad. 5. Despite high ambitions and the adoption of a long-term perspective, the future direction of cooperation development may be limited by the dominant value of selectivity both in relation to entrepreneurs and the University of Warsaw. This means that the university is not able to fully effectively utilize all the possibilities that

arise and will emerge in the broader environment. Practice confirms that the main axis of university development focuses on building the strongest possible position in relations with the business environment of Warsaw and its surroundings. The university is active not only in Poland but also internationally, although this activity often has a demonstrative-declarative character. In this area, the university has not managed to build a strong base to compete, for example, with Jagiellonian University in Lesser Poland, not to mention competing with foreign universities. This does not mean that such possibilities do not exist. On the contrary, the information age has completely changed the rules of the game, but what limits these new directions of development are mental-cultural barriers manifested in the value of selectivity. The situation looks similar as far as entrepreneurs from Mazovia are concerned as they are closer to their local academic centers.

Ad. 6. The University of Warsaw differs in its approach to developing and stabilizing its economic environment from entrepreneurs by accepting the risk for the sake of gaining opportunities for faster growth of its own potential thanks to the business infrastructure.

Ad. 7. The University of Warsaw and entrepreneurs are unable to fully utilize their potential, which in the case of the university is not only culturally conditioned but also organizationally through the existence of too large a structure relative to the management models developed so far. Similarly, despite many successes, the university is not fully able to adapt to the challenges of the information civilization in order to maximize its effectiveness through comprehensive and multi-directional utilization of its own potential.

CONCLUSIONS

Considering the size of its structure and mental-cultural legacy, including the gradual exchange of staff, the University of Warsaw serves as a good example of progressive thinking ahead of the expectations of the contemporary information civilization. Giving voice

and creating a platform for activity to students and staff (representing the younger generation) in institutionalized forms such as the special-purpose company and UW Incubator.

3.3. Collaboration Between the Jagiellonian University and Business Entities

Concerns: Evaluation of the effectiveness of academic-business collaboration between the Jagiellonian University (Pol. Uniwersytet Jagielloński – UJ) and its business partners: a case study using an adopted method of cultural forecasting.

Rationale for selecting the UJ as the research subject and the adopted profile of academic-business collaboration: the Jagiellonian University, the oldest Polish university founded in 1364 by Casimir the Great, makes a natural choice for studying and evaluating the effectiveness of its academic-business cooperation and forecasting its future development, particularly due to its longstanding tradition in education and research. The university was closed during the German occupation and resumed its activities after the war in 1945. Like other major academic centers, the UJ is active in three areas: education, scientific research, and collaboration with the social, cultural, and economic environment. This activity spans the fields of exact sciences, natural sciences, medicine, humanities, and social sciences. To institutionalize the development of these collaborations, UJ established the Innovation Center, Technology Transfer Office, and University Development, as well as a Careers Section. Furthermore, initiatives independent of these structures are undertaken at various faculties and their organizational units.

In response to business community expectations, the university offers a variety of research services and the potential use of inventions developed through its scientific activities. To facilitate this, the UJ has developed a website with intuitive search engines for services (over 130) and inventions (51).

To enhance technology transfer, the university employs ten technology brokers who provide services within the Innovation Center, Technology Transfer, and the University Development Office. The partners of the Center are carefully selected, evidenced by the inclusion of only elite groups like the LifeScience Cluster of Countries, the Jagiellonian Innovation Center, and the Academic Centers for Technology Transfer (PACTT) network, which includes representatives from units responsible for the management and commercialization of intellectual property of Polish universities, research institutes, and the Polish Academy of Sciences. This network also includes entities like the AGH University of Science and Technology in Krakow – Technology Transfer Center; the Gdańsk University of Technology – Knowledge and Technology Transfer Center; the Silesian University of Technology – Innovation and Technology Transfer Center; Wroclaw University of Technology – Wroclaw Technology Transfer Center; and the West Pomeranian University of Technology in Szczecin – Regional Center for Innovation and Technology Transfer.

The brokers employed at the Center offer a wide range of advisory services for UJ scientists in terms of assessing: the innovativeness of a product/invention; patent capability; readiness for implementation; the market value of the innovation and target markets. Additionally, the brokers at the Center identify and connect the UJ's research teams/experts with business partners interested in collaboration within: consortia in projects for SMEs funded by EU funds and others; subcontracting/expert services in projects for SMEs funded by EU funds and others; commercial research services conducted on behalf of companies, and expert panels.

Moreover, the university is also involved in the Krakow Scientific Consortium "Matter Energy Future" and the CELL-MOCH-TELL Consortium. It can be assumed that the University is focused on developing and strengthening its position, with a particular emphasis on its geographically close region.

SWOT ANALYSIS

Strengths:

- Relatively profiled educational offerings aimed at businesses focus on enhancing the skills, knowledge, and capabilities of employees and business owners.
- An extensive and highly professional service in the field of technology transfer targeted both at university staff and entrepreneurs, evidenced by the employment of 10 technology brokers under the Innovation Center, Technology Transfer, and University Development, which is reflected in a long list of inventions (51) and over 130 tailored services for various industries.

Weaknesses:

- Collaboration in technology transfer and particularly in research and development focuses only on part of the country, not engaging entities from across Poland, let alone a few exceptions from other countries.
- Slow decision-making processes that can negatively affect competitiveness in the rapidly changing specifics of the educational services and technology transfer market, whereby the Jagiellonian University's position as a strong partner for business entities might weaken over time due to an overly cautious policy.
- The lack of a long-term vision materialized in the form of concrete goals, meaning that the university focuses efforts on strengthening and developing current capabilities, which could give a competitive edge to more forward-looking entities.

Opportunities:

- Expanding technology transfer services to previously unengaged business entities from across the country and gradually from abroad, for which the university is prepared from an infrastructural standpoint, though it might then be necessary to strengthen the human resources of the Innovation Center, Tech-

nology Transfer, and University Development. This could further enhance the university's position by developing cooperation, especially with the foreign economic environment.

Threats:

- The possibility of gradually taking over some of the collaboration with entrepreneurs previously associated with the UJ by other universities, also involved in joint initiatives, if they could develop a more favorable and efficient formula for providing services in the area of technology transfer.
- Excessive focus on achieving its own goals and interests, even at the expense of other academic and economic entities, especially in the area of technology transfer, which could lead to weakening or loss of relations with these entities, thereby losing the ability to actively shape part of this market segment.

Cultural codes' values influencing the effectiveness of cooperation between academic and economic entities:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ **KM**	**WN/ NN**	**WS/ NS**
The researched economic entity	WR	SM	RW/ST	KT	SL	WN	WS/ NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The university manages and utilizes its resources relatively effectively, distinguishing the UJ from other large universities that are not fully able to manage their own capabilities in this regard. As a result, the UJ is ready to expand structures aimed at technology transfer, with the potential to extend them not only across Poland but also to business entities from other countries.						

Ad. 1 . Driven by the longest academic tradition in Poland, the Jagiellonian University strives to establish and develop cooperation only with entities it deems sufficiently strong or promising. Entrepre-

neurs also regard their connections with the university as a form of ennoblement but are eager to utilize the technology transfer services developed by the UJ due to the high level of professionalism exhibited by the technology brokers employed at the university.

Ad. 2. Despite efforts to build institutionalized and multi-faceted forms of cooperation with business entities and other universities, there is an observable tendency towards securing its own position and fulfilling its interests, even at the expense of other entities.

Ad. 3. The Jagiellonian University aims to stabilize the economic environment with which it develops relations, although there is a greater emphasis on competition, as reflected in the expanding service of technology transfer. In this realm, the university seeks to maintain autonomy, thereby competing with other academic centers and economic entities that could pose competition. In this respect, it undertakes actions more reminiscent of a business entity than an academic one.

Ad. 4. The university's policy regarding the expansion and promotion of technology transfer services is focused on strengthening its current position without a long-term vision articulated as a specific goal to be achieved in the long-term perspective. Both the university and its academic and economic partners cooperate for immediate benefits, which may lead to a loosening or cessation of such cooperation in the near future should discrepancies between these interests arise.

Ad. 5. The Jagiellonian University focuses on current capabilities and resources, gradually enhancing and expanding them, which simultaneously indicates a lack of vision for utilizing resources of other entities through various forms of cooperation. This narrow perspective on using current resources limits future developmental possibilities compared to those entities that master such skills.

Ad. 6. In developing cooperation with the economic environment, the Jagiellonian University is marked by extensive caution, which may slow down the decision-making process in an increasingly dynamic

market, particularly in adapting to contemporary requirements. Although economic entities also exhibit great caution, the university's continued cautious policy may lose competitive edge against entities that make quicker decisions in the constantly changing specifics of the educational services and technology market.

Ad. 7. The Jagiellonian University is effective at managing its resources, albeit limited to the current state, without the capability to foresee and create future resources to manage them in advance effectively. However, entrepreneurs are characterized by a similar mental-cultural conditioning, which means that this value will not negatively impact the cooperation.

CONCLUSIONS

As the oldest academic center in Poland, the Jagiellonian University has a strong position in establishing and developing cooperation with the economic environment, but it lacks a stable vision for the further development of this cooperation and achieving benefits beyond strengthening its current position. One of its undeniable advantages is the developed and institutionalized form of providing technology transfer services, which has so far focused only on the geographical vicinity of the university's headquarters in Poland. Despite relatively effective management of its own resources, the university's decision-making process is characterized by extensive caution, which negatively affects the speed of decision-making to which entrepreneurs functioning in a highly dynamic market environment are accustomed. Consequently, although the Jagiellonian University has much to offer in terms of inventions and highly professional services for various industries, it has not developed a sufficiently thoughtful and prospective vision for further development. Over time, the position of the Jagiellonian University, despite its developed and attractive cooperation offer, may weaken compared to academic centers characterized by greater openness and much quicker decision-making processes, especially in the case of smaller and prospective econom-

ic entities that may strengthen their position in the rapidly changing realities of the contemporary market. Expanding structures responsible for providing services to individual industries, as well as technology transfer, to direct the offer to a much wider, especially foreign audience, could positively impact the university's position in the future. A pragmatic and well-thought-out development strategy in this area would also be necessary, incorporating the identification of new economic entities with high growth potential, and addressing the problem of the decision-making process to possibly accelerate decision-making in this sphere of university activity.

3.4. Collaboration of Adam Mickiewicz University in Poznań with Business Entities

Concerns: Evaluation of the effectiveness of academic-business collaboration between Adam Mickiewicz University in Poznań (Pol. Uniwersytet Adama Mickiewicza – UAM) and its business partners: a case study using an adopted method of cultural forecasting.

Rationale for choosing UAM as the research subject and the adopted profile of academic-business collaboration: Adam Mickiewicz University in Poznań is among the top ten research universities in Poland and is the largest in the Greater Poland region, making it a suitable subject for expert analysis. Additionally, the university is a member of the European consortium of universities, EPICUR – European Partnership for an Innovative Campus Unifying Regions, which includes: the University of Strasbourg (France), the University of Amsterdam (Netherlands), Albert-Ludwigs-University Freiburg (Germany), Karlsruher Institut für Technologie (Germany), the University of Haute-Alsace (France), the University of Natural Resources and Life Sciences, Vienna (Austria), and Aristotle University of Thessaloniki (Greece). Currently, the university offers nearly 80 programs and over two hundred specializations. More than 1,300 doctoral stu-

dents are educated within the Doctoral School, and the university also has an extensive offering of postgraduate studies and courses. The following studies might be of interest to the university's business partners and economic entities:

- Administration;
- Food Product Analytics;
- Data Analysis and Processing;
- Internet of Things Applications;
- National Security;
- Biophysics;
- Bioinformatics;
- Biology;
- Human Health Biology;
- Biotechnology;
- Chemistry;
- Applied Chemistry;
- Material Chemistry;
- Digital Entrepreneurship;
- Environmental Protection;
- European Legal Studies;
- Medical Physics;
- Water Management and Engineering;
- Spatial Economy;
- Computer Science;
- German Language and Business Communication;
- Cartography and Geomatics;
- Legal-Economic Direction;
- Cognitive Science;
- Mediation and Image Communication;
- Interactive Media and Performances;
- Neurobiology;
- New Media Communication;
- Environmental Protection;

— Law;
— European Law;
— Audiovisual Production;
— Psychology;
— Sound Directing;
— Sinology;
— Information Technology;
— Computer Technology;
— Tourism and Recreation;
— Polish-English Conference Translation;
— Creative and Specialist Translation;
— Written and Multimedia Translation;
— Oriental Studies;
— Management and Business Law.

University partners include Santander Bank through the university's participation in the Santander Universidades scholarship program, and businesses collaborating with the university include:

— KKS Lech Poznań,
— Sonalake,
— Cognifide,
— Akces Edukacja,
— Beyond.pl,
— Kinguin,
— Komputronik,
— Mobica.

A significant predominance of IT companies in this group, especially those focused on developing software and online sites, as well as the relatively declarative content of the agreements, clearly indicate that the development direction chosen within UAM very limitedly addresses collaboration with the economic environment, especially beyond the geographical reach of the university. It can be assumed that the only services currently provided that could meet with limited interest from economic entities are the educational programs offered

by the university, as detailed below. Technology transfer, similar to practices at the University of Warsaw or the Jagiellonian University, has not yet been institutionalized, which impacts the university's stature as a strong partner in establishing business relations.

SWOT ANALYSIS

Strengths:

- None listed

Weaknesses:

- Lack of a complementary and dedicated educational offer targeted towards acquiring employees, managerial staff, and owners tailored to partners and economic entities.
- Absence of an institutionalized form of providing services in the broad area of technology transfer.

Opportunities:

- Opportunity to institutionalize the technology transfer service similar to models at the University of Warsaw or the Jagiellonian University, potentially directed at entrepreneurs from the Greater Poland Voivodeship.

Threats:

- Risk of gradually weakening the position as a credible partner for the Poznań and Greater Poland business environment due to competitive offers in education and technology transfer from other, much more active academic entities in this area.

Cultural Codes' Values Impacting the Effectiveness of Collaboration Between Academic and Economic Entities.

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	**SL/ KM**	**WN/ NN**	**WS/ NS**
The researched economic entity	NR	SM	ST	KT	SL	WN	NS

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	**SL/ KM**	**WN/ NN**	**WS/ NS**
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	Values that can positively influence the development of relations with a dynamically changing international environment are NR and ST, while those that may complicate establishing and strengthening collaboration with business entities include other values, some of which fortunately align with those represented by these entities. In conclusion, the average cultural values do not hinder the development of relations with the business environment.						

Ad. 1. Adam Mickiewicz University does not prioritize business partners based on their market position or potential (current/future), as evident from the list of entities with which it has formed partnerships, and even more so from the list of entities with which it has not engaged in any form of cooperation. This approach could be positively viewed as it indicates that the university is open to all forms of collaboration with a wide array of entities, including those the potential of which may yet to be realized.

Ad. 2. Outside of the typical academic cluster, the university has not established any collaboration with economic entities in any institutionalized form of activity and primarily operates with its own interest in mind, promoting its educational offerings to a broad audience without considering the specific needs of entrepreneurs or individual industries.

Ad. 3. In the policy of Adam Mickiewicz University, it is difficult to see any inclination towards competition, not only with economic entities but also with academic ones. This could potentially be an advantage in the future if real actions were taken to develop cooperation with the business environment.

Ad. 4. Within Adam Mickiewicz University, there is no real institution actively responsible for developing cooperation with economic

entities, and thus there is also a lack of any vision (including long-term) in this area of the university's activities.

Ad. 5. Adam Mickiewicz University possesses considerable potential, also in the sciences and natural sciences beyond the social sciences, which could be effectively utilized to create and promote services for business, similar to the University of Warsaw or Jagiellonian University. However, such initiatives are not undertaken, indicating not only a lack of vision or the will to take such actions but also an absence of a concept for utilizing the university's resources in this area. Geographically, the university's activities are focused on Poznań and its surroundings, which also points to an inability to effectively manage its own potential.

Ad. 6. Adam Mickiewicz University follows a policy characterized by avoiding any risk, even at the expense of accelerating its own development or even maintaining its current position, which in the face of a dynamically changing market situation may soon become increasingly difficult.

Ad. 7. The university does not exhibit the ability to comprehensively and effectively utilize current capabilities and resources.

CONCLUSIONS

Adam Mickiewicz University is not interested in developing cooperation with the economic environment, as clearly seen by the extremely limited list of entrepreneurs with whom it has formed declarative cooperation agreements. The university lacks an institutionalized form for providing services for business (including educational services, which are fundamental to the university's activities), as well as a technology transfer service, which could be implemented by drawing from the examples of active universities like the University of Warsaw and the Jagiellonian University. Thus, it can be assumed that competitive academic centers will eventually occupy the niche of cooperation with Greater Poland's economic entities due to the lack of activity in this area from UAM.

3.5. Collaboration of Nicolaus Copernicus University with Business Entities

Concerns: Evaluation of the effectiveness of academic-business collaboration between Nicolaus Copernicus University (pol. Uniwersytet Mikołaja Kopernika – UMK) and its business partners: a case study using an adopted method of cultural forecasting.

Rationale for choosing UMK as the research subject and the adopted profile of academic-business collaboration: Nicolaus Copernicus University, established post-war in 1945, operates a research station in Spitsbergen and is ranked among the top universities in Poland by the 2022 Perspektywy ranking, making it one of the country's top ten research universities. As a relatively young and dynamically developing academic center in Poland, it is highly suitable for an analysis of the effectiveness of its academic-business collaboration.

The university hosts the Center for Academic Entrepreneurship and Technology Transfer, aimed at fostering academic entrepreneurship and making innovations developed at UMK available. This center supports individuals in turning ideas into operational businesses, provided these ideas are realistically and promisingly assessed. It offers assistance in technology transfer, intellectual property protection, and the development of academic entrepreneurship. The center helps innovators manage intellectual property developed within the university, develop preliminary business models, protect research outcomes, prepare patent applications if necessary, and even find potential business partners. The underlying premise is that researchers should focus on their passions—conducting research and making discoveries—while the center handles the formal, legal, and business aspects of their projects. To this end, the center employs four technology brokers, referred to as innovation brokers, whose tasks include conducting needs analysis (verifying IP protection needs, securing necessary funding, and finding partners); developing strategies

(formulating project development strategies, including goal setting, identifying constraints, structuring, and management modeling); and selecting the right commercialization paths (identifying funding sources, developing innovation protection methods, and providing recommendations for actualizing business visions). The Patent Office at the university employs a patent attorney and a specialist.

The university also initiated the Copernicus Startup Labs, where participants can test products or services, assemble teams, acquire necessary skills, and build stable and prospective businesses. Throughout the various stages of business development, creators receive support in brand design and funding acquisition. Initially, ideas are assessed for market potential, and, if positively evaluated, are matched with suitable business models, tested in real-like but safe conditions, and the participants are taught brand management. Funding choices are facilitated through connections with investors inspired by the university and through programs offered by partner institutions in the YUFE network.

Directly related to the business environment, the university showcases offers from individual faculties, university-developed inventions, and filed patents. The following centers, laboratories, and research teams operate within the university:

- Center for Medieval and Modern Archaeology;
- NCU Astronomy Center;
- Center for Cybercrime Research;
- Center for Central and Eastern European Studies;
- Copernican Research Center;
- Juliusz P. Schauder Center for Nonlinear Studies;
- Center for Climate Change Studies;
- Center for Leadership and Corporate Social Responsibility;
- Center for Electoral Studies;
- Interdisciplinary Center for Modern Technologies;
- Veterinary Medicine Institute.

A diverse range of faculties that could cooperate with interested entrepreneurs allows for the establishment of partnerships across various industries:

- Faculty of Chemistry;
- Faculty of Pharmacy (Collegium Medicum in Bydgoszcz);
- Faculty of Philosophy and Social Sciences;
- Faculty of Physics, Astronomy, and Applied Computer Science;
- Faculty of Humanities;
- Faculty of Medicine (Collegium Medicum in Bydgoszcz);
- Faculty of Mathematics and Computer Science;
- Faculty of Biological and Veterinary Sciences;
- Faculty of Economic Sciences and Management;
- Faculty of Historical Sciences;
- Faculty of Political Science and Security Studies;
- Faculty of Health Sciences (Collegium Medicum in Bydgoszcz);
- Faculty of Earth Sciences and Spatial Management;
- Faculty of Law and Administration;
- Faculty of Fine Arts;
- Faculty of Theology.
- Interdisciplinary Center for Modern Technologies

The university's approach to developing cooperation with entrepreneurs is based on two main directions: prospectively supporting UMK staff and students in developing promising business ideas, leading to the creation of their own business base, and offering inventions, patents, and services to entrepreneurs already in the market.

Regarding educational services, the following study programs could contribute to providing students and also offer opportunities for employees to gain or enhance qualifications:

- Administration;
- Medical Analytics;
- Data Analysis;
- Information Architecture;
- Interior Architecture;

— Archival and Document Management;
— Automation and Robotics;
— National Security;
— Biology;
— Forensic Biology;
— Biotechnology;
— Medical Biotechnology;
— Chemistry;
— Food Chemistry and Technology;
— Cosmetic Chemistry;
— Medical Chemistry;
— Dietetics;
— Tax Advisory;
— Journalism and Social Communication;
— Economics;
— Pharmacy;
— English Studies;
— Balkan Studies;
— German Studies;
— Russian Studies;
— Italian Studies;
— Finance and Accounting;
— Physiotherapy;
— Physics;
— Technical Physics;
— Graphic Design;
— Computer Science;
— Japanology;
— Cognitive Science;
— Communication and Psychology in Business;
— Cosmetology;
— Medical Studies;
— Practical Linguistics and Copywriting;

— Logistics;
— Media Studies;
— Optical Optometry with Elements of Optometry;
— Nursing;
— Midwifery;
— Law;
— Psychology;
— Medical Rescue;
— Media Art and Visual Education;
— Tourism and Recreation;
— Veterinary;
— Physical Education and Sport;
— Management;
— Public Health.

Additionally, the following postgraduate studies may provide valuable knowledge enhancement for employees from specific businesses:

— Postgraduate Studies in Spatial Planning;
— Postgraduate Studies in Secret Chancellery and Protection of Classified Information;
— Postgraduate Studies in Archival and Document Management;
— Postgraduate Studies in Geriatric, Long-term, and Palliative Care Management;
— Postgraduate Studies in Applied and Clinical Physiology with Elements of Exercise Physiology;
— Postgraduate Studies in Physiotherapy in Geriatrics;
— Postgraduate Studies in Psychogeriatrics;
— Postgraduate Studies in Occupational Safety and Health;
— Postgraduate Studies in Neurology Speech Therapy;
— Postgraduate Studies in Speech Therapy;
— Postgraduate Studies in Public Administration;
— Postgraduate Studies in Medical Law;
— Postgraduate Studies in Tax Law;

- Postgraduate Studies in Public Procurement Law;
- Postgraduate Studies in Administrative Execution;
- Postgraduate Studies in Direct Taxes in European Union and International Law;
- Postgraduate Studies in Personal Data Protection Law;
- Postgraduate Studies in Labor Law;
- Postgraduate Studies in Business Leadership Competence Building;
- Postgraduate Studies in Business Controlling;
- Postgraduate Studies in Project Management;
- Postgraduate Studies in Event Management;
- Postgraduate Studies in Executive Master of Business Administration;
- Postgraduate Studies in Internal Audit of the Public Finance Sector;
- Postgraduate Studies in Quality Management;
- Postgraduate Studies in Human Resource Management;
- Postgraduate Studies in Data Science in Business;
- Postgraduate Studies in Accounting.

SWOT ANALYSIS

Strengths:

- Thoughtfully designed educational offer.
- Institutionalized form of technology transfer directed to entrepreneurs and potential clients, perspective of gradually creating its own business environment which fits into building and developing enduring relations with economic entities (initiated and supported by the university at the development stage).

Weaknesses:

- Developing cooperation in technology transfer and research and development mainly with economic entities active in Poland, without extending an attractive offer to foreign entities.

Opportunities:

- Potential to build its own business environment, thereby strengthening its position in the local market enough to gain a stronger stance in developing cooperation with entrepreneurs present in this market.

Threats:

- Intensification of activities limited to the local market, which may lead to self-limitation in acquiring future business partners and reduce the chance for faster and more effective development of relations with the business environment across Poland and other countries.

Cultural codes' values impacting the effectiveness of cooperation between academic and economic entities:

	WR/ NR	SM/ KO	RW/ ST	DT/ **KT**	**SL/ KM**	**WN/ NN**	**WS/ NS**
The researched economic entity	WR/ NR	SM/ KO	RW/ST	DT/KT	SL	WN	NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The university's decision-making process is geared toward stable growth, considering limited and calculated risks in favor of a controlled and not necessarily significant acceleration in strengthening its position in the market. From the perspective of business entities, such a partner is reliable, which bodes well for continued collaboration with the business environment.						

Ad. 1. The university maintains a balanced approach toward entrepreneurs, focusing not solely on their market position but more so on their current and future potential. This perspective allows for the recognition of positive aspects in developing future relationships with the business environment. Simultaneously, Nicolaus Copernicus Uni-

versity (UMK) may differentiate its approach depending on the market standing of the enterprise, though not in a manner that restricts collaboration with small but developmentally interesting entities.

Ad. 2. The university is prepared to establish institutionalized forms of cooperation not only with economic entities but also with academic ones, aimed at achieving higher mutual benefits.

Ad. 3. Nicolaus Copernicus University prioritizes the well-being of the institution and thus its own interests; however, it recognizes the broader and longer-term perspective of relationships, capable of bearing some costs for the price of future, mutual growth.

Ad. 4. The operational model adopted by the university in establishing and developing cooperation with entrepreneurs indicates that these actions are driven by a far-reaching vision of the future, into which UMK is unafraid to invest, exemplified by the establishment of the Academic Entrepreneurship and Technology Transfer Center and Copernicus Startup Labs.

Ad. 5. The university focuses on utilizing its current and primarily own capabilities, which means it does not demonstrate the ability to leverage the potential of other entities and the opportunities that arise from them. Its potential is predominantly based on its own resources.

Ad 6. The university is willing to undertake calculated risks, even those spread over many years, for the sake of achievable profits.

Ad 7. A certain kind of limitation, but also a safeguard for the university's activities, is its reluctance to undertake too great a risk, which, on the one hand, guarantees stable growth in standing but, on the other hand, limits the possibility of exploiting emerging yet risky opportunities to outpace the competition more rapidly.

CONCLUSIONS

Nicolaus Copernicus University, a relatively young and promising institution, has recognized the potential inherent in developing cooperation with the business environment. To this end, it has launched an institutionalized structure responsible for establishing and fostering relation-

ships with the business community, ensuring technology transfer from academia to the economy, and supporting future entrepreneurs from UMK in building their businesses. This will gradually strengthen the already robust position of the university over the years. Unfortunately, this process has been primarily concentrated on the geographically proximate surroundings of UMK, which may limit further growth in the future as competitive centers overcome cultural barriers and shift focus to national and even international development. The educational offerings of the university are also noteworthy, as they meet the expectations of the market and thus the entrepreneurs.

3.6. Collaboration of the University of Silesia in Katowice with Economic Entities

Concerns: Assessment of the Effectiveness of Academic and Economic Cooperation between the University of Silesia in Katowice (Pol. Uniwersytet Śląski – UŚ) and a Group of Collaborating Entrepreneurs: A Case Study Utilizing Adopted Cultural Forecasting Methods

Rationale for Selecting UŚ as the Subject of Research and the Adopted Profile of Economic-Academic Cooperation:

The university, established relatively recently in 1968, has since demonstrated high academic activity and, operating for decades in the economically dynamic landscape of Silesia, aims to develop cooperation with entrepreneurs through bilateral agreements, cluster initiatives, and promoting entrepreneurial development within the academic community. The services offered include:

- Contract research services,
- Access to laboratories and research equipment,
- Transfer of intellectual property,
- Assessments of innovation,
- Expert collaboration,
- Joint postgraduate programs,

— Intern and trainee placements,
— Consulting on educational program development,
— Execution of joint projects co-financed by EU funds,
— Implementation of joint research and development projects,
— Co-organization of academic and student events.

Furthermore, the university demonstrates great flexibility, indicating openness to other forms of cooperation. To implement these services, the Office for Cooperation with the Economy was established at the UŚ in 2018. Additionally, the university offers the possibility to utilize inventions (19) under conditions agreed upon by the parties and to conduct commissioned research in various fields including:

— Health, demographic changes, and quality of life studies,
— Information and communication technology,
— Social sciences,
— Urban and Metropolitan Processes,
— Nanotechnology and Nanomaterials.

The university also operates laboratories that are open to collaboration with the business sector:

— Departmental Laboratory of Computer Microtomography,
— Departmental Environmental Analysis Laboratory,
— Departmental Laboratory of Scanning Electron Microscopy,
— Surface Physics Laboratory,
— BIO-FARMA L112 Electron Spectroscopy Laboratory,
— Polymer Laboratories of the Biomaterials Department,
— Insect Morphological Analysis Laboratory,
— Departmental Molecular Biology Laboratory,
— Enzymology Research Laboratory,
— Departmental Laboratory of Molecular Markers and Sequencing,
— Departmental Plant Biotechnology Laboratory,
— Fluorescence Microscopy Laboratory,
— Fluorescence Microscopy and Image Cytometry Laboratory,
— Departmental Flow Cytometry Laboratory,

- Molecular Cytogenetics Laboratory,
- Histology Laboratory,
- Departmental Protein Biochemistry Laboratory,
- Departmental Environmental Biotechnology Laboratory,
- Departmental Cell Biology Laboratory,
- Botanical Documentation Laboratory, Scientific Herbarium of the University of Silesia (KTU),
- Atomic Absorption Spectrometry Laboratory,
- Chromatographic Laboratory,
- Departmental Soil Analysis Laboratory,
- EPR Laboratory,
- X-ray Spectrometry Laboratory,
- UV-Vis Spectrometry Laboratory,
- Departmental Invertebrate Molecular Biology Laboratory,
- Gemmological Laboratory,
- Water Analysis Laboratory,
- Paleontological Laboratory,
- Organic Geochemistry Laboratory,
- Scanning Microscopy Laboratory WNoZ,
- Soil, Ground, and Rock Analysis Laboratory,
- X-ray Structural Analysis Laboratory,
- Organic Petrology Laboratory,
- Luminescent Properties Laboratory,
- Natural Radioactivity Laboratory,
- Analytical Chemistry Laboratory,
- Silesian GIS Laboratory,
- Collection Protection and Digitization Laboratory,
- Accredited Corrosion Testing Laboratory,
- Computer Simulation Laboratory,
- Mössbauer Effect Laboratory,
- Positron Annihilation Laboratory,
- Mechanical Properties Laboratory,
- Surface Layer Analysis Laboratory,

- Metallography Laboratory,
- Light Microscopy Laboratory,
- IIM Technology Laboratory,
- Electrical Measurements Laboratory,
- Magnetic Measurements Laboratory,
- Dielectric Spectroscopy and Optical Anisotropy Laboratory,
- Mechanical Spectroscopy Laboratory,
- Quantitative Analysis and Surface Biomaterials Modeling Laboratory – "Conlab,"
- X-ray Diffraction Laboratory,
- Electron Microscopy Laboratory,
- Surface Research Laboratory,
- Thermal Analysis Laboratory,
- Monocrystal Cultivation Laboratory,
- 3D Biomedical Object Modeling Laboratory,
- Image Analysis and Processing Laboratory,
- Multi-Laboratory of Communication and Information Technology,
- Physicochemical Properties of Liquid Systems Research Laboratory,
- Speech Processing Laboratory,
- Low Temperature Laboratory,
- Ultrafast Laser Spectroscopy Laboratory,
- X-ray Structural Analysis Laboratory,
- Absorptive and Emissive Electron Spectroscopy and Infrared Spectroscopy Laboratory,
- Analytical Spectroscopic Methods Laboratory,
- AAS II Laboratory,
- AES II Laboratory,
- Luminescent Materials Research Laboratory,
- University Atmospheric Control Laboratories,
- NMR Laboratory,
- Sample Preparation Laboratory,

- Luminescent Material Synthesis Laboratory,
- Chemical Technology Laboratories,
- Departmental Mycology Laboratory,
- Departmental Biomarker Laboratory,
- Monocrystalline Material Research Laboratory,
- X-ray Topography Laboratory,
- Precise Network Parameter Measurement Laboratory,
- Monocrystal Laboratory,
- Structural Defects in Monocrystals Research Laboratory.

To date, the university has completed five research and development projects and is currently implementing three more, which also serve as a platform for developing cooperation with entrepreneurs.
Currently, four programs operate within the mentioned Office:

- Innovation Incubator 4.0 (initiating and "strengthening cooperation between the scientific community and the economic environment, including finding entities interested in implementing the results of scientific research and development work, through the promotion of the technological offer and participation in 'science to business' exhibitions and fairs, as well as preparing projects for the commercialization of scientific research and development results, particularly including analyses of the market potential of inventions and their readiness for implementation, as well as the valuation of industrial property rights"),
- Improving Research and Innovation Infrastructure Performance: from Fragmented to Integrated and Sustainable Cooperation – InnoHEIs ("The aim of the InnoHEIs project is to increase the contribution of scientific institutions and their research infrastructure to regional innovation efficiency by creating a favorable environment for interactive business and industry engagement and cooperation among quadruple helix members addressing regional social challenges"),
- Science Closer to You – disseminating the effects of the scientific and research activity of the University of Silesia,

— Network of Regional Specialized Observatories in the Entrepreneurial Discovery Process in the Silesian Voivodeship (SO RIS in PPO – II).

The university has so far concluded over 200 agreements and letters of intent, and 11 cluster connections. In the university, there is also a dedicated company, SPIN-US, enabling the incubation and implementation of business ideas, resulting in the development and market introduction of innovative products, services, and solutions. Thus, employees, doctoral students, and students of the University of Silesia can count on support in the process of commercializing knowledge and technology – from business, legal, and financial advice to the establishment of spin-off initiatives. The company provides brokerage services, participates in the creation of R&D projects, and actively cooperates with the business environment through the implementation of industry-commissioned research.

In addition to the services directly targeted at the economic environment, the university conducts vibrant educational activities, a portion of which is also directed at entrepreneurs (employees, managers, and owners).

SWOT ANALYSIS

Strengths:

- A professionally prepared educational offer that meets the needs of the highly dynamic Silesian market.
- A professionally prepared service offer aimed at entrepreneurs in the area of technology transfer.
- A strong position within the business environment of Silesia.

Weaknesses:

- Limited offerings directed at entrepreneurs outside of Silesia.
- Very limited offerings aimed at foreign entrepreneurs.

Opportunities:

- Possessing infrastructure, experience, and a scientific-business

background that enables expansion of cooperation across all of Poland.

- Having a rich and market-tested offer that could be directed to foreign entities, which would significantly strengthen the university's position among other Polish academic centers as a leading center in technology transfer.

Threats:

- The risk of the emergence of a center that could outpace the university in business offerings through active acquisition of national and international partners, creating a solid foundation for competing with the University of Silesia in its local region.

Cultural codes' values influencing the effectiveness of cooperation between academic and economic entities:

	WR/ NR	SM/ KO	RW/ ST	**DT/ KT**	**SL/ KM**	**WN/ NN**	**WS/ NS**
The researched economic entity	WR/ NR	SM/ KO	RW/ST	DT/KT	SL/KM	WN	WS/ NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The decision-making process of the university in establishing and developing cooperation with business entities is primarily positively influenced by DT/KT, partially positively influenced by WR/NR, SM/KO, SL/KM, and WS/NS, and predominantly negatively influenced by WN. In the values shaping the decision-making process of the university, there is an ability to engage in medium-term planning along with the capacity to identify most variables. This, coupled with the partially effective management of its own resources and the orientation towards cooperation or competition depending on the achievable gains (in the medium-term perspective), allows us to assume that the university will not only gradually strengthen its position but may eventually come to dominate in the regions where local academic entities remain too passive in shaping relations with the business environment.						

Ad. 1. The University of Silesia focuses on the multi-dimensional development of cooperation with economic entities based on current and future market potential.

Ad. 2. The University of Silesia aims to strengthen its own position while concurrently building strong, lasting relationships through clusters and research and development projects initiated with economic entities, which positively affects its reinforcement as a leading institution in this field in Silesia.

Ad. 3. The University of Silesia competes, and, to a limited extent, cooperates, with other regional universities of similar potential in business services and technology transfer, contributing through initiated projects (clusters, research and development) to the stable growth of the Silesian economy for the benefit of all involved parties.

Ad. 4. Initiatives in clustering and research and development undertaken by the university, as well as enabling UŚ employees and students to develop their own activities, contribute to creating a solid foundation for long-term strengthening of its position in the region.

Ad. 5. The university effectively manages and utilizes its potential, resources, and capabilities in strengthening its position in Silesia, but, with a significant limitation to this region, it is unable to affect similarly the potential of other entities to engage them in its own/joint development.

Ad. 6. The university is not inclined to take particular risks in expanding its activities, which guarantees the security of investments made (including by partners in various UŚ-initiated projects), but also prevents faster strengthening of its position not only locally but also nationally.

Ad. 7. The University of Silesia effectively manages its resources, but only within the direct area of its activity.

CONCLUSIONS

For years, the University of Silesia has been building a strong position in the Silesian market and has established durable foundations

for further strengthening its role as a leader in technology transfer and providing specialized services for the regional business environment. It also cautiously attempts to reach out to entrepreneurs across the country. Given the values determining the decision-making process and the position built in the meantime, it can be assumed that despite the high dynamics of changes in the local market, the University of Silesia will continue to gradually strengthen its position, distancing itself from the competition. A threat could arise not only from a domestic center with sufficiently developed potential and great flexibility allowing it to gain a competitive advantage in the highly informative environment of modern business, but also from a foreign center that invests in its position in Poland, considering the market growth in technology transfer and business services. However, such a threat is relatively small in the near future.

3.7. Collaboration of the University of Warmia and Mazury in Olsztyn with Business Entities

Concerns: Evaluation of the Effectiveness of Academic-Business Cooperation between the University of Warmia and Mazury in Olsztyn (Pol. Uniwersytet Warmińsko-Mazurski – UWM) and the Associated Group of Entrepreneurs: A Case Study Utilizing an Adopted Method of Cultural Forecasting.

Rationale for Selecting the UWM as the Research Entity and the Adopted Profile of Economic-Academic Cooperation at UWM:

The University of Warmia and Mazury, established in 1999 through the merger of the Agricultural and Technical Academy, the Higher School of Education, and the Warmian Theological Institute, is a relatively young institution. It has progressively developed activities in cooperation with business entities, with the following research centers addressing the needs of local entrepreneurs:

- Renewable Energy Research Center: Focuses on creating and implementing new renewable energy technologies through scientific research, the development of functional energy installations, and educational, promotional, and dissemination activities.
- Dairy Research and Development Center: Conducts scientific research, training, and promotional activities within its scope.
- Eastern Europe Research Center: Aims to integrate academic, governmental, and economic activities in the cultural, political, and economic relations between Poland and Eastern European countries through interdisciplinary research.
- Social Research Center: Integrates academic, governmental, and economic environments in the revival of traditional raw materials and technologies for producing traditional and regional foods.
- Nutri-Bio-Chemical Center: Established to integrate scientific research potential in comprehensive biological, chemical, and biotechnological analysis of the environment and food concerning health actions.
- Center for Innovative Diagnostic and Therapeutic Techniques: Integrates scientific research potential in the area of human and animal disease diagnostics and therapy in the aspect of public health protection.
- Interdisciplinary Research Center "Probalticum": Focuses on integrating academic efforts through interdisciplinary research on the cultural and natural heritage of the Baltic Sea countries.
- Research Center for Cultural and Natural Heritage: Integrates academic, governmental, and economic actions in the recognition, planning, and strategic management of regional cultural and natural heritage.

The university also joined the Advanced Technologies Center RIMAMI, which aims to develop and implement modern risk management and data transmission systems across distributed databases.

Furthermore, the University of Warmia and Mazury has contributed to the establishment and development of several clusters, such as:

— Kętrzyn Renewable Energy Cluster,
— Vistula Renewable Energy Cluster,
— Baltic Eco-Energy Cluster,
— Brewery Cluster,
— Dairy Cluster,
— Warmia-Mazury "Together Warmer" Cluster.

These clusters and laboratories play the leading role, especially in the agricultural sector, which is characteristic of the region where the university operates. The Veterinary Faculty and specialized laboratories are particularly active in providing services to local entrepreneurs.

The Research and Development Center at the university has developed a range of technological services aimed at the local market, including:

— GNSS Antenna Calibration Station,
— Mechanical Harvester for Cabbage Plants, especially Cauliflower and Broccoli,
— Applicator for Building Underground Retention Barriers with Semi-Fluid Substances,
— GNSS Antenna Vibration Simulator,
— Device for Compacting Post-Fermentation Sludge in Agricultural Biogas Plants,
— Vegetable Crusher,
— Method of Producing Prodigiosin and its Application in Creating an Antibacterial Barrier for Dressing Materials,
— Tourniquet for Controlling Bleeding in Animals and Humans,
— Sleeping Bag for Animals to Maintain Optimal Temperature,
— Sleeping Bag for Humans to Prevent Hypothermia,
— Buckwheat Seed Separator,
— Fruit Jam and Method of Making Fruit Jam,
— Cauliflower and Broccoli Calibrator,
— Dispersion System Analyzer,
— Development of Nutritional Preparations Targeted for Autistic Children,

— Heat Generator,
— Use of Purple Willow Varieties for Pharmaceutical Purposes.

Additionally, the university offers paid services, such as expert opinions, analyses, reports, and publications. Another area of business collaboration involves the Innovation and Technology Transfer Center, which has developed an internal procedure for research and service work, facilitating contracts beneficial to both university staff and external entities.

A crucial component in strengthening and developing cooperation with the economic environment, as well as supporting employees and students interested in entrepreneurship, is the establishment of the targeted company InnoInvest UWM Ltd. in 2015. The main goal of the company is the indirect commercialization of research results owned by UWM, creating profit-oriented business activities in the fields of biotechnology, natural sciences, social sciences and humanities, financial holdings, and professional scientific and technical activities.

The university also boasts an extensive educational offering, providing opportunities for local enterprise employees, management, and business owners to acquire education and enhance qualifications.

SWOT ANALYSIS

Strengths:

- Comprehensive and strongly profiled service offerings for the local economic environment.
- Developing activities in technology transfer oriented towards the needs of the local market.
- Educational offerings tailored to the needs of local entrepreneurs.

Weaknesses:

- Limitation of a significant portion of the offerings directed only to local entrepreneurs.

Opportunities:

- The possibility of expanding offers directed to business based on current experiences with entrepreneurs from the agricultural sector both nationally and internationally, having the appropriate infrastructure and facilities. However, it would likely be necessary to develop suitable marketing and communication channels.

Threats:

- Excessive self-limitation to the needs of the local market could lead to the rapid marginalization of the university, especially in non-agricultural industries if competitive academic centers (including foreign ones) decide to expand their influence in the university's region of activity.

Cultural codes' values influencing the effectiveness of cooperation between academic and economic entities:

	WR/ NR	SM/ KO	RW/ **ST**	**DT/ KT**	**SL/ KM**	**WN/ NN**	**WS/ NS**
The researched economic entity	WR	SM/ KO	ST	KT	SL	WN	NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The decision-making process of the university in establishing and developing cooperation with business entities is primarily positively influenced by ST, partially positively influenced by SM/KO and WS/NS, and predominantly negatively influenced by the remaining values, with particular emphasis on KT, SL, WN, and NS. As a result, the forecast for the development of cooperation with the business environment is not overly optimistic. The university is likely to continue operating in a rather conservative and passive manner, maintaining relationships with local business entities.						

Ad. 1. The university is characterized by a high level of discernment, which means it aims to build and develop relationships with larger economic partners, as well as those active in industries relevant to the university's experiences and chosen direction of development. As a result, it maximizes efforts in selected directions and entities but also limits the possibility of strengthening its position regarding entrepreneurs from other industries.

Ad. 2. The university is interested in developing cooperation with selected entrepreneurs both bilaterally and through various institutional forms, such as clusters or research and development projects, as evidenced by the university's past experiences in this area of activity.

Ad. 3. The university aims to stabilize the business environment, albeit limited to entrepreneurs considered priority from the perspective of the university's development directions.

Ad. 4. On the one hand, the university strives to support employees and students in creating their own businesses, primarily through a specially established targeted company. On the other hand, its vision for the future is limited to strengthening its position in the most important industries from the university's perspective, which indicates that its actions are characterized by a short-term approach.

Ad. 5. In developing cooperation with entrepreneurs, the university focuses only on its own resources, indicating the dominant influence of Selectivity on the UWM decision-making process.

Ad. 6. The university exercises a high degree of caution in developing cooperation with the business environment and initiating significant projects, affecting the risk of not utilizing opportunities arising from expanding cooperation with other industries.

Ad. 7. Despite its surprisingly valuable potential for its young tenure in the local market, the university is unable to leverage all its strengths to develop in as many industry dimensions of the business environment as possible.

CONCLUSIONS

The University of Warmia and Mazury is a unique institution, particularly because of its very short tenure compared to other Polish academic centers and its meticulously developed potential, which is considered valuable. However, the university is developing cooperation fastest only with selected industries that are the strongest in the local market (especially agriculture), ensuring a strong position but simultaneously self-limiting in developing this cooperation with all other industries represented by entrepreneurs outside the geographical area of the university's activity. Such an approach may lead to the emergence of competitive academic centers that will focus efforts on accommodating entrepreneurs from those industries, leaving the UWM only those industries in which it has the strongest leadership position. In the coming years, the UWM will most likely continue to develop cooperation with entrepreneurs from these industries, particularly in providing specialized services and further contributing to increasingly specialized technology transfer. In the event of the emergence of competitive centers in these industries, the university will likely maintain its status as an undisputed leader.

3.8. Cooperation of the University of Gdańsk with Business Entities

Concerns: Evaluation of the Effectiveness of Academic-Business Cooperation between the University of Gdańsk (Pol. Uniwersytet Gdański – UG) and the Associated Group of Entrepreneurs: A Case Study Utilizing an Adopted Method of Cultural Forecasting.

Rationale for Choosing UG as a Research Entity and the Adopted Profile of Economic-Academic Cooperation at UG:

Founded in 1970 from the merger of the Higher School of Economics in Sopot and the Higher School of Education in Gdańsk, the Uni-

versity of Gdańsk, alongside the Maritime University of Gdynia, stands as one of the oldest and most significant institutions in Pomerania. It is therefore deemed an appropriate entity for this study. The University of Gdańsk offers entrepreneurs the opportunity to collaborate in research through the following organizational units, representing key fields and scientific disciplines: the Faculty of Biology, the Faculty of Chemistry, the Faculty of Economics, the Faculty of Language Studies, the Faculty of Mathematics, Physics and Information Technology, the Faculty of Law and Administration, the Faculty of Management, the Intercollegiate Faculty of Biotechnology, and the Faculty of Oceanography and Geography. Moreover, the university facilitates the creation of consortia and research teams, particularly emphasizing areas where the UG has extensive experience, such as chemistry, biotechnology, biology (including serum and vaccine development), oceanography, investment project management, and logistics.

Notable initiatives include the collaboration with Olivia Business Centre in the joint project called Olivia Campus. This initiative was implemented with the goal of facilitating relationships between academics and the business world and easing students' transition into the job market after their education. Besides the university and Olivia Business Centre, the Gdańsk University of Technology and various business entities joined the initiative, including:

- Energa, Bayer,
- Sii, Playsoft,
- Goyello,
- HK Finance,
- Noble Bank,
- Hays,
- PwC,
- COB,
- Studio HR,
- Thomson Reuters,
- Black Pearls,

- AIP Business Link,
- CCC. Other entities associated with Olivia Campus include:
  - Business Angel Seedfund
  - Interizon
  - Employers of Pomerania
  - Student Forum Business Centre Club
  - Banking School of Higher Education
  - C'Estiem LG Gdańsk.

This initiative has so far managed to conduct job fairs, "Maximising Your Career Advantage" conferences, and language courses for students from the UG Faculty of Language Studies. Additionally, the university offers specialized postgraduate studies, courses, and training dedicated to employees, management staff, and business owners. Specialized postgraduate studies for business entities include:

- International Business,
- EMBA,
- Logistics Support for Business Activities,
- Public Procurement,
- Risk in Finance and Insurance – with programming and data analysis,
- Finance in Small and Medium Enterprises,
- Data Protection,
- Tax and Tax Law,
- Administrative Procedures,
- Labor Law,
- Intellectual Property Law and New Technology Law,
- Medical Law,
- Corporate Law,
- Social Insurance,
- Education Management with Education Law,
- Data Analysis – Big Data,
- Controlling in Business Management,
- Commercial Real Estate,

— Management,
— Organization and Management in Railway Transport,
— Programming of Business Web and Mobile Applications,
— Accounting and Taxation,
— ACCA Accounting,
— Real Estate Valuation,
— Advanced Financial, Managerial, and Tax Accounting,
— Management of Public Administration Units,
— Human Capital Management,
— Property and Development Project Management,
— Health Care Entities Management,
— Business Process Management,
— Project Management,

IT Project Management Specialized courses and training for business entities:

— Diploma in Accounting and Business,
— Continuing Education Course in Economics and Business,
— "Programming Business Web and Mobile Applications" course,
— R Programming,
— Data Analysis Methods,
— Apache Spark,
— ECDL IT Training,
— CISCO IT Training.

It should be noted that the university's activity in developing cooperation with business entities is not particularly vibrant, considering the poor nature of the webpage dedicated to this cooperation, as well as the lack of a structure responsible for this area of activity, and the absence of a targeted company established by the university that would show significant activity. Thus, the UG's activity is passive rather than active. The university remains open to cooperation using its potential but does not conduct university-wide, top-down organized, and systematic actions to develop and strengthen, much less expand its influence in its business environment. This type of initia-

tive is conducted almost independently by individual faculties without structural-institutional support from the university as is the case with the University of Warsaw, the Jagiellonian University, Nicolaus Copernicus University, and the University of Warmia and Mazury. The University of Gdańsk willingly engages in existing initiatives in the form of clusters (mostly regional).

SWOT ANALYSIS

Strengths:

- Extensive and professional educational offer aimed at businesses focused on enhancing qualifications, gaining knowledge, and skills by employees at all levels and business owners.

Weaknesses:

- Lack of centralized, structured support of organizational units within the university for establishing cooperation with the business environment.

Opportunities:

- Potential to expand educational services targeted at entrepreneurs, which would require institutional strengthening of the offer by the university through more active participation in existing structures engaging regional entrepreneurs.
- Possibility of establishing a targeted company to prepare for technology transfer from the university to business.

Threats:

- Risk of marginalization of the university in the area of technology transfer by more active academic entities previously focused on their own region/possibility of strong foreign competition emerging.

Cultural Codes Influencing the Effectiveness of Cooperation Between Academic and Economic Entities:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
The researched economic entity	WR	SM	ST	KT	SL	WN	NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	Extremely high values in the evaluated codes indicate that the University of Gdańsk will continue its current policy of slowly and gradually developing educational services, neglecting areas of activity that are important to businesses, such as technology transfer. This raises the possibility that the university may be marginalized as a strong partner within the regional business community.						

Ad. 1. High Awareness drives the university to establish relations with economically stronger entities in the highly dynamic business environment, which may lead to the underutilization of a significant portion of the regional business environment.

Ad. 2. The university primarily focuses on its educational activities without dedicating the necessary resources and efforts to develop and strengthen relations with the business environment. In this case, one can speak of an extremely high value of Independence.

Ad. 3. The university does not show an inclination to compete with other entities, focusing only on securing a strong position in providing educational services limited to the region.

Ad. 4. The university's activities lack a cohesive, long-term vision for development beyond maintaining the current status quo.

Ad. 5. The university focuses its development only on the resources it directly controls, showing no greater aspirations in contributing to building a strong business environment in the region, of which it would be an integral part.

Ad. 6. In its development policy, the university avoids any risk that could accelerate the market development process (including limitation to the region).

Ad. 7. Despite having various development possibilities resulting from its infrastructure and long-standing presence in the local market, the university does not utilize even part of its potential in building a strong position as not only a reliable, but primarily a benefit-generating business partner (including those active only in the region).

CONCLUSIONS

The potential of the University of Gdańsk, compared to other institutions more advanced in building and developing lasting relations with the business environment, and currently focusing only on too slowly expanding its educational offer, does not hold a very strong, mutually beneficial position among local entrepreneurs. Continuing such a policy will lead to the emergence of much more advanced entities in the region, which, with such an approach by the UG, will relatively quickly establish a strong and challenging position as a credible partner engaged in the development of local business.

3.9. Cooperation of the Maritime University of Gdynia with Business Entities

Concerns: Evaluation of the Effectiveness of Academic-Business Cooperation between the Maritime University of Gdynia (Pol. Uniwersytet Morski – UM) and Associated Business Entities: A Case Study Utilizing an Adopted Method of Cultural Forecasting.

Rationale for Choosing the UM as the Study Entity and the Adopted Profile of Economic-Academic Cooperation at the UM:

The Maritime University has a long-standing tradition dating back to 1920, when the Maritime School was established in Tczew, later

relocated to Gdynia in 1930 as the State Maritime School. Despite the disruptions of World War II, it continued its educational activities in England. After the war, it functioned in Gdynia as a secondary school, becoming the Marine Mechanical Technical School in 1951 and reverting to the State Maritime School in 1958 after further changes. In 1968, following further transformations and the expansion of its structure and acquisition of academic rights, it became the Higher Maritime School. In 2001, upon acquiring additional rights, it was designated as the Maritime Academy, and in 2018, it became the Maritime University of Gdynia. With such a long evolution, specialized education, research activities, and a decades-long position in the local market, the UM is an appropriate entity for this study.

The Maritime University has pursued a direction of developing cooperation with the business environment by providing highly specialized services related to the university's profile. In this regard, there is no threat from competing academic centers. In 2022, the university updated its offer to business entities, also considering the newly established Intellectual Property and Research Commercialization Team, located under the Vice-Rector for Cooperation and Development, responsible for initiating the limited process of technology transfer to the business sector. Compared to other, more progressive academic centers (some of which have dedicated companies), this step was taken relatively late. However, given the university's potential, it should be seen as a positive signal of the vision for developing and strengthening the university's position in the business environment, focusing on areas where competition from other entities (mainly technical universities) may be very limited.

The team focuses its activities on four areas:

- Commercialization of scientific research results (execution of projects that develop unique solutions and support the commercialization process);
- Protection of intellectual property (support and advice on industrial property rights);

- Support for cooperation with the socio-economic environment (initiating projects with implementation potential in cooperation with entrepreneurs and socio-economic institutions);
- Utilization of research infrastructure (organization of advisory services, expertise, research, and analyses performed by UM staff on behalf of business entities).

The team includes a patent attorney, a technology transfer specialist, and two technology brokers. It is possible that, as the team develops and technology transfer subjects arise, the mentioned dedicated company will be established to facilitate the transfer while ensuring the expected security for the involved university employees and students.

Over the past five years, the university has managed to carry out 900 R&D projects, among which works, notable ones include:

- Electromagnetic field intensity studies;
- Core and soil sediment sample analysis;
- Water and wastewater sample testing;
- Monitoring of water quality at solid waste sites;
- Analysis of wave patterns within port aquatoriums;
- Environmental impact forecasts for investments;
- Wave studies in port entrance areas;
- Environmental studies on marine and terrestrial areas;
- Measurements of thresholds and breakwaters with piers;
- Reviews of food product innovation;
- Expert opinions on quality assessment of voltage;
- Reviews of technological product innovation in the maritime and automotive industries;
- Describing the analytical path for algorithms to be implemented in IT systems;
- Expertises related to maritime transport;
- Safety assessments at sea;
- Durability testing of marine unit equipment;
- Development of an innovative vehicle charging station;
- Productivity analyses of rotor machines;

- Maintenance analyses of floating units at buoys or quays;
- Navigational analyses of the approach and docking of floating units;
- Design of seals for flow machines.

Additionally, the university offers specialized services in:

- Development of tourism and hospitality businesses, organization of business events;
- Analytical services for developing new human resource management methods and tools;
- Creation of health-promoting food products and raising health awareness;
- Consumer research services;
- Marketing research services;
- Social dependency research services;
- Information technology application services, evaluating their effectiveness and quality;
- Data analysis services, including Big Data;
- Diagnostic and monitoring services for machinery and its parts;
- Evaluation of machinery part operation conditions;
- Production of machine elements, ship hulls;
- Research on reducing particulate emissions in exhaust gases;
- Evaluation of rheological properties of operational fluids;
- Production of polymer materials;
- Property assessments of various materials using modern methods;
- Simulation research of intelligent control systems;
- Research on ship traffic control;
- Modeling of marine basins;
- Design and safety evaluation of marine towings;
- Analysis and planning of maneuvers;
- Methods for securing cargoes and assessing the risk associated with transporting hazardous substances;
- Services aimed at improving safety and efficiency of transport and logistics services in ports;

- Measurements and analysis of electrical energy characteristics in power systems;
- Multimodal human-machine interfaces;
- Services for improving energy efficiency in construction and industry;
- Creation of renewable energy sources;
- Methods for energy storage;
- Research on alternative drives.

The university also conducts specialized research within the Management, Information Technology, and Quality of Goods areas, aligning with all four Pomeranian Smart Specializations (PSS):

- PSS1: Offshore and Port-Logistics Technologies;
- PSS2: Interactive Technologies in an Information-Saturated Environment;
- PSS3: Eco-Efficient Technologies in Production, Transmission, Distribution, and Consumption of Energy and Fuels, and in Construction;
- PSS4: Medical Technologies for Lifestyle Diseases and Aging.

SWOT ANALYSIS

Strengths:

- Extensive and highly professional service and research areas that strictly cater to selected market segments, making these offers largely non-competitive.
- Establishment of the Intellectual Property and Research Commercialization Team as the nucleus of a future structure to enhance the technology transfer service based on the university's significant R&D potential recognized by the business environment specializing in this market segment.

Weaknesses:

- Limited capability to identify additional market niches due to the significant engagement of the university's potential in de-

veloping leading research directions, which could risk the over-dispersion of forces and resources.

Opportunities:

- The potential to strengthen the position of the center not only with domestic entities but also internationally through the further development of the provided highly specialized services, as well as studies, courses, and training.
- The possibility to expand and promote the technology transfer service in the areas of the university's R&D activity, not only in Poland but abroad.

Threats:

- The risk of encountering infrastructural and structural limitations in case of too rapid and extensive expansion of the university's offer, which, given the current policy, should not occur.

Cultural Code Values Influencing the Effectiveness of Cooperation Between Academic and Economic Entities:

	WR/ NR	SM/ **KO**	**RW/ ST**	**DT/ KT**	**SL/ KM**	**WN/ NN**	**WS/ NS**
The researched economic entity	WR/ NR	SM/ KO	RW/ST	KT	SL	WN	WS/ NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The Maritime University is not only a reliable, but also a steadily strong partner for businesses active in industries that align with the University's areas of activity, particularly in research and development. The average cultural values indicate that the University is a predictable and thus safe business partner, while also showing that its decision-making process leads to steady, albeit gradual, progress in the future.						

Ad. 1. The Maritime University focuses on establishing partnerships with entities representing sectors crucial for the institution. In

this regard, it does not differentiate between economic entities based on their market position, operating under the assumption that any collaborator active in areas congruent with the university's activities is equally important for the development of the UM's potential and for expanding cooperation with the business environment.

Ad. 2. The Maritime University is oriented towards building its own highly specialized potential, which stems from a slight predominance of Independence. Simultaneously, it demonstrates openness to building structures that involve multiple entities, provided these contribute to the development of activities aligned with the university's research and development functions.

Ad. 3. The university continuously strives to secure a leadership position in the industries where it is active, aiming to be the strongest partner for business entities within these sectors. It also shows openness to stabilizing the business environment while emphasizing its own strong position. This reflects the predominance of Competition over Stability values, though the latter also influences the university's policy, albeit to a lesser extent than Competition.

Ad. 4. The Maritime University is focused on progressively strengthening its position; however, the university's policy lacks a long-term and broader vision aimed at achieving specific (not general) objectives that would ensure the university benefits in the distant future.

Ad. 5. In its development, the university utilizes only its potential without making efforts to integrate the potentials of other entities to strengthen its position. This arises from the dominant character of Selectivity in assessing its own capabilities in terms of building relationships with the business environment.

Ad. 6 The university's policy indicates continuous development but avoids engaging in risky ventures that could bring many benefits but also losses. The university continues the tradition of gradually strengthening its position without attempting to exploit risky opportunities.

Ad. 7. The university fully utilizes its potential to achieve its own goals but fails to leverage opportunities that arise from engaging the potentials of other entities.

CONCLUSIONS

The Maritime University is an academic entity with a specific nature characteristic of certain industries. This means that the university is an ideal partner for these economic entities and, considering the cultural code values that characterize its decision-making process, also a stable partner with an exceptionally strong market position and a very real prospect for further development. As a result, the university's position in its area of activity as a partner for the industry-specific business environment will likely remain undisturbed for many years. Even if sufficiently strong and similarly specialized competition emerges, given the relationships that have been nurtured and built over decades, the university undoubtedly possesses the capabilities and potential to defend its position.

3.10. Cooperation of the University of Zielona Góra with Business Entities

Concerns: Evaluation of the Effectiveness of Academic-Business Cooperation between the University of Zielona Góra (Pol. Uniwersytet Zielonogórski – UZ) and Associated Business Entities: A Case Study Utilizing an Adopted Method of Cultural Forecasting.

Rationale for Choosing the UZ as the Research Entity and the Adopted Profile of Economic-Academic Cooperation at the UZ:

The University of Zielona Góra originated in the 1960s, established in 1965 as the Higher Engineering School, which later evolved into the Zielona Góra University of Technology in 2001 through a merger with the Higher School of Pedagogy. Officially named the University of Zielona Góra in the early 21st century, its roots (staff, structure, tradition)

reach back several decades earlier. In 2017, the State Higher Vocational School in Sulechów was incorporated as a branch campus and then gained the status of a faculty in 2019. This demonstrates the evolutionary process of an institution that continues to expand and solidify its strong regional position, making it a valuable subject of study. Located in a strategic region, the University of Zielona Góra has developed a broad and highly professional range of cooperation offer directed at businesses, including technological services, R&D collaboration, patent cooperation, startup creation, technology transfer, intern placements, and facility rental services. The university's technical background significantly influences this approach to enterprises, not to overlook its mature strategy aimed at meeting the expectations of the industry.

Within its technological services, the university offers access to its research infrastructure along with conducting and commissioning research, particularly active at the Institute of Environmental Engineering and its laboratory. Other organizational units interested in developing research, development, and implementation cooperation with the industry include:

- Institute of Construction,
- Institute of Material and Biomedical Engineering,
- Institute of Mechanical Engineering,
- Institute of Mathematics,
- Institute of Metrology, Electronics, and Computer Science,
- Institute of Psychology,
- Institute of Sociology,
- Department of Biotechnology,
- Institute of Architecture and Urban Planning,
- Institute of Legal Studies,
- Institute of Management and Quality Sciences,
- Institute of Biological Sciences.

The university's academic staff actively participates in developing and filing inventive projects with the Polish Patent Office, the European Office, and other international offices.

The technology transfer process developed within the university to interested business representatives involves the Entrepreneurship and Technology Transfer Center and three science and technology parks established as dedicated companies: the UZ Science and Technology Park, the Renewable Energy Center, and the Lubusz Center for Agrotechnical Innovation and Implementation. This process is also supported by the Academic Entrepreneurship Incubator and the Virtual Entrepreneurship Incubator, which offer support not only to researchers but also to graduates and students. The Business Leaders Center at the University of Zielona Góra not only promotes entrepreneurship among students but also integrates the academic community with business representatives in the region.

Regarding the Entrepreneurship and Technology Transfer Center, it is worth highlighting that it provides services and support in the development and conduct of analyses, research, expertise, projects, technological audits, evaluations, measurements, reports, and reviews of the innovativeness of submitted projects. The academic staff can receive support in the area of intellectual property protection and patent applications (the university employs a patent attorney). Currently, the Center is running three projects:

- Enterprise Europe Network;
- Modern teaching and practical cooperation with entrepreneurs – University of Zielona Góra development program – Knowledge Education Development Program;
- Innovation Incubator 4.0;
- Research and development support for enterprises and startups in Western Poland – Science for Society.

Completed projects at the Center include:

- Enterprise Europe Network for West Poland;
- INNOVATION INCUBATOR 4.0;
- "Modern teaching and practical cooperation with entrepreneurs – University of Zielona Góra development program;"
- Science for Society;

— Klakson – Edition I;
— Klakson – Edition II.

The Center also supports students, graduates, and university staff in starting businesses through the aforementioned Academic Entrepreneurship Incubator and Virtual Entrepreneurship Incubator.

Some of the university's programs align with the needs of local businesses as a backdrop for future employees or opportunities to enhance qualifications in line with market needs:

— Material Engineering and Recycling,
— Smart Urban Systems,
— Aviation Engineering,
— Geoinformatics and Satellite Techniques,
— Energy,
— Tourism and Recreation,
— Law,
— Psychology,
— Environmental Protection,
— Biotechnology,
— Biology,
— Management and Production Engineering,
— Mechanics and Machine Design,
— Occupational Safety and Health,
— Biomedical Engineering,
— Data Engineering,
— Information Science and Econometrics,
— Information technology,
— Electrical Engineering,
— E-business,
— Automation and Robotics,
— Management,
— Logistics,
— Economics,
— Environmental Engineering,

— Construction,
— Architecture,
— Graphic Design,
— Interior Architecture.

In addition to undergraduate programs, the university also offers postgraduate studies aimed at acquiring new qualifications according to the needs of a particular company, such as:

— Real Estate Management,
— Renewable Energy,
— Energy-efficient construction. Energy audit and energy assessment of buildings,
— Logistics,
— Transportation and Freight Forwarding,
— Accounting and Finance of Managing Entities,
— Human Resources and Payroll in Law and Practice,
— Public Procurement and Public-Private Partnership,
— Employment Law and Work Psychology.

Despite such an extensive and developed offer, the university does not promote cooperation with specific businesses on its website, apart from companies involved in joint projects within the UZ Science and Technology Park, Renewable Energy Center, and the Lubusz Center for Agrotechnical Innovation and Implementation.

SWOT ANALYSIS

Strengths:

- Extensive and professional educational offer directed at companies aimed at enhancing qualifications, acquiring knowledge and skills by employees at all levels, and business owners, mainly tailored to the needs of regional companies.
- Comprehensive and professional technology transfer offer tailored to regional companies.
- Support offer for students, graduates, and university staff aimed

at helping start their own businesses along with providing risk assessment in the given market conditions.

Weaknesses:

- Lack of a broader offer also directed at entrepreneurs outside the region

Opportunities:

- Based on years of experience and professional educational and technology transfer services, the potential to develop an offer for business entities outside the region with an proposals tailored to these entrepreneurs' needs.

Threats:

- The risk of marginalizing the offer only to the regional business and the future emergence of a competitive academic entity with a much more extensive and versatile offer, possibly capturing at least a part of the local market by providing competitive services for business (educational, technology transfer, implementation).

Cultural Code Values Influencing the Effectiveness of Cooperation Between Academic and Economic Entities:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
The researched economic entity	WR	SM	ST	KT	SL	WN	NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	Over the years of its operation and with its polytechnic sphere as part of its structure, the University of Zielona Góra has built solid foundations for rapidly developing cooperation not only with local businesses, but also with entrepreneurs from all over Poland, based on sectors of the economy closest to the university. On the other hand, due to the average influence of the cultural values examined, it is unable to fully utilize its potential.						

Ad. 1. The University of Zielona Góra is guided by the value of High Awareness in its decision-making process, which, in the context of very dynamic business environments (especially those active in the virtual sphere), may miss opportunities and fail to meet the expectations of new market needs. This could result in a lack of understanding in mutual relations.

Ad. 2. The University of Zielona Góra and local entrepreneurs are guided by the value of Independence, which does not favor building long-lasting and long-term cooperation structures. This is evident from the limited number of such initiatives despite the university's long-standing tradition in the local market.

Ad. 3. The University of Zielona Góra aims to maintain stable relations with local economic entities, but in light of other studied values, it does not undertake innovative initiatives that could stimulate this cooperation, limiting the university's possibilities to develop collaboration, especially with young, dynamic entrepreneurs who are largely active online.

Ad. 4. Both the University and entrepreneurs engage in short-term ventures (lasting a maximum of a few years), showing no inclination to develop plans that span over a decade or several decades. This means that cooperation develops, but very slowly, despite solid conditions for much more dynamic, multifaceted cooperation.

Ad. 5. The University of Zielona Góra directs its activities in cooperation with business entities mainly towards the region, influenced by the value of Selectivity, thereby self-limiting its own development.

Ad. 6. Neither the UZ nor the entrepreneurs are inclined to undertake unnecessary risk.

Ad. 7. Examining the potential of the University of Zielona Góra, it is evident that there are significant opportunities in terms of providing services to business, technology transfer, and expanding the educational offer. However, the university does not utilize its full potential but only a part of it, although it should be noted that the degree of utilization of this potential has increased compared to previous

years. Nevertheless, it remains largely untapped given its capabilities and the needs of the local market.

CONCLUSIONS

The potential of the University of Zielona Góra is significantly greater than its actual use in developing lasting and long-term relationships with business entities. This approach is influenced by the values of cultural codes that determine the perspective and decision-making process at the University of Zielona Góra. Therefore, there is a concern that its currently undisputed strong position in the local market could be threatened in the future by a much more dynamic academic entity that better understands the conditions of a rapidly evolving market.

3.11. Cooperation of the University of Rzeszów with Business Entities

Concerns: Evaluation of the Effectiveness of Academic-Business Cooperation between the University of Rzeszów (Pol. Uniwersytet Rzeszowski – URZ) and Associated Business Entities: A Case Study Utilizing an Adopted Method of Cultural Forecasting.

Rationale for Choosing the URZ as the Research Entity and the Adopted Profile of Economic-Academic Cooperation at the URZ:

The University of Rzeszów has its roots in the 1960s, specifically in 1963, when the Area Studies of the Philological-Historical and Mathematical-Physical Faculties of the Higher School of Pedagogy in Krakow were established in Rzeszów. In 1965, this institution was transformed into the Higher School of Pedagogy in Rzeszów, becoming the second independent higher education institution in the region. Interestingly, in 1969 it faced competition from a branch of the Maria Curie-Skłodowska University in Lublin, and in 1973 the External Faculty of Economics of Agricultural Production and Trade

from the Hugo Kołłątaj Agricultural Academy in Krakow was added. After the fall of socialism, throughout the 1990s, efforts were made to achieve university status, which was finally granted in 2001 by merging three existing institutions in Rzeszów: the Rzeszów Higher School of Pedagogy, the branch of the Maria Curie-Skłodowska University, and the Faculty of Economics of the Krakow Agricultural Academy. This merger significantly enhanced the university's standing and eliminated potential competition. It can be assumed that this significant moment in the history of the University of Rzeszów influences its unique character in the local market.

The University of Rzeszów has developed a rich and diverse offer aimed at fostering cooperation with the local economic environment. In 2017, the purpose-specific company Inventur Sp z o.o. was established with the following tasks:

- Indirect commercialization involving the acquisition of shares or subscription warrants in companies to implement or prepare the implementation of scientific activity results or related know-how.
- Direct commercialization involving the sale of research results, development works, or related know-how, or making these results or know-how available for use, especially based on licensing agreements, leasing, and renting.
- Providing research services based on the scientific resources of the University of Rzeszów, including the execution of laboratory and research services.

This extensive task catalog clearly reflects a well-thought-out vision for the development of the company and its activities in the Polish market. Additionally, the university hosts several research centers offering services to businesses:

- Center for Technology Transfer and Basic Research;
- Center for Innovation and Implementation in the Food Industry;
- Center for Biomass and Waste Energy Processing;
- Center for Marketing of Food Products;

- Center for Applied Biotechnology and Basic Sciences;
- Center for Microelectronics and Nanotechnology;
- Center for Innovation and Technical-Natural Knowledge Transfer;
- Interdisciplinary Center for Computer Modeling;
- Natural-Medical Center for Innovative Research;
- Innovative Environmental Research Center;
- Biotechnology Laboratory;
- University Technology Transfer Center.

The University Technology Transfer Center at the University of Rzeszów is specifically focused on transferring technology from the university to business entities. The university also supports two clusters:

- Subcarpathian Renewable Energy Cluster;
- Subcarpathian Social Economy Cluster.

Free consultations for researchers on industrial property protection and commercialization are also offered. What is a unique service among Polish universities worth highlighting is the execution of expert graphology analyses. The university also offers Bachelor's, Master's, and Doctoral degree programs, as well as valuable postgraduate studies and courses which may interest entrepreneurs as potential paths providing qualified employees or serving to enhance existing qualifications. Notable undergraduate and graduate programs include:

- Administration,
- Agroforestry,
- Medical Analytics,
- Landscape Architecture,
- Biology,
- Biotechnology,
- Dietetics,
- Economics,
- Electroradiology,

— English Studies,
— German Studies,
— Polish Studies,
— Russian Studies,
— Philosophy,
— Finance and Accounting,
— Physiotherapy,
— Graphic Design,
— Computer Science,
— Information Science and Econometrics,
— Material Engineering,
— Intercultural Communication,
— Logistics in the Agri-food Sector,
— Speech Therapy with Teaching Polish as a Foreign Language,
— Mathematics,
— Mechatronics,
— Foreign Language Teaching – English and Russian,
— Environmental Protection,
— Renewable Energy Sources and Waste Management,
— Nursing,
— Midwifery,
— Law,
— Emergency Medical Services,
— Agriculture,
— Sociology,
— International Relations,
— Diagnostic Systems in Medicine,
— Visual Arts,
— Food Technology and Human Nutrition,
— Historical and Cultural Tourism,
— Tourism and Recreation,
— Physical Education,
— Public Health.

SWOT ANALYSIS

Strengths:

- Extensive and professional educational offer directed at businesses focused on enhancing qualifications, acquiring knowledge, and skills by employees at all levels, and business owners.
- Comprehensive technology transfer offer from the university to the economic environment.
- Extensive service offer directed at businesses including: indirect commercialization involving acquiring shares or subscription warrants in companies; direct commercialization involving the sale of research results, development works, or related know-how; providing research services based on the scientific resources of the University of Rzeszów.

Weaknesses:

- Still not fully exploited cooperation with local entrepreneurs, with existing platforms for building lasting ties with entrepreneurs limited to clusters, not solely the university's potential.

Opportunities:

- Potential to expand and strengthen the current offer directed at business entities – both local and national.

Threats:

- Risk of emerging strong competition from other academic entities in the market.

Cultural Code Values Influencing the Effectiveness of Cooperation Between Academic and Economic Entities:

	WR/ **NR**	**SM/ KO**	**RW/ ST**	**DT/ KT**	**SL/ KM**	**WN/ NN**	**WS/ NS**
The researched economic entity	WR	SM	RW	KT	SL	WN	NS

	WR/ **NR**	**SM/ KO**	**RW/ ST**	**DT/ KT**	**SL/ KM**	**WN/ NN**	**WS/ NS**
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The university has initiated many valuable projects in its collaboration with the business environment, but this does not reflect a broader, long-term strategy, rather a series of ad hoc actions aimed at gradually strengthening its own potential. There is a lack of vision for where such a policy might lead, resulting in only partial utilization of its potential and generating far fewer benefits than could be possible. There is a risk, with the relatively slow development of business collaboration, that in the event of strong competition, the university may be outpaced by a more dynamic academic entity with clearly defined goals for harnessing the benefits of this collaboration.						

Ad. 1. The University of Rzeszów is guided by the value of High Awareness, preferring to establish relationships with entities that have a strong market position, thereby limiting the actual possibilities for developing cooperation in this area.

Ad. 2. The university focuses on building its own potential without relying on creating larger structures within which it could be more significant. This approach is clearly visible in the case of one of the clusters, where it is the only academic entity involved. Such an approach may limit the university's ability to build lasting and long-term relationships with enterprises.

Ad. 3. The University of Rzeszów is oriented towards competing both with economic entities and, to some extent, with entrepreneurs active in the field of educational services. As a result, instead of creating supra-entity structures, it competes for primacy in the industry dominated by the university.

Ad. 4. The university lacks a well-thought-out vision for its own development in relations with the economic environment, limiting itself to commendably expanding its own business-oriented offer,

yet without a long-term vision for future cooperation with economic entities.

Ad. 5 .Determined by the value of Selectivity, like the entrepreneurs, the university does not fully effectively utilize its rich potential, which could bring much better results than those achieved so far.

Ad. 6. In its cooperation policy with the business environment, the University of Rzeszów is guided by caution and pragmatism, which, on the one hand, can be positive, but on the other hand, it does not allow taking too much risk in developing mutual relations.

Ad. 7. The university, as seen in its extensive offer and two initiated clusters, has significant potential in developing cooperation with the business environment; however, this potential is only partially utilized.

CONCLUSIONS

The University of Rzeszów possesses valuable potential that enables achieving many long-term benefits from cooperation with the business environment. Unfortunately, the values that determine the perceptual-decision process result in a lack of long-term policy for developing such cooperation, the underutilization of the full possibilities arising from the university's potential, and thus exposing it to the risk of emerging of strong and dynamic competition. The only effective form so far of engaging entrepreneurs in joint projects has been through clusters, yet there is a lack of other, strictly university-led initiatives that would gather the business community around the university, thereby generating new opportunities and benefits for both sides. The university operates somewhat alongside this environment, providing various services due to its position in the market and the educational and research and development sectors, without engaging in creating and developing broader cooperation structures, which would strengthen the university's market position as not only a reliable but primarily a strong partner for business.

3.12. Cooperation of Maria Curie-Skłodowska University in Lublin with Business Entities

Concerns: Evaluation of the Effectiveness of Academic-Business Cooperation between Maria Curie-Skłodowska University (Pol. Uniwersytet Marii Curie-Skłodowskiej – UMCS) and Associated Business Entities: A Case Study Utilizing an Adopted Method of Cultural Forecasting.

Rationale for Choosing UMCS as the Research Entity and the Adopted Profile of Economic-Academic Cooperation at UMCS:

Founded in 1944, shortly after the war, Maria Curie-Skłodowska University was the fifth university established in Poland. Until the 1950s, the university maintained a profile linked to the four original faculties: Medicine, Natural Sciences, Agriculture, and Veterinary Medicine. A pharmaceutical faculty was added shortly thereafter. In 1949, the establishment of the Faculty of Law marked a departure from the university's previous educational-research profile by expanding into social sciences. By 1951, the Faculty of Mathematics and Natural Sciences had evolved, further subdividing into fully independent faculties of Mathematics, Physics and Chemistry, Biology, and Earth Sciences. In 1953, the university again expanded its scope by establishing the Faculty of Humanities. By the mid-1950s, the university was addressing most scientific disciplines, which ultimately led to the separation of the Agricultural Academy (now the University of Life Sciences) based on the medical and pharmaceutical faculties assigned to the new entity. This dynamic development not only presents an interesting case but also provides a strong impetus for research into the cooperation practiced at the university with business entities. It can be surmised that such a development-oriented faculty likely approached building and strengthening business relations ambitiously, as a cornerstone for the development of all significant academic centers worldwide.

Currently, UMCS hosts the Knowledge and Technology Transfer Center, Analytical Laboratory, ECO-TECH COMPLEX (Analytical and Programming Center for Environmentally Friendly Advanced Technologies), and offers a variety of services from teaching to room rentals. Naturally, this study focuses only on those activities that genuinely contribute to building lasting and developmental relations with the economic environment.

Within the Knowledge and Technology Transfer Center, UMCS offers businesses:

- Laboratory research (analysis of alpha, beta, gamma radionuclides, metal cations, and particle size distributions; qualitative and quantitative analysis of chemicals and their mixtures; determining heat deflection temperature and Vicat softening temperature).
- Scientific research (collaborative research and development in environmental studies; theriological studies; laccase enzyme isolated from the fungus cerrena unicolor for use in cervical cancer treatment; applications of high-performance computing; mechanical drilling with Eijkelkamp equipment including core sampling of undisturbed internal structure of sediments; identifying the potential use of natural compounds for the treatment of neurodegenerative and psychiatric diseases; identification of mold and pathogenic fungi on organic and inorganic substrates; studying the properties of natural and anthropogenic soils including slope stability modeling; terrestrial laser scanning, GPS positioning, precise laser measurements of land and infrastructure deformations, inventory of natural resources and infrastructure).
- Consulting and expertise (research, expert assessments, pre-project studies, environmental impact analyses; IT consulting and business process modeling, including logistics processes; environmental impact reports and land quality maps; measurement of natural radiation levels; marketing advice; preparation of documentation related to ecology and environmental protection; creating educational trails highlighting the natural attrib-

utes of an area; financial and management accounting; strategic and marketing documents for local and regional governments).
- Courses.
- Patents (biotechnology).
- Land surveys.
- Report preparation.
- Training (accounting systems for businesses and institutions, film subtitle creation and translation, high-performance computing applications, biological field activities for teachers/students in line with current curricula, natural education for employees of national parks, state forests, and forest promotion complexes, innovation management and through innovation training, social and political communication training).
- Other services (synthesis of a methane catalyst from carbon dioxide with high activity and selectivity for methane and increased resistance to the presence of sulfur compounds in the gas stream; identification of blood-sucking insects; creation and translation of film subtitles; identification of amphibians and reptiles; herpetological supervision; swimming lessons, recreational activities, endurance testing; concerts, musical accompaniment for ceremonies, CD, DVD recordings, etc.; digital polymer printing, incidental workshop printing – design, layout, and printing; narrative exhibition spaces).

The Center also provides research and development services within a variety of projects and programs (currently 14), including three incubators. With its own staff/students in mind, it supports the commercialization of scientific research results by assisting in launching startups after a thorough assessment of the market potential of the projects submitted. Additionally, the university offers the opportunity to undertake studies to enhance qualifications, which is directed both at employees and business managers.

All this makes UMCS active not only on the local but also on the national Polish market, as evidenced both by the number of programs

conducted jointly with businesses and by the highly specialized offers detailed above, tailored to the predefined needs of various business entities. UMCS distinguishes itself with this high degree of specialization of its offer compared to many academic entities whose offer is much more general. UMCS also conducts accreditations, which naturally bring the business environment from across Poland closer, ensuring that the university's position on the Polish map of academic entities open to and capable of effective cooperation with entrepreneurs is very strong and consequently attractive. The mentioned ECO-TECH is also progressively developing cooperation with businesses interested in implementing environmentally friendly technologies, which in today's times constitutes an ideal niche rapidly transforming into a significant business branch, which the university has also effectively capitalized on in advance. In conclusion, in keeping with its genesis, UMCS is active in the national business environment, also operating in sectors that are still in the early stages of development, which bodes well for the expansion of the university's offer beyond the immediate local region of activity.

SWOT ANALYSIS

Strengths:

- Extensive and current educational offer tailored to meet the current needs of entrepreneurs;
- Extensive and current offer of highly specialized services directed at businesses, not only on a regional scale but also nationally;
- Extensive and current research and development offer that meets the current and future needs of the business environment, not just regionally but across Poland.

Weaknesses:

- Lack of strongly developed cooperation with foreign business entities.

Opportunities:

- Potential to significantly strengthen the university's position in previously established areas of cooperation with the business environment, thereby presenting a strong offer to foreign enterprises.

Threats:

- Potential emergence of a strong foreign entity, although relatively small compared to UMCS's strong position not only regionally but across Poland in progressively occupied areas of academic-business cooperation.

Cultural Code Values Influencing the Effectiveness of Cooperation Between Academic and Economic Entities:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
The researched economic entity	NR	KO	RW	DT/KT	SL/KM	WN/ NN	WS/ NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The model of collaboration with business entities practiced at UMCS has focused for years on strengthening its position, and thus its offer, in specific industries, while also following a long-term vision for the development of these relationships to achieve mutual benefits. This is aided by a catalog of values identified in the study, which distinguishes the university from others and also contributes to the effective nature of its decision-making process (particularly DT/KT; SL/KM, WN/NN, WS/NS).						

Ad. 1. Maria Curie-Skłodowska University (UMCS) approaches the development of cooperation with entrepreneurs with a practical focus, concentrating on fostering collaboration within market sectors already occupied by the university and considering both new, small enterprises and entities with significant potential. The priority is to

strengthen the university's position as a credible business partner, which translates into progressively strengthening the mutual potential.

Ad. 2. In its interactions with the business environment, UMCS focuses on building various forms of cooperation, as evidenced by the number of joint projects initiated with enterprises, including incubators.

Ad. 3. The university competes with other academic and economic entities in its occupied areas by developing strong and lasting cooperation ties with enterprises, which are natural partners in developing mutual relations and thereby mutual potential.

Ad. 4. The genesis and designated directions of cooperation clearly show a long-term strategy of strengthening collaboration with the business environment, which has been effectively expanded and reinforced over the years.

Ad. 5. By occupying its proper areas of activity directed towards the business environment, the university fully utilizes its potential while also making efforts to progressively strengthen those elements of its own potential that seem essential for further reinforcing UMCS's position as a reliable partner for economic entities which might be interested in the university's offerings.

Ad. 6. The university is willing to take calculated risks within the accepted directions of developing cooperation with economic entities.

Ad. 7. UMCS effectively utilizes its own potential to continually strengthen and develop links with the business environment.

CONCLUSIONS

UMCS distinguishes itself from other universities especially through values such as DT/KT, SL/KM, WN/NN, and WS/NS. From the analysis of the university's long-term activities aimed at developing and strengthening cooperation with the business environment, it is evident that the actions taken by the university fit within the established

direction of development as a strong and credible partner providing highly specialized services in innovation, implementation, technology transfer, and specialized offer directed at economic entities active in areas where the university has also been active for many years. Consequently, the university's offer reaches not only the regional but also the national business environment. It also appears that this offer may gradually become attractive to foreign entities. Thus, it can be assumed that the adopted and progressively implemented direction of development will ensure that the university's position will continue to strengthen, and in areas of providing specialized services for business by UMCS, it may in the future constitute competition for other Polish academic entities active in different regions. Currently, the real threat may be generated in the coming years mainly by foreign entities, especially due to the further dissemination and development of modern information technologies.

3.13. Cooperation of the University of Wrocław with Business Entities

Concerns: Evaluation of the Effectiveness of Academic and Business Collaboration between the University of Wrocław (Uniwersytet Wrocławski – UWR) and the Associated Group of Entrepreneurs: A Case Study Using an Adopted Method of Cultural Forecasting.

Rationale for Selecting UWR as the Research Subject and the Adopted Profile of Economic-Academic Collaboration at UWR:

The University of Wrocław boasts a long tradition among other Polish academic centers. Founded in 1702 as Academia Leopoldina, it merged in 1811 with the Viadrina University, which had been relocated to Frankfurt an der Oder. Similar to other historic Polish academic entities, this evolution contributed to forming a solid foundation of social and academic underpinnings for the institution re-established in 1945 as a distinctly Polish university, drawing on the legacy of

generations past. Today, the academic community of the university not only embraces traditions from German centers but also from the Jan Kazimierz University in Lviv, which contributed significantly to the post-war academic staff. It is noteworthy that this university was founded as early as 1661. On its website, the university authorities cite a long and multicultural tradition that draws on past experiences, incorporating the historical heritage of Silesia and the legacies of Austrian, Prussian, Czech, and Polish cultures, while also continuing the traditions of Polish universities in Lviv and Vilnius. Consequently, the university proves to be a fitting research subject in terms of traditions of collaboration with business entities, especially given its modern character and open approach to contemporary and future challenges. An indication of this is the UWR's achievement of Research University status, the only one of its kind in Lower Silesia and one of 10 across Poland. Within the UWR, the Technology Transfer Center (TTC) operates, a university-wide unit established to support the development of the UWR's scientific and technological potential and the direct transfer of research results to the broader economy. The primary goal of this unit is the commercialization of research findings. Through collaboration with the TTC, support can be obtained in identifying research results suitable for transfer and commercialization, as well as assessing the market potential of these results. Furthermore, the TTC supports legal formalities from the documentation stage (necessary to initiate scientific research cooperation) and continues through the further stages of developing contacts with external entities and initiating joint research projects. The TTC also facilitates participation in training and workshops and promotes the research results obtained.

Within the UWR, the following institutionalized forms of collaboration with business operate (Scientific and Research Services Platform):

- Laboratory of Cultural Heritage Research (studies of art and archaeological objects).

- Simple Polish Workshop (language support for entrepreneurs developing texts for mass audiences).
- Institute of Archaeology (services in archaeological research and conservation works, in accordance with current legal standards);
- X-ray Diffraction (structural studies on monocrystals and polycrystalline samples).
- Gemmology Workshop (Gemmology, Petroarcheology, and Technical Petrography Workshop).
- Electron Microscopy (Laboratory conducting measurements using transmission and scanning electron microscopes).
- Electron Paramagnetic Resonance (EPR spectroscopy for studies of substances containing paramagnetic centers).
- Independent Geological Services Workshop "Wro-Min" (execution of projects, documentation, studies, and geological, hydrogeological, and environmental maps).
- EAT LAB (Laboratory provides expert services in performing and interpreting precise body composition analysis).
- Thermal Analysis (Laboratory performs measurements of transformation temperatures and heat flow related to phase transitions in samples).
- Magnetochemistry (Laboratory performs measurements with a SQUID magnetometer and by weight methods).
- Elemental Analysis (Laboratory offers services in determining the elemental composition of chemical compounds and their mixtures).
- Infrared Spectroscopy (Laboratory studies radiation absorption related to the excitation of molecular oscillation levels).
- Nuclear Magnetic Resonance (NMR Laboratory performs 1D and 2D NMR experiments in solutions and solid state).

The university also launched the "Innovation Voucher" program, through which financial resources can be obtained for the development of business entities by financing a scientific-research service conducted by the University of Wrocław on behalf of an entrepre-

neur. Services that can be financed for an entrepreneur under a program financed from EU funds include:

- Laboratory Services;
- Expert Services (analyses, expertise, other studies);
- Development of a new or improved product;
- Development of a new or improved utility model. Depending on the specific support program, the financing conditions may vary, typically ranging from 70 to 90%. The remaining portion is the entrepreneur's own contribution, who is also required to pay the Value Added Tax (VAT). The funding amount can range from several tens to several hundred thousand PLN depending on the program and the supporting institution.

The UWR's Equipment for Commercial Research also offers a wide range of research equipment available for use by business entities, currently exceeding 130 units: MAGEE Aethalometer for determining OC in the air; DSC3 Analyzer with Star software and equipment; VARIO EL CUBE CHNS Elemental Analyzer; AMA-254 Mercury Analyzer; FIMS 100 Mercury Analyzer; PerkinElmer Technical Analyzer; 3100 AVANT DEMO Genetic Analyzer; Equipment for characterizing surface and pore size; Octet K2 equipment for measuring macromolecule interactions; Interferometry-based interaction measurement equipment; Zetasizer Nano ZS with MPT-2 titrator; Foster&Freeman document examination equipment; Electrophysiological measurement equipment; ARES Automatic Resistivity System; Solaar M-6 Atomic Absorption Spectrometer; ASAP-2020 Automatic Sorption Equipment; Biacore 3000; Kipp&Zonen CNR4 Net Radiometer; Liquid Chromatography (HPLC); Ultra-High Performance Liquid Chromatography; Dionex DX 120 Ion Chromatograph; Gas Chromatograph; Dual Channel Gas Chromatograph with Mass Detector and Pump; Kipp&Zonen CM11 Total Radiation Sensor; Kipp&Zonen CM11 Scattered Radiation Sensor; Vaisalla HMP45 Air Temperature and Humidity Sensor; Kipp&Zonen CSD3 Sunshine Sensor; Ultra-Sensitive Plate Reader CM Infinite M1000; Multwell Plate Reader; EnVision Xcite

Multwell Plate Reader; Spectrofluorometric Spectra Max Gemini Reader; Multidetection Microplate Reader; CL Cathodoluminescence Detector; DLS Wyatt – equipment for particle size determination; Dual Channel Gas Chromatography Set with Detector; Four-Circle Diffractometer; Mastersizer 2000 Laser Diffractometer; Monocrystal Diffractometer; Excalibur PX Monocrystal Diffractometer; Powder Diffractometer KP-2025; XRD Diffractometer; XRD Diffractometer-5005; CIMEL Solar and Lunar Photometer; DSC-8500 Scanning Calorimeter; EASYMAX Compact Dual-Reaction Set; Avance III 300 Console; Luminator; SQUID Magnetometer; Axio Examiner.Z1 Microscope; Digital Microscope with Japan Camera; Electron Microscope; Talos L120C Electron Microscope; Leica DM6 Fluorescence Microscope; Axio Vert. A1 Fluorescence Microscope with Camera; Hyperion 1000 Microscope; AxioObserver Z1 Confocal Microscope; Leica Microscope; Leica DMI 6000B Inverted Microscope for Bright Field Work; Inverted Microscope with FLU Confocal Unit; Zeiss Axio Observer.Z1 Inverted Microscope; Olympus BHS Microscope; Optiphot-2 Microscope; Joel JSM IT500LA Scanning Electron Microscope; Joel JSM-IT100LV Scanning Electron Microscope; Nikon SMZ18 Stereomicroscope; TIRF and SPT Axio Observer 7 Microscope with Elyra 7 Head; Aurora 4000 Polar Nephelometer; GPS-RTK Measurement System Receiver; PEM Optical Module for Nexus; Module for Spectral Analysis of Fluorescent Images; Low-Medium Flow Dust Sampler; Preparative-Analytical HPLC System Shimadzu; Geological Radar RAMAC/GPR with Equipment; Nuclear Magnetic Resonance Equipment; Seismograph; 3-Laser Cell Sorter with Flow Cytometer; Atomic Absorption Spectrophotometer; Agilent Technol. Cary Spectrophotometer; Avance 500 NMR Spectrometer; ICP OES Emission Spectrometer iCAP 7400 Duo; Cyclotron Ion Resonance Spectrometer ICR; FTIR Spectrophotometer; FT Raman Spectrometer; FTIR Infrared Range Nicolet IS 10 Spectrophotometer; FTIR Infrared Cary Spectrophotometer; NMR 500 Spectrometer; NMR-600 MHZ Spectrometer; Agilent 8543 UV-Vis Spectrophotometer; Cary

Eclipse Spectrofluorometer with Equipment; Spectrofluorometer with Sample Thermostating Attachment; HITACHI Model F-4500 Spectrofluorometer; AAS Spectrometer; contrAA 800 G Spectrometer; Micron Particle Spectrometer APS (TSI); Submicron Particle Spectrometer SMPS (TSI); EPR Spectrometer; GR-320 C/GPX-21A+ Spectrometer; Nexus Spectrometer; Picarro G2201-i Spectrometer; Picarro G5131-i Spectrometer; Picarro L2140-i Spectrometer; RCDS Spectrometer; Circular Dichroism Measurement Spectropolarimeter; IASCO-715/150L Spectropolarimeter; Genetic Shotgun – Parts and Accessories; LightCycler® 480 Amplification System; Cell Analysis System; In Vitro Cell Migration and Proliferation Analysis System; Protein Interaction and Contract Analysis System; Microorganism Growth Analysis System Bioscreen C; Capillary Electrophoresis System Qiaxcel Advanced; Chemiluminescence and Fluorescence Imaging System; Real-Time PCR System; Real-Time PCR Reaction System; Temperature Control System Compatible with Dielectric Analyzer; 7500 Polymerase Analysis Thermocycler; LightCycler 96 Real-Time Analysis Thermocycler; Premier II 500V Ferroelectric Property Tester; Ultramicrotome; CS150FNX Ultracentrifuge with Rotor; Optima Max-XP Ultracentrifuge; Optima TL Ultracentrifuge; Light Sources with Filters for Delta Vision Elite Microscopes.

In support of developing academic entrepreneurship, the university operates several noteworthy projects that provide support for starting a business to the academic staff, doctoral students, and students of the UWR, as well as offering cooperation with entrepreneurs: the UWR Academic Entrepreneurship Consultation Point; the Lower Silesian Academic Entrepreneurship Incubator; the Integrative Entrepreneurship Incubator BOX; Academic Box – an offer for scientific circles; Concordia Design Wrocław.

The university also offers the opportunity to benefit from patents developed at the UWR: Phosphor – White Light (Phosphor emitting white light upon excitation in the near ultraviolet range); Phosphor – White, Yellow, Red, and Green Light (Phosphor consisting of a ma-

trix made of yttrium and calcium silicate or strontium with europium doping); Phosphor – White and Red Light (Phosphor consisting of a matrix made of yttrium and calcium silicate or strontium with cesium and magnesium ion doping); Gas Explosion Warning (Method for assessing the risk and predicting gas eruptions in a mine); Multicomponent Granulated Fertilizer (Method of using acidic potassium phosphate for the production of multicomponent fertilizer); FGF1 Growth Factor Conjugate (Method for delivering a drug to cancer-altered cells); Cage-Like Silicon Compounds (Method of transforming T8 Polyhedral Oligomeric Silsesquioxanes into T10 type compounds); Dewatering Waterlogged Objects (Method for drying, decontaminating, and protecting flooded and microorganism-damaged exhibits); Artificial Sandstone (Method of producing artificial sandstone from metallurgical waste and processing); 3-Bromopyruvate in the Treatment of Cryptococcosis (Use of 3-bromopyruvate for the prevention and treatment of cryptococcosis); Drone with an Air Pollution Meter (Unmanned aerial vehicle with a differential air pollution meter); Biogas from Meadow Biomass (Method for producing biogas from biomass resulting from mowing meadows).

It should be emphasized that all these patents can find application in industries particularly developed in Lower Silesia, which testifies to the potential arising from their commercialization. They may also attract interest from both national and international entities due to their practical nature, which can influence cost reduction and profit generation.

SWOT ANALYSIS

Strengths:

- A comprehensive and professional educational offer in the form of Bachelor's, Master's, and postgraduate studies, aimed at companies focused on improving the qualifications, knowledge, and skills of employees at all levels, as well as business owners.

- An extensive and attractive offer of commissioning scientific research and technological development and implementation of new solutions in enterprises.
- Offering patented technological solutions valuable in specific industries with a comprehensively understood implementation process.

Weaknesses:

- Limited promotion of the offer aimed at business entities in the country and very limited promotion of this offer aimed at foreign business entities.

Opportunities:

- With increased promotion of the offer aimed at foreign entities, there is a chance to gain new clients and recognition of the university as a known and tested brand in the international market in specific industries.

Threats:

- With too extensive an offer, there is a risk of being unable to meet demand, which could negatively affect the brand of the university; to avoid this, it would be necessary to progressively expand the potential to provide services for an increasingly large number of entrepreneurs.
- There is a risk of marginalization and limitation to the local market in the event of the emergence of strong foreign entities in the Polish market offering a similar range of services to Polish and local entrepreneurs.

Cultural Code Values Influencing the Effectiveness of Cooperation Between Academic and Economic Entities:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
The researched economic entity	WR	SM	ST	KT	SL	WN	WS/ NS

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The University of Wrocław is a unique type of university that combines elements of social sciences, humanities, and technical disciplines in equal measure. For this reason, its offer to entrepreneurs is enriched with technological elements, significantly enhancing its attractiveness to business entities. Despite its international offer, the university's activities are largely focused on the region close to its location, with less emphasis on the rest of Poland. This approach is influenced by cultural values, primarily SM, KT, SL, and WN.						

Ad. 1. The university strives to build strong ties, primarily with robust entities, which imposes a self-inflicted limitation on the ability to acquire lesser-known but potentially developing entities.

Ad. 2. The university is culturally oriented towards independent activity, especially in relation to other academic institutions. Such an approach does not foster the building of long-term and extensive academic-business structures, but merely the establishment of these structures in a short-term perspective for immediate purposes, often only as long as funding from external sources (e.g., incubators) is received.

Ad. 3. The university aims to stabilize its economic environment.

Ad. 4. The university plans and implements actions over the next few years, indicating a short-term approach and thus a lack of ability to effectively plan for several decades ahead. Consequently, the university's policy towards entrepreneurs is focused on immediately attainable benefits.

Ad. 5. The university concentrates the vast majority of its activities on the geographically close area, directing its efforts and cooperation offer to entities located in other parts of the country, and even more so in other countries, to a limited extent.

Ad. 6. The university does not exhibit a tendency to take any risks, focusing its activities on achieving immediate benefits.

Ad. 7. Locally, the university's potential is used relatively effectively and comprehensively, yet the part that could be used for building and strengthening lasting relationships with entrepreneurs representing specific industries across Poland is utilized to a minimal extent.

CONCLUSIONS

The University of Wrocław is among the fastest-growing and most modern universities in Poland. However, the perceptual-decision-making process of those directing the development of the university is determined by cultural value codes, which makes the university's decision-makers reluctant to take risks, and also limits the effectiveness of the planning process to a few years. As a result, it is not easy to develop a stable and far-reaching vision for the university's development over not just a few years but several decades. On the one hand, the university possesses enormous service, research, and research-development potential, which garners broad interest not only regionally but also nationally. On the other hand, the effort put into building business relationships concentrates on the geographic region close to the university's location, only minimally extending to other regions of Poland, not to mention other countries. This raises the risk of marginalization in the event that strong foreign entities with decades of potential development and thus highly competitive offers appear in Poland. To strengthen its position, the university should intensify the development of its staff and infrastructure by actively acquiring a broader client base equally from Poland and abroad. In the next decade or so, there is a chance to build a strong brand that would pose a serious challenge to potential foreign competition, which over time may start investing in the educational and research-development sector in Poland.

3.14. Cooperation of the Warsaw University of Technology with Business Entities

Concerns: Assessment of the Effectiveness of Academic-Business Collaboration between Warsaw University of Technology (Pol. Politechnika Warszawska – PW) and Partnering Entrepreneurs: A Case Study Using an Adopted Method of Cultural Forecasting.

Rationale for Selecting the PW as the Research Subject and the Profile of Economic-Academic Collaboration at the PW: Warsaw University of Technology was established in 1915, initiated by the Warsaw Scientific Society, positioning it as one of the oldest technical universities in Poland. Today, it is one of the largest universities of technology with significant achievements not only nationally but also in the Central and Eastern European region. It is worth noting that the university's establishment was preceded by the creation of the Preparatory School for the Polytechnic Institute in 1826, which was closed after the fall of the November Uprising in 1831 due to the patriotic nature of its staff. In 1951, the Warsaw University of Technology incorporated the Hipolit Wawelberg and Stanisław Rotwand School of Engineering in Warsaw (a tradition dating back to 1895). Concluding, the Warsaw University of Technology is an example of an academic entity that should be studied due to its long-standing tradition and decades-long focus on collaboration with the economic environment.

The Warsaw University of Technology can boast of numerous projects significant from a business potential standpoint, worth mentioning:

- UAV Baltic Nord system;
- Unmanned aerial vehicle Spectre-1 (WUT Chimera);
- Micro rocket engine;
- Research on the properties of liquid rocket propellants;
- SZURAD – short-range noise radar;
- NavSAR – radio navigation support system;

— XY-DemoRad radar;
— Family of compact radars in C and K bands – XY-SAR Sensor;
— Device for calibrating radar stations XY-Active Echo;
— Greaseless ball bearings;
— Drive system with SRM machine;
— SiC/GaN technology demonstrator;
— MPDIT – Mobile Point of Teleinformatics Infrastructure Distribution;
— Quantum computer infrastructure;
— ISW – Vision Systems Integrator;
— Nanocomposite particles with biocidal properties;
— Explosive method for reinforcing pure titanium;
— Crane drive for road and water vehicles;
— Composite material shielding electromagnetic radiation;
— Method for producing flake graphene;
— 3D printing ink;
— Dynamic substitutes for cancellous bone;
— ELumCal – lighting analysis system based on raster images;
— FloodLum – illumination design system;
— Beeswax;
— Cosmetic raw materials produced by baker's yeast.

Within its walls, the university has also developed numerous successful patent applications and initiated many spin-off companies aimed at commercializing research and development projects with high market potential. In 2021, over 3,000 scientific publications were prepared, and 77 inventive projects from PW were submitted to the Polish Patent Office, securing 82 exclusive rights. Currently, under the initiative of the polytechnic, 25 spin-off companies are operational, in which the university holds shares.

This particular type of practical support in implementing research results by scientists, PhD students, and students is possible thanks to a group of experts at the university, the task of which is to provide assistance not only in conducting and finalizing scientific research

but also in offering necessary support in legal, economic, and environmental aspects essential for a comprehensively understood technology transfer.

This arrangement allows for the preparation of a precise and favorable offer regarding technology transfer processes, their protection, and commercialization. Dedicated institutions within the polytechnic include the Innovation Management and Technology Transfer Center at the PW and the PW Institute of Applied Research.

The Center provides expert services in technology transfer, offering innovative technological solutions according to the needs of entrepreneurs, already patented technologies, utility models, and access to research facilities. Additionally, the Center offers specialized assessments for selecting appropriate technological solutions for entrepreneurs, assistance in their implementation, and conducting market value appraisals of the specified technologies. Numerous research teams at the university collaborate with the Center, developing new technological solutions and refining existing ones. Often, these teams include individuals with experience from collaborating with entrepreneurs, impacting the market-oriented nature of the cooperation with business entities. The Center's offer is directed at companies, public institutions, academic entities, and private individuals interested in establishing cooperation and utilizing the university potential.

The Center employs both innovation brokers and specialists in technology transfer, demonstrating a professional approach to the services offered to entrepreneurs (including implementing research results from polytechnic scientists, students, and PhD students).

Additionally, an incubator has been established to support young technology companies that fit into the university's innovation ecosystem and are taking their first steps in the challenging new technology market. This support is intended to guide young entrepreneurs through the early stages of business development, from initial growth to gradual stabilization and achieving market independence. The participation period in the program is up to two years.

Currently, 14 companies operate within the PW Innovation Incubator, and a total of 18 business entities have passed through this formula to date. The vast majority of these operate in the field of new technologies, including AI and nanotechnology, https://www.cziitt.pw.edu.pl/dla-pracownikow-pw/badania-i-analizy-na-potrzeby-zespolow-naukowych-i-uczelni/przestrzen-badawcza-laboratoria-badawcze/.

The WUT also has a Research and Analysis Department CZIiTT of the PW along with a network of research and analytical laboratories, among which those most engaged in business cooperation projects are listed below:

- Social Research Laboratory (professional studio for conducting computer-assisted telephone interviews, social and economic research using telephone survey technique (CATI) with CADAS CATI software, automation of contact database collection and processing, cyclic updating and verification of thematic databases).
- Data Processing and Analysis Laboratory (conducting advanced analytical work using professional IT systems, social and economic research using internet survey technique (CAWI), including with a portable set of tablets, social and economic research using paper survey technique (PAPI), methodological consultations – support in developing research tools within statistical analysis and research projects, data analysis (quantitative and qualitative) and interpretation: exploratory data analysis, statistical analysis, discovering business-useful patterns and relationships through data mining, text mining, machine learning techniques, visualization of research results by creating interactive charts and infographics based on research findings, building recommendations essential for using research results in practice, preparing a research report including: summary, so-called executive summary, description of methodology, research process, main data, analysis, interpretation, conclusions, recommendations).

- Project Work Laboratory (project workshops – for companies, institutions, organizations, and individuals wishing to collaborate with the Center in research work, Service Design, execution of science and business networking processes, consultations on research techniques and tools, development of research concepts, execution of research projects, creation of project sheets and funding applications using creative work techniques and design-facilitating tools – service provided under cooperation agreements, evaluation and monitoring of projects, designing research project management processes).
- Creativity Studio (dedicated to developing innovative project work, such as: Design Thinking, Service Design, Design Management, conducting social research using creative work methods, conducting economic research using creative games e.g., Business Model Poker, creative workshops aimed at finding innovative ideas and solutions for selected issues, creative thinking training).
- Non-Technological Innovations Laboratory (moderation of public consultations, creation of social innovations by linking existing social problems with available technological innovations, conducting research for social initiatives supporting scientific and technical achievements, diagnosing existing social problems and creating proposals for their solutions through existing solutions and innovations, exploring new, socially useful applications of existing technological solutions, public consultations of developed solutions using interactive presentations as a method of obtaining feedback from potential users, social research in the field of User Experience, research in foresight methodology, testing applications designed for interactive tables).
- Multimedia Techniques Laboratory (Recording Studio, professionally soundproofed studio allows for interior arrangement, blue box technique application, services offered in cooperation with the Student Internet Television TVPW, audio-video services, event transmissions and streaming – multi-camera live

internet broadcasting, conducting photo sessions and photo editing in graphic software, event photo reports, providing the studio for recording and production needs, as well as equipment of the Recording Studio for events organized at PW, webinars dedicated to PW: academic staff, units, and faculties).

The Warsaw University of Technology, rich in experience related to promoting future research-development businesses, also provides support in building the image of future business entities, fully understanding the importance of effectively conducted marketing for prospective enterprises.

At the university, higher education, postgraduate studies, and courses and training are also offered, allowing employees of various companies to acquire knowledge and experience. However, the main direction of development in cooperation with the business environment is the commercialization of technological solutions developed at the university through granting paid licenses for their use, selling them, or initiating companies with university participation, which serves their direct sale in the market.

SWOT ANALYSIS

Strengths:

- Comprehensive and professional educational offer aimed at companies focused on enhancing qualifications, gaining knowledge and skills by employees at all levels, and business owners.
- Extensive research and development infrastructure focused on executing a variety of tasks commissioned by entrepreneurs representing technological industries.
- A large base of patented technologies ready for implementation;
- Provision of professional services based on the achievements of both technical sciences and social sciences, including in the area of multimedia techniques and analytics and forecasting of social phenomena.

Weaknesses:

- Too rapid growth in demand for the university specialized offer compared to its supply capabilities.

Opportunities:

- Opportunity to progressively develop supply capabilities by engaging specialists not only from Poland but also from abroad.

Threats:

- Risk of being unable to satisfy the rapidly growing demand and gradual decline in the number of entrepreneurs interested in future cooperation.
- Risk of the emergence of new entities with a much more creative vision for developing cooperation with entrepreneurs.

Cultural codes values influencing the effectiveness of cooperation between academic and economic:

	WR/ NR	**SM/ KO**	**RW/ ST**	**DT/ KT**	**SL/ KM**	**WN/ NN**	**WS/ NS**
The researched economic entity	WR/ NR	SM/ KO	RW/ST	KT	SL	WN	NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	Lack of a coherent vision for the long-term development of relations with the business environment, relying on existing and continuously improved solutions in this area. This approach is determined by the values KT, SL, and NS.						

Ad. 1. The Warsaw University of Technology equally develops relationships with both large and small business entities, focusing on future, mutual opportunities to strengthen shared potentials.

Ad. 2. Depending on the situation, the university focuses solely on achieving its own goals, or on mutual goals, meeting various forms of long-term cooperation with business entities.

Ad. 3. Depending on the situation, the university either competes with or collaborates with academic and economic entities.

Ad. 4. The Warsaw University of Technology lacks a long-term, coherent vision for future policy development in relations with business entities, which may lead to a decrease in the attractiveness of the university's offer to entrepreneurs in the long term, and in the short term to a decline in supply capabilities in meeting the dynamically growing demand from entrepreneurs interested in collaboration.

Ad. 5. The university focuses only on selected market segments, while it could potentially exploit additional segments based on its existing potential.

Ad. 6. In developing cooperation with the business environment, the Warsaw University of Technology exercises extreme caution, hindering rapid development in accordance with the growing market needs.

Ad. 7. The university does not fully utilize its current potential, and without a clear vision for its own development, it does not use the full spectrum of opportunities to develop this potential quickly enough to meet market needs.

CONCLUSIONS

The Warsaw University of Technology is perceived as a solid brand within the national business environment, worthy of cooperation and investment in its projects. Unfortunately, it only utilizes existing development opportunities to a small extent, leading a pragmatic and very conservative policy in this area, which results in too slow development of the university's potential relative to these possibilities. Consequently, there is a risk of gradually losing potential clients who will be forced to look for alternatives, which may lead to the loss of the currently established status in the long term. Such an approach is conditioned by the values of cultural codes that have determined the current operating model of the university in its interactions with the business environment. Changing this attitude is hindered by the

university's overly large structure, perpetuated by an excessively developed staff and outdated internal administrative procedures that do not meet contemporary requirements.

3.15. Cooperation of the Wrocław University of Science and Technology with Economic Entities

Concerns: Evaluation of the Effectiveness of Academic-Economic Cooperation between the Wrocław University of Science and Technology (Pol. Politechnika Wrocławska – PWR) and Associated Entrepreneurs: A Case Study Using an Adapted Cultural Forecasting Method.

Justification for Choosing the PWR as the Research Subject and the Adopted Profile of Economic-Academic Cooperation:

Within the university, the Wrocław University of the Technology Center for Innovation and Business (CIB) offers services for entrepreneurs and scientists, including patent protection, a list of technologies available for commercialization, the ability to commission research, analyses, and expert reports, and direct collaboration with laboratories conducting research in areas of interest to businesses through the CIB. In the area of patent protection, the CIB provides access to the Regional Patent Information Center, which conducts patent analyses, provides information on patent applicants, geographical and technical areas where patents are filed, available solutions, and trends. Furthermore, it can assess the innovation level of a given invention, find potentially important industries and markets for the technology, and support its further commercialization. The RPIC employs engineers engaged in identifying solutions within the broad field of R&D, who, with years of experience, can support the development of an intellectual property portfolio and guide the course of future research and protection of the results.

The Wrocław University of Science and Technology is among the most modern technical universities in the country, conducting nu-

merous studies at a global level, with a focus on the potential for commercialization not only in Poland but also abroad. Nearly half of the patents filed in Lower Silesia have been developed at the university, evidenced by over 5,000 patent and utility model applications. The regular acquisition of European funds also attests to the high degree of innovation in the projects, which is recognized worldwide. Noteworthy technologies with significant commercialization potential include:

- An innovative method for recovering lithium and manganese from used lithium batteries;
- Vibration reduction during machining;
- A system for waste heat recovery and removing impurities from ceramic gas radiators;
- A device for hybrid spot welding of composite materials with a metal layer;
- Gravity storage rack;
- Membrane technology for water recovery from treated wastewater;
- An innovative improvement to a lathe for regenerating rail vehicle wheel sets;
- Control algorithms and optimization of energy storage cooperating with renewable sources;
- A multisensory, redundant system for monitoring selected industrial environmental hazards;
- A method for producing health-promoting, functional vegetable and fruit juices;
- A sensor for measuring breathing frequency;
- Epoxy-granite composite and its application;
- Aberrant optical distance sensor for technological processes and a method for measuring distance in technological processes;
- A surfactant compound containing a natural component as a new, safe, and effective antistatic product;

- A passive device supporting spinal work;
- An enzyme biosensor for detecting and monitoring biomolecule levels;
- Duo-hydrothermal processing of biomass and waste substrates and a system for its implementation;
- Nitrogen removal technology from wastewater and leachate with elevated ammonium nitrogen concentration;
- Monomers for synthesizing photochromic polymers;
- Polymers with photochromic properties for industrial applications;
- Ether-based aromatic compounds;
- Cement flooring modified with granite powder;
- Cultivation installation for fruits sensitive to fungal infections;
- Protective Sol-Gel Oxide Coatings Limiting Hydrogen Permeation through polymer materials;
- A system for measuring spontaneous electromagnetic emission from rocks;
- Photo-magnetic stimulated nanocargos for superior cancer treatments;
- Biocatalytic method for obtaining pure isomer hydrochloride (R) 3-pyridylmethyl (amino) phosphonic acid;
- Silica nanoparticles synthesized using corn cob husks as a substrate;
- Attachment for reducing the working space of 3D printers;
- Antibacterial additives, their production, and application method;
- Composite fiber-cement material;
- Innovative technology for producing fiber-cement boards;
- Marker for writing on glass;
- Method for producing granular NPK fertilizer from agricultural waste, food industry waste, and inedible animal raw materials;
- Recycling of waste PUR (polyurethane) foam into full-fledged products;

- Method for producing granular NPK fertilizer from agricultural waste, food industry waste, and inedible animal raw materials;
- LS/L-PBF laser sintering technology for plastics PA12, PS;
- Innovative polymer+rock mineral composite from recycling;
- Recycling of polymeric, polyurethane waste into full-fledged products;
- SLM/L-PBF selective laser melting technology for aluminum alloys;
- Robotic, mobile painting system;
- Modular vibroacoustic housing;
- Synthesis and surface modification of silica spheres doped with antibacterial nanoparticles;
- Method and device for measuring the physical properties of semiconductor layers;
- Method for deactivating antibiotics in aqueous solutions;
- Miniature electrochemical cell for energy storage – supercapacitor;
- Plant growth stimulant biopreparations and their production method from wastewater;
- Fertilizer production method using animal-based raw materials;
- Pneumatic vest acting as an intelligent exoskeleton;
- Nanocomposite magnetic hydrogel as a 3D printing filament;
- Magnetic-hydrodynamic microfluidic platform;
- Magnetic microfluidic device for rapid screening;
- Miniature electrochemical cell for energy storage;
- Compact multi-pass cell of a new type;
- Mathematical model simulating the operation of a biogas-producing ecosystem;
- Biogas cleaning-enrichment method;
- Pharmaceutical preparations for treating and preventing herpes simplex type 1;
- Technology for chemical preparations for treating and preventing herpes simplex type 1;

- Innovative software for analyzing research projects;
- Armored military vehicle;
- Resource recovery technology from waste;
- Technology for regenerating calcium sorbent for CO2 capture in a chemical loop;
- Wrocław road plate for covering construction excavations;
- Innovative concrete core drill bit;
- Mobile device for examining the morphology of flat surfaces, especially concrete;
- Bioreactor process for waste stream management;
- Waste stream management using membrane separations;
- Method for producing epoxy flooring;
- Resin-based coating product;
- Biocatalytic production of 4-hydroxyphenylacetic acid;
- Method for driving the working tool of a hammer machine and its drive;
- Natural antioxidant compounds produced from medicinal plants;
- Innovative pump with stepless adjustment of the working space;
- Innovative mechanism for sliding shutters;
- Innovative vane pump with integrated electric drive;
- Method for synthesizing gold nanoparticles;
- Composite catalyst for producing high-quality diesel fuel;
- System for decomposing and measuring the electromagnetic field;
- Gelatin hydrogel matrices as colored tests for detecting β-galactosidase;
- Method for producing composite granules enriched with microelements;
- Mechatronic system for modifying the trajectory of a human knee prosthesis;
- Mechatronic system for adapting the trajectory of a knee orthosis;

- Chiral ionic liquids for stabilizing and activating lipase;
- Production of fine chemicals using biotechnological methods;
- Enzyme electrode for determining and monitoring dopamine concentrations;
- Fluorescent biosensor for determining and monitoring dopamine concentrations;
- Application of phosphonic analogs of lysine and arginine to inhibit Zika virus replication;
- Structural and material analysis of refrigerators concerning recycling processes; selected subsystems for refrigerator recycling lines;
- Microprocessor single-frequency green laser;
- Humidity monitoring system;
- Cycloidal gear set;
- Internal gear hydraulic devices;
- Gerotor hydraulic device;
- Active foundation shields for water-immersed structures;
- Solar radiation absorption device;
- Microdevices for conducting cell cultures in gradients of bioactive substances;
- Method for increasing formability of aluminum sheets from precipitation-hardenable alloys, especially 6000 and 7000 series;
- Laser-fiber optic vibrometer;
- Method for producing multilayer microfluidic devices for tissue cultures under dynamic conditions;
- System for interactive augmented visualization of multimodal medical image fusion;
- Method for soft soldering aluminum alloys with graphite-based composite materials;
- Method for joining aluminum alloys with nickel superalloys by brazing;
- Device for reducing the peronial gap;
- Innovative diagnostic system for voltage inverter faults.

Additionally, the PWR offers extensive services for conducting specialized commissioned research, implementing existing technologies into the economy, and conducting various expert evaluations and training. For commissioned research, accredited laboratories offer research and R&D services to businesses (with calibration, testing, and conformity assessment services for products, systems, and installations according to EU standards):

- Acoustic Research Laboratory;
- Transport Infrastructure Research Laboratory;
- Occupational Safety Laboratory accredited by PCA, AB 905;
- Chemical Multi-element Analysis Laboratory;
- Machine and Vehicle Construction Laboratory;
- Electromagnetic Compatibility Laboratory;
- Reverse Engineering Laboratory;
- Conveyor Transport Laboratory;
- Electromagnetic Field Calibration and Metrology Laboratory.

The university also offers studies, including postgraduate programs for entrepreneurs aiming to train their employees, and collaborates in recruiting its graduates to fit various industry needs.

Current projects at the PWR include:

- Atlas of Open Science Resources 2.0 (a project aimed at providing open access to important materials for science and industry, including publications, recordings, videos, lectures, language courses, etc.).
- Agile Bionic Hand Prosthesis (controlled by biosignals, recognizing patterns in these signals representing the user's intention to control prosthesis movements).
- TRAILS and TRAILS+ ("Traveling Innovation Labs and Services," workshops in mobile innovation labs aimed at boosting innovation in the Poland-Saxony cross-border region).

Another crucial form of developing relationships with the economic environment is supporting academic entrepreneurship, allowing business ideas to be tested in controlled conditions and safely

implemented before reaching market stability and growth potential. This support is institutionally provided by the Institute for Technology Transfer Ltd., a special-purpose company of the PWR, enabling indirect commercialization of R&D results developed at the university.

The PWR's extensive offer has built strong relations with the regional and national economic environment, focusing on technological sectors in which the university stands out among Polish technical universities.

SWOT ANALYSIS

Strengths:

- Extensive educational offer for firms in selected technological sectors, focusing on improving qualifications and skills for employees at all levels and company owners.
- Providing new technological solutions for selected sectors with significant commercialization potential.
- R&D projects aimed at strengthening cooperation with the business environment.
- Identifying and supporting research results with high commercialization potential, providing comprehensive support from establishing a company to its growth and independent operation in the free market.

Weaknesses:

- Lack of promotion of the university's offer to international entities, focusing mainly on regional or national businesses.

Opportunities:

- Utilizing the university's potential to promote its technological solutions internationally.

Threats:

- Lack of international promotion may lead to losing business relations when large international entities enter Poland with

superior R&D and economic potential, offering similar services.

Cultural Codes Affecting the Effectiveness of Academic-Economic Cooperation:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
The researched economic entity	NR	SM/ KO	ST	KT	SL/KM	WN	NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The decision-making process determining the development of relations with business entities is primarily conditioned by NR, SM/KO, ST, and SL/KM, which provides the university with a stable direction for strengthening its potential in the regional and partially national market. However, due to the influence of KT, WN, and NS values, it hinders quicker progress and appropriately active acquisition of foreign entities for collaboration						

Ad. 1. A positive value influencing the university's decision-making process in establishing relationships with economic entities is the Non-Restrictive (NR) approach, which imposes no limitations on the university in seeking future business partners/clients.

Ad. 2. Depending on circumstances, the university adopts either an autonomous or cooperative approach in its initiatives, which fosters the development of long-term, stable academic-business structures.

Ad. 3. The university seeks to stabilize the business environment, and even the academic one, not perceiving other entities as rivals, but as potential partners for cooperation (short – or long-term) focused on mutual growth.

Ad. 4. With its significant scientific, research, and R&D potential, the university gradually expands its activities in relationships with economic entities. However, this process occurs on an ad hoc basis,

lacking a broader, long-term vision, which should accompany a complex and forward-looking institution such as this university.

Ad. 5. The university's selective approach strengthens and develops its position in the business environment, focusing on its region and parts of Poland. However, its potential allows for acquiring many more business partners and clients not only domestically but also abroad.

Ad. 6. Both the PWR and entrepreneurs are averse to taking unnecessary risks.

Ad. 7. In developing relationships with economic entities, the university utilizes much of its potential, as seen in the scale and scope of its actions. However, not all elements of this potential are used, evident from the lack of developed promotion of its solutions on the international market.

CONCLUSIONS

The Wrocław University of Science and Technology is one of the most modern technical universities in Poland, with an extensive scientific, research, and R&D base aimed at providing new technological solutions with substantial commercialization potential. This sector of the university's activities seems most attractive to economic entities that form or may form business partners. However, the influence of some cultural codes on the university's perceptual-decision process limits and delays potential progress, including actively acquiring foreign clients. The university has a strong position in the regional and national markets within developed sectors, but excessive inertia in self-development poses the risk of strong (foreign) competition due to the ineffective utilization of its potential for sufficiently rapid growth.

3.16. Cooperation Between the Gdańsk University of Technology and Economic Entities

Concerns: Evaluation of the Effectiveness of Academic-Economic Cooperation between the Gdańsk University of Technology (Pol. Politechnika Gdańska – PG) and Associated Entrepreneurs: A Case Study Using an Adapted Cultural Forecasting Method.

Justification for Choosing the PG as the Research Subject and the Adopted Profile of Economic-Academic Cooperation:

The Gdańsk University of Technology is one of Poland's largest technical universities, employing over 1,200 scientific staff. Under the 'Excellence Initiative – Research University' (IDUB) program, many new projects have been launched to progressively improve the university's scientific activities. The university has nine faculties with specific areas of teaching and research, along with teams conducting research beyond individual faculties, reflecting its interdisciplinary status. The PG's four research centers bring together experience, skills, and competencies from scientists across faculties, aiming to develop innovative solutions and, ultimately, new solutions in biotechnology, bioengineering, eco-friendly technologies, digital technologies, and advanced materials for industry and medicine.

The PG offers support to both scientists and entrepreneurs, fostering innovative connections between academia and business by actively seeking areas of collaboration. This enables businesses to implement scientific solutions developed at the PG, with support throughout the comprehensive implementation process, aiming at commercializing research results. To facilitate this, the PG has established a Business Service Point.

The PG also provides commissioned research services, including research projects, laboratory tasks, consultancy, expert opinions on technologies and their potential, and other services utilizing the university's staff and infrastructure. The university conducts around 300 research services annually, ensuring stable income and demonstrating

strong relationships with the economic environment. The university's Innovation Assessment service is valuable for businesses operating in highly specialized technology sectors, supporting:

- Funding applications from structural funds,
- Technology credit applications,
- Negotiations with investors,
- Tax purposes,
- Marketing purposes.

The PG is also active in developing new technological solutions for the market and patenting them. Currently, the university has over 630 applications for inventions, utility models, and industrial designs, mostly in marine technologies, making it well-known in the maritime industry for providing innovative solutions. The PG also collaborates with businesses on diverse R&D projects, supported by entities such as NCBiR, PARP, and the EU. The PG has experience in establishing spin-off and spin-on companies to ensure professional commercialization of its research outcomes. These companies, with the PG's capital participation, are formed by its special-purpose company, Excento sp. z o.o. Examples of such companies include:

1. NovaPUR sp. z o.o. (R&D based on PG technology, producing eco-friendly rigid polyurethane foams, and licensing their production for industries including aviation, automotive, apparel, and construction).
2. ARGEVIDE sp. z o.o. (implementing and selling services from the NOR-STA project, supporting conformity processes with national and international standards).
3. AssisTech sp. z o.o. (a spin-off from PG, working on the C-Eye® system prototype, focusing on IT, multimedia, and biomedical engineering solutions).
4. DetoxED sp. z o.o. (a spin-off by PG and the Medical University of Gdańsk, developing interdisciplinary methods (chemistry, toxicology, dietetics) to reduce exposure to endocrine-disrupting chemicals (EDCs) at home and assess individual EDC exposure,

mitigating health risks such as hormonal disorders, obesity, infertility, and cancers).

5. Solutions 4 Tomorrow sp. z o.o. (developing unmanned aerial vehicle technology, aiming for full autonomy, improved efficiency, and safety).
6. Byotta sp. z o.o. (designing cooling systems for complex setups, particularly for electric vehicle traction batteries).

The PG offers over 50 postgraduate programs and numerous refresher courses for professionals, including the "International MBA in Strategy, Programme and Project Management," accredited by AMBA. Its laboratories provide commissioned research services, including:

- Brain and Mind Electrophysiology Lab,
- Civitronics Center – Center for Advanced Technologies,
- GUT LightLab,
- GUT Tribology,
- InerLAB – Marine and Coastal Gravimetric Measurements Lab,
- KPD | Plasmid and Microbial Collection,
- Laser Ablation and Nanolithography Lab,
- Power Systems Analysis Lab,
- Electric Drive Automation Lab,
- Road Testing Lab,
- Field Testing Lab,
- Research Lab 2–3,
- Customer Experience Lab,
- Engine and Piston Compressor Diagnostics Lab,
- Physics and Electrodynamics Lab,
- Electron Collision Physics Lab,
- Hydraulic Power Lab,
- Hydromechanics Lab,
- Innovative IT Applications Lab,
- Intelligent Energy LAB-6,
- Quality Engineering Lab Q,
- Material Engineering, Building Physics, and Concrete Technology Lab,

- Ocean Engineering Lab,
- LINTE^2 Lab,
- Ship Machinery and Systems Lab,
- Optoelectronic Materials and Innovative Materials and Displays Lab – Center for Advanced Technologies,
- Polymer Materials Lab,
- Nanomaterials Lab CZT,
- smartLAB,
- Synthesis of Innovative Materials and Components Lab,
- Computer Techniques in Accounting and E-Business Lab,
- Vibroacoustics Lab,
- High Voltage Lab,
- Advanced Plasma-Chemical Processes Lab,
- Immersive 3D Visualization Lab LZWP,
- Building Automation Management and Integration Lab,
- Energy Sources Lab in the Department of Energy Conversion and Storage,
- Testing Center, Electrical Engineering and Automation Faculty,
- Low-Altitude Photogrammetry and Remote Sensing Lab,
- Scanning Electron Microscopy Facility,
- Tryton Supercomputer,
- Wireless Technologies Lab,
- Center for Advanced Technologies

An interesting project is the Startup School run by the Technology Transfer Center, aiming to initiate and support academic entrepreneurship based on the PG's research. The Molybdenum Startup School program serves to transfer knowledge and technology, aiming to create a lasting mechanism for supporting academic entrepreneurship. Activities include:

- Promoting academic entrepreneurship knowledge;
- Organizing business idea workshops;
- Team-building sessions;
- Scientific-technological and mentoring support;
- Grants for the best teams planning to form startups or spin-offs.

Two competitions are also ongoing:
— Startup School One: for participating in a program developing business models based on participants' ideas;
— Startup School Two: for advancing a model developed in Startup School One, with financial support as a grant.

The program includes students, PhD candidates, staff, and alumni of the PG. The university also belongs to research consortia such as INTERIZON – Polish ICT Cluster, encompassing entities from 13 economic sectors, mainly IT, telecom, electronics, and education. The PG is also a member of the Polish Synchrotron Consortium, grouping 36 academic entities interested in research with the SOLARIS synchrotron.

SWOT ANALYSIS

Strengths:

- Commissioned research and R&D services achievable within the PG's extensive laboratory infrastructure and staff resources.
- Comprehensive and professional support for students, PhD candidates, staff, and alumni in knowledge transfer and commercialization of research with significant market potential.
- Comprehensive educational offer for entrepreneurs, aimed at improving qualifications, knowledge, and skills for employees at all levels, including company owners.

Weaknesses:

- Limited promotion of collaboration offer for foreign entities, both academic and business.

Opportunities:

- Developing promotion and adapting cooperation offerings for foreign businesses, leveraging the PG's infrastructure and staff potential.

Threats:

- Risk of competitive entities targeting foreign markets, occupying areas that the PG can serve.

Cultural Codes Affecting the Effectiveness of Academic-Economic Cooperation:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
The researched economic entity	WR	SM	RW	KT	SL	WN	NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The university's perceptual-decision-making process is determined by WR, SM, and RW, which limits the initiation of projects and programs with other academic entities and a broader range of business entities. Meanwhile, KT, SL, WN, and NS values mean that the university not only lacks a long-term vision for developing relationships with the business environment and strengthening its own position, but also utilizes its potential only to a limited extent. The university approach is predominantly passive, focused on offering its services in the market but without independently and sufficiently promoting this offer, including by initiating multi-entity structures. The multi-entity structures in which the university is involved do not reflect its full potential, which could be engaged in these endeavors.						

Ad. 1. The university aims to develop relationships with economic entities of greater potential, showing limited interest in small domestic entities and not meeting the expectations of small foreign entities.

Ad. 2. In its programs and projects, the university focuses primarily on its own development, with limited initiatives aimed at engaging a large number of businesses. The university's potential allows for much broader activity in this area.

Ad. 3. The university generally adopts a competitive stance towards other academic and economic entities, even when their activities overlap. It mainly collaborates in fields where its competencies complement those of its partners.

Ad. 4. The university's goals and development directions for cooperation with economic entities are set realistically for the next few

years, with further goals being vague. There is no clear vision for expanding business collaboration, even regionally, instead relying on a slowly but steadily built position in the Tri-City market and somewhat broader in the region.

Ad. 5. In its development policy for business relations, the university limits itself to its own region and certain sectors nationally, without a broader perspective on these sectors in other countries.

Ad. 6. In its activities focused on developing relations with the business environment, the university avoids risk.

Ad. 7. The university makes limited use of its resources in developing cooperation with businesses in its economic environment.

CONCLUSIONS

The Gdańsk University of Technology has extensive infrastructure (laboratories) and staff resources that can be actively used to collaborate with economic entities, including foreign ones. However, its policy has been focused on steadily acquiring partners and clients over time, which may lead to competition from foreign entities with an attractive offer, promoting services and initiating multi-dimensional cooperation much more dynamically, both regionally and nationally. A long-term perspective, with a plan for developing business relations that equally considers domestic and foreign entities, could prevent this and strengthen the PG's position, allowing for new funding and further investment in its standing regionally and beyond.

3.17. Cooperation Between the Poznań University of Technology and Economic Entities

Concerns: Evaluation of the Effectiveness of Academic-Economic Cooperation between the Poznań University of Technology (Pol. Politechnika Poznańska – PP) and Associated Entrepreneurs: A Case Study Using an Adapted Cultural Forecasting Method.

Justification for Choosing the PP as the Research Subject and the Adopted Profile of Economic-Academic Cooperation:

The university collaborates with economic entities in two main areas: conducting commissioned research based on its research and development infrastructure and staff resources, and transferring technologies developed by PP scientists, including implementing research results into the economic environment.

To facilitate this cooperation, a special-purpose company, "Politechnika Innowacje sp. z o.o.," was established in 2016, wholly owned by the university. Like similar special-purpose companies, its goal is indirect commercialization (owning shares in spin-off companies). Knowledge transfer and commercialization are handled by the Poznań University of Technology, Technology Transfer Center, which conducts direct commercialization tasks (mainly selling and licensing scientific research results).

The special-purpose company also offers commissioned research services, including solving technological and organizational problems. Technologies available for businesses include:

- Hybrid material for enzyme immobilization;
- Biosensor for interleukin detection in clinical and diagnostic research;
- Biosensor for cathepsin S detection in clinical and diagnostic research;
- Biosensor for carcinoembryonic antigen detection in clinical and diagnostic research;
- Biosensor for detecting human protein concentrations in clinical and diagnostic research;
- Ionic liquids for restoring historic pine wood;
- Method for separating cobalt from multi-component acidic aqueous solutions;
- Method for producing alpha-ketoglutaric acid (AKG) from single-component aqueous solutions;

- Method for extracting alpha-ketoglutaric acid (AKG) from actual post-fermentation fluids;
- Method for extracting alpha-ketoglutaric acid (AKG) from multi-component aqueous solutions;
- High-temperature electrochemical capacitor for the automotive and aerospace industries;
- Method for modifying activated carbon for electrochemical capacitor electrodes for renewable energy;
- Lead-acid battery electrodes;
- Electrochemical capacitor with modified electrode material for renewable energy;
- Electrochemical capacitor for renewable energy;
- Nickel plating bath for electroplating plants;
- Method for intercalating nitric oxide into graphite for producing fire seals and plates for construction and energy;
- Layered laminate for producing floorboards, panels, and wood-like floor or wall coverings;
- Method for obtaining quinine for pharmaceuticals and cosmetics;
- Cement composite for nuclear energy;
- Wheelchair testing on a dynamometer to measure biomechanical parameters resulting from manual drive use;
- Kit for converting a manual wheelchair drive to an electric-manual hybrid;
- Gesture-controlled system for an electric wheelchair;
- Manual drive for vehicles, particularly manual wheelchairs;
- Module for a universal lever brake wheel for a wheelchair I;
- Module for a universal lever brake wheel for a wheelchair II;
- Wheelchair chassis with mounting system;
- Multi-speed hub with traction drive for manual wheelchairs;
- Traction for a wheelchair wheel;
- Set of traction gears for a wheelchair;
- Device for cleaning coastal waters and beaches from algae;

- Perforating head with two cutting edges and a movable plate;
- Perforating head with two cutting edges and a movable punch;
- Perforating head with one cutting edge;
- Mechanical perforation system for vacuum transport belts with optical control;
- Buffering-tensioning device for a transport belt in its production process;
- Belt perforation device;
- Device for measuring linear displacement of a transport belt;
- Dosing-positioning device for a transport belt in its production process;
- Roller shredder for wood with an overload system;
- Die press for multi-operational shaping of fuse cap;
- Method for making a fuse cap;
- Speed control system for a roller shredder drive with an internal combustion engine;
- Reinforced thin-walled sigma beam;
- Lightweight thin-walled steel beam with high stiffness;
- Multi-layered plate with high stiffness and good damping for industrial walls and roofs;
- Chemically hardened polymer composite with natural filler;
- Method for rolling the edges of thick welded plates for the metal and defense industries;
- Method for stamping thick welded plates for the metal and defense industries;
- System for measuring time or speed of filling a small-section casting mold cavity;
- Dynamic inductive heating system for a mold surface for producing thin-walled automotive and home appliance molds;
- Injection mold with selective inductive heating for producing thin-walled automotive and home appliance molds;
- Method for drawing a thick plate stamping wall for the metal and defense industries;

- Selection of tool materials when turning nickel superalloys and laser-clad carbides under laser-assisted turning conditions;
- Stationary inductive heating system for selected mold surfaces for producing thin-walled automotive and home appliance molds;
- Rotary table for disabled and elderly persons;
- Hybrid switch for electrical equipment protection;
- Ultrasonic transducer for detecting and locating acoustic emission signals generated by partial discharges;
- Device for continuous, precise air quality monitoring;
- Mobile inspection system with 3D map building and analysis capabilities;
- Reinforced thin-walled sigma beam;
- Rotary table for disabled and elderly persons;
- Lightweight composite for thermal insulation and microwave radiation shielding;
- Low-floor trailer for transporting oversized vehicles;
- Modular lightweight explosion-proof screen system for defense and construction industries;
- Uniaxial damper for explosion-proof systems in gates, doors, and windows;
- Post-process heat recovery system for sterilization and pasteurization equipment;
- Brake disc for automotive and railways;
- Magnetic shock absorber for automotive and railways;
- Composite with enhanced thermo-mechanical properties for electrical machinery and equipment.

What deserves particular attention is the university's initiative in establishing a foundation to consolidate the entrepreneurial community with the university, creating a coherent academic-socio-economic structure that serves as a platform for promoting the university's offer and developing new forms of mutual benefit.

Interestingly, the Foundation for the Development of the Poznań University of Technology was established in 2000 by Poznań-based companies with significant market potential. Its statutory goals include:

- Promoting the PP's scientific research and teaching domestically and abroad.
- Financially and organizationally supporting the PP.
- Financially and organizationally supporting the PP's investments.
- Providing continuing education to bring the latest scientific, technological, and organizational achievements closer to society.
- Informational campaigns about the Foundation's goals.

Another institution worth mentioning is the Poznań University of Technology Intellectual Property Center, providing access to patent documentation (Polish and foreign) and publications from the Polish Patent Office. The center also offers industrial and intellectual property protection consulting services, working with a patent attorney.

The final institution aimed at streamlining the commercialization of research results by students, doctoral candidates, and staff is the Poznań University of Technology Academic Entrepreneurship Incubator (AIP PP). It guides scientists through the entire knowledge transfer and commercialization process.

The PP also offers an extensive range of studies, training, and courses, allowing individuals to gain new qualifications useful in various sectors, mainly technological. Through strong and lasting relations with the business environment, the PP is a reliable partner providing highly specialized educational services to businesses and qualified employees for various industries.

SWOT ANALYSIS

Strengths:

- Extensive offer of technological solutions meeting market needs across industries.

- Extensive offer for commissioned research within modern laboratory infrastructure.
- Extensive network of relationships with the regional business environment, including a foundation associated with the university.
- Professional knowledge transfer and implementation services, emphasizing the practical aspect due to strong ties to the local market and ability to credibly assess project potential.
- Comprehensive educational offer for businesses, aimed at improving qualifications, knowledge, and skills for employees at all levels, including company owners.

Weaknesses:

- Limited activity in developing cooperation with the economic environment nationally and with potential foreign partners.

Opportunities:

- Utilizing the university's potential to actively acquire clients/partners from across Poland and even from other countries.

Threats:

- The university's position in the regional market is stable, but there is a risk of limiting its ability to acquire clients/partners nationwide due to the emergence of strong (including foreign) entities with a nationwide reach.

Cultural Codes Affecting the Effectiveness of Academic-Economic Cooperation:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
The researched economic entity	NR	KO	ST	KT/DT	SL	WN	WS/ NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The university policy on developing relations with the business environment is focused on the region, determined by SL and NS. In this area, there is a visible long-term and successively implemented plan for the development of these relationships, as well as their stabilization and structuring, conditioned by NR, KO, ST, and KT/DT. The university's position in the regional market is thus continuously strengthened, postponing the potential threat of other entities with a similar profile trying to penetrate this market.						

Ad. 1. The Poznań University of Technology (PP) aims to develop cooperation with economic entities of varying potential.

Ad. 2. The university strives to build multifaceted structures involving as many businesses as possible, exemplified by the foundation established at the university by large businesses from Poznań.

Ad. 3. The PP seeks to stabilize its socio-economic environment by establishing and developing relationships with as many businesses as possible, both as future clients and partners.

Ad. 4. In its regional market activities, the university's long-term plan is evident, aiming to build a stable economic environment where it plays an intermediary role between businesses and broader technology transfer, specialized educational services for business, and commissioned research and development tasks.

Ad. 5. Despite its extensive and growing laboratory and staff resources, the PP focuses on its region, rarely offering its services nationally or to foreign entities.

Ad. 6. The PP's activities reflect caution, avoiding risky decisions that could bring potential benefits.

Ad. 7. The university engages most of its potential in developing relationships with the regional business environment, but it still does not fully utilize its potential in this area.

CONCLUSIONS

The Poznań University of Technology has a strong position in the regional business environment, thanks not only to its extensive offer in education, research, R&D, knowledge transfer, and commercialization services, but mainly due to its strong relationships with regional businesses, including the most powerful ones. This will deepen over time due to the PP's long-term, systematic approach. However, the university does not actively seek clients and partners from across Poland, limiting activities in this area. In the future, other institutions may occupy areas of cooperation with businesses from other parts of Poland that could currently be developed, hindering the PP's growth beyond its region. The university's potential is large enough to expand its activities and gradually acquire foreign partners and clients.

3.18. Cooperation Between the Koszalin University of Technology and Economic Entities

Concerns: Evaluation of the Effectiveness of Academic-Economic Cooperation between the Koszalin University of Technology (Pol. Politechnika Koszalińska – PK) and Associated Entrepreneurs: A Case Study Using an Adapted Cultural Forecasting Method.

Justification for Choosing the PK as the Research Subject and the Adopted Profile of Economic-Academic Cooperation:

The Koszalin University of Technology was established as the Higher School of Engineering on June 8, 1968, and was renamed to the Koszalin University of Technology by an act on July 4, 1996. Over time, the university has steadily developed new faculties and study programs, hired an increasing number of academic staff, and gradually expanded its academic, teaching, and R&D activities. In 2015, it ranked 15th among technical universities in Poland. Currently, it has the authority to award doctoral degrees in three disciplines and postdoctoral degrees in seven disciplines, with over 500 academic

staff members, including 49 titular professors, 56 habilitated doctors, and 200 doctors.

The PK conducts several projects funded by the state budget, including:

- Multicriteria Optimization of Accuracy Assessment Procedures for Technological Processes Using a Coordinate Measuring Machine (under implementation doctorates).
- "Smart Regional Development – Idea and Reality," aiming to integrate and collaborate the academic environment with the socio-economic environment and exchange views on knowledge and innovation in the context of sustainable regional development.
- Economy 4.0, Industry 4.0, Logistics 4.0, Mobility 4.0, and Openness to the Future and the World – lectures to broaden the perspectives of high school students and others, introducing concepts like Economy 4.0, Industry 4.0, Logistics 4.0, and Mobility 4.0, and exploring the current state of knowledge and development directions.

Reviewing the PK's activities in developing relationships with the business environment reveals that it is just starting to tap into this vital area. Notably, the "Smart Regional Development – Idea and Reality" project is dedicated to cooperation with the business environment, supported by a dedicated website. This site lists the PK's research and R&D projects that could contribute to future knowledge transfer and commercialization for local, regional, and national businesses. These include:

- Research on the biological and biostimulant activity of allelopathic plant extracts based on analysis of secondary polyphenolic metabolites, minerals, and phytohormonal profiling.
- Application of the Stress Engineering concept to design anti-wear Zr-C coatings for shape-memory NiTi alloys.
- R&D work on individualized teaching of STEM subjects based on neuroscience, cognitive science, cognitive training, and neu-

rolearning, introducing the market to the Genius Conduction system using adaptive artificial intelligence A2NL algorithms.
- Adaptive capacity to climate change for sustainable livelihoods in the agricultural sector.
- R&D work by WASCOVILLA S.C. and PK on system solutions for constructing multi-family residential buildings using wooden modules connected by height and length.
- Research on refrigerant condensation on tube bundles in compact heat exchangers.
- R&D to introduce an innovative modular sanitary station for the HoReCa sector to the market.
- Innovation systems in peripheral regions.
- Layered hot water storage with PCM.
- Developing a prototype protective visor against COVID-19 and other pathogens.
- Method for planning resilient employee competency structures for organizations.
- Smart development of Middle Pomerania – innovative approach to creating regional competitive advantage.
- Determining local tidal coefficients h2, l2 for selected observation stations based on satellite laser measurements.
- Between Utopia and Dystopia: Ideological Frames of the Press Discourse on the Internet in Selected American and Polish Socio-Political Magazines.
- Determining the mutual attainability conditions for cyclic steady-state flows in discrete event systems – a series of research trips.
- Properties of Wood Materials.
- Mechanical processing technology of carp in aquaculture farms and fish processing plants: A guide.
- Determining primary criteria for optimizing regeneration and storage conditions for chemical washing solutions in CIP station tanks.

- R&D work by ITS Sp. z o.o. and PK on an optimal building partition for timber construction.
- Steering the exploratory and exploitative properties of evolutionary algorithms.
- New numerical analysis method for ellipsometric measurements of thin-film structures.
- Seasonal determinants of labor demand in tourism enterprises
- Innovative zinc plating technology.
- Benefits of agricultural drones for applying pesticides and fertilizers.
- Using catalysts to reduce emissions from burning waste biomass.
- Impact of thermal aging conditions and moisture content on the mechanical and energy properties of biomass pellets.
- Laser beam reflection intensity as an additional attribute in building diagnostics.
- Improving process and material efficiency in the sawmilling industry.
- Recognizing flow structures using laser techniques and quantitative stereology.
- Production of second-generation bioethanol from lignocellulosic biomass from fallow land using ionic liquids.
- Developing new porous coatings on titanium using Plasma Electrochemical Oxidation in electrolytes containing phosphoric acid and calcium, magnesium, copper, and zinc nitrates.
- Multicriteria optimization of gradient coatings for anti-wear properties.
- Friendly House – Cross-Border Network of Energy-Efficient Demonstration Buildings.

Additionally, the PK offers a wide range of Bachelor's, Master's, and doctoral programs, along with postgraduate studies, courses, and training for various industry professionals. However, compared to most Polish universities, the PK's activity in building and developing relationships with the business and socio-economic environment is marginal.

SWOT ANALYSIS

Strengths:

- Industry-specific educational offer for companies aimed at improving qualifications, knowledge, and skills for employees at all levels and company owners.

Weaknesses:

- Very limited cooperation with the economic environment.
- Lack of institutions for creating and strengthening relationships with economic entities.
- Lack of infrastructure for knowledge transfer and commercialization.

Opportunities:

- Creating infrastructure for knowledge transfer based on completed and ongoing research into innovative solutions relevant to specific industries.

Threats:

- Risk of marginalizing the university due to the emergence of a strong academic entity focused on building relationships with the economic environment, especially as the PK lacks lasting relationships with the local or regional business environment, leading to further marginalization as a credible partner in the eyes of economic entities.

Cultural Codes Affecting the Effectiveness of Academic-Economic Cooperation:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
The researched economic entity	WR	SM	RW	KT	SL	WN	NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	In the decision-making process of the PK, there is a cumulative impact of cultural code values that negatively influence the willingness and aspiration to build cooperation with the business environment, especially values such as WR, SM, and concerning the lack of a clear vision for the university's future development, KT, SL, WN, and NS.						

Ad. 1. The university shows no real interest in developing relationships with the business environment, as evidenced by its lack of investment in this area, relying instead on external funding.

Ad. 2. The university is focused on its own development without building lasting relationships with the business environment.

Ad. 3. The university aims to compete with other academic institutions, entirely ignoring economic entities operating in areas other than teaching and research.

Ad. 4. The university lacks a clear and well-thought-out vision for its development, let alone for developing relationships with the economic environment, as seen in its activities over past decades.

Ad. 5. The university limits most of its teaching and research activities to its region, and even its city.

Ad. 6. The university is unwilling to take any risks in investing in cooperation with the business environment.

Ad. 7. The university uses its potential only in a very limited way, especially in research and development, exemplified by its lack of infrastructure for knowledge transfer and commercialization.

CONCLUSIONS

The Koszalin University of Technology focuses on teaching, research, and R&D, allowing its scientists to transfer knowledge to the economy only in a very limited way, partly due to its lack of lasting relationships with local and regional economic entities. The analysis of the

university's activities suggests it neglects this area, lacking awareness of the benefits it could bring to the university, its staff, and students in the future. Consequently, the emergence of a strong academic institution in Koszalin focused on cooperating with economic entities could gradually marginalize the PK in the local market, diminishing the appeal of its educational offer, and potentially even its research and R&D.

3.19. Cooperation Between the West Pomeranian University of Technology in Szczecin and Economic Entities

Concerns: Evaluation of the Effectiveness of Academic-Economic Cooperation between the West Pomeranian University of Technology in Szczecin (Pol. Zachodniopomorski Uniwersytet Technologiczny – ZUT) and Associated Entrepreneurs: A Case Study Using an Adapted Cultural Forecasting Method.

Justification for Choosing the ZUT as the Research Subject and the Adopted Profile of Economic-Academic Cooperation:

The university was established on January 1, 2009, in Szczecin, through the merger of the Agricultural University of Szczecin and the Szczecin University of Technology. It specializes in teaching and research in technical, agricultural, economic, biological, chemical, and mathematical sciences. In 2015, it ranked 10th among Polish technical universities. From its inception, thanks to its extensive relationships with regional and some national economic entities, the university's management has focused on strengthening its position within its nearby socio-economic environment. Efforts are continually made to identify prospective business partners, including foreign ones, which sets the university apart on the Polish technical university map, where most focus on domestic entities. The university also specializes in mediating technology sales and purchases, supporting

entities in international business negotiations, identifying innovation potential in businesses, and providing comprehensive consultancy. Additionally, it supports finding sources of financing innovative solutions, securing funding from Structural Funds, and alternative financing options.

The university also provides services as part of the Enterprise Europe Network, one of the world's most extensive networks for establishing business and technology contacts. Another interesting service for businesses is encouraging entrepreneurs to participate in the EU's Horizon Europe Framework Programme, offering support in:

- Identifying the appropriate competition;
- Finding suitable partners for the future consortium;
- Project proposal preparation;
- Administrative support for the project;
- Assistance in creating an expert profile in the European Commission database.

The university also facilitates the Horizontal Contact Point, bridging the European Commission, which funds research and innovation, and its beneficiaries, and the Academic Entrepreneurship Incubator, which offers office space.

The Academic Entrepreneurship Incubator provides comprehensive support for starting and developing a new business, including support for establishing the company, handling administrative matters, developing a business plan, and even acquiring initial clients. It also helps find funding for starting and growing the business, aids in connecting with potential investors, and prepares entrepreneurs for negotiations.

Thus, the university's activities target not only the academic community interested in starting a business but also individuals with a promising business idea. This extensive offer reaches existing businesses and supports new companies in their early and challenging stages. This creates strong, developmental relationships with local, regional, and even national economic environments.

In its specialized disciplines, the university offers studies, courses, and training for improving or acquiring professional qualifications for staff in businesses active in areas related to the university's academic and research activities.

SWOT ANALYSIS

Strengths:

- Extensive, professional educational offer for businesses, aimed at improving qualifications, knowledge, and skills for employees at all levels and company owners.
- Extensive knowledge transfer and commercialization offer for the academic community, prospective entrepreneurs, and established businesses.
- Actively seeking cooperation with foreign businesses.

Weaknesses:

- Lack of dynamic expansion into currently unexplored scientific disciplines.

Opportunities:

- Expanding into a broader range of disciplines, including social sciences, to increase the university's offer and potential in the Polish and global markets, given its current position and potential.

Threats:

- The risk of limiting activities to currently explored disciplines.

Cultural Codes Affecting the Effectiveness of Academic-Economic Cooperation:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ **NS**
The researched economic entity	NR	KO	ST	DT	KM	NN	WS

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	WS/ **NS**
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*
Description of the impact of averaged values on decision-making	The university leadership is characterized by cultural code values that are entirely different from the leadership of most universities in Poland, ensuring progressive development and expansion of the university's offer in a planned and targeted manner, not only for Polish entities but also for international ones. Such a unique combination of cultural code values among Polish academic institutions guarantees continuous progress and the constant strengthening of the university's position in the national market.						

Ad. 1. The university collaborates with entities of varying potential, considering their real growth prospects rather than their current potential.

Ad. 2. The university aims to create various collaboration platforms with economic entities to build a stable and developing business environment, where the ZUT plays a key role, at least in the region.

Ad. 3. The university seeks to stabilize its environment and contribute to mutual benefits, avoiding destructive competition.

Ad. 4. The university's activities reflect a well-thought-out strategy aimed at achieving its long-term goals.

Ad. 5. In its activities, the university seeks to develop various areas, including local, regional, national, and global business environments.

Ad. 6. The university is willing to take risks to achieve long-term goals, although this risk is calculated considering other decision-making factors.

Ad. 7. The university's decision-making process comprehensively utilizes its potential across its multifaceted activities.

CONCLUSIONS

The West Pomeranian University of Technology in Szczecin has been developing and strengthening relationships not only with its local and regional business environment but also nationally and, in part, internationally. This is conditioned by cultural values that guide the university's decision-making process. Over time, the university's position will likely strengthen within its region and begin to dominate in other regions across sectors defined by its scientific disciplines. In the coming decade, the university's development may threaten regions where local universities lack strong relationships with the business environment, while gradually strengthening the ZUT's position against national economic entities. The ZUT currently shows strong growth prospects compared to other Polish universities, including technical ones.

3.20. Cooperation Between the Lodz University of Technology and Economic Entities

Concerns: Evaluation of the Effectiveness of Academic-Economic Cooperation between the Lodz University of Technology (Pol. Politechnika Łódzka – PŁ) and Associated Entrepreneurs: A Case Study Using an Adapted Cultural Forecasting Method.

Justification for Choosing the PŁ as the Research Subject and the Adopted Profile of Economic-Academic Cooperation:

The Lodz University of Technology was established on May 24, 1945, in Lodz. Over time, it has expanded its scope of activities by creating new faculties for new disciplines. In a 2020 ranking by "Perspektywy," PŁ ranked fourth among Polish technical universities. The university has actively developed cooperation with entrepreneurs through various initiatives, such as:

— Collaboration in jointly initiated projects prepared with research teams tailored to the nature of the venture. This can be done

on general university terms (the business entity is a member/contractor/subcontractor) or on fully commercial terms.

– Technological offer aligned with the research teams in the university's organizational units (faculties), with technologies available for adoption, including: • Granulation and surface modification of dust from perlite expansion and abrasive blasting processes • Production of titanium – and oxygen-doped carbon coatings using RF PACVD • Low-pressure hydrogen storage tank with graphene bed • Optomechatronic device to measure the cleanliness of material surfaces after abrasive blasting • Vertical axis wind turbine with variable blade geometry • Miniature orthopedic measuring device NaviFAST 6D • Mobile robot with variable tool configuration and kinematic structure; six – and four-rotor flying robots with a payload of up to 6 kg and partial autonomy; robots with variable drive geometry ensuring vertical takeoff and winged flight • Test stand for human-robot interaction with visual and force control system • New-generation photovoltaic cells with increased efficiency • Switching strong DC currents in a vacuum with countercurrent, taking such currents from contacts in air and vacuum with a semiconductor element, synchronizing AC current switching, and methods to limit high-energy switching surges • Sulfur-organic copolymers to modify concrete, asphalt, and polymers • Polymeric biomaterials: design, production, sterilization, property testing, and expertise • Identification of cancerous changes through Raman imaging and spectroscopy of human tissues, translating into clinical diagnostic research • Technology of Real System Analyzers (TAUR) • Biodegradable polymer composites • Biodegradable material for dressings and hygiene • Biodegradable half-masks for respiratory protection and industrial dust filters • Digital printing technology for producing sensory and electro-conductive textiles • Textile charger for powering mobile electronic devices • Technology for producing spirit beverages

flavored with plant materials • Method for ozonating liquids or pastes • Method for revitalizing a wind turbine • Digital control systems • Software for computer simulation of photonic structures • TuneFollower software and tools for analyzing and processing audio signals • Method for producing thermo-sensitive chitosan hydrogel containing calcium and phosphorus • Cold plasma-based technologies • Method for producing polymer tubes, primarily for medical applications • Technology to reduce acidic gas emissions from combustion processes using a dry method • ExAWZ toolset.

— Specialist services provided by university organizational units, including: • Analysis of the chemical composition and structure of materials, materials expertise • Optoelectronic system for motion analysis, particularly of people • Design, testing, and analysis of flow machines, installations, and devices • Strength tests, static and dynamic calculations, and training in material strength • Reverse engineering and dimensional control with a 3D scanner • Advanced control methods: robust, nonlinear, adaptive, and optimal control; use of AI and expert systems for decision-making • Process tomography: non-invasive monitoring of industrial processes • Design of contact-quenching systems for electrical switches, computer systems for testing switches and components, and technical expertise on switch applications and contact materials • Modeling and design of WBAN radio networks near the human body for 5G systems • Vibration and noise analysis of electrical devices: theoretical modeling and experimental testing of electrical machines and transformers to determine vibrations and noise emitted • Organic electronic devices (LEDs, photodetectors, photovoltaic cells, field-effect transistors): determination of operational parameters • Material aging, lifetime determination, Material Aging Lab • Artificial nose: ion mobility spectrometry coupled with a multicapillary column • Irradiation of materials • Design and

manufacture of jacquard fabrics • CAD/CAM-based design and technology for clothing • Expertise and consultancy on woven structures and technical textiles, including composite reinforcements • Production technology for thermoset composites using vacuum bagging and infusion • Testing selected properties of fibers and textile products • Simulation testing of thermomechanical properties of textile composites • Accredited Lab-TEX • Determining selected bioactive compounds • Analytical services for the fermentation industry • Low-waste methods to convert sugar, starch, and lignocellulosic waste into bioethanol and yeast biomass • Determining bioactive compounds and biological activity of plant-based raw materials and products • Accredited SLAC Lab: assessing the quality and suitability of sugar products for market entry • Storage conditions, product composition, and packaging for shelf-life extension, shelf-life determination, property improvement • Vibration measurements of engineering structures, inducing vibrations at a specific frequency, dynamic analysis of building structures • Strengthening existing structures using pre-stressed FRP polymer composites with a gradient method • Determining heavy metal content in liquid samples using AAS • Strengthening existing structures with pre-stressed FRP composites by embedding them in concrete covers (NSM method) • Constructing new concrete structures using non-metallic FRP reinforcement • Mathematics applications in industry and biomedicine • Computer simulations of photonic structures • Statistical data analysis • Decision-making in uncertain or random financial markets • Parallel processing, analysis, and visualization of multimedia data and virtual reality systems • Analysis and assessment of production and logistics processes in Industry 4.0 • Analysis and assessment of production and logistics processes in the circular economy • Technology readiness for commercialization • Product and process life cycle assessment • Business model design support •

Rheological property measurements • Advanced material structure analysis techniques • Services in bioprocesses.

- Accredited Innovation Center's offer: transferring technologies developed at PŁ to business, with the Center for Innovation and Entrepreneurship holding an ISO 9001:2015 Quality Management System certificate (the only university unit in Poland to hold this certificate in knowledge transfer and innovative technology commercialization) and official Accredited Innovation Center status.
- Innovation and Entrepreneurship Center's offer: directed at academia, including students/doctoral candidates, and businesses, including through launching the Innovation Incubator 4.0 – "Spin-off Competition," enabling support for establishing spin-off companies at PŁ, with the competition run under the "Innovation Incubator 4.0" project, where winners receive "SPIN-OFF on START" packages, including: • Funding for valuing the technology for the spin-off • Funding for a professional business plan • Legal and notarial support at company creation, with Organiser's advice throughout.
- The PŁ's special-purpose company TELVENTURE Sp. z o.o. (commercializing knowledge produced at the PŁ and offering it to businesses).
- Extensive offerings for employers: connecting scientists, experts, and businesses for joint projects, dedicated training and workshops for specific industries, including developmental programs such as the Lodz IT Test, the "I Have a Startup Idea!" competition for the young in Lodz, certified competency tests, career counseling, business coaching, and career coaching.
- Introducing innovations in interested entities through an information campaign aimed at businesses on developed and potential innovations for company growth in select industries.

The PŁ also offers extensive educational activities, allowing business staff to gain and enhance qualifications necessary for further company development.

SWOT ANALYSIS

Strengths:

- Extensive and professional educational offer for businesses, aimed at improving qualifications, knowledge, and skills for employees at all levels and company owners.
- Extensive offer for commercialization and knowledge transfer to regional and national businesses.

Weaknesses:

- Lack of an attractive offer promoted among foreign businesses.

Opportunities:

- Expanding offer in disciplines close to the university, directed at foreign entities in selected countries.

Threats:

- Difficulty promoting an offer to foreign entities amid increasing competition from other international academic centers, potentially interested in the Polish market.

Cultural Codes Affecting the Effectiveness of Academic-Economic Cooperation:

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	**WS/ NS**
The researched economic entity	WR/ NR	SM/ KO	ST	KT	SL	WN/ NN	WS/ NS
Enterprises collaborating with the researched academic entity	WR	SM	RW	KT	SL	WN	NS
The influence of values on the decision-making process of economic and academic entities	*Ad. 1*	*Ad. 2*	*Ad. 3*	*Ad. 4*	*Ad. 5*	*Ad. 6*	*Ad. 7*

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ KM	WN/ NN	**WS/ NS**
Description of the impact of averaged values on decision-making	The decision-making process of the university in establishing and developing cooperation with business entities is primarily positively influenced by ST, partially positively influenced by WR/NR, SM/KO, and WS/NS, and predominantly negatively influenced by KT, SL, and WN/NN. Therefore, it can be forecast that the university will function stably in the local business environment, but without the prospect of dynamically developing and strengthening relations with business entities, which creates an opportunity for other, much more active and flexible academic entities.						

Ad. 1. In developing relationships with the economic environment, the university gives more weight to strong partners that have been successful in the local and regional markets for many years, while also establishing infrastructure that enables technology companies started by the academic community to flourish.

Ad. 2. The university initiates many projects directed at entrepreneurs interested in collaborating with it, yet it has not established structures intended to bring together the regional business community over the long term, such as NGOs. Such an organization may be formed in the future.

Ad. 3. The university does not seek to compete with academic or economic entities, instead focusing on developing its offer directed at entrepreneurs.

Ad. 4 The university's policy for developing relationships with the economic environment is characterized by gradual, successive progress, not due to a set plan, but rather a slow evolution of university activities in this area.

Ad. 5. The university does not fully utilize its potential, especially in actively acquiring foreign partners. On the national market, it initiates many information campaigns about its services and technologies, which is possible due to the infrastructure created for knowledge transfer from the university to the economic environment.

Ad. 6. The university's activities in the local and regional economic environment involve taking calculated, partial risks to develop relationships with selected industries and businesses.

Ad. 7. The university partly utilizes its potential in building a strong position in the local, regional, and partly national markets, but to a limited extent compared to its actual capabilities.

CONCLUSIONS

The Lodz University of Technology has a modern approach to developing relationships with the economic environment, with a deep awareness of the need to strengthen ties with selected industries and entities close to the academic community. Most efforts in this area focus on the local, regional, and partly national markets. However, the university does not actively pursue foreign partners, despite its potential in teaching, research, and R&D. This poses a risk of its offer being marginalized by more active academic entities from other countries. However, its position in the industries of its geographical region appears stable for the coming years.

4. Processing the Research Results

Conducting an experiment to verify the cognitive value of the obtained research results, make necessary corrections, and develop the final version of the titular prognostic method.

This stage of the research is dedicated to conducting an experiment to confirm or refute the utility of the cultural codes used in previous stages for forecasting the effectiveness of cooperation between academic and economic entities based on the decision-making process forecast for these entities. The experiment evaluated the effectiveness of cooperation between the Military University of Technology and three selected economic entities by assessing the decision-making process using the Cultural Codes Matrix by M. Górnikiewicz, which was utilized in earlier stages. The following reasons supported choosing the Military University of Technology:

1. The university has not been previously studied.
2. Access to a broad range of information on the course of cooperation with the selected economic entities.
3. The selected economic entities were chosen randomly, without criteria that could influence the research results.
4. The goal was to confirm whether the previously used Cultural Codes Matrix allows effective forecasting for the Military University of Technology, with significantly deeper data access than in the previously studied 20 academic entities.

The decision-making process at the Military University of Technology is strongly influenced by the decision-making culture of the Polish Armed Forces, reflected in NR, DT/KT, ST, SL, WN, and WS/NS. A value resulting from partially functioning in the academic environment is SM/KO, as in an exclusively military environment KO prevails. Contrary to expectations, the armed forces, understood as a social organization in a developing administrative structure, prefer ST over RW. Comparing the cultural code values obtained with the values characterizing the pattern for maximum effectiveness in developing cooperation with the economic environment, the values determining the Military University of Technology's decision-making process inspire optimism about future cooperation with economic entities (four out of seven codes match). Based on the available data, the cultural code values determining the decision-making process at the Military University of Technology were identified:

Military University of Technology (Pol. Wojskowa Akademia Techniczna – WAT)	WR	SM/KO	ST	DT/KT	SL	WN	WS/NS
Averaged values for strengthening the position in the geographic region of the academic entity's activity	WR/NR	SM/KO	ST	DT/KT	SL/KM	WN/NN	WS/NS

The values of the cultural codes for the Military University of Technology (WAT) are compared with the values of three selected economic entities, and an overall forecast of the cooperation between the university and these entities is developed. This forecast is then compared to the actual nature of this cooperation, allowing a final verification of the adopted cultural code values and an assessment of the practical utility of the Cultural Codes Matrix in forecasting the effectiveness of cooperation between academic and economic entities.

	WR/ NR	SM/ KO	RW/ ST	DT/ KT	SL/ **KM**	**WN/ NN**	**WS/ NS**
Military University of Technology (Pol. Wojskowa Akademia Techniczna – WAT)	WR	SM/ KO	ST	DT/KT	SL	WN	WS/ NS
Cisco Systems Inc. (CSI)	NR	KO	RW/ST	KT	SL	NN	NS
Łukasiewicz Research Network (Pol. Sieć Badawcza Łukasiewicz)	NR	SM/ KO	ST	DT/KT	SL	WN/ NN	WS/ NS
Polish Armaments Group (Pol. Polska Grupa Zbrojeniowa – PGZ)	WR	SM	RW	KT	SL	WN/ NN	NS

WAT and CSI

The Military University of Technology (WAT) and Cisco Systems Inc. (CSI) established a collaboration aimed at developing a system to cool servers while ensuring their mobility in case of emergency. As a result, Cisco conducted an audit in cooperation with the WAT to assess the university's capabilities in this area and to find a suitable solution. Consequently, the space occupied by the equipment was reduced, and it was housed in a special container. This resulted in a modern, fully mobile data center, made possible by migrating to Cisco blade servers. The ACI solution also reduced space usage and made the infrastructure significantly simpler and cheaper to use than before.

Based on the identified cultural code values of the Military University of Technology and Cisco Systems Inc., it can be assumed that the alignment of SM/KO (WAT) with KO (CSI) provides a foundation for developing cooperation, further strengthened by ST (WAT) and RW/ST (CSI). Due to the strong foundations in these two values, and the university's longer-term perspective in planning future projects, despite KT on Cisco's side, it can be assumed that joint projects will be planned effectively. The limitation in utilizing the full spectrum of possibilities and potential is SL on both sides, while WN (WAT) and NN (CSI) can complement each other as a rationalizing factor for future plans, similarly to WS/NS (WAT) and NS (CSI). From the WAT's perspective, Cisco

is a valuable partner (WR), while for Cisco, the potential from collaboration with the university is more important than its status and market position, so comparing these two values, there are no factors that might negatively impact future cooperation between these entities.

Communication between the entities was characterized by mutual understanding, respect, and striving for solutions that are as effective and optimal as possible in every way. The consistent cultural code values indicate that further cooperation between the WAT and Cisco is likely to continue and strengthen.

WAT and the Łukasiewicz Research Network

The research and development cooperation between the Military University of Technology and the Łukasiewicz Research Network covers a range of research and development projects, including the "Piast" project, aimed at placing a constellation of three observational nanosatellites in orbit. The WAT serves as the project leader, with the Institute of Aviation as a partner from the Network. Another noteworthy project, co-financed by the NCBiR, involves work on laser weapons, where WAT scientists collaborate with engineers from the Institute of Microelectronics and Photonics. Additionally, there is a project dedicated to developing hybrid systems of electromagnetic radiation and kinetic energy absorbers. The cooperation also extends to education, with programs aimed at developing the qualifications of both entities' personnel. Implementation doctorates and courses led by Łukasiewicz experts are of particular importance in this area.

Regarding the cultural values influencing the decision-making process of the Łukasiewicz Research Network and the Military University of Technology, some values align (SM/KO; ST/ST; DT/KT; SL, WS/NS), while the differing values on the Network's side support cooperation (NR relative to WR and WN/NN relative to WN). Nonetheless, five out of seven values align, with both sides preferring ST over RW. This indicates that the cooperation between these entities

has a promising future, and their current cooperation confirms this. Given the near-ideal alignment of cultural code values guiding their cooperation, it can be assumed that mutually beneficial collaboration will continue to develop in the near and distant future.

The WAT and the Polish Armaments Group (Pol. Polska Grupa Zbrojeniowa – PGZ)

One notable project they jointly undertook is the Tytan Project, initiated by the Polish Armed Forces, aimed at developing advanced individual equipment for 21st-century soldiers. This project includes research on modernizing equipment, creating new-generation combat uniforms, and modern tactical gear. The Radom-based Łucznik Arms Factory was also involved to develop and produce a modular MSBS firearm in 5.56mm caliber. Other projects include programmable ammunition, unmanned platforms, diagnostic systems, sound reconnaissance systems, and systems for tactical radio reconnaissance.

The decision-making process at the Military University of Technology is in a prolonged transformation from the old model characteristic of military entities from the past two decades to models addressing modern challenges. This is evident in the cultural values guiding this process. For the Polish Armaments Group, the process is largely shaped by values specific to the defense industry from the past century, as seen in the clearly emphasized values of WR, SM, KT, SL, and NS. The changes are indicated by RW and WN/NN. Comparing these values to those of the WAT, the only aligning value is SL. The remaining values differ, leading to disrupted communication due to differing interpretations of the same content and different decision-making models. In other words, the decision-making processes of these institutions are significantly different, hindering communication and cooperation. However, due to their shared areas of research, R&D, and partial implementation, as well as their alignment under relevant ministries, both the WAT and the Polish Armaments Group are institutionally bound to

cooperate, gradually unifying the values guiding their joint perceptual and decision-making process. However, this process is progressing slowly enough for cooperation between the PGZ and the WAT remain less than ideal for a considerable time, until the PGZ's cultural values more closely align with those of the WAT.

Averaged SWOT Analysis of the Decision-Making Processes of Studied Universities for Developing Cooperation with Economic Entities.

Below we present a comparison of the strengths and weaknesses of the decision-making process (conditioned by cultural code values) of the researched academic entities regarding the development of cooperation with economic entities, as well as the resulting opportunities and threats to the future development of such cooperation. As a result, a preliminary identification of academic entities with high effectiveness in the researched decision-making process was conducted.

Military University of Technology:

Strengths:

- Expanded and professional educational offer aimed at companies, focused on enhancing qualifications, acquiring knowledge, and skills for employees at all levels and business owners (including collaboration with the Łukasiewicz Research Network).
- Expanded research and development infrastructure aimed at carrying out various tasks commissioned by entrepreneurs representing technological industries.
- Extensive base of patented technologies ready for implementation.
- Provision of professional services to the external environment, including businesses, based on the achievements of both technical sciences and social sciences, including multimedia techniques and social phenomena analysis and forecasting (e.g., CCJ).

Weaknesses:

- The development of the existing formula for technology transfer and research and development is mostly focused on businesses active in Poland, although over the years, more foreign entities are emerging (CTT).
- Most of the educational offers are in Polish, significantly limiting the ability to attract talented students from outside Poland.

Opportunities:

- Potential for initiating support for innovative business ideas with market potential from students, through the university's intermediary role in representing these ideas to entrepreneurs and supporting finding potential investors (CTT development).
- Potential for expanding educational programs to meet not only the requirements of the Polish market but also at least European standards.
- Potential for wider and deeper utilization of new communication technologies in distance learning (mainly targeting students from outside Poland) and further development of AI-supported technologies in the teaching process.

Threats:

- Risk of being unable to meet the rapidly growing demand and a gradual decrease in the number of entrepreneurs interested in future collaboration.
- Risk of emerging new entities with significantly more creative visions for cooperation development with entrepreneurs.

Cisco System Inc.

Strengths:

- Experienced and educated personnel at every level of the company.

- Effective personnel motivation system to encourage more efficient work, providing employees with a high level of satisfaction, including valuing creativity and innovation in finding technological solutions to problems.

Weaknesses:

- Inability to compete with large corporations capable of managing significant human, financial, and technical resources, thereby achieving desired results in significantly shorter timeframes and with much greater margin for error.

Opportunities:

- Potential for promoting developed solutions among our own customer base and supporting a referral system based on provided products and services.

hreats:

- Very high and diverse competition, necessitating the establishment and strengthening of relationships with existing clients, as well as meticulous brand management to attract new clients through a carefully cultivated image of the company characterized by high levels of credibility and reliability.

Łukasiewicz Research Network

Strengths:

- An entity the existence of which is inherently tied to collaboration with academic institutions by leveraging the intellectual potential of people and partially academic resources, while also offering the opportunity for very good earnings and gaining experience through working alongside outstanding experts in specific fields.
- An entity the potential of which is so enormous that it naturally bridges the gap between academic institutions and businesses

seeking technological improvements to existing solutions or the development of new technologies that did not exist before, but perfectly meet the needs of a given entity.

Weaknesses:

- No significant weaknesses, with minor ones being a lower-than-possible number of distinguished scientists from other countries engaged in specific projects—cultural diversity supports the development of innovation and creativity in every progressive company.
- Lack of market-desired activity by such a large entity in the IT/AI industry.

Opportunities:

- Possessing the potential to dominate the European market for intermediary services between academic entities (research and research-developmental) and businesses interested in new technological solutions.

Threats:

- The risk of overly complex administrative procedures and structures as personnel resources grow and internal logistical processes develop.

Polish Armaments Group

Strengths:

- A corporation on par with European defense industry giants.
- A reliable partner for collaboration with the Polish defense industry in any capacity.

Weaknesses:

- An overly complex administrative, logistical, and infrastructural structure, resulting in a burdensome decision-making process within the PGZ.

- The inclusion of individuals without experience and qualifications in the defense industry into the board.
- High staff turnover, negatively affecting the decision-making process.
- Lack of organizational culture within the PGZ, where departing managers usually do not transfer their knowledge to successors, which leads to dysfunctional organization and management of the corporation, as well as a lack of credibility among counterparts from countries where interpersonal relationships are valued first, and then business activities develop (East Asia, Central Asia, Southeast Asia, South Asia, the Arabian Peninsula, and North Africa).
- The export offer for foreign markets needs marketization compared to the more attractively priced offer from competing entities.

Opportunities:

- Possessing enormous potential to dominate part of the European market, provided changes are made to the management system over the vast structure, allowing for continuity in organizational and decision-making processes.

Threats:

- The activity of trade unions and a non-dynamic administrative structure contribute to decision-making inertia and highly inefficient use of financial resources.

CONCLUSIONS

From the compilation of the identified cultural values determining the perceptual and decision-making processes at the Military University of Technology (WAT) and three cooperating entities (Cisco Systems Inc., the Łukasiewicz Research Network, and the Polish Armaments Group), it can be concluded that the collaboration between the WAT and the Łukasiewicz Research Network is likely to be the most ef-

fective, while cooperation with Cisco Systems Inc. will continue to develop positively. However, due to the institutional positioning of both entities, the cooperation with the Polish Armaments Group will be developed amidst often difficult discussions and recurring communication errors. The identified cultural values enabled a forecast of the effectiveness of further cooperation between the chosen academic entity (WAT) and the cooperating economic entities under study (Cisco Systems Inc., Łukasiewicz Research Network, and Polish Armaments Group). The forecast aligns with the current state of cooperation with these entities and confirms that the cultural forecasting method can be used to predict the effectiveness of cooperation between academic and economic entities. In conclusion, the experiment aimed at verifying the cognitive value of the research results was successful, and no corrections were needed for the developed forecasting method.

Conclusion

The third decade of the 21st century is a time when the cooperation between economic and academic entities, including research, academic, and R&D institutions, is rapidly expanding. This is due to the accelerating pace of the civilization's transition from an information-industrial to an information-postindustrial era. Innovative and creative thinking, which manifests in solving existing problems and creating new perspectives on old issues and new areas of societal exploitation, is becoming increasingly important for GDP rather than financial flows and services (including information assets). The latest scientific advancements overcome technological limitations, making new areas accessible. Consequently, economic entities striving to make money are adapting to the realities of the postindustrial-information age to continue generating profits. Thus, academic entities that nurture innovation and creativity and educate new generations of students, from whom highly intellectual and creative individuals can emerge, form a natural foundation. These individuals contribute innovative solutions, fueling both societal and economic growth for the entities involved. Therefore, the union between business and academia is a natural consequence of human progress during this transition.

The developed forecasting method for decision-making processes in collaborating economic and academic entities helps identify values that might hinder cooperation. In other words, it enables the

adjustment of the cooperation model to avoid excessive costs and ensure both entities achieve appropriate profits. In conclusion, the developed method is a useful tool for optimizing cooperation costs between business and academia, significantly increasing potential profits while reducing losses from adjusting organizational and decision-making models. The authors hope their research will be positively received by economic and academic representatives, elevating the cooperation to a level that benefits all parties involved.