

	<p align="center">Science, Education and Innovations in the Context of Modern Problems Issue 11, Vol. 8, 2025</p>
	<p align="center">Title of research article</p> <p align="center">Universities and the Contemporary Educational Environment in Developed Countries: Comparative Analysis of Institutional Innovation, Entrepreneurial Functions, and International Research Collaboration in Germany, Poland, and the Czech Republic</p>
<p>Boyukagha Mikayilli</p>	<p>Researcher Ministry of Science and Education of the Republic of Azerbaijan, editor-in-chief of “Preschool and primary education” scientific-methodical journal Azerbaijan, Baku</p> <p>E-mail: tehsil.zaman@mail.ru ORCID: https://orcid.org/0000-0001-8931-0459</p>
<p>Issue web link</p>	<p>https://imcra-az.org/archive/385-science-education-and-innovations-in-the-context-of-modern-problems-issue-11-vol-8-2025.html</p>
<p>Keywords</p>	<p>university rankings, innovations, entrepreneurial university, addictology, scholarship programs</p>
<p>Abstract This article examines the activities of prestigious universities in Germany, Poland, and the Czech Republic, focusing on innovations within their educational systems, similarities and differences across institutional structures, and their broader contributions to global knowledge and society. Special emphasis is placed on the development of material and technical infrastructure, the scope of scientific research, international collaboration networks, and the implementation of scholarship and grant programs. These initiatives are shown to play a crucial role in enhancing teaching quality and shaping research with contemporary relevance. The study highlights that such universities hold a significant position not only within their national frameworks but also in the scientific, economic, social, and cultural development of the wider world. Attention is further given to the historical trajectories and development paths of these institutions, underlining the importance of both scientific-technological progress and the human factor in shaping modern universities. The article also addresses the question of “What constitutes an Innovative and Entrepreneurial University?”, evaluating the role of universities in knowledge production and applied research. Finally, the study discusses the implementation of entrepreneurial functions in Azerbaijani and other post-Soviet higher education institutions, identifying existing progress as well as limitations, and analyzing the underlying causes and consequences.</p>	
<p>Citation. Mikayilli B. (2025). Universities and the Contemporary Educational Environment in Developed Countries: Comparative Analysis of Institutional Innovation, Entrepreneurial Functions, and International Research Collaboration in Germany, Poland, and the Czech Republic. <i>Science, Education and Innovations in the Context of Modern Problems</i>, 8(11), 450–465. https://doi.org/10.56352/sei/8.11.34</p>	
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<p>Received: 08.04.2025</p>	<p>Accepted: 21.08.2025</p>
<p>Published: 02.09.2025 (available online)</p>	

Introduction

During my visits to higher education institutions in Germany, Poland, the Czech Republic, and Russia, I observed that these universities have successfully integrated the latest technologies, innovative teaching models,

and modern methodological approaches into their academic processes. The effective use of material and technical resources, coupled with highly qualified academic staff, has significantly contributed to the enhancement of teaching quality and the preparation of professional specialists.

State-of-the-art laboratories and equipment at these universities reflect continuous modernization in line with global demands. Particularly within medical faculties, laboratories resemble research-production complexes. For instance, the pharmaceutical products developed at institutions such as Jagiellonian University in Krakow, Heinrich Heine University in Düsseldorf, Humboldt University of Berlin, the Technical University of Berlin, and Charles University in Prague are widely recognized as among the highest-quality medicines worldwide. These drugs are often created, tested, and refined within university laboratories before being distributed internationally, bringing academic, economic, and social benefits not only to the universities themselves but also to broader societies (Stopka; Tijssen, 2006).

Furthermore, these universities support research projects that aim to improve living standards, ensure public health, and safeguard environmental sustainability. The underlying principle is clear: qualified personnel, knowledgeable scientists, creative specialists, and advanced technology collectively foster an effective academic and research environment. Such an environment produces both capable graduates and high-quality products, contributing directly to the wellbeing of society.

Another notable observation is the significant investment of grant funding into research projects, awarded to individuals with the intellectual and academic capacity to engage in advanced scientific inquiry. Research in these institutions is conducted with cutting-edge equipment and resources, ensuring quality and reliability. Importantly, strong collaboration networks exist not only among university staff but also between universities and research centers across the globe, as well as with industrial partners.

These dynamics expand the scope of universities far beyond teaching and research, embedding them within innovation systems, entrepreneurial activities, and global knowledge networks. Integration of education, science, and innovation, alongside international partnerships, social cooperation with organizations, and the creation of business links, forms the foundation of an innovative and entrepreneurial university environment.

Collaboration with 405 Scientific Organizations Worldwide: The Case of Jagiellonian University

Jagiellonian University in Poland actively collaborates with nearly 400 of the world's leading higher education institutions, positioning itself among the top-ranked universities globally. Established on May 12, 1364, by the decree of King Casimir the Great, the university initially comprised three faculties—liberal arts, medicine, and law. However, the law faculty faced difficulties in maintaining stable activity, and following the king's death, the university temporarily ceased operations.

Polish scholars, recognizing the indispensable value of science and education, persistently sought to revive the institution. Their efforts were realized on July 26, 1400, when King Władysław II Jagiełło ordered its reopening, with the addition of a theology faculty. In the 15th century, faculties of law and philosophy were also established, marking what is often described as the university's golden era. During this period, Jagiellonian became a flourishing academic hub that attracted students from across Europe, including Russians, Lithuanians, Hungarians, Germans, English, Dutch, Czechs, Swedes, French, Italians, Spaniards, and Turks. This diversity reflects the university's long-standing role as a center of knowledge meeting the intellectual demands of its time (Graham; Lankin et al. 2011)

From its earliest years, Jagiellonian was recognized as a leading institution for the study of law, mathematics, and astronomy—fields highly relevant during the Middle Ages. These academic achievements contributed to the training of distinguished scholars and specialists who significantly influenced European intellectual life.

Today, Jagiellonian University continues to rank among the world's best institutions, as confirmed by its placement in the Shanghai Rankings and the *Times Higher Education Supplement* (QS World University

Rankings). In addition to being a center for advanced research, the university prioritizes international academic cooperation, student exchange, and scholarship programs. At present, over 130 projects and programs are active, involving partnerships with 405 research organizations worldwide. These collaborations foster fundamental research, strengthen global academic networks, and enhance the university's capacity for scientific innovation (EC-2010)

Jagiellonian University's Scholarship Programs: How Do They Shape the Advancement of Science?

Scholarships for students form a central component of Jagiellonian University's mission. These funds operate under various titles, supported by diverse sources, including private donations and institutional endowments. For instance, the **Private Scholarship Fund**, established between 1999 and 2002 at the initiative of the university's rector, originally relied on contributions from organizations and individuals seeking to support the development of science in Poland. Over time, its scope expanded significantly.

Among the most notable initiatives is the **Queen Jadwiga Fund**, which provides financial support to students and researchers from Central and Eastern Europe. Queen Jadwiga, renowned for her philanthropy, dedicated her personal wealth to advancing education and scholarship at Jagiellonian University and in Poland more broadly. The fund was designed to strengthen international academic ties and promote scholarly exchange across Eastern and Southern Europe. Supported through both individual and corporate donations, the fund accumulated substantial "iron capital," ensuring its sustainability regardless of future levels of investment.

Another example is the **Bogdan Łysiak Scholarship Fund**, created from a donation by his daughters, Lidia Proczyk and Anna Łysiak. It aims to provide financial assistance to outstanding students specializing in Ukrainian philology within the Faculty of Philology. The scholarship is awarded annually for a period of ten months, with applications accepted each spring semester (Golubev, 2010).

The **Ad Polonos Scholarship Fund**, established in the autumn of 2016, was founded through the contribution of Professor Urszula Marty Doleżał to honor the memory of her late husband, Professor Marian Doleżał. Its mission is to support the education of young people of Polish descent, particularly those whose families suffered displacement. The fund provides financial assistance to students of Polish origin from Belarus, Georgia, Kazakhstan, Lithuania, Russia, and Ukraine who are pursuing degrees at Jagiellonian. Scholarships are granted for a ten-month period.

In addition, the university offers **PhD scholarships**, typically lasting one year, to enable doctoral students to conduct more effective and impactful research. Depending on the progress and outcomes of the candidate's work, the scholarship may be renewed. Applications are accepted throughout the academic year.

The prestigious **Rector's Scholarship** was created for outstanding graduates of bachelor's and master's programs at Jagiellonian University. Selection criteria include high **GPA (Grade Point Average)** scores as well as exceptional achievements in science, the arts, or sports. This scholarship is designed to support talented graduates in their early careers but may also be granted to current students under exceptional circumstances. Students holding a "Polish Card" (Karta Polaka) are also eligible to apply (Grudzinskiy, 2004).

These diverse scholarship programs reflect a broader European academic culture, where investments in science and education are designed to be sustainable and impactful. Initiatives are carefully structured to ensure continuity, often expanding beyond their original scope to include additional institutions, countries, and partners. Importantly, the primary aim is not immediate financial profit but rather the advancement of education, scientific research, and social development.

German Universities: Distinctive Features

Among Europe's highest-ranked institutions, **Berlin Technical University**, **Humboldt University of Berlin**, and **Heinrich Heine University Düsseldorf** hold prominent positions. A defining characteristic of technologically

advanced, so-called “innovative countries” is their commitment to substantial investment in science and education. Germany stands at the forefront of this group, with approximately 30 universities listed among Europe’s most innovative institutions (Grudzinskiy, 2004).

Germany’s higher education system is distinctive for its classification of institutions into several types, a structure not commonly replicated elsewhere. These include:

- **Hochschule** – Institutions with a focus on the humanities.
- **Fachhochschule** – Universities of applied sciences, specializing in practical disciplines such as engineering, business administration, design, and social sciences. These typically offer four-year programs, including two semesters of industrial practice.
- **Universität** – Comprehensive universities with broader academic scope, offering nearly 400 subjects across disciplines such as medicine, law, engineering, natural sciences, theology, economics, sociology, and agricultural studies. Universities integrate both **fundamental and applied research**, enabling students to specialize across a wide spectrum of scientific fields (Peterkova, et al. 2022).
- **Technische Universität** – Technical universities specializing in engineering and the natural sciences. For example, **Berlin Technical University** conducts advanced theoretical and applied research in physics, chemistry, mechanical engineering, electronics, metallurgy, and related disciplines.

Alongside these categories, Germany also maintains specialized institutions in pedagogy, theology, fine arts, music, and film studies.

German higher education is organized into **three cycles**:

1. **Bachelor’s degree (B.A., B.Sc., B.Eng.)** – typically 3–4 years, with *Fachhochschule* programs requiring four years plus industrial practice and a final thesis.
2. **Master’s degree (M.A., M.Sc., M.Eng.)** – lasting 1–4 years, strongly research-oriented and culminating in a thesis and state examination.
3. **Doctoral degree (Ph.D.)** – requiring 2–5 years, depending on the complexity of the research. Students independently select their supervisors, who then define suitable research topics. German universities’ strong research infrastructure, material resources, and grant-based project funding provide favorable conditions for doctoral research.

This system not only ensures academic rigor but also encourages intellectual autonomy, allowing students to navigate their own academic trajectories (Asadov. 2021).

Humboldt University of Berlin: A Model of Modern Higher Education

Founded in 1809 by **Wilhelm von Humboldt**, philologist, philosopher, statesman, and diplomat, Humboldt University is one of Germany’s most historically significant academic institutions. Currently, it hosts students from over 100 countries. Over its **210-year history**, the university has produced an exceptional roster of scholars and cultural figures, including **Johann Gottlieb Fichte** (its first rector), **Friedrich Schleiermacher**, **Georg Wilhelm Friedrich Hegel**, **Arthur Schopenhauer**, **Albert Einstein**, **Max Planck**, **Karl Marx**, **Friedrich Engels**, **Heinrich Heine**, **Otto von Bismarck**, and **Robert Schumann**.

Initially established with faculties of law, medicine, theology, and philosophy, the university admitted 256 students in its first year, taught by 52 professors. Within a short time, it developed extensive campuses, natural science centers, and a medical campus. By the early 20th century, Humboldt had emerged as a hub of intellectual and scientific progress (Sidorova, 2014).

However, the university’s history also reflects the turbulence of Germany’s political landscape. During the **Nazi era**, Humboldt University suffered significant setbacks: thousands of books from its library were burned, approximately 250 Jewish professors were dismissed, and many other scholars critical of the regime were

expelled. The war years left parts of the campus destroyed, and the university was temporarily closed. Today, the **memorial at Bebelplatz**, symbolized by empty bookshelves, commemorates this tragic period.

The **Humboldtian Model of Higher Education** emerged in the early 19th century, reshaping universities worldwide. This model rested on three core principles:

1. **Unity of teaching and research** – universities should simultaneously cultivate knowledge and advance scholarship.
2. **Academic freedom** – both faculty and students must enjoy autonomy in research and teaching.
3. **Cultural mission** – universities should contribute not only to professional training but also to national intellectual and cultural development.

This model profoundly influenced the development of higher education across Europe and North America. American reformers such as **Daniel Coit Gilman** drew inspiration from Humboldt, advocating for research-based graduate education in the United States, particularly in medicine and history. Similarly, the model impacted the evolution of French, Russian, and British universities [Nalětova, 2005].

Philosophical underpinnings of this model were rooted in German classical philosophy, particularly the works of **Immanuel Kant**, **Fichte**, **Schelling**, and **Schleiermacher**. By synthesizing their ideas, Humboldt articulated a vision of the university as both a cultural institution and a research center. This framework not only shaped German education but also provided a **prototype for the modern research university** globally.

As Schwedelbach (2002) argues, Humboldt envisioned universities as institutions serving **three essential functions**:

1. To operate as centers of professional training, culture, and research.
2. To remain at the forefront of intellectual achievement.
3. To contribute directly to national development.

Thus, Humboldt University is more than an academic institution; it represents a foundational **paradigm in the global history of higher education**, bridging cultural, intellectual, and scientific progress.

Transformation of the Humboldt University Model

At the turn of the 20th to the 21st century, the **Humboldt University model** continued to evolve in response to new global challenges. This transformation enabled the expansion of higher education from an **elitist system to mass education**, and from mass education to universal accessibility. As a result, universities diversified their functions and developed into comprehensive academic, research, and production structures. The adaptation of the Humboldt model to modern conditions has increased the role of universities in **socio-economic development, social mobility, and the resolution of global challenges** [Vasilenok & Shapiro, 2004].

Following World War II, the **University of Berlin** reopened in 1946. Much like the city itself, the university reflected the political division of Germany: in the Federal Republic, it became known as the **Free University of Berlin**, while in the German Democratic Republic, it continued as the **University of Berlin**, renamed in 1949 as **Humboldt University of Berlin**. Despite ideological constraints under the Socialist Party, from the 1970s the institution reestablished **international cooperation** with leading universities across Western Europe, Asia, Africa, and Latin America. After German reunification, extensive reforms were introduced: much of the faculty was replaced with specialists from West Germany, and significant investments were made to modernize the university's infrastructure and strengthen its scientific potential.

Today, Humboldt University functions as a **global research center**, attracting students and scholars from across Europe and the wider world. It provides opportunities for both **theoretical and practical education**, enabling students to pursue careers as specialists and researchers. Its academic ecosystem is enriched by collaborations

with multinational corporations, research institutes, and clinical facilities. Of particular note is **Charité – Universitätsmedizin Berlin**, one of Europe’s largest and most advanced university hospitals, operating under the auspices of Humboldt University.

Currently, the university encompasses **11 faculties and 261 academic programs**. Examples include:

- **Agriculture and Horticulture Faculty:** horticultural sciences, agrarian economics, fisheries and aquaculture, soil nitrogen research.
- **Law Faculty:** bachelor’s, master’s, and doctoral programs covering German and European law, political science, and intellectual property law.
- **Economics Faculty:** economics and statistics, corporate finance, financial engineering, applied economics.
- **Mathematics and Natural Sciences Faculties (I and II):** the first focuses on chemistry, physics, and biology; the second on psychology, mathematics, geography, and computer sciences.
- **Philosophy Faculties (I–IV):** covering history, computer science, European ethnology, German literature, classical philology, social sciences, cultural studies, art history, health sciences, pedagogy, and rehabilitation.
- **Theology Faculty:** ancient and modern languages, history, philosophy, and psychology of religion.
- **Medicine Faculty:** operating within Charité Medical Center, offering cutting-edge research and clinical training.

Charité, founded in 1710 during a plague outbreak, has since grown into Europe’s largest and most renowned university hospital, encompassing **four major campuses in Berlin**. Its guiding motto—“**Research, Teach, Heal, Help**”—reflects its mission. The hospital is a pioneer in **minimally invasive surgery**, employing advanced technologies such as the **Da Vinci robotic surgical system**.

Internationalization and Dual-Degree Programs

One of Humboldt University’s notable innovations is its **dual-degree programs**, which foster academic mobility and expand students’ intellectual horizons. These programs are offered in collaboration with prestigious global universities, including **King’s College London, University of Bologna, University College Dublin, University of Vienna, Tallinn University, Université Paris Diderot (Paris 7), University of Rome III, University of Rome Tor Vergata, Complutense University of Madrid, Charles University in Prague, University of Washington, and the University of North Carolina at Chapel Hill**.

Humboldt also participates in **student exchange and internship programs**, offering placements at leading universities such as the **National University of Singapore, University of São Paulo, University of Toronto, Uppsala University, University of Queensland, University of Zurich, Princeton University, Waseda University, and Stellenbosch University**. In addition, it is a partner in the **Erasmus Mundus program**, which provides international mobility opportunities for both study and internships.

Scholarship and Grant Programs

Humboldt University offers an extensive range of **scholarships and grants** designed to support academically talented and active students, particularly at the master’s, doctoral, and postdoctoral levels. Selected programs include:

- **Humboldt Post-Doc Scholarships** – for doctoral graduates wishing to continue research at the university. Duration: 6 months, with a stipend of €1,500 per month and coverage of travel expenses.
- **International Research Awards (for women)** – targeted at female doctoral students. Duration: 6 months, with a stipend of €1,750 per month.

- **Caroline von Humboldt Programme (for women)** – supports doctoral candidates on maternity or childcare leave. Provides €1,365 per month plus €400 for childcare.
- **Rosa-Luxemburg-Stiftung Scholarships** – awarded annually to 150 active students promoting democratic values, gender equality, and social justice. Each recipient receives €750 per month.

Berlin Technical University

Another prominent institution is the **Berlin Technical University (Technische Universität Berlin, TU Berlin)**, unique in Germany as a technical university that also integrates **humanities and social sciences**. TU Berlin offers strong programs in **sociology, chemical engineering, biology, and business administration**, and enjoys an excellent reputation in the labor market. Statistics indicate that most graduates secure employment in their field within one year, making TU Berlin a strategic choice for students aspiring to careers in European industries.

The university conducts advanced research in **civil engineering, computer science, and programming**, and collaborates with major German corporations such as **Deutsche Telekom, Siemens, Bosch, and Daimler**, which often co-finance large-scale research projects. TU Berlin also serves as a **training hub for multinational corporations** across Germany, France, Italy, and beyond, preparing highly qualified specialists in mechanical engineering, industrial management, and information technologies.

Its alumni include distinguished Nobel laureates and pioneers of science and technology, such as **Gustav Hertz, Konrad Zuse** (inventor of the first programmable computer and high-level programming language in 1941–1948), **Karl Bosch, Gerhard Ertl, Eugene Wigner, Dennis Gabor**, and **Werner von Braun** (designer of the first ballistic missiles and later a key architect of NASA's rocket programs). In architecture, **Bruno Taut**, a leading figure of modernism and the “New Objectivity” movement, is among its notable graduates; many of his buildings were later recognized as UNESCO World Heritage Sites.

In total, TU Berlin counts **10 Nobel laureates and 2 national prize winners** among its alumni, underscoring its reputation as one of Europe's leading centers of engineering and innovation.

Berlin Technical University: Research and Academic Profile

Berlin Technical University (TU Berlin) offers **over 100 academic programs** at the bachelor's, master's, and doctoral levels. Through agreements with **26 universities worldwide**, graduates may obtain dual degrees. The university hosts **40 research institutes** engaged in fundamental scientific investigations.

Currently, TU Berlin conducts **large-scale international research** in areas such as **cyber-physical systems, energy, rational use of resources, ecology, design, development of new materials, and optimization of production processes**. Overall, the university participates in **120 major international projects**, while faculty members contribute to **1,500 scientific studies** annually. Professors and students also engage in at least **40 scientific, startup, and spinoff initiatives each year**.

Several **master's programs in English** are available, requiring minimum admission scores of **IELTS 6.5, TOEFL 88, or CAE grade C**.

The structure of TU Berlin's faculties reflects its mission to integrate **science and practice**. Since its renaming in 1946, the university has pursued a dual focus on **technical and humanistic disciplines**.

- **Faculty I: Humanities and Educational Sciences** – established to balance technical training with the humanities, supporting interdisciplinary research in social sciences, natural sciences, and engineering.
- **Faculty II: Mathematics and Natural Sciences** – covering mathematics, physics, and chemistry, including traditional mathematics as well as technical and business mathematics.

- **Faculty III: Process Sciences** – internationally recognized for innovative approaches to education and research. Its mission is to enhance students' research capacity by combining **practical training, creativity, and industry applications**. Faculty III plays a central role in shaping Berlin's scientific agenda and research strategy.

Heinrich Heine University Düsseldorf

Founded in **1965**, Heinrich Heine University Düsseldorf (HHU) has grown into a prominent **research university** with a **network of campuses, clinics, laboratories, specialized libraries, and research centers**. Approximately **35,000 students** are enrolled. Established on the basis of the Düsseldorf Medical Academy, the university maintains a strong focus on research-led teaching.

HHU comprises faculties of **Law; Mathematics and Natural Sciences; Medicine; Arts and Humanities; Business Administration and Economics**.

The **Faculty of Medicine**, originally founded in 1907 as the Academy of Applied Medicine, is the university's historic core. It quickly achieved international recognition through fundamental research and clinical practice. Today it includes **31 institutes, 30 clinics, and two central facilities** (an animal research center and a biomedical research center). The faculty collaborates closely with specialized institutes such as the **Leibniz Institute for Diabetes Research** and the **Institute for Environmental Hygiene Research**. Research areas span **hepatology, cardiovascular diseases, ecological medicine, gerontology, neuroscience, and molecular biology**. Its clinics serve nearly **200,000 patients annually** with state-of-the-art medical equipment and laboratories.

HHU is a major participant in **Erasmus Mundus** and other European-funded programs. Numerous grant schemes support scientific activity, including **Family Mobility Grants (FMG), Partnership Mobility Grants (PMG), Social Development Mobility Grants (SCMG), and High-Potential Mobility Grants (HPMG)**.

The **Heine Research Academies** provide structured training and career development for young researchers. These include:

- **iGRAD** – the Interdisciplinary Graduate and Research Academy, founded in 2008 within the Faculty of Mathematics and Natural Sciences.
- **medRSD** – the Medical Research School Düsseldorf.
- **PhilGRAD** – the Graduate Academy of the Faculty of Philosophy.
- **Young Academics and International Research Centers** – coordinating interdisciplinary initiatives.

The **Walter Benjamin Program** supports early-career researchers pursuing independent studies after completing their doctorate. Other competitive programs include the **European Research Council (ERC), Emmy Noether Programme, Heisenberg Programme, Liebig Fellowship (Chemical Industry Fund), Volkswagen Foundation initiatives, and German cancer research networks**.

The **Junior Scientist and International Research Center (JUNO)** further these aims by fostering **academic career development and international collaboration**. JUNO seminars prepare students for research careers and facilitate cooperation with international scholars (EC-2010).

In 2018, the university established the **Strategic Research Fund** to enhance its research profile, competitiveness, and innovation capacity. The fund supports (1) young researchers' projects, (2) large-scale collaborations, and (3) rector-approved strategic initiatives. Importantly, from the **first year of study**, students are introduced to research activities, scholarship opportunities, and study-abroad programs—creating an environment for early talent development.

Although HHU is a **state university**, it also welcomes contributions from private benefactors committed to supporting science and education. Its research funding priorities are:

1. Investing in scientific progress as a foundation for the future.
2. Strengthening Düsseldorf's regional role.
3. Promoting participation in international research and exchange programs.
4. Supporting young talents in scientific research and professional development.
5. Expanding university–civil society engagement.

Charles University, Prague: Internationalization Strategy

Founded in **1348** by Emperor Charles IV, **Charles University** in Prague (also known as Karlova University) is one of Europe's oldest and most prestigious centers of learning. Created with the counsel of Archbishop Arnošt of Pardubice, the institution—sometimes referred to as the “Imperial University”—emerged during a period marked by crusades and the influence of the Holy Roman Empire.

The university has hosted many notable figures, including **Jan Hus (Czech national hero)**, **Albert Einstein**, **Nikola Tesla**, and writers such as **Milan Kundera**. **Franz Kafka** completed his doctoral studies in law here under Alfred Weber's supervision.

Today, Charles University ranks among the **world's leading research universities**, known for the quality and relevance of its scientific output, participation in **international projects**, membership in global networks, and extensive involvement in **summer schools, conferences, and exchange programs**.

According to *Times Higher Education World University Rankings*, Charles University is consistently placed among the **top 500 universities worldwide**. In the **Shanghai Ranking (ARWU)**, it holds a position around the **top 200 globally**, ranking **7th among European universities** and **1st in Erasmus Mundus student participation**.

Table 1. Foundations of the Functioning of an Innovative University

Role of Secondary School	Role of University	Role of Industry	Role of the State	Role of NGOs
1. Systematic organization of career-oriented activities in schools. 2. Development of intensive, scientifically grounded cooperation between secondary schools and universities.	1. Organization of innovative activity directions. 2. Conduct of intensive scientific research. 3. Identification of new research areas. 4. Establishment of research structures. 5. Creation of production enterprises. 6. Expansion of international cooperation. 7. Analysis of global political and economic development dynamics. 8. Establishment of techno-parks. 9. Organization of laboratories equipped with modern technologies. 10. Study of the socio-economic demands of	1. Presentation of new projects to universities. 2. Support for equipping universities' material-technical base with modern technologies. 3. Support for establishing cooperation between universities and local/foreign companies. 4. Provision of conditions for practical training and research. 5. Establishment of business accelerators. 6. Establishment of business incubators.	1. Coordination of activities between the Ministry of Education and the Ministry of Economic Development. 2. Allocation of grants and funding programs to universities. 3. Provision of grants for start-up projects. 4. Allocation of preferential loans to projects transforming into businesses.	1. Implementation of joint projects with universities. 2. Conduct of public awareness campaigns. 3. Organization of social surveys.

	society. 11. Ensuring sufficient autonomy for universities. 12. Provision of highly qualified academic staff. 13. Allocation of financial resources for scientific research. 14. Establishment of science-production departments. 15. Development of infrastructure for an innovative environment.			
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Internationalization and Academic Structure of Charles University

One of the key directions of Charles University's international engagement is **student and faculty mobility**, including **dual-degree programs**. The university is recognized among Europe's leading institutions for the high quality of its participation in the **Erasmus Mundus program**. At present, Charles University cooperates with more than **200 prestigious universities worldwide**.

Doctoral students also have the opportunity to participate in the **Cotutelle program**, which allows them to conduct research under the joint supervision of two academic advisors. Upon successful defense, graduates receive diplomas from both Charles University and the partner institution. These programs enable students to pursue research in foreign universities and scientific centers.

Currently, Charles University enrolls **nearly 50,000 students**, including around **7,000 international students**. The university consists of **17 faculties, research institutes, teaching centers, and supporting organizations**. The university is governed by the **Rector**, while faculties are headed by **Deans**. Education is offered at the **bachelor's, master's, and doctoral levels**. Charles University is a member of the **European University Association**, alongside Oxford, Sorbonne, Bologna, and Geneva.

- The **Faculty of Catholic Theology**, active since 1348, teaches the history of art and theology.
- The **Faculty of Protestant Theology** prepares students for service in religious and social institutions.
- The **Faculty of Hussite Theology**, established in 1920, focuses on Hussite doctrine, its religious and social dimensions.
- The **Faculty of Law**, one of the oldest, has educated prominent legal and political figures in Czech public life. Teaching is offered only full-time, lasting **five years** and leading directly to a **master's degree**.

Charles University has a particularly rich tradition in **medical education**, with **six faculties of medicine**:

- The **First Faculty of Medicine** (founded in 1215) is one of the oldest centers of medical education in Europe, specializing in physical therapy, intensive care, and dietetics.
- The **Second Faculty of Medicine** focuses on pediatrics.
- The **Third Faculty of Medicine** offers comprehensive training across all medical disciplines, supported by an extensive network of Czech hospitals, institutes, and clinics. It also includes a **Department of Public Health**.
- The **Plzeň Faculty of Medicine** provides master's and doctoral programs.
- The **Hradec Králové Faculty of Medicine** specializes in pharmacy.

The university has gained **global recognition** for research in fields such as **Egyptology, addictology, and criminology**.

The **Faculty of Philosophy** is among the most popular, hosting more than **8,000 students**, many of them international. Lectures are frequently delivered by world-renowned scholars.

Across its **17 faculties**, Charles University offers over **300 accredited programs** at the bachelor's and master's levels, spanning **642 specializations**. Most faculties include affiliated **institutes, research groups, and preparatory courses**.

The **Faculty of Education** reflects distinctive features of Czech teacher training, where students usually specialize in **two teaching subjects** (e.g., English and mathematics; chemistry and biology; history and literature). The faculty offers broad specialization options, including **psychology, pedagogy, and special education**. Admission involves both **tests and interviews**, with oral interviews assessing applicants' motivation and aptitude. For foreign students, a Czech language certificate is not required. The psychology program requires a **written test**, based partly on recommended literature; approximately **15% of the questions are in English**, requiring at least **B2-level proficiency**.

Charles University is also home to numerous specialized **research centers**, including the **Institute of History and Archives, Center for Theoretical Studies, Center for Economic Research and Postgraduate Education, Environmental Center, Computer Science Center, School for Knowledge and Technology Transfer, Institute of Linguistic Studies, Institute of Political Science and International Relations, Institute of Sociology, Institute of Communication and Journalism, European Information Center, and Ecology Center**. Together with its central library, these institutions significantly enhance the university's standing among Europe's top research universities. Their overarching aim is to strengthen Charles University's role as a **research hub**, expand **university-society relations**, and ensure the regular dissemination of research in **scientometric databases**.

The Entrepreneurial and Innovative University Model

The universities examined in this study share a commitment to **innovation** and to the principles of the **"entrepreneurial university."** As innovative institutions, they contribute to the development of **human capital, science and technology, industry, and agriculture**, thus playing a decisive role in the intellectual and economic progress of their respective countries.

Switzerland exemplifies this model. According to *Reuters World's Most Innovative Universities*, the country invests approximately **16 billion Swiss francs annually** in science, education, technology, and innovation. The **Swiss Federal Institute of Technology in Zurich (ETH Zurich)** embodies this strategy. In 1936, its president Arthur Rohn introduced the **"Innovation Policy Program"**, which laid the groundwork for the creation of the **Swiss National Science Foundation** in 1942. ETH Zurich counts **21 Nobel laureates** among its alumni and faculty.

In the past decade, ETH has consistently ranked among the **top five European technical universities** and among the **world's leading institutions**. Its graduates rarely face difficulties finding employment in their fields, reflecting the university's reputation for professional excellence. ETH Zurich's relatively **low tuition fees**, coupled with its heavy investment in **education, teaching quality, and scientific research**, ensure that resources are effectively allocated. Crucially, ETH promotes not only research and teaching but also the **integration of science into industry**, thereby advancing the modern model of the entrepreneurial university. One key indicator of success in this regard is **Industry Income**, representing revenue from non-governmental research and discovery transferred to the commercial sector.

A similar trajectory can be observed at the **Tambov State University named after G.R. Derzhavin (Russia)**, where the shift toward an **innovative education-research model** began in the early 2000s. Its **development strategy** includes:

- Optimizing innovation and investment activity as a factor in regional development.
- Strengthening orientation toward civil society.

- Establishing **innovation technoparks** that integrate education, research, production, and social infrastructure.
- Building the university's **competitive brand**.
- Promoting a **corporate academic culture**.
- Improving education quality and ensuring competitiveness of research.
- Enhancing the university's position in the **international education and research space**.
- Improving living and working conditions for staff and students, including housing provision.
- Expanding the university's role as a **regional ideological and cultural center**.
- Promoting **public education and outreach**.
- Advancing **practice-based education**.

The university's development plan clearly reflects its adoption of **innovation as a core principle**, aligning all activities with the **dynamic needs of modern society**.

As **S.B. Abdygapparova (2010)** notes, the potential for innovative activity in a university must be evaluated through **comprehensive economic analysis**. This involves assessing the university's:

- overall economic performance,
- efficiency of resource use,
- labor and wage structures,
- student performance indicators,
- profitability and revenue,
- financial stability and working capital,
- and effectiveness of economic incentives.

Such an analysis identifies whether sufficient foundations exist for innovative development, and if so, helps determine the scope of **future investment** in university innovation. This approach also supports the creation of a **national innovation ecosystem** and the mobilization of **state innovation resources**.

One of the key factors in the implementation of innovative activities in universities is the scientific personnel potential. This is essential, since it is the staff who regulate and carry out innovation. At the current stage of scientific and technological progress, possessing knowledge alone is not sufficient for academic staff. They must also be able to apply the latest advances in technology to the teaching process, stimulate students' interest, and foster enthusiasm for their chosen field. University personnel are expected to demonstrate flexible thinking, analytical skills, and the ability to make prompt decisions. At the same time, the university must take responsibility for the continuous professional development of its staff.

The creation of an effective management system constitutes a decisive step towards building an innovative university. Such a system, by incorporating science-industry-business relations, paves the way for the establishment of an innovation-friendly environment (Bunyak, 2016). Leaders of universities who seek efficiency in specialist training, research activities, and high-quality production increasingly aim to adopt the globally expanding "entrepreneurial university" model. The integration of entrepreneurial university features into modern higher education institutions represents a major step forward in the pursuit of innovation.

Within this model, the achievement of high results in personnel training is only part of the process. The primary goal is to promote collaboration with industrial enterprises and large corporations, thereby ensuring the commercialization of scientific research. The research activity envisaged in entrepreneurial universities is expected to meet the demands of industry. This concept was initially articulated in the mid-1990s in the works of American scholars B.R. Clark and Peter Drucker, and subsequently developed further by European, Russian, and Ukrainian researchers. The Massachusetts Institute of Technology (MIT), Stanford University, New York University, and a number of European institutions—including those examined in this study—are often cited as classical examples of entrepreneurial universities.

Clark's longitudinal research on five European universities over a ten-year period demonstrated that the entrepreneurial university model constitutes their path towards innovation (Clark, 2011). Adoption of this concept by a university implies readiness for fundamental institutional change. Importantly, Clark emphasized that universities can embrace the entrepreneurial model without compromising their traditional academic values.

According to Professor A.O. Grudzinskiy, Doctor of Sociological Sciences, entrepreneurial universities are systematically engaged in creating knowledge, delivering education, and translating this knowledge into practice. He characterizes entrepreneurial universities as institutions that:

1. Operate with innovation as their central goal, capable of functioning under conditions of risk and dynamic demand.
2. Are economically efficient, primarily relying on their own resources.
3. Possess a flexible and network-based organizational structure.
4. Derive balanced benefits from the skills and risk-taking capacities of individuals and groups.
5. Focus not on controlling or monitoring staff activities, but on fostering an environment that supports the institution's strategic mission.
6. Demonstrate adaptability to changing consumer demands and provide rapid responses (Grudzinskiy, 2004).

In Clark's (2011) view, the transformation of universities into entrepreneurial institutions requires at least five essential elements:

- a strengthened steering core;
- an expanded developmental periphery;
- a diversified funding base;
- a stimulated academic heartland;
- an integrated entrepreneurial culture.

These elements are central to the operational strategies of the universities analyzed in this study. Russian scholars A. Sidorova and N.A. Rumyantsev argue that entrepreneurial universities serve as research centers which, in addition to fulfilling the traditional functions of education and science, effectively transfer knowledge to the practical domains of the economy and society (Zimmermannová, et al. 2022).

S.V. Golubev, in his research, highlights the social mission of entrepreneurial universities, examining their operations through the lens of social entrepreneurship. He stresses that the primary responsibility of such universities lies in the broad implementation of innovative educational programs and the creation of entrepreneurial ecosystems within their respective regions (Golubev, 2004). J. Ropkey adds that entrepreneurial universities must display entrepreneurial behavior institutionally, while also embedding this mindset conceptually (Ropkey, 2004).

Ukrainian scholar N.M. Bunyak (2016) argues that analysis of different approaches to defining the essence of the entrepreneurial university supports the conclusion that its entrepreneurial function is often associated with the commercialization of research outcomes. According to him, entrepreneurial universities:

- diversify their sources of funding;
- reduce institutional dependence on public and governmental structures;
- train specialists with creative thinking capable of implementing innovative projects across different fields;
- generate new knowledge and ensure its capitalization.

Such institutions are characterized by organizational flexibility that allows them to adapt quickly to changing societal and market needs. They actively promote the establishment of new enterprises by faculty and students to commercialize research outcomes, facilitate the entire cycle of knowledge creation—from idea generation to

prototyping innovations—and encourage the integration of education, science, and business. Collectively, these features contribute to the creation of initial conditions necessary for the innovative development of the national economy (Bunyak, 2016).

Conclusion

Although some efforts have been made in contemporary Azerbaijan and in universities of the former Soviet republics to implement entrepreneurial functions, these initiatives have not yet been fully realized across a wide spectrum. Several factors contribute to this. Most universities prioritize personnel training over research activities, often concluding the process solely with teaching, without encouraging students to engage in scientific and creative work. This trend is particularly evident in state universities. Another challenge is the underdevelopment of an innovative educational and work environment. Factors hindering progress include insufficient connections between universities and business structures, corporations, leading global universities, research centers, and society at large.

The absence of an entrepreneurial culture and the lack of entrepreneurial experience among faculty further hinder the emergence of an entrepreneurial university tradition in the post-Soviet space. Consequently, students often become passive, focusing solely on obtaining their diplomas and securing employment, rather than keeping pace with the modern trends in industrial development, technology, and science. Personnel who do not meet the demands of the contemporary world cannot contribute to the advancement of science, industry, or technology.

The entrepreneurial university integrates teaching, research, and entrepreneurial activities, generating revenue from these functions while also serving as a critical participant in the country's innovation processes. Such universities not only train innovative-minded specialists for various fields but also produce new knowledge and commercialize it. By providing students with deep theoretical knowledge alongside the development of fundamental research skills, intellectual stimulation through teaching and research, and opportunities to acquire practical skills aligned with personal professional needs, universities actively prepare graduates for the workforce. In other words, the university participates directly in innovation activities and scientific production at both macro and micro levels.

The entrepreneurial university pursues two key objectives:

1. To train specialists for students wishing to establish their own businesses, offering and implementing entrepreneurship programs that develop students' entrepreneurial mindset.
2. To engage students and graduates in entrepreneurial activities through the establishment of business incubators, technology parks, and similar initiatives, thereby assisting them in founding their own companies and functioning as an entrepreneurial institution.

In the universities examined in this study, these factors were identified as particularly significant. Operating at the level of contemporary demands opens pathways to innovation and lays the foundation for new prospects for these higher education institutions. The findings suggest that the entrepreneurial university not only conducts training and research in business and other socio-economic fields but also facilitates significant financial investments from large corporations and governments, and generates revenue from its own entrepreneurial activities.

The development of university entrepreneurship is supported by initiatives such as the 2003 Gelsenkirchen Institutional Entrepreneurship Declaration, which is recognized as a key step for promoting entrepreneurship education in European higher education systems. The declaration emphasizes that the entrepreneurial university concept entails appropriate institutionalization of university management structures and activities, characterized by:

- Professionalization of university management and staff, establishing strong executive leadership;
- Diversification of income sources;

- Careful attention to core academic values while studying and integrating new market management methods;
- Close engagement with the business world and society;
- Promotion of initiative and an innovative entrepreneurial culture, including knowledge transfer, establishment of new production companies, continuation of education, alumni relations, and attracting financial resources;
- Integration of academic and research divisions beyond traditional boundaries, and preparation of projects aligned with new knowledge production methods.

The realization of this concept requires scientifically grounded, forward-looking, and fundamental activity.

Conflict of Interest

The author declares no conflict of interest regarding the publication of this manuscript.

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