



JAGIELLONIAN UNIVERSITY
IN KRAKÓW

SWOT Analysis

CRACOW 2019

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1. The results synthesis

The results of the multistage SWOT analysis, the scope of which covered the entire spectrum of areas and disciplines represented at the Jagiellonian University (see point 2), allowed identifying priority research areas (PRA called here POB) in which the university is already highly positioned in the international scientific environment, and its potential resulting from intellectual capital (above all human, structural and relational) makes it possible to further strengthen its competitive position in selected areas. At the same time, the development of the indicated POB on a global scale is forecasted, as they are part of current trends not only in world science, but also in social, economic and cultural trends, as well as current political, legal and systemic conditions.

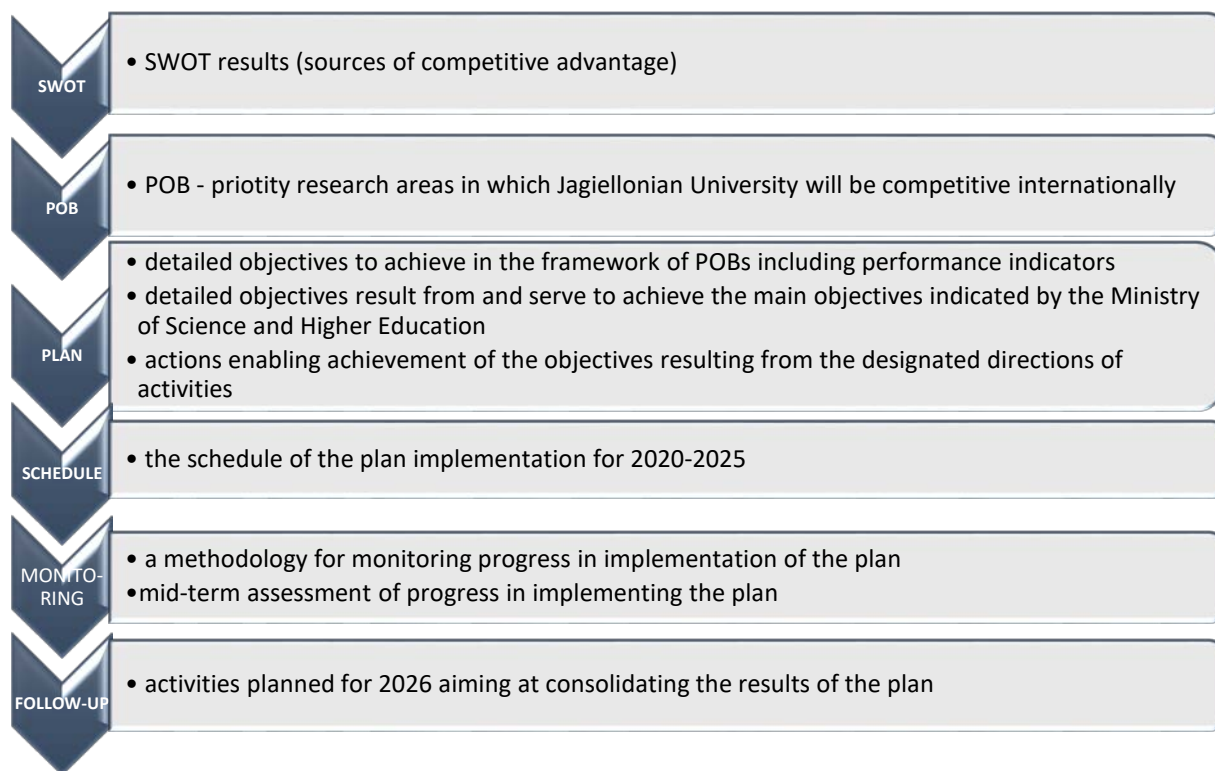
Based on SWOT analysis, Jagiellonian University identified the following POB:

1. **Heritage** - cultural heritage (identity of individuals and entire societies, language, civilizational challenges of modern world),
2. **FutureSoc** - interdisciplinary research on social changes caused by the development of new technologies and the cognitive sciences (politics, security, law, management, mind, communication, society),
3. **BioS** - structural and translational biology (genomics and bioinformatics, cell biology, evolutionary biology and biodiversity),
4. **qLife** - better research for better quality of life (translational research: civilization diseases, reproductive health, regenerative medicine; drug development: mechanisms, targets, clinical trials),
5. **SciMat** - design of advanced materials from models and theoretical tools via synthesis and characterization to applications (nanostructures, electronics, photonics, biomaterials, energy sources),
6. **DigiWorld** - digital world and cyber space (innovative technologies of artificial intelligence and machine learning in interdisciplinary applications),
7. **Anthropocene** - the causes, paths and consequences of global environmental changes (human impact on environmental systems, climate, globalization, migration, circular economy, new technologies).

All POBs are characterized by high interdisciplinarity, which is guaranteed by the scientific profile and organizational structure of the University together with numerous specialized administrative support units, managed in a decentralized manner.

What is essential, also from the point of view of the entire higher education system in Poland, defined POB scopes ensure the implementation of the mission and vision of the University in the aspect of its sustainable development, assuming synergy of research, education and cooperation with external stakeholders. A synthetic presentation of the results of the analyses carried out is presented in the matrix (see section 4.1) aggregating the results of the SWOT analysis for the entire University in the context of all objectives indicated by the Ministry of Science and Higher Education with specific objectives defined by the university and a set of actions guaranteeing achievement of objectives. It is in this context that the POB is shown that corresponds to the results of the SWOT analysis, specific objectives and activities, in the sense not only of the process of their identification, but above all of their construction and development. In this sense, all resultant SWOT factors imply future implementation of activities and achievement of objectives within individual POB. This approach was reflected in the whole preparatory process for the "The excellence initiative - research institution" program with the key SWOT analysis initiating this process (see Figure 1).

Figure 1. Location of SWOT analysis in preparatory work



POBs were selected based on the University's strengths and opportunities in its environment (indicated grades according to a standardized five-level Likert scale). Putting them in superior categories of key or significant importance for achieving the five main objectives, it is stated that POB will be built and developed on such foundations as:

- competences (grade 5),
- scientific activity (grade 5),
- organization and management (grade 4),
- tangible assets (grade 5),
- and university relational capital (grade 5),

and they are ready to effectively use the opportunities resulting from:

- political environment (grade 5),
- system conditions (grade 4),
- global trends (grade 5),
- opportunities for developing relationships and cooperation (grade 5),
- and new technologies (grade 5).

2. Methodology for preparing SWOT analyses and identifying priority research areas

2.1. Preliminary assumptions

The starting point for the adoption of the SWOT analysis methodology and selection of priority research areas (POB) of the Jagiellonian University were the conditions of the competition, included in the document "Communication of the Minister of Science and Higher Education of March 26, 2019 on the first competition under the "Excellence initiative - research institution" program. The Communication indicated that the SWOT analysis is to lead to the identification of Priority Research Areas (POBs) of the university and at the same time is to be linked to the following objectives:

1. Increasing the impact of the university's research activity on the development of world science, especially in priority research areas with high development potential, in which the university plans to intensify its research activity.
2. Enhancing research collaboration with research institutions of high international reputation, especially in priority research areas.
3. Improving quality of education provision for students and doctoral training, especially in fields of study and disciplines of science related to priority research areas, taking into account the need to include students and doctoral candidates in research activities and the need to compete effectively for the most talented applicants, including foreign ones, to study programmes and to doctoral schools.
4. Devising and implementing comprehensive solutions for the professional development of the university's staff, especially young scientists, in the meaning of Article 360(2) of the Law of 20 July 2018 on Higher Education and Science.
5. Improving quality of university governance and management, including quality-enhancing organisational changes.

In accordance with the above-mentioned guidelines, the SWOT analysis method was used, consisting of identification of four categories of factors: strengths and weaknesses of the university, as well as opportunities and threats related mainly to its surroundings. To achieve the best results, the analytical process aimed at selecting the POB was divided into three stages, in which triangulation of data sources, techniques and tools as well as working teams participating in the analysis were applied.

2.2. Data collection and interpretation techniques and detailed methodological assumptions

2.2.1. Working teams

Three groups of people forming working teams participated in the work:

- representatives of various fields and disciplines participating in research conducted at the University, with extensive experience in cooperating with the international environment;
- representatives of various fields and disciplines with individual scientific achievements of international significance;
- people with many years of management experience in higher education and the environment.

A team of strategists supervised the course of work. The team was composed of representatives of management sciences, specializing in carrying out strategic analyses. The task of the strategic team was to provide support, monitoring and supervision over the work of working teams at all stages of the process. In addition, during the preparatory work it was

necessary to familiarize the teams with the principles of the SWOT method, with particular emphasis on the nature of the conducted analyses and competition expectations. This stage of work was in the form of workshops run by a strategic team.

2.2.2. Data sources

In accordance with the accepted principle of triple triangulation, the conducted analytical works used diversified and independent data sources, which concerned the University, the national and international environment. The data obtained were quantitative (e.g. bibliometric indicators) and qualitative (e.g. expert evaluations, descriptions). Some of them took the form of reports available to individual units of the Jagiellonian University (the list in the "Sources" section), and a part was developed specifically for the purposes of SWOT analysis, in the form of reports, summaries, descriptions, lists, indicators and other information. Data on the publication activity of employees of the Jagiellonian University were generated by the team of the Institutional Analysis and Reporting Office based on the resources of the Scopus database, using the SciVal analytical tool associated with this database. The indication to use the Scopus database was a much higher percentage of magazines devoted to the humanities and social sciences than is the case in the Web of Science database. Data collected for both the University as a whole and for individual POBs included:

- percentage of scientific articles in the upper decile (%);
- number of scientific articles in the upper decile;
- normalized quotation rate;
- percentage of scientific articles published in international cooperation (%);
- normalized quotation rate for scientific articles in international cooperation.

Data on scientific monographs in prestigious publications come from the Repository of the Jagiellonian University. Other detailed data were obtained from the university management information systems (SAP, USOS), POL-on, as well as from university experts representing various fields and disciplines and the most important organizational units of the University (eg faculties, CAWP, BAIiR, Careers Office, CITTRU). The work involved people with professional preparation and experience in the field of obtaining and processing information, including scientific information.

2.2.3. Techniques and tools for analysis, evaluation and interpretation of data

The triangulation of techniques and tools of analysis and evaluation implied the necessity of using various quantitative and qualitative techniques as well as tools for analyzing and evaluating research carried out due to the criteria of: international, national and internal meaning. At the first and second stages of work on the preparation of detailed SWOT analyses, based on information from various sources, techniques and tools were used, such as: average factor ratings and the five-point Likert scale. In addition, teamwork techniques such as brainstorming, nominal group technique, kinship diagram, multi-criteria decision analysis, V. Pareto diagram were used at the second and third stages of the work.

For the assessment of a given factor within each category of strengths, weaknesses, opportunities and threats, a coherent, five-level Likert scale was applied:

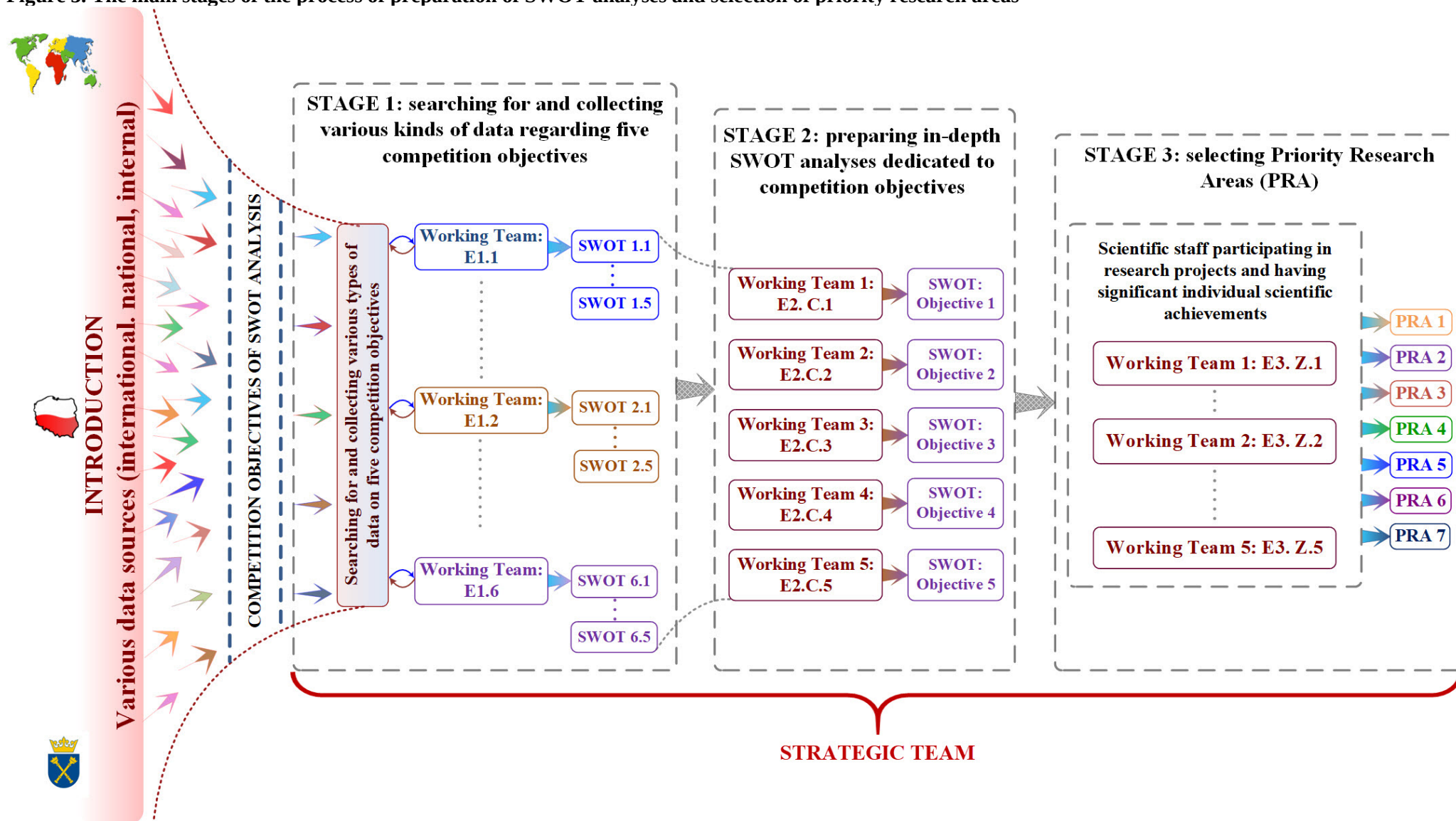
- 5 - very important, key to achieve the objective;
- 4 - important to achieve the objective;
- 3 - average to achieve the objective;
- 2 - not essential to achieve the objective;
- 1 - irrelevant to achieve the objective.

The selected POB proposals were additionally checked to see if they correspond with current trends prevailing in world science. These trends were determined based on the analysis of the most frequently repeated words (word count, Atlas.ti program) in the "Subject Categories Web of Science". Because the Scopus database was used for bibliometric analysis, according to the accepted principle of triangulation, the descriptions of the WoS scientific categories were used for additional verification.

2.3. Process of SWOT analysis in order to select POB

The analytical process leading to the identification of priority research areas has been divided into three stages, described below. At each stage of the work, working teams were organized in a different configuration, which is why they were marked accordingly (see Figure 3).

Figure 3. The main stages of the process of preparation of SWOT analyses and selection of priority research areas



Source: Own elaboration

2.3.1 First stage: preliminary SWOT analysis

In the first stage of works (Figure 3), the working teams were composed of representatives of various fields and disciplines, cooperating within the research carried out at the university, including people with professional preparation and experience in obtaining and processing information, including scientific information. The task of these teams was to identify general SWOT factors and make their initial assessment in terms of impact on the objectives set out in the MNiSW communication.

Identifying and assessing the factors required a series of team sessions. As part of the work of these teams, factors were identified in four categories: strengths, weaknesses, opportunities and threats. Then, all team members, based on their expert knowledge, assessed each factor, using a standardized five-point Likert scale, regarding the strength of the factor's impact on the objectives set out in the MNiSW communication. The final average value of the assessment of each factor within a given team was calculated according to the following relationship:

$$\forall_j = 1, \dots, 4 \text{ oraz } \forall_m = 1, \dots, M, C_{z_{mj}} = \frac{\sum_{z=1}^Z Oc_z}{Z} \quad (1)$$

[oraz = and]

where:

j – index expressing j-th category of SWOT analysis factors, i.e. 1 - strengths, 2 - weaknesses, 3 - opportunities, 4 - threats,

M – number of factors assessed within a given j-th category of SWOT analysis factors,

m – another factor,

C_{z_{mj}} – collective assessment of the m-th factor in the j-th category of SWOT analysis factors,

O_{c_z} – assessment of the influence of a given m-th factor in the j-th category made by a z-th member of the team,

Z – the number of members of the research team,

z – another member of the team.

Each of the six work teams prepared five SWOT analyzes for each of the five objectives indicated in the MNiSW communication. In the course of this work, each team defined a list of the most important factors, which were subject to detailed analysis at the second stage of work and for which further detailed empirical data were obtained. As part of this work phase, the strategic team coordinated the process of collecting empirical data that has been prepared by various university units (see paragraph 2.2).

The result of the first stage work was: preparation of preliminary, team SWOT analyses in the context of each of the five objectives specified in the MNiSW communication (Figure 3) and the collection of specific empirical data. This information constituted the input data for the second stage of work, i.e. an in-depth SWOT analysis for each objective. Guided by the expected coherence of the document, the results of this stage are not presented in full and separately, but only partly as part of the presentation of the results for the second stage in paragraph 4.2.

2.3.2 Second stage: in-depth SWOT analysis related to the main objectives indicated in the communication of MNiSW (Ministry of Science and Higher Education)

In the second stage of works (Fig. 3), the teams were reorganized so that one team worked in the area of one objective defined in the MNiSW communication. At this stage, as before, teams from various fields and disciplines were included in the team cooperation, who participate in research carried out at the university and people with many years of management experience in higher education and the environment.

Input data were factors resulting from the initial SWOT analysis and empirical data. In the course of team work, each member of the team dedicated to one of the five objectives, assessed each of the factors (included in the initial, team SWOT analyses), including specific empirical ones. The standardized five-point Likert scale was used as before. The use of the same scale of assessments was necessary due to the necessity of methodological integrity in the measurement, which at the same time enabled the calculation of final assessment values for each factor included in the detailed SWOT analyses, according to the following relationship:

$$\forall_j = 1, \dots, 4, \quad \forall_m = 1, \dots, M, \quad \text{oraz} \quad \forall_g = 1, \dots, 5, \quad Fz_{mjg} = \frac{Cz_{mj} + \sum_{p=1}^P Oc_p}{P+1} \quad (2)$$

[oraz = and]

where:

j – index expressing j-th category of SWOT analysis factors, i.e. 1 - strengths, 2 - weaknesses, 3 - opportunities, 4 - threats,

M – number of factors assessed within a given j-th category of SWOT analysis factors,

m – another factor,

g – index expressing the g-th objective specified in the MNiSW communication,

Fz_{mjg} – collective assessment of the influence of a given m-th factor in the j-th category made by a member of the team within the framework of the g-th objective,

Cz_{mj} – collective assessment of the m-th factor in the j-th category of SWOT analysis factors,

Oc_p – assessment of the influence of a given m-th factor in the j-th category made by a z-th member of the team within the framework of g-th objective,

P – the number of members of the research team,

p – another member of the team.

The final grades obtained in this way were the basis for grouping factors, which resulted in in-depth SWOT analysis for each objective. Each SWOT analysis includes six factors in each of the four categories of strengths and weaknesses as well as opportunities and threats that received the highest scores. The synthesis of the results of this stage of work is included in point 3.

2.3.3 Third stage: selecting POBs (Priority research areas) and indicating the course of action.

At this stage of the work, the information obtained at the second stage was interpreted in terms of selecting the POB and the proposed directions of action.

A subsequent reorganization of the teams was made. They included representatives of various fields and disciplines with significant individual achievements in the international arena, according to the key corresponding to the main interdisciplinary research directions, as well as the deans of each department or their representatives to make binding arrangements for future coalitions of interdepartmental teams. The POB selected in this way result from the SWOT analysis in the substantive and social sense, because real nucleus of future teams implementing activities under the selected POB have been created.

Based on empirical data assigned to SWOT factors (especially strengths and opportunities) and on the assessment of each of these factors, seven POB were selected. Two basic assumptions have been adopted. First of all, each POB proposal should have a strong support in the strengths of scientific, didactic and international cooperation as well as in the opportunities resulting from, among others, from research, social, technological and economic trends. Most important factors additionally supporting all identified POBs on the University level (e.g. number of projects, participation in international university networks) were also take into account.

Secondly, all POB's proposals should be part of the mission of the UJ, assuming the sustainable development of scientific areas.

Moreover, the interpretation of the results of the detailed SWOT analysis allowed to indicate the proposed directions of activities. These proposals constituted the input data for the development of detailed objectives and activities indicated in the competition application under the IDUB program. The results of the third phase of the work, in conjunction with the specific objectives and activities, are included in point 4.1

3. SWOT analysis results with regard to five main objectives

3.1 Main objective 1

MAIN OBJECTIVE 1: Increasing the impact of academic activities on the development of world science, in particular in priority research areas with high development potential, in which the university plans to intensify its scientific activity.					
CODE	STRENGTHS	GRADE	CODE	WEAKNESSES	GRADE
O1_S1	Research competence of academic staff.	5	O1_W1	Publishing activity in the first decile of the most-cited magazines.	5
O1_S2	Increasing efficiency in obtaining national and international grants.	5	O1_W2	Low activity in obtaining prestigious international grants and their low number currently.	4
O1_S3	Publishing activity in the first quartile of the most-cited magazines.	5	O1_W3	Tendency to conduct research individually and in narrow thematic areas of minor importance for the progress of science.	4
O1_S4	Infrastructure and scientific apparatus supporting research processes (with the exception of medical sciences).	5	O1_W4	Insufficient cooperation with external stakeholders, in particular from the business environment.	4
O1_S5	The presence of many scientific disciplines that creates the potential for interdisciplinary research	4	O1_W5	Too much workload of teaching and administrative activities.	4
O1_S6	The application character of conducted scientific research.	4	O1_W6	Age and hierarchical structure of the academic staff.	3

CODE	OPPORTUNITIES	GRADE	CODE	THREATS	GRADE
O1_O1	Dynamic development of selected sectors and industries related to the directions of scientific research.	5	O1_T1	Supply of funds for scientific research in Poland in relation to other European Union countries and low total value of expenditure on science.	5
O1_O2	National scientific policy preferring concentration of inputs in the best research units.	5	O1_T2	A systemic problem of the retention of talented researchers, especially young scientists.	4
O1_O3	Development of cooperation with world-leading research centers.	5	O1_T3	Competitive pressure from selected scientific centers.	3
O1_O4	Social and economic trends stimulating the demand for research.	4	O1_T4	Lack of international aspirations of Polish science and benchmarking focused on the domestic market.	3
O1_O5	Unique industrial surroundings of Krakow and the cooperation of the university with companies from the high-tech industry.	4	O1_T5	Lack of stability of legal regulations concerning higher education.	3
O1_O6	Participation of doctoral schools in research processes.	3	O1_T6	Weak position of Polish scientific journals internationally.	3

3.2 Main objective 2

MAIN OBJECTIVE 2: The increase of research cooperation with highly renowned scientific institutions on an international scale, in particular in priority research areas.					
CODE	STRENGTHS	GRADE	CODE	WEAKNESSES	GRADE
O2_S1	Active participation in the work of international university networks.	5	O2_W1	Low attractiveness of the university offer for foreign researchers.	5
O2_S2	Measurable results of international research cooperation (publications and grants).	5	O2_W2	Low intensity and effectiveness of actions promoting the research results and the university's scientific offer.	5
O2_S3	Recognition of selected scientists on the international arena.	5	O2_W3	Image and recognition of the university brand and individual scientific disciplines on the international arena.	5
O2_S4	Employees' experience in managing international projects.	5	O2_W4	The percentage of employees undertaking the challenge of participating in international research teams.	4
O2_S5	Specialized administrative units in the university structure supporting international cooperation.	4	O2_W5	Insufficient competence in building international relations.	3
O2_S6	Number of cooperation agreements concluded with foreign research centers.	4	O2_W6	A small range of cooperation with international corporations.	3

CODE	OPPORTUNITIES	GRADE	CODE	THREATS	GRADE
O2_O1	Correlation of university research areas with priorities in European and world science.	5	O2_T1	Formal and legal difficulties and lack of financial support programs for researchers from abroad.	5
O2_O2	Emerging research areas of a global character.	5	O2_T2	The emergence of new competitive geographical regions of research interest.	5
O2_O3	The development of international university networks focused on conducting research.	5	O2_T3	The abundance of competing scientific centers.	4
O2_O4	The development of information technologies facilitating the establishing of international contacts and communication between researchers.	4	O2_T4	Increased isolationist moods.	4
O2_O5	The attractiveness of Cracow's location in terms of transport, culture and the business environment.	4	O2_T5	The risk of divergence of Poland's economic and foreign policy with generally applicable global trends.	4
O2_O6	Decreasing cultural and linguistic barrier.	4	O2_T6	Less and less scholarships for researchers from Central Europe.	3

3.3 Main objective 3

MAIN OBJECTIVE 3: Improving the quality of education of students and doctoral students, in particular in fields and scientific disciplines related to priority research areas, including the need to include students and doctoral students in conducting scientific research, as well as the need to compete effectively for the most talented candidates and for doctoral schools, also from abroad , and talent management.					
CODE	STRENGTHS	GRADE	CODE	WEAKNESSES	GRADE
O3_S1	Internationalization of the educational process, including didactic offer in English.	5	O3_W1	Dominance of pre-defined study programs limiting the individual approach to building learning paths.	5
O3_S2	Projects aimed at raising research, professional and language competences of students as well as didactic competences of academic teachers.	5	O3_W2	Lack of incentives to improve the quality of didactic work in the university's motivational system.	5
O3_S3	Authorship and co-authorship of students and doctoral students in international publications.	5	O3_W3	Insufficient scholarship offer and lack of system activities for competing for the best candidates.	4
O3_S4	Access to high-class teaching and scientific infrastructure.	5	O3_W4	Lack of system solutions in the field of talent management.	4
O3_S5	Competences of the teaching staff and the optimal relationship of students to academic teachers.	5	O3_W5	Lack of funding for research carried out as part of the preparation of diploma theses.	4
O3_S6	Leading places in national university rankings and distinguishing assessment of the Polish Accreditation Committee.	4	O3_W6	Low mobility of academic staff.	4

CODE	OPPORTUNITIES	GRADE	CODE	THREATS	GRADE
O3_O1	The use of advanced modern technologies in teaching.	5	O3_T1	Increasing bureaucratisation of didactic processes and the associated risk of petrification of teaching content.	5
O3_O2	The location of the university surrounded by a technological park and scientific research institutions.	5	O3_T2	Lack of support programs for outstanding students adequate to the current assumptions of educational processes.	5
O3_O3	A direct business environment offering attractive jobs for graduates.	5	O3_T3	Insufficient level of preparation of secondary school graduates for university studies.	5
O3_O4	Development of didactic cooperation with the external environment.	5	O3_T4	Expectations of the labor market regarding the competences of university graduates.	5
O3_O5	National and international programs and initiatives popularizing studying at the Jagiellonian University.	4	O3_T5	System and legal solutions limiting flexibility in creating study programs.	4
O3_O6	Increased interest in studies in Poland in the countries of Eastern Europe and Central Asia.	4	O3_T6	Taking over the most talented graduates of the first degree studies by the labor market.	3

3.4 Main objective 4

MAIN OBJECTIVE 4: Preparation and implementation of comprehensive solutions for the professional development of university employees, in particular young researchers, within the meaning of art. 360 sec. 2 acts.					
CODE	STRENGTHS	GRADE	CODE	WEAKNESSES	GRADE
O4_S1	Experienced scientific staff constituting an appropriate research and development environment for the development of young scientists.	5	O4_W1	Lack of research on the needs and satisfaction of employees.	5
O4_S2	Projects and programs for the development of employees' academic competences.	5	O4_W2	Lack of mentoring programs for young scientists.	5
O4_S3	Funding streams dedicated to various groups of employees, including young scientists.	5	O4_W3	The subordination of the path of development to scientific advancement.	4
O4_S4	Focus of young scientists on continuous improvement of competences.	5	O4_W4	Inadequate methodological training.	4
O4_S5	Access to a comprehensive didactic offer of the university as well as research infrastructure and equipment.	4	O4_W5	Lack of programs to stimulate the mobility of young scientists.	3
O4_S6	Career management courses in study programs.	3	O4_W6	Lack of professional support programs in non-academic organizations.	3

CODE	OPPORTUNITIES	GRADE	CODE	THREATS	GRADE
O4_O1	National and international programs supporting the development of academic staff.	5	O4_T1	Incommensurability of salaries of scientific employees in relation to the expected results at the highest global level.	5
O4_O2	Recommendations of the European Commission regarding the development of research and teaching staff as well as international standards stimulating scientific development of university employees.	5	O4_T2	Problems related to work-life balance typical of the higher education sector.	5
O4_O3	Increasing availability of internships in organizations of selected non-academic sectors.	5	O4_T3	The phenomenon of negative mentoring, propagating bad habits and patterns (including ethical ones) among young researchers.	5
O4_O4	Penetrating good practices to the academic environment from other sectors and industries.	4	O4_T4	Volatility of universal law provisions defining the rules of academic development.	4
O4_O5	Increased flexibility of using the subsidy from public funds.	4	O4_T5	Low expenditures on higher education in Poland.	4
O4_O6	Extensive access to modern information and communication technologies.	4	O4_T6	Lack of age management solutions for the higher education sector.	3

3.5 Main objective 5

MAIN OBJECTIVE 5: Increasing the quality of university management, including the implementation of pro-quality organizational changes.					
CODE	STRENGTHS	GRADE	CODE	WEAKNESSES	GRADE
O5_S1	Administrative support units for the basic functions of the university.	5	O5_W1	Ineffective motivational system.	5
O5_S2	Integrated IT systems supporting management.	5	O5_W2	Incompatibility of the system of periodic evaluations to the needs of employees' professional development.	5
O5_S3	Stability of organizational procedures and decision-making.	4	O5_W3	Hierarchical model of organizational structure with limited flexibility and excessive organizational formalization.	5
O5_S4	Decentralization of the university management system.	4	O5_W4	Lack of integration of university management elements.	5
O5_S5	Model of managers' promotion based on experience.	4	O5_W5	Insufficient analytical support for strategic decision making processes.	4
O5_S6	Reflecting the university's social sensitivity in the organizational structure.	3	O5_W6	Insufficient embedding of strategies in internal and external conditions.	4

CODE	OPPORTUNITIES	GRADE	CODE	THREATS	GRADE
O5_O1	Digitization of the university.	5	O5_T1	Changes in the labor market reducing the relative attractiveness of work at the university.	5
O5_O2	Benchmarks in the field of efficient organizational solutions in prestigious universities.	5	O5_T2	Problems with adapting to changes in legal regulations.	5
O5_O3	Development of standards and good practices in the field of university management.	5	O5_T3	The increasing complexity and heterogeneity of external IT systems.	4
O5_O4	Megatrends in management.	4	O5_T4	Excessive focus on results in funding and university assessment systems.	4
O5_O5	Possibilities for diversifying the sources of university funding.	4	O5_T5	Excessive focus on project-based system related to university management.	3
O5_O6	Increased participation of external stakeholders in university management.	3	O5_T6	Greater ability to change of other national and foreign universities.	3

4. Analysis results concerning the identification of POBs (Priority research areas)

4.1. Matrix aggregating the results of the SWOT analysis in connection with the defined specific objectives, actions leading to the achievement of objectives and corresponding priority research areas

4.1.1. Strengths

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
COMPETENCES	5	Research competences of academic staff.	O1_S1	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.1. The growth of human capital and its greater use	New Blood, Incentives Program, R2R-Research to Research, Jagiellonian Fellowships Program, Jagiellonian Chairs Program, Labs
		Increasing efficiency in obtaining national and international grants.	O1_S2		1.3. Improving the efficiency of international fund-raising for research funding	Incentives Program, R2R-Research to Research, Outgoing Fund, Conferences & Seminars, Research Administration
		Employees' experience in managing international projects.	O2_S4		2.2. Enhanced participation of researchers from the Jagiellonian University in international research co-operation	Outgoing Fund, Young Labs Program, Incentives Program
		Internationalization of the educational process, including didactic offer in English.	O3_S1		3.2. Expanding the internationality of educational programmes, 6.1. Building the university brand and its international position	EduPrograms for the Future, EduTools, Talent Management, Jagiellonian Fellowship Program, Visibility Strategy, Skills #3, Sustainable University, Management

		Projects aimed at raising re- search, professional and lan- guage competences of stu- dents as well as didactic com- petences of academic teach- ers.	O3_S2		3.3. Development and implementa- tion of modern educational formats, 3.4. Design and implementation of mechanisms for attracting and fos- tering talented students and doctoral students	EduTools, EduPrograms for the Future, Talent Management, Skills #1, Gates - Space for science, Visibility Strategy
		Competences of the teaching staff and the optimal relation- ship of students to academic teachers.	O3_S5		3.3. Development and implementa- tion of modern educational formats	EduTools, EduPrograms for the Future, Talent Management, Skills #1, Gates - Space for science
		Leading places in national university rankings and dis- tinguishing assessment of the Polish Accreditation Commit- tee.	O3_S6		3.1. Expanding the interdiscipli- narity of educational programmes, 3.2. Expanding the internationality of educational programmes, 3.3. De- velopment and implementation of modern educational formats, 3.4. Design and implementation of mechanisms for attracting and fos- tering talented students and doctoral students	EduPrograms for the Future, EduTools, Skills #1, Talent Management, Labs, Gates - Space for science, Jagiellonian Fellowship Program, Visibility Strategy
		Experienced scientific staff constituting an appropriate re-	O4_S1		4.2. Design and implementation of mechanisms fostering the creation of young research leaders	Young Labs Program, Incentives Pro- gram, Labs, Gates - Space for science

		search and development environment for the development of young scientists.				
		Projects and programs for the development of employees' academic competences.	O4_S2		4.1. Improving the level of research and transversal competences of researchers	Skills #2, Individual Development Program, Incentives Program
		Focus of young scientists on continuous improvement of competences.	O4_S4		4.1. Improving the level of research and transversal competences of researchers, 4.2. Design and implementation of mechanisms fostering the creation of young research leaders	Skills #2, Individual Development Program, Incentives Program, Young Labs Program, Labs, Gates - Space for science
		Career management courses in study programs.	O4_S6		4.2. Design and implementation of mechanisms fostering the creation of young research leaders	Young Labs Program, Incentives Program, Labs, Gates - Space for science
SCIENTIFIC ACTIVITY	5	Publishing activity in the first quartile of the most-cited magazines.	O1_S3	SciMat, Anthropocene, BioS, DigiWorld, qLife,	1.1. The growth of human capital and its greater use, 1.2. Expansion of the research ecosystem	New Blood, Incentives Program, R2R-Research to Research, Jagiellonian Fellowships Program, Jagiellonian Chairs Program, Labs, Strategic Research Infrastructure #1 & #2

		The presence of many scientific disciplines creating the potential for interdisciplinary research.	O1_S5	FutureSoc, Heritage	1.4. Improving the openness of research and maximizing access to research results , 1.5. Improving the level of innovation, interdisciplinarity of research and the integration of University's mission	Open Access, Conferences & Seminars, Outgoing Fund, R2R-Research to Research, R2S-Research to Society, R2B-Research to Business, Labs, Gates - Space for science, Sustainable University
		The application character of conducted scientific research.	O1_S6		1.2. Expansion of the research ecosystem, 1.5. Improving the level of innovation, interdisciplinarity of research and the integration of University's mission, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	Strategic Research Infrastructure #1 & #2, R2R-Research to Research, R2B-Research to Business, R2S-Research to Society, Gates - Space for science, Labs, Sustainable University, Management, The Future University Lab
		Active participation in the work of international university networks.	O2_S1		2.3. Building sustainable and mutually beneficial research partnerships	R2B-Research to Business, Incentives Program, Outgoing Fund, Young Labs Program
		Measurable results of international research cooperation (publications and grants).	O2_S2		2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation, 2.3. Building sustainable and mutually beneficial research partnerships	Outgoing Fund, Young Labs Program, Incentives Program, R2B-Research to Business

		Recognition of selected scientists on the international arena.	O2_S3		2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation, 2.3. Building sustainable and mutually beneficial research partnerships, 6.1. Building the university brand and its international position	Outgoing Fund, Young Labs Program, Incentives Program, R2B-Research to Business, Visibility Strategy, Skills #3, Sustainable University, Management
		Authorship and co-authorship of students and doctoral students in international publications.	O3_S3		3.3. Development and implementation of modern educational formats, 3.4. Design and implementation of mechanisms for attracting and fostering talented students and doctoral students	EduTools, EduPrograms for the Future, Talent Management, Skills #1, Gates - Space for science, Visibility Strategy
ORGANIZATION AND MANAGEMENT	4	Specialized administrative units in the university structure supporting international cooperation.	O2_S5	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	2.1. Enhancing the role of young foreign scientists and experts in the activity of the University, 2.3. Building sustainable and mutually beneficial research partnerships, 6.1. Building the university brand and its international position	Jagiellonian Fellowship Program, Jagiellonian Chairs Program, R2B-Research to Business, Visibility Strategy, Skills #3, Sustainable University, Management

		Funding streams dedicated to various groups of employees, including young scientists.	O4_S3		4.1. Improving the level of research and transversal competences of researchers, 4.2. Design and implementation of mechanisms fostering the creation of young research leaders	Skills #2, Individual Development Program, Incentives Program, Young Labs Program, Labs, Gates - Space for science
		Administrative support units for the basic functions of the university.	O5_S1		5.2. Introduction of modern university management concepts	Management, Research Administration, Skills #3, Sustainable University, The Future University Lab
		Integrated IT systems supporting management.	O5_S2		5.2. Introduction of modern university management concepts, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	Management, Research Administration, Skills #3, Sustainable University, The Future University Lab
		Stability of organizational procedures and decision-making.	O5_S3			
		Decentralization of the university management system.	O5_S4		5.2. Introduction of modern university management concepts	Management, Research Administration, Skills #3, Sustainable University, The Future University Lab
		Model of managers' promotion based on experience.	O5_S5			
		Reflecting the university's social sensitivity in the organizational structure.	O5_S6		5.3. Design and implementation of strategic reflection mechanisms to	The Future University Lab, Management, Skills #3, Sustainable University, R2S-

					prepare the University for the challenges of the future, 6.3. Strengthening the social impact of the University	Research to Society, R2B-Research to Business, Visibility Strategy
TANGIBLE ASSETS	5	Infrastructure and scientific apparatus supporting research processes.	O1_S4	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.2. Expansion of the research ecosystem	Strategic Research Infrastructure #1 & #2
		Access to high-class teaching and scientific infrastructure.	O3_S4	SciMat, Anthropocene, BioS, DigiWorld, qLife, Heritage	3.1. Expanding the interdisciplinarity of educational programmes, 3.3. Development and implementation of modern educational formats	EduPrograms for the Future, EduTools, Skills #1, Talent Management, Labs, Gates - Space for science
		Access to a comprehensive didactic offer of the university as well as research infrastructure and equipment.	O4_S5	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc,	4.1. Improving the level of research and transversal competences of researchers, 4.2. Design and implementation of mechanisms fostering the creation of young research leaders	Skills #2, Individual Development Program, Incentives Program, Young Labs Program, Labs, Gates - Space for science

				Heritage		
RELATIONAL CAPITAL	4	Number of cooperation agreements concluded with foreign research centers.	O2_S6	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	2.1. Enhancing the role of young foreign scientists and experts in the activity of the University, 2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation, 2.3. Building sustainable and mutually beneficial research partnerships	Jagiellonian Fellowship Program, Jagiellonian Chairs Program, Outgoing Fund, Young Labs Program, Incentives Program, R2B-Research to Business

4.1.2 Weaknesses

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
COMPETENCES	4	Insufficient competence in building international relations.	O2_W5	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation, 2.3. Building sustainable and mutually beneficial research partnerships	Outgoing Fund, Young Labs Program, Incentives Program, R2B-Research to Business

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		Inadequate methodological training.	O4_W4	FutureSoc, Heritage	4.1. Improving the level of research and transversal competences of researchers	Skills #2, Individual Development Program, Incentives Program
SCIENTIFIC ACTIVITIES	4	Publishing activity in the first decile of the most-cited magazines.	O1_W1	SciMat, FutureSoc, Heritage	1.1. The growth of human capital and its greater use, 1.2. Expansion of the research ecosystem	New Blood, Incentives Program, R2R-Research to Research, Jagiellonian Fellowships Program, Jagiellonian Chairs Program, Labs, Strategic Research Infrastructure #1 & #2
		Low activity in obtaining prestigious international grants and their low number currently.	O1_W2	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.3. Improving the efficiency of international fund-raising for research funding	Incentives Program, R2R-Research to Research, Outgoing Fund, Conferences & Seminars, Research Administration
		The tendency to conduct research individually and in narrow thematic areas of minor importance for the progress of science.	O1_W3	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc,	1.4. Improving the openness of research and maximizing access to research results , 1.5. Improving the level of innovation, interdisciplinarity of research and the integration of University's mission	Open Access, Conferences & Seminars, Outgoing Fund, R2R-Research to Research, R2S-Research to Society, R2B-Research to Business, Labs, Gates - Space for science, Sustainable University

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		The percentage of employees undertaking the challenge of participating in international research teams.	O2_W4	Heritage	2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation	Outgoing Fund, Young Labs Program, Incentives Program
		Low mobility of academic staff.	O3_W6		3.2. Expanding the internationality of educational programmes	EduPrograms for the Future, EduTools, Talent Management, Jagiellonian Fellowship Program, Visibility Strategy
ORGANIZATION AND MANAGEMENT	4	Too much workload regarding didactic and administrative activities.	O1_W5	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.1. The growth of human capital and its greater use, 1.5. Improving the level of innovation, interdisciplinarity of research and the integration of University's mission	New Blood, Incentives Program, R2R-Research to Research, Jagiellonian Fellowships Program, Jagiellonian Chairs Program, Labs, R2B-Research to Business, R2S-Research to Society, Gates - Space for science, Labs, Sustainable University
		Age and hierarchical structure of the scientific staff.	O1_W6			
		Low attractiveness of the university offer for foreign researchers.	O2_W1		2.1. Enhancing the role of young foreign scientists and experts in the activity of the University, 6.1. Building the university brand and its international position	Jagiellonian Fellowship Program, Jagiellonian Chairs Program, Visibility Strategy, Skills #3, Sustainable University, Management

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		Low intensity and effectiveness of activities promoting the research results and the university's scientific offer.	O2_W2		2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation, 6.1. Building the university brand and its international position	Outgoing Fund, Young Labs Program, Incentives Program, Visibility Strategy, Skills #3, Sustainable University, Management
		Dominance of pre-defined study programs limiting the individual approach to building learning paths.	O3_W1		3.1. Expanding the interdisciplinarity of educational programmes	EduPrograms for the Future, EduTools, Skills #1, Talent Management, Labs, Gates - Space for science
		Lack of incentives to improve the quality of didactic work in the university's motivational system.	O3_W2		3.3. Development and implementation of modern educational formats	EduTools, EduPrograms for the Future, Talent Management, Skills #1, Gates - Space for science
		Insufficient scholarship offer and lack of system activities for competing for the best candidates.	O3_W3		3.2. Expanding the internationality of educational programmes, 3.4. Design and implementation of mechanisms for attracting and fostering talented students and doctoral students, 6.1. Building the university brand and its international position	EduPrograms for the Future, EduTools, Talent Management, Jagiellonian Fellowship Program, Visibility Strategy, Skills #1, Skills #3, Sustainable University, Management

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		Lack of system solutions in the field of talent management.	O3_W4		3.4. Design and implementation of mechanisms for attracting and fostering talented students and doctoral students	Talent Management, Skills #1, EduPrograms for the Future, EduTools, Visibility Strategy
		Lack of needs analysis and satisfaction surveys of employees.	O4_W1		4.1. Improving the level of research and transversal competences of researchers, 4.2. Design and implementation of mechanisms fostering the creation of young research leaders	Skills #2, Individual Development Program, Incentives Program, Young Labs Program, Labs, Gates - Space for science
		Lack of mentoring programs for young scientists.	O4_W2			
		The subordination of the path of development to scientific advancement.	O4_W3			
		Lack of programs to stimulate the mobility of young scientists.	O4_W5		4.2. Design and implementation of mechanisms fostering the creation of young research leaders, 4.3. Design of a system enabling acquisition and fostering of competences related to cooperation with the social and economic environment	Young Labs Program, Incentives Program, Labs, Gates - Space for science, R2B-Research to Business, R2S-Research to Society, Sustainable University

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		Ineffective motivational system.	O5_W1		5.2. Introduction of modern university management concepts, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	Management, Research Administration, Skills #3, Sustainable University, The Future University Lab
		Incompatibility of the system of periodic evaluations to the needs of employees' professional development.	O5_W2			
		Hierarchical model of organizational structure with limited flexibility and excessive organizational formalization.	O5_W3			
		Lack of integration of university management elements.	O5_W4			
		Insufficient analytical support for strategic decision making processes.	O5_W5		5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	The Future University Lab, Management, Skills #3, Sustainable University

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		Insufficient embedding of strategies in internal and external conditions.	O5_W6		5.1. Expanding internationalisation of the university's management process, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	Research Administration, Skills #3, Sustainable University, The Future University Lab, Management, Visibility Strategy, R2B-Research to Business, R2S-Research to Society, Gates - Space for science
TANGIBLE ASSETS	4	Lack of funding for research carried out as part of the preparation of diploma theses.	O3_W5	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	3.3. Development and implementation of modern educational formats, 3.4. Design and implementation of mechanisms for attracting and fostering talented students and doctoral students	EduTools, EduPrograms for the Future, Talent Management, Skills #1, Gates - Space for science, Visibility Strategy
RELATIONAL CAPITAL	4	Insufficient cooperation with external stakeholders, in particular from the business environment.	O1_W4	Anthropocene, BioS, qLife, FutureSoc, Heritage	1.4. Improving the openness of research and maximizing access to research results, 1.5. Improving the level of innovation, interdisciplinarity of research and the integration	Open Access, Conferences & Seminars, Outgoing Fund, R2R-Research to Research, R2S-Research to Society, R2B-Research to Business, Labs, Gates - Space

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
					of University's mission, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments, 6.3. Strengthening the social impact of the University	for science, Sustainable University, Management, The Future University Lab, Visibility Strategy
		Image and recognition of the university brand and individual scientific disciplines on the international arena.	O2_W3	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation, 6.1. Building the university brand and its international position	Outgoing Fund, Young Labs Program, Incentives Program, Visibility Strategy, Skills #3, Sustainable University, Management
		A small range of cooperation with international corporations.	O2_W6	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc	2.3. Building sustainable and mutually beneficial research partnerships, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	R2B-Research to Business, Incentives Program, Outgoing Fund, Young Labs Program, Sustainable University, R2B-Research to Business, R2S-Research to Society, Gates - Space for science, Management, The Future University Lab

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		Lack of professional support programs in non-academic organizations.	O4_W6	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	4.3. Design of a system enabling acquisition and fostering of competences related to cooperation with the social and economic environment, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	R2B-Research to Business, R2S-Research to Society, Gates - Space for science, Sustainable University, Management, The Future University Lab

4.1.3 Opportunities

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
POLITICS (FINANCES AND LAW)	5	National scientific policy preferring concentration of inputs in the best research units.	O1_O2	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.1. The growth of human capital and its greater use, 1.2. Expansion of the research ecosystem, 1.3. Improving the efficiency of international fund-raising for research funding, 1.5. Improving the level of innovation, interdisciplinarity of research and the integration of University's mission	New Blood, Incentives Program, R2R-Research to Research, Jagiellonian Fellowships Program, Jagiellonian Chairs Program, Labs, Strategic Research Infrastructure #1 & #2, Outgoing Fund, Conferences & Seminars, Research Administration, R2B-Research to Business, R2S-Research to Society, Gates - Space for science, Sustainable University

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		Recommendations of the European Commission regarding the development of research and teaching staff as well as international standards stimulating scientific development of university employees.	O4_O2		4.1. Improving the level of research and transversal competences of researchers, 4.2. Design and implementation of mechanisms fostering the creation of young research leaders, 4.3. Design of a system enabling acquisition and fostering of competences related to cooperation with the social and economic environment	Skills #2, Individual Development Program, Incentives Program, Young Labs Program, Labs, Gates - Space for science, R2B-Research to Business, R2S-Research to Society, Sustainable University
		Increased flexibility of using the subsidy from public funds.	O4_O5			
		Possibilities for diversifying the sources of university funding.	O5_O5		5.2. Introduction of modern university management concepts	Management, Research Administration, Skills #3, Sustainable University, The Future University Lab
SYSTEM	4	Participation of doctoral schools in research processes.	O1_O6	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.1. The growth of human capital and its greater use, 1.4. Improving the openness of research and maximizing access to research results	New Blood, Incentives Program, R2R-Research to Research, Jagiellonian Fellowships Program, Jagiellonian Chairs Program, Labs, Open Access, Conferences & Seminars, Outgoing Fund, R2R-Research to Research, R2S-Research to Society, R2B-Research to Business

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		National and international programs supporting the development of academic staff.	O4_O1		4.1. Improving the level of research and transversal competences of researchers, 4.2. Design and implementation of mechanisms fostering the creation of young research leaders, 4.3. Design of a system enabling acquisition and fostering of competences related to cooperation with the social and economic environment	Skills #2, Individual Development Program, Incentives Program, Young Labs Program, Labs, Gates - Space for science, R2B-Research to Business, R2S-Research to Society, Sustainable University
		Development of standards and good practices in the field of university management.	O5_O3		5.1. Expanding internationalisation of the university's management process, 5.2. Introduction of modern university management concepts, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future 6.3. Strengthening the social impact of the University	Research Administration, Skills #3, Sustainable University, The Future University Lab, Management, Visibility Strategy, Management, R2S-Research to Society, R2B-Research to Business

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		Increased participation of external stakeholders in university management.	O5_O6		5.1. Expanding internationalisation of the university's management process, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	Research Administration, Skills #3, Sustainable University, The Future University Lab, Management, Visibility Strategy
TRENDS	5	Dynamic development of selected sectors and industries related to the directions of scientific research.	O1_O1	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.4. Improving the openness of research and maximizing access to research results, 1.5. Improving the level of innovation, interdisciplinarity of research and the integration of University's mission, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	Open Access, Conferences & Seminars, Outgoing Fund, R2R-Research to Research, R2S-Research to Society, R2B-Research to Business, Labs, Gates - Space for science, Sustainable University, Management, The Future University Lab
		Social and economic trends stimulating the demand for research.	O1_O4		1.3. Improving the efficiency of international fund-raising for research funding, 1.5. Improving the level of innovation, interdisciplinarity of research and the integration of University's mission, 6.2. Evolution of	Incentives Program, R2R-Research to Research, Outgoing Fund, Conferences & Seminars, Research Administration, R2B-Research to Business, R2S-Re-

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
					strategic partnerships with institutions from the social and economic environments	search to Society, Gates - Space for science, Labs, Sustainable University, Management, The Future University Lab
		Correlation of university research areas with priorities in European and world science.	O2_O1		2.1. Enhancing the role of young foreign scientists and experts in the activity of the University, 2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation, 2.3. Building sustainable and mutually beneficial research partnerships, 6.1. Building the university brand and its international position	Jagiellonian Fellowship Program, Jagiellonian Chairs Program, Outgoing Fund, Young Labs Program, Incentives Program, R2B-Research to Business, Visibility Strategy, Skills #3, Sustainable University, Management
		Emerging research areas of a global character.	O2_O2			
		Increased interest in studies in Poland, in the countries of Eastern Europe and Central Asia.	O3_O6		3.2. Expanding the internationality of educational programmes, 6.1. Building the university brand and its international position	EduPrograms for the Future, EduTools, Talent Management, Jagiellonian Fellowship Program, Visibility Strategy, Skills #3, Sustainable University, Management
		Penetrating good practices to the academic environment from other sectors and industries.	O4_O4		4.3. Design of a system enabling acquisition and fostering of competences related to cooperation with	R2B-Research to Business, R2S-Research to Society, Gates - Space for science, Sustainable University, Management, The Future University Lab

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
					the social and economic environment, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	
		Benchmarks in the field of efficient organizational solutions in prestigious universities.	O5_O2		5.1. Expanding internationalisation of the university's management process, 5.2. Introduction of modern university management concepts, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future, 6.1. Building the university brand and its international position	Research Administration, Skills #3, Sustainable University, The Future University Lab, Management, Visibility Strategy
		Megatrends in management.	O5_O4		5.2. Introduction of modern university management concepts, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	Management, Research Administration, Skills #3, Sustainable University, The Future University Lab

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
RELATIONSHIPS AND COOPERATION	5	Development of cooperation with world-leading research centers.	O1_O3	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.2. Expansion of the research ecosystem, 1.3. Improving the efficiency of international fund-raising for research funding, 1.4. Improving the openness of research and maximizing access to research results, 6.1. Building the university brand and its international position	Strategic Research Infrastructure #1 & #2, Incentives Program, R2R-Research to Research, Outgoing Fund, Conferences & Seminars, Research Administration, Visibility Strategy, Skills #3, Sustainable University, Management
		The unique industrial surroundings of Cracow and the cooperation of the university with companies from the high-tech industry.	O1_O5	SciMat, DigiWorld, Heritage, BioS, qLife	1.2. Expansion of the research ecosystem, 1.4. Improving the openness of research and maximizing access to research results, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	Strategic Research Infrastructure #1 & #2, Open Access, Conferences & Seminars, Outgoing Fund, R2R-Research to Research, R2S-Research to Society, R2B-Research to Business, Labs, Sustainable University, Gates - Space for science, Management, The Future University Lab
		The development of international university networks focused on conducting research.	O2_O3	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc,	2.3. Building sustainable and mutually beneficial research partnerships, 6.1. Building the university brand and its international position	R2B-Research to Business, Incentives Program, Outgoing Fund, Young Labs Program, Visibility Strategy, Skills #3, Sustainable University, Management
		The attractiveness of Cracow's location in terms of	O2_O5			

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		transport, culture and the business environment.		Heritage	2.1. Enhancing the role of young foreign scientists and experts in the activity of the University, 6.1. Building the university brand and its international position, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	Jagiellonian Fellowship Program, Jagiellonian Chairs Program, Visibility Strategy, Skills #3, Sustainable University, Management, R2B-Research to Business, R2S-Research to Society, Gates - Space for science, The Future University Lab
		Decreasing cultural and language barrier.	O2_O6			
		The location of the university surrounded by a technological park and scientific research institutions.	O3_O2	SciMat, BioS, DigiWorld, qLife, FutureSoc	3.1. Expanding the interdisciplinarity of educational programmes, 3.3. Development and implementation of modern educational formats, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	EduPrograms for the Future, EduTools, Skills #1, Talent Management, Labs, Gates - Space for science, Sustainable University, R2B-Research to Business, R2S-Research to Society, Management, The Future University Lab
		A direct business environment offering attractive jobs for graduates.	O3_O3	SciMat, BioS, DigiWorld, qLife, FutureSoc, Heritage	3.4. Design and implementation of mechanisms for attracting and fostering talented students and doctoral students, 6.2. Evolution of strategic partnerships with institutions from	Talent Management, Skills #1, EduPrograms for the Future, EduTools, Visibility Strategy

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
					the social and economic environments	
		Development of didactic cooperation with the external environment.	O3_O4	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	3.3. Development and implementation of modern educational formats, 6.1. Building the university brand and its international position, 6.3. Strengthening the social impact of the University	EduTools, EduPrograms for the Future, Talent Management, Skills #1, Gates - Space for science, Visibility Strategy, Skills #3, Sustainable University, Management, R2S-Research to Society, R2B-Research to Business, The Future University Lab, Visibility Strategy
		National and international programs and initiatives popularizing studying at the Jagiellonian University.	O3_O5		3.4. Design and implementation of mechanisms for attracting and fostering talented students and doctoral students, 6.1. Building the university brand and its international position	Talent Management, Skills #1, EduPrograms for the Future, EduTools, Visibility Strategy, Skills #3, Sustainable University, Management
		Increasing availability of internships in organizations of selected non-academic sectors.	O4_O3		4.3. Design of a system enabling acquisition and fostering of competences related to cooperation with the social and economic environment	R2B-Research to Business, R2S-Research to Society, Gates - Space for science, Sustainable University

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
TECHNOLOGIES	5	The development of information technologies facilitating the establishment of international contacts and communication between researchers.	O2_O4	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	2.1. Enhancing the role of young foreign scientists and experts in the activity of the University, 2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation	Jagiellonian Fellowship Program, Jagiellonian Chairs Program, Outgoing Fund, Young Labs Program, Incentives Program
		The use of advanced modern technologies in teaching.	O3_O1		3.3. Development and implementation of modern educational formats	EduTools, EduPrograms for the Future, Talent Management, Skills #1, Gates - Space for science
		Extensive access to modern information and communication technologies.	O4_O6		4.1. Improving the level of research and transversal competences of, 6.1. Building the university brand and its international position	Skills #2, Individual Development Program, Incentives Program, Visibility Strategy, Skills #3, Sustainable University, Management
		Digitization of the university.	O5_O1		5.1. Expanding internationalisation of the university's management process, 5.2. Introduction of modern university management concepts, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	Research Administration, Skills #3, Sustainable University, The Future University Lab, Management, Visibility Strategy

4.1.4. Threats

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
POLITICS (FINANCES AND LAW)	4	Supply of funds for scientific research in Poland in relation to other European Union countries and low total value of expenditure on science.	O1_T1	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.3. Improving the efficiency of international fund-raising for research funding, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	Incentives Program, R2R-Research to Research, Outgoing Fund, Conferences & Seminars, Research Administration, Sustainable University, R2B-Research to Business, R2S-Research to Society, Gates - Space for science, Management, The Future University Lab
		Lack of stability of legal regulations concerning higher education.	O1_T5		1.5. Improving the level of innovation, interdisciplinarity of research and the integration of University's mission	R2R-Research to Research, R2B-Research to Business, R2S-Research to Society, Gates - Space for science, Labs, Sustainable University
		Formal and legal difficulties and lack of financial support programs for researchers from abroad.	O2_T1		2.1. Enhancing the role of young foreign scientists and experts in the activity of the University, 6.1. Building the university brand and its international position	Jagiellonian Fellowship Program, Jagiellonian Chairs Program, Visibility Strategy, Skills #3, Sustainable University, Management
		The risk of divergence of Poland's economic and foreign policy with the general global trends.	O2_T5		2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation, 6.1.	Outgoing Fund, Young Labs Program, Incentives Program, Visibility Strategy, Skills #3, Sustainable University, Management

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
					Building the university brand and its international position	
		Taking over the most talented graduates of the first degree studies through the labor market.	O3_T6		3.4. Design and implementation of mechanisms for attracting and fostering talented students and doctoral students, 6.1. Building the university brand and its international position	Talent Management, Skills #1, EduPrograms for the Future, EduTools, Visibility Strategy, Skills #3, Sustainable University, Management
		Variability of universal law provisions defining the rules of academic development.	O4_T4		4.1. Improving the level of research and transversal competences of researchers, 4.2. Design and implementation of mechanisms fostering the creation of young research leaders, 4.3. Design of a system enabling acquisition and fostering of competences related to cooperation with the social and economic environment, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	Skills #2, Individual Development Program, Incentives Program, Young Labs Program, Labs, Gates - Space for science, R2B-Research to Business, R2S-Research to Society, Sustainable University, Management, The Future University Lab
		Low expenditures on higher education in Poland.	O4_T5			

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		Problems with adapting to changes in legal regulations.	O5_T2		5.3. Development and implementation of strategic reflection mechanisms preparing the university for the challenges of the future	The Future University Lab, Management, Skills #3, Sustainable University
SYSTEM	4	A systemic problem of the retention of talented researchers, especially young scientists.	O1_T2	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.1. The growth of human capital and its greater use, 1.3. Improving the efficiency of international fund-raising for research funding, 6.1. Building the university brand and its international position	New Blood, Incentives Program, R2R-Research to Research, Jagiellonian Fellowships Program, Jagiellonian Chairs Program, Labs, Outgoing Fund, Conferences & Seminars, Research Administration, Visibility Strategy, Skills #3, Sustainable University, Management
		The lack of international aspirations of Polish science and benchmarking focused on the domestic market.	O1_T4		1.3. Improving the efficiency of international fund-raising for research funding, 6.1. Building the university brand and its international position	Incentives Program, R2R-Research to Research, Outgoing Fund, Conferences & Seminars, Research Administration, Visibility Strategy, Skills #3, Sustainable University, Management
		The weak position of Polish scientific journals on the international arena.	O1_T6		1.4. Improving the openness of research and maximizing access to research results	Open Access, Conferences & Seminars, Outgoing Fund, R2R-Research to Research, R2S-Research to Society, R2B-Research to Business, Labs

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		The abundance of competing scientific centers.	O2_T3		2.3. Building sustainable and mutually beneficial research partnerships, 6.1. Building the university brand and its international position, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	R2B-Research to Business, Incentives Program, Outgoing Fund, Young Labs Program, Visibility Strategy, Skills #3, Sustainable University, Management, University, R2S-Research to Society, Gates - Space for science, The Future University Lab
		Less and less scholarships for researchers from Central Europe.	O2_T6		2.2. Enhanced participation of researchers from the Jagiellonian University in international research cooperation, 2.3. Building sustainable and mutually beneficial research partnerships	Outgoing Fund, Young Labs Program, Incentives Program, R2B-Research to Business
		Increasing bureaucratisation of didactic processes and the associated risk of petrification of teaching content.	O3_T1		3.1. Expanding the interdisciplinarity of educational programmes	EduPrograms for the Future, EduTools, Skills #1, Talent Management, Labs, Gates - Space for science
		Lack of support programs for outstanding students adequate to the current assumptions of educational processes.	O3_T2		3.4. Design and implementation of mechanisms for attracting and fostering talented students and doctoral students	Talent Management, Skills #1, EduPrograms for the Future, EduTools, Visibility Strategy

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		Insufficient level of preparation of secondary school graduates for university studies.	O3_T3		3.2. Expanding the internationality of educational programmes, 3.4. Design and implementation of mechanisms for attracting and fostering talented students and doctoral students, 6.1. Building the university brand and its international position	EduPrograms for the Future, EduTools, Talent Management, Jagiellonian Fellowship Program, Visibility Strategy, Skills #1, Skills #3, Sustainable University, Management
		System and legal solutions limiting flexibility in creating study programs.	O3_T5		3.1. Expanding the interdisciplinarity of educational programmes	EduPrograms for the Future, EduTools, Skills #1, Talent Management, Labs, Gates - Space for science
		Incommensurability of salaries of scientific employees in relation to the expected results at the highest global level.	O4_T1		4.1. Improving the level of research and transversal competences of researchers, 4.2. Design and implementation of mechanisms fostering the creation of young research leaders, 4.3. Design of a system enabling acquisition and fostering of competences related to cooperation with the social and economic environment	Skills #2, Individual Development Program, Incentives Program, Young Labs Program, Labs, Gates - Space for science, R2B-Research to Business, R2S-Research to Society, Sustainable University
		Problems related to work-life balance typical of the higher education sector.	O4_T2			
		The phenomenon of negative mentoring, propagating bad	O4_T3			Young Labs Program, Incentives Program, Labs, Gates - Space for science

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
		habits and patterns (including ethical ones) among young researchers.			4.2. Design and implementation of mechanisms fostering the creation of young research leaders	
		Lack of age management solutions for the higher education sector.	O4_T6			
		Excessive focus on results in funding and university assessment systems.	O5_T4		5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	The Future University Lab, Management, Skills #3, Sustainable University
		Excessive focus on projects related to university management.	O5_T5		5.2. Introduction of modern university management concepts, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	Management, Research Administration, Skills #3, Sustainable University, The Future University Lab
		Greater ability to change other national and foreign universities.	O5_T6		5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	The Future University Lab, Management, Skills #3, Sustainable University

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
TRENDS	5	The emergence of new competitive geographical regions of research interest.	O2_T2	Anthropocene, FutureSoc, Heritage	2.1. Enhancing the role of young foreign scientists and experts in the activity of the University, 2.3. Building sustainable and mutually beneficial research partnerships, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	Jagiellonian Fellowship Program, Jagiellonian Chairs Program, R2B-Research to Business, Incentives Program, Outgoing Fund, Young Labs Program, Sustainable University, R2S-Research to Society, Gates - Space for science, Management, The Future University Lab
		Increased isolationist moods.	O2_T4	FutureSoc, Heritage	2.1. Enhancing the role of young foreign scientists and experts in the activity of the University, 2.3. Building sustainable and mutually beneficial research partnerships, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	Jagiellonian Fellowship Program, Jagiellonian Chairs Program, R2B-Research to Business, Incentives Program, Outgoing Fund, Young Labs Program, Sustainable University, R2S-Research to Society, Gates - Space for science, Management, The Future University Lab
		Expectations of the labor market regarding the competences of university graduates.	O3_T4	SciMat, Anthropocene, BioS, DigiWorld, qLife,	3.1. Expanding the interdisciplinarity of educational programmes, 3.2. Expanding the internationality of educational programmes, 3.3. Development and implementation of modern educational	EduPrograms for the Future, EduTools, Skills #1, Talent Management, Labs, Gates - Space for science, Jagiellonian Fellowship Program, Visibility Strategy

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
				FutureSoc, Heritage	formats, 3.4. Design and implementation of mechanisms for attracting and fostering talented students and doctoral students, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	
		Changes in the labor market reducing the relative attractiveness of work at the university.	05_T1		5.1. Expanding internationalisation of the university's management process, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	Research Administration, Skills #3, Sustainable University, The Future University Lab, Management, Visibility Strategy
RELATIONSHIPS AND COOPERATION	3	Competitive pressure from selected scientific centers.	O1_T3	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	1.1. The growth of human capital and its greater use, 1.2. Expansion of the research ecosystem 1.3. Improving the efficiency of international fund-raising for research funding, 6.1. Building the university brand and its international position, 6.2. Evolution of strategic partnerships with institutions from the social and economic environments	New Blood, Incentives Program, R2R-Research to Research, Jagiellonian Fellowships Program, Jagiellonian Chairs Program, Labs, Strategic Research Infrastructure #1 & #2, R2R-Research to Research, Outgoing Fund, Conferences & Seminars, Research Administration, Visibility Strategy, Skills #3, Sustainable

CATEGORY OF FACTORS	GRADE	RELATED DETAILED FACTORS	FACTOR CODE	CORRESPONDING POBs	CORRESPONDING DETAILED OBJECTIVES	RELATED ACTIONS
						ble University, Management, R2B-Research to Business, R2S-Research to Society, Gates - Space for science, The Future University Lab
TECHNOLOGIES	4	The increasing complexity and heterogeneity of external IT systems.	O5_T3	SciMat, Anthropocene, BioS, DigiWorld, qLife, FutureSoc, Heritage	5.2. Introduction of modern university management concepts, 5.3. Design and implementation of strategic reflection mechanisms to prepare the University for the challenges of the future	Management, Research Administration, Skills #3, Sustainable University, The Future University Lab

4.2. Detailed justification of POBs identification as a result of the SWOT analysis results

4.2.1. SciMat

Selected data justifying POB (Priority Research Area)

Code	Factors in SWOT analysis	Selected detailed data justifying SciMat POB
Strengths		
O1_S1	Research competence of the academic staff	The faculties have the category A + MNiSW (Faculty of Physics, Astronomy and Applied Computer Science A +, Faculty of Chemistry A +, Faculty of Mathematics and Computer Science A +). According to Scopus, the normalized citation rate for 2013-2017 is generally 1.50 for a university, and the same aggregate indicator for categories assigned to POB is 1.00.
O1_S2	Increasing efficiency in obtaining national and international grants.	In general, for the Jagiellonian University: In the years 2014-2018, it is possible to observe upward trends in the number of research projects commenced in particular years, this applies to the total number of research projects, the number of international projects and the number of projects under the Horizon 2020 Program. The number of research projects started in 2014-2018 amounted to 308, 248, 302, 351, 331 (+35), respectively. The number of international projects launched in the years 2014-2018 was 23, 18, 34, 19, 30 respectively. The number of projects of the Horizon 2020 Program in the years 2014-2018 amounted to: 0, 5, 3, 5, 10.
O1_S3	Publishing activity in the first quartile of the most-cited magazines.	In general, for the Jagiellonian University, the value of the item index in the first quartile in 2013-2017 is 53.1%. The value of the aggregate ratio for the categories assigned to the OP for the period 2013-2017 is 62.8%.
O1_S4	Infrastructure and scientific apparatus supporting research processes.	In accordance with the list of high-value infrastructure, the apparatus, for example, XTAL LAB SYNERGY-S (Department of Chemistry) mono crystalline diffractometer (SOLARIS Center).

Code	Factors in SWOT analysis	Selected detailed data justifying SciMat POB
O1_S5	The presence of many scientific disciplines that creates the potential for interdisciplinary research.	According to experts, currently research on new materials requires complementary activities in the fields of physics, chemistry, mathematics and computer science, and all these areas are represented by the faculties of the Jagiellonian University: Faculty of Physics, Astronomy and Applied Computer Science, Faculty of Chemistry, Faculty of Mathematics and Computer Science.
O2_S1	Active participation in the work of international university networks.	Membership of the Jagiellonian University in, among others: Coimbra Group, The GUILD.
O2_S2	Measurable results of international research cooperation (publications and grants).	According to Scopus, the percentage of scientific articles in international cooperation for the years 2013-2017 aggregated for the categories assigned to POB is 44.60%, while the normalized quotation rate for scientific articles in international cooperation 2013-2017 is 1.21. In the UJ scale (the list does not include CM) in 2014-2018, 248 international projects were completed, including mainly research and education projects. In this group there are 10 research projects related to the trends identified in the SWOT analysis chances and which justify the selection of POB. For example: Generation of energy from diversified sources for the sustainable and efficient exploitation of coal. New materials for the power industry. Multifunctional molecular magnets through cyanide chemistry. Experimental investigation and modeling of nanoscale solid state reactions with high technological impact. Simulations of Quantum Insulators and Conductors. Zero and ultra-low field nuclear magnetic resonance.
O2_S3	Recognition of selected scientists on the international arena.	Achievements and cooperation of the most outstanding scientists, including: Professor dr hab. Michał A. Oleś (permanent reviewer in the best magazines, eg PRB, PRL, New J. Phys., Nature Materials,

Code	Factors in SWOT analysis	Selected detailed data justifying SciMat POB
		Sci. Reports, repeatedly consulted by the Nobel Prize Committees, laureate of foreign scientific awards, including Humboldt-Forschungspreis (2018), Deutsche Physikalische Gesellschaft (DPG), Marian Smoluchowski-Emil Warburg (2017). Professor dr hab. Marek Szymonski (Polish Representative (Councillor 2004-2007 and 2010-2013) First Deputy (Alternate Councilor 2001-2004 and 2007-2009) in the Executive Committee of the International Union of Sciences "Int. Union for Vacuum Science, Technology and Applications (IUVSTA)", Chairman of the Commission of European Representatives in the International Union of IUVSTA (2004-2007), a reviewer in prestigious magazines such as ACS Nano, Physical Review B, Physical Review Letters, Nanotechnology, Journal of Physics C). Professor dr hab. Zbigniew Blocki (repeatedly invited with guest lectures to renowned research centers, including Princeton, Harvard, Colombia, Member of the Management Council of Science Europe since 2015, from 2015 Director of the National Science Center, in 2006 and 2013 he was a visiting professor at Indiana University) . Professor dr hab. Grażyna Stochel (member of the Coimbra Chemistry Center Advisory Board). Professor dr hab. Zbigniew Sojka (Member of the Scientific Council of the journal Research of Chemical Intermediates (Springer)).
O2_S4	Employees' experience in managing international projects.	In 2014-2018, the Jagiellonian University staff were managers in 16 major international projects, in which the Jagiellonian University has a leading position (including the faculties: Mathematics and Information Technology, Physics, Astronomy and Applied Computer Science). In addition, during the period other than the above, the employees held managerial positions in various international projects. Sample experience: Professor dr hab. Stanisław Migórski, 'LIDER', nonlinear inclusions and hemivariational inequalities and their applications

Code	Factors in SWOT analysis	Selected detailed data justifying SciMat POB
		in contact mechanics; as well as Nonsmooth Contact Dynamics - 'CONMECH'. Professor dr hab. Rafal Abdank-Kozubski, 'LIDER', Experimental investigation and modeling of nanoscale solid state reactions with high technological impact. Dr hab. Szymon Pustelny, 'LIDER', Zero and ultra-low field nuclear magnetic resonance. Professor dr hab. Marek Szymonski (7FP EU Cooperation ICT, FP7-610446-CollaborativeProject, "PAMS", head of the Polish research team 2013 - 2017).
O2_S6	Number of cooperation agreements concluded with foreign research centers.	At the level of the Jagiellonian University, the number of international agreements (as of 01/04/2019): 343 bilateral agreements, 1567 Erasmus + KA 103, 48 Erasmus + Ka 107 contracts.
O3_S1	Internationalization of the educational process, including didactic offer in English.	Generally at the Jagiellonian University: In 2016/2017 and 2017/2018, the number of students leaving for a period of at least 3 months increased from 792 to 815, and students coming for a period of at least 3 months increased from 933 to 1029. In the years 2016/2017 and 2017/2018, the number of doctoral students leaving for a period of at least 3 months increased from 87 to 111, and doctoral students coming for a period of at least 3 months increased from 21 to 28. In 2016/2017 and 2017/2018, the number of outgoing academic teachers (irrespective of the duration of mobility) increased from 1295 to 1574, and incoming academic teachers (regardless of the duration of mobility) increased from 152 to 158.
O3_S4	Access to high-class teaching and scientific infrastructure.	Modern scientific and research infrastructure at the Third Campus of the Jagiellonian University (e.g. Faculty of Physics, Astronomy and Applied Computer Science, Faculty of Chemistry, Faculty of Mathematics and Computer Science).

Code	Factors in SWOT analysis	Selected detailed data justifying SciMat POB
O3_S6	Leading places in national university rankings and distinguishing assessment of the Polish Accreditation Committee	• Shanghai ranking: Astronomy, physics: 201-300; Environmental protection 201-300; Chemistry: 301-400. • QS World University Rankings: Chemistry: 351-400, Astronomy, physics: 251-300. • Place in the Outlook of Prospects 2018: Chemistry: 1. • Polish Accreditation Commission: distinctive assessment (Chemistry, Environmental Protection).
Weaknesses		
O1_W1	Publishing activity in the first decile of the most-cited magazines.	Aggregate indicators for the categories assigned to POB: percentage of scientific articles in the upper decile of 2013-2017 9.80% (Scopus), number of scientific articles in the upper decile: 347 (Scopus).
Opportunities		
O1_O1	Dynamic development of selected sectors and industries related to the directions of scientific research.	According to experts, there is a dynamic development of advanced materials, which is based on one hand on the synthesis and analysis of the properties of new materials, and on the other hand on new mathematical tools supported by the development of information technology and algorithms. This scope is related to the directions of research at the faculties, including the research directions of the most outstanding scholars such as Prof. dr hab. Michał A. Oleś, Professor dr hab. Marek Szymonski, Prof. dr hab. Zbigniew Błocki, Professor dr hab. Grażyna Stochel Professor dr hab. Zbigniew Sojka.
O1_O3	Development of cooperation with world-leading research centers.	So far, the cooperation with many centers and teams, including those from the Shanghai list, e.g., University of Bologna, University of Lund, University of Milan, University of Shenyang, Indiana University, Bloomington (USA), University of Basel, Max Planck Institute for Research Permanent Stages (Stuttgart), Donostia International Physics Center, DIPC & Center for Materials Physics CSIC-UPV / EHU (Donostia-San Sebastián).

Code	Factors in SWOT analysis	Selected detailed data justifying SciMat POB
O1_O4	Social and economic trends stimulating the demand for research.	According to experts, civilization development is becoming more and more dependent on the development of new technologies, and these are largely based on the use of new advanced materials.
O1_O5	The unique industrial surroundings of Krakow and the cooperation of the university with companies from the high-tech industry.	Krakow is one of the leading places in Poland favorable to the creation of startups with numerous special economic zones (e.g. managed by KPT), spaces for coworking and many capital funds, including seed funds (e.g. Innoventure, Augere, ABAN, HumanAlfa). Examples of companies are InnoEnergy, ABB, cooperation with Nitoms, employee spin-out companies, e.g. InPhoCat, MarCelli.
O1_O6	Participation of doctoral schools in research processes.	Doctoral programs: Physics, Chemistry, Mathematics, Informatics
O2_O1	Correlation of university research areas with priorities in European and world science.	Publishing and reviewing activity of the most outstanding scientists from the Jagiellonian University in the highest-cited magazines. Main research directions of the most outstanding scientists of the Jagiellonian University, including: Professor dr hab. Michał A. Oleś (Expert on the world scale in the theory of electron correlation and quantum theory of magnetism.) Scientific articles published by him constitute an important contribution to world science in the theory of: ferromagnetism in transition metals, electron states in molecules, high temperature superconductors and in Mott insulators. He is a co-creator of the t-J model, the quantum theory of spin-orbital interactions and the so-called orbital interactions and hole propagation in many strongly correlated transition metal oxides, for the quantum phenomenon of spin-orbital confusion he has predicted experimental consequences). Professor dr hab. Marek Szymoński (Physics of nanostructures and quantum low-dimensional systems, main achievement: first measurement of coherent electronic transport by 2-test STM method in atomic wire at Ge, Nature Communications, 10, 2019. Synthesis and characterization of nanographene (GRN nanoflakes and nanoribbons) on the surface of precious

Code	Factors in SWOT analysis	Selected detailed data justifying SciMat POB
		metals and semiconductors, main achievements: first synthesis of nanographene flakes on the surface of semiconductor rutile, Science, 363, 2019 & synthesis of the longest ribbon of nanocarbon, Angewandte Chemistry, Int. Ed., 57, 2018. Applications of nanotechnology in biology and medicine , main achievement: first measurement of fenestration nanostructure in living endothelial cells, real-time in-vitro pharmacology of the endothelium, Hepatology, 69, 2019). Professor dr hab. Zbigniew Blocki (Partial differential equations, Functions of many complex variables, Pluripotent theory). Professor dr hab. Grażyna Stochel (Bioinorganic chemistry, Coordination chemistry, Photochemistry and photocatalysis, Medical and environmental chemistry, Advanced materials). Professor dr hab. Zbigniew Sojka (Heterogeneous catalysis, Materials and surface chemistry, Molecular modeling of reactions, catalytic, Thermodynamics and kinetics of surface phenomena, Spectroscopy and electron microscopy).
O2_O2	Emerging research areas of a global character.	Based on the experts' opinion, it has been found that currently research into new materials can no longer be carried out within the closed fields of physics, chemistry or biology. The basis for the creation of this new class of advanced materials lies in combining the use of knowledge and appropriate technology developed in the fields of nanotechnology, new energy sources, organic and molecular electronics, photonics and biotechnology.
O2_O3	The development of international university networks focused on conducting research.	Development of current networks in which the Jagiellonian University is a member, including: UNA EUROPA, Coimbra Group, The GUILD, Baltic University Program, and joining new networks.
O3_O2	The location of the university surrounded by a technology park and scientific research units.	The Jagiellonian University is a partner in Life Science and South Poland Cleantech clusters.

Code	Factors in SWOT analysis	Selected detailed data justifying SciMat POB
O3_O3	A direct business environment offering attractive jobs for graduates.	According to the UJ Career Office, graduates find jobs in such companies as, for example: Aptiv, Delphi Poland. The expectations of the labor market are also growing, related to the development of industries using advanced materials.
O3_O6	Increased interest in studies in Poland in the countries of Eastern Europe and Central Asia.	In 2016 - 2018, the number of foreigners from Eastern Europe and Asia increased in the full cycle from 1306 to 1737. Most students were from Ukraine, Belarus and Russia.

Justification of POB range and recommended course of action

POB name
SciMat
Justification of POB range
The modern development of technology is to a large extent related to the search for and development of new materials, enabling both (recycling), energy saving and higher strength of building structures, vehicles as well as application in modern semiconductors, superconductors and other materials used in medicine and industry. They require cooperation between scientists representing different scientific fields and disciplines as part of individual research projects. Therefore, the scope of POB includes exact sciences, such as physics, materials science, chemistry, and mathematics. The results of these works are therefore characterized by the application character.
Proposed course of action within the framework of strengths in SWOT analysis
Increasing the impact on the development of world science 1. Increasing the competences of the academic staff by involving a greater number of young scientific staff and further acquiring new contacts with the most significant scientific institutions in the world. 2. Concentration on research works of international character, which have an application character. 3. Obtaining the necessary infrastructure and research equipment in terms of participation and conducting international research projects. Increase international research cooperation 4. Active search and acquisition of the participation of scientific staff in international research projects.

Improving the quality of education

5. Developing measures to increase the internationalization of the education process in English in connection with leading international universities.
6. Organizing educational programs responding to the challenges related to the thematic scope of the non-research area, which will enable raising the level of professional and language competences of students as well as teaching competences of academic teachers.
7. Promoting in the motivational system the publication of co-authoring international undergraduates and doctoral students on the subject of this research area.
8. Developing activities supporting and developing access to high-class teaching infrastructure.
9. Developing programs to improve teaching competences in the area of optimal relationship between science people and undergraduates and doctoral students.
10. Activities aimed at maintaining high grade in university rankings (PKA).

Scientific development of employees

11. Acquisition of appropriate funding streams dedicated to groups of employees involved in international research projects and conducting individual research in the area of the most important research challenges in the world.
12. Maintenance and further development in the field of access to the university's infrastructure and research equipment.

Improving the quality of university management

13. Improvement of organizational procedures in the area of establishing and conducting international research projects, targeted financing of international scientific research with the use of IT systems supporting management in conducting international research projects.

Justification of course of action resulting from strengths in SWOT analysis

Scientists from the Jagiellonian University, representing the fields and disciplines covered by the SciMat priority research area, conduct research of international and global significance. It is necessary not only to maintain them, but also to involve more young scientists in them and to establish new contacts with the most important scientific institutions in the world. This requires the development of long-term development plans for improving the quality and internationalisation of the educational process in the fields and disciplines falling within the scope of this research area, increased involvement of young scientists in the design works and implementation of further facilitations in the management of the University. Such actions imply the need to ensure stable funding at a level commensurate with the ambitious challenges.

Proposed course of action within the framework of weaknesses in SWOT analysis

Increasing the impact on the development of world science

1. Actions aimed at increasing the number of: employees undertaking challenges to participate in international research projects and obtained prestigious international grants.
2. Developing activities aimed at intensifying contacts with global companies operating in the university's environment.
3. Scheduled activities reducing the burden of didactic and administrative activities for employees undertaking cooperation in international research teams dealing with the issues of the research area which is not smaller.
4. The need to plan actions towards making the age structure more flexible and to make more optimal use of the scientific staff, in particular in the field of international cooperation.

Increasing the international research cooperation

5. Activities aimed at increasing the number of research workers undertaking the challenge of participating in international research teams through actions to reduce the teaching and organizational burden and providing additional funding streams.

Improving the quality of education

6. Developing systemic programs of universities that would support the competition for the best candidates for studies.
7. Developing system solutions in the field of talent management.

Scientific development of employees

8. Developing activities aimed at changing the dominant systemic solution, which implies subordinating the path of development of young scientists to scientific advancement, and not the development of international research works.
9. The need to develop mentoring programs for young scientists.

Improving the quality of university management

10. Development of activities aimed at correcting the incentive system, which includes participation in international research projects.
11. Developing activities aimed at improving the integration of university management elements for a more efficient management of complex, international cross-domain projects.

Justification of course of action resulting from weaknesses in SWOT analysis

Decentralization of the university management system, favorable to the purposeful financing of international scientific research. However, the progressive development of the integrated management system does not keep up with the atomization of making decisions on establishing and conducting international research works. Therefore, actions are needed to speed up work in this area.

In the promotion procedure, the synergy effects of joint project work carried out by scientists are not taken into account. The atomised environment of people of science, caused by statutory regulations in the area of

promotion assessment of science workers, is a reason for young people to search for such research areas, where individual work can bring scientific achievements sufficient to gain promotion, but irrelevant on the international arena. Which, in the absence of talent management and the lack of mentoring programs for young scientists, makes it from the point of view of scientific advancement, cooperation in international research projects is unprofitable, and young employees themselves must search for research areas. The development of mentoring programs will enable appropriate targeting of young scientists and increase the level of their publication in the international dimension.

Proposed course of action within the framework of opportunities in SWOT analysis

Increasing the impact on the development of world science

1. Developing activities aimed at increasing the number of research projects carried out in cooperation with the fastest growing industries and international scientific centers in the field of the subject area related to this research area.
2. Actions aimed at greater use of national scientific policy, preferring concentration of inputs in units taking part in international research projects.
3. Activities aimed at greater use of the convenient industrial environment of Cracow and establishing cooperation between universities and global high-tech companies in research.
4. Undertaking activities aimed at increasing the participation of doctoral students in research projects.

Increasing international research cooperation

5. Developing action programs aimed at greater correlation of the research areas of the university with the priorities in European and global science.
6. Developing ways of identifying priority research areas of a global nature related to this research area and giving it priority importance as research areas of the university.
7. Planning and undertaking activities aimed at participating in research works of university networks of international renown.
8. Planning activities to facilitate the acquisition and use of information technologies in establishing international contacts and reducing language barriers.
9. Increasing the use of Cracow's exceptional industrial environment in establishing cooperation in the field of this research area between the university and global companies from the high-tech industry.

Improving the quality of education

10. Increase in the acquisition of employees with the highest scientific and didactic qualifications, through the use of a convenient location of the university in the vicinity of the technology park and scientific and research units.

Scientific development of employees

11. Developing activities aimed at increasing the use of national and international programs supporting the development of academic staff.

12. Undertaking activities aimed at recognizing and applying EU recommendations regarding the development of scientific staff.

13. Actions aimed at using the increase in the flexibility of public subsidies to establish and conduct research in the field of this research area.

14. Undertaking activities aimed at greater use of advanced modern technologies in the area of improving the scientific competence of employees.

Improving the quality of university management

15. Actions aimed at integrating the university management information system (university digitization).

16. Actions facilitating the use of the possibilities of diversifying the sources of financing of universities for establishing and conducting research works in the field of this research area.

Justification of course of action resulting from opportunities in SWOT analysis

It is necessary to prepare activities in the scope of increasing the use of the possibilities of concentration of expenditures on research works dedicated to units representing fields and disciplines of science falling within the scope of this research area. Integration of the management system should support more efficient acquisition and focusing of expenditures around international research projects carried out within the scope of this research area. Concentration of this kind of inputs should support activities aimed at diversified use of the attractiveness of the university's location, immediate vicinity of industry related to the scope of this research area, as well as establishing cooperation with leading scientific and research institutions in the world. Improvement of the flexibility of the subsidies used and diversification in this respect require the development of an action plan aimed at a more effective use of national and international programs supporting the development of academic staff in the fields and disciplines falling within the scope of this research area. Also, actions should be taken to use ICT resources for faster communication between researchers from various international centers and leveling language barriers.

Proposed course of action within the framework of threats in SWOT analysis

Increasing the impact on the development of world science

1. Developing activities aimed at concentrating the ways and sources of obtaining very limited financial resources for research, in order to reduce dissonance in relation to other European Union countries in this research area.

2. Developing activities aimed at retaining talented young scientists at the university.

3. Offers better working conditions and scientific development as counteracting competitive pressure from other scientific centers.

Increasing international research cooperation

4. Activities that intensify establishing contacts with universities and research centers as well as global enterprises emerging in new competitive geographic regions in the thematic scope of this research area.

Improving the quality of education

5. Undertaking activities in raising the level of knowledge of candidates for studies.
6. Developing system and legal solutions that will increase flexibility in creating study programs.
7. Developing system solutions limiting the growing bureaucracy of didactic processes and the associated risk of petrification of teaching content.
8. Offers better working conditions and scientific development for the most talented undergraduate students as preventing them being taken over by companies.

Scientific development of employees

9. Activities aimed at a significant improvement of the salaries of researchers in obtaining research results at the highest global level.
10. Preparation of activities aimed at solving problems related to higher education's "work-life balance".
11. Development of system and legal solutions in the field of age management for higher education, introduction of activities taking into account the diversity of roles of young scientists and older people of science.

Improving the quality of university management

12. Actions aimed at preparing the offer of better working conditions and scientific development for the most talented students and improving the attractiveness of work at the university in relation to jobs in industry.
13. Developing guidelines for activities aimed at maintaining uniformity and IT compatibility of the university system.

Justification of course of action resulting from threats in SWOT analysis

Achieving research results at the highest international level requires a sufficiently high level of financing for research projects. In particular, this refers to the scope of this research area, because the development in this area requires adequate equipment of laboratories and appropriate rewarding of science people who devote their research career to conducting research. It should be realized that the level of modern technological advancement requires large and growing expenditures. Nowadays innovations of global importance are not created "for free". Meanwhile, foreign competitive research and development centers have much larger financial resources, which puts pressure on our university, and on the other hand, retention of talented researchers. Therefore, it is necessary to develop an action plan which, significantly faster than competition level, will guarantee a constant and long-term increase in expenditure on science development in the field of this research area. As part of establishing research and scientific cooperation, activities aimed at strengthening cooperation with research centers that are still not recognized in Europe, should be planned. The importance of cooperation with Asian centers, in particular Chinese, South Korean and Japanese should be increased. The lack of flexibility in the preparation of study programs makes it difficult to properly prepare young research staff in the field of this research area. It is necessary to enable adapting these programs to the most important international challenges. In connection with the increase in the attractiveness of financing research works may bring the expected effect in the form of reducing the attractiveness of job offers coming from industry and taking over the most talented graduates. One of the most important threats is statutory discretion in the assessment of scientific achievements during promotion procedures. This threat is associated with the development of better offers of

working conditions and scientific development. The current promotion procedure of employees of science allows a multiple of reviews associated with a high level of individual discretion of reviewers. In the promotion procedure, scientific achievements, which have already been reviewed at least twice, such as monographs and texts published in renowned international journals listed in the Web of Science and Scopus, are reviewed. This creates a situation of multiple reviews of scientific results already reviewed on the international forum. In addition, the promotion procedure does not recognize the importance of team work, even if it was developed as part of international research projects. The synergy effects of joint project work carried out by scientists are not taken into account. This kind of threat comes from the legislators, posing threats to every action that will be taken by universities. It is necessary to raise awareness of the legislator's problem and to amend the provisions of the Act as soon as possible in the direction of unambiguous assessment of scientific achievements.

4.2.2. Anthropocene

Selected data justifying POB (Priority Research Area)

Code	Factors in SWOT analysis	Selected detailed data justifying POB Anthropocene
Strengths		
O1_S1	Research competence of the academic staff	The faculties have the category A + or A MNiSW (Faculty of Geography and Geology A, Faculty of Physics, Astronomy and Applied Computer Science A +, Faculty of Chemistry A +, Faculty of Management and Social Communication A, Faculty of Philosophy A +, Faculty of Mathematics and Computer Science A +, Faculty of Law and Administration A) . According to Scopus, the normalized citation rate for 2013-2017 is generally 1.50 for a university, and the same aggregate indicator for categories assigned to POB is 1.32.
O1_S2	Increasing efficiency in obtaining national and international grants.	In general, for the Jagiellonian University: In the years 2014-2018, it is possible to observe upward trends in the number of research projects commenced in particular years, this applies to the total number of research projects, the number of international projects and the number of projects under the Horizon 2020 Program. The number of research projects started in 2014-2018 amounted to 308, 248, 302, 351, 331 (+35), respectively. The number of international projects started in 2014-2018 amounted to: 23, 18, 34, 19, 30. The number of projects of the Horizon 2020 Program in the years 2014-2018 amounted to: 0, 5, 3, 5, 10.
O1_S3	Publishing activity in the first quartile of the most-cited magazines.	In general, for the Jagiellonian University, the value of the item index in the first quartile in 2013-2017 is 53.1%. The value of the aggregate ratio for the categories assigned to the POB for the period 2013-2017 is 70.2% (Scopus).

Code	Factors in SWOT analysis	Selected detailed data justifying POB Anthropocene
O1_S4	Infrastructure and scientific apparatus supporting research processes.	In accordance with the list of high-value infrastructure, equipment, for example, X-ray diffractometer with equipment (Faculty of Geography and Geology), neurosensory analyzer for measuring thresholds (Faculty of Philosophy).
O1_S5	The presence of many scientific disciplines that creates the potential for interdisciplinary research.	According to experts, studies on anthropocene require complementary activities in the fields of physics, chemistry, geology, geography, law, management, economics, economy, technology, mathematics and computer science, ethics. All these areas are represented by faculties of the Jagiellonian University: Faculty of Geography and Geology, Faculty of Physics, Astronomy and Applied Computer Science, Faculty of Chemistry, Faculty of Management and Social Communication, Faculty of Philosophy, Faculty of Mathematics and Computer Science. Faculty of Law and Administration.
O2_S1	Active participation in the work of international university networks.	Membership of the Jagiellonian University in, among others: UNA EUROPA, Coimbra Group, The GUILD, Baltic University Program.
O2_S2	Measurable results of international research cooperation (publications and grants).	According to Scopus, the percentage of scientific articles in international cooperation for the years 2013-2017 aggregated for the categories assigned to POB is 53.20%, while the normalized quotation rate for scientific articles in international cooperation 2013-2017 is 1.84. In the Jagiellonian University scale (the list does not include CM) in 2014-2018, 248 international projects were completed, including mainly research and education projects. In this group there are 9 research projects related to the trends identified in the SWOT analysis chances and which justify the selection of POB. For example: Mechanistic models of effects on ecological risk assessment from chemical substances, Current status and expected changes among pollinating insects in Europe,

Code	Factors in SWOT analysis	Selected detailed data justifying POB Anthropocene
		Sustainable financing for sustainable agriculture and fisheries, An international, multi-disciplinary, multi-sectoral training network on ageism - EuroAgeism. Deep uncertainties in bioethics: genetic research, preventive medicine, reproductive decisions (GRANT ERC-2018-STG).
O2_S3	Recognition of selected scientists on the international arena.	Achievements and cooperation of the most outstanding scientists, including: prof. dr hab. Piotr Kuśtrowski (Delegate of the Polish Catalysis Club in the International Association of Catalysis Societies, Member of the Editorial Board of the Polimery magazine), prof. dr hab. Alfred Uchman (President of the International Ichnological Association, 2012-2016), prof. dr hab. Zbigniew Ustrnul (Chairman of the Climatological Committee of the International Geographical Union), prof. dr hab. Piotr Zgliczyński (WoS h-index = 18, 813 citations, cooperation with NSF-NATO).
O2_S4	Employees' experience in managing international projects.	In 2014-2018, the Jagiellonian University staff were managers in 16 major international projects, in which the Jagiellonian University has a leading position (among others, the faculties: Matematyka and Computer Science, Physics, Astronomy and Applied Computer Science, Philosophy, Law and Administration, International and Political Studies, Geography and Geology). In addition, during the period other than the above, the employees held managerial positions in various international projects. Sample experience: • Professor dr hab. Alfred Uchman, UJ / OU / 2017/04/01 • Dr Tomasz Żuradzki, LEADER of the project, Deep

Code	Factors in SWOT analysis	Selected detailed data justifying POB Antrophocene
		uncertainties in bioethics: genetic research, preventive medicine, reproductive decisions (GRANT ERC-2018-STG). • prof. dr hab. Piotr Kuśtrowski (project manager financed from the EU under structural funds) • prof. dr hab. Zbigniew Ustrnul (A Multidisciplinary Protocol for Assessing Climate Impacts, Vulnerability, and Adaptation for Regional and International Markets, NSF (USA)).
O2_S6	Number of cooperation agreements concluded with foreign research centers.	At the level of the Jagiellonian University, the number of international agreements as of 01/04/2019: 343 bilateral agreements, 1567 Erasmus + KA 103, 48 Erasmus + Ka 107 contracts.
O3_S1	Internationalization of the educational process, including didactic offer in English.	• In general, at the Jagiellonian University: in 15 fields, in 17 specialties, programs in English are run. In total, he studies (as of 13.06) 1218 students on English-language programs. Studies in English and the number of foreign students: Intellectual Property and New Technologies (20), Business and Finance Management (124). In addition, generally at the Jagiellonian University: • In 2016/2017 and 2017/2018, the number of students leaving for a period of at least 3 months increased from 792 to 815, and students coming for a period of at least 3 months increased from 933 to 1029. • In the years 2016/2017 and 2017/2018, the number of PhD students leaving for a period of at least 3 months increased from 87 to 111, and PhD students coming for a period of at least 3 months increased from 21 to 28. • In 2016/2017 and 2017/2018, the number of outgoing academic teachers (irrespective of the duration of mo-

Code	Factors in SWOT analysis	Selected detailed data justifying POB Antrophocene
		bility) increased from 1295 to 1574, and incoming academic teachers (regardless of the duration of mobility) increased from 152 to 158.
O3_S4	Access to high-class teaching and scientific infrastructure.	According to the list of high-value infrastructure, e.g. a radio interferometer station, the LOFAR station is part of the International LOFAR Telescope interferometer. Modern scientific and didactic infrastructure on the Campus of the Jagiellonian University, in which many faculties have been placed (e.g. Faculty of Geography and Geology, Faculty of Physics, Astronomy and Applied Computer Science, Faculty of Chemistry, Faculty of Management and Social Communication, Faculty of Mathematics and Computer Science).
O3_S6	Leading places in national university rankings and distinguishing assessment of the Polish Accreditation Committee.	• Shanghai ranking: Astronomy, physics: 201-300; Environmental protection 201-300; Sustainable chemistry: 301-400. • QS World University Rankings: Philosophy: 151-200, Geography and spatial management: 151-200, Chemistry of sustainable development: 351-400, Astronomy, physics: 251-300. • Place in the Outlook of Prospects 2019: Environmental protection: 1; Law: 1; Administration: 1; Philosophy: 2, Geography and spatial management: 2, Astronomy, physics: 2, geology: 2. • Polish Accreditation Commission: distinctive assessment (Environmental protection, Law, Administration).
Opportunities		
O1_O1	Dynamic development of selected sectors and industries related to the directions of scientific research.	According to experts, there is a dynamic development, among others management of natural resources or the space sector. They are related to the directions of research at faculties, including the research directions of the most outstanding scholars such as:

Code	Factors in SWOT analysis	Selected detailed data justifying POB Anthropocene
		Professor dr hab. Alfred Uchman, dr hab. Łukasz Stawarz, prof. dr hab. Piotr Kuśtrowski, prof. dr hab. Zbigniew Ustrnul, prof. dr hab. Piotr Zgliczyński, dr Tomasz Żuradzki.
O1_O3	Development of cooperation with world-leading research centers.	Development of the cooperation with many centers and teams, including those from the Shanghai list, e.g. Sorbonne Universites (France), University of Antwerp (Belgium), Stockholm University (Sweden), Universitaet Basel (Switzerland), University of Bristol (UK), University of Saskatchewan (Canada), University of Arizona (USA), Michigan State University (USA), Lund University (SWE), University of Calgary (CAN), University of California, Berkeley, (USA) Kyoto University (Japan), Imperial College London (UK), Rutgers, The State University of New Jersey, (USA).
O1_O4	Social and economic trends stimulating the demand for research.	According to experts, the current world is the resultant of many factors in it: from natural (terrestrial and extraterrestrial) to human activity and the associated social world (including the world of organization and institutions), the world of ethics, legal regulations, religions and technology development. One observes, among others the growing importance of sustainable development or colonization of the cosmos, but also changes in the ethical and religious sphere.
O1_O6	Participation of doctoral schools in research processes.	PhD programs: Earth and environment sciences, Chemistry, Management and quality sciences, Economics, Sociology, Pedagogy, Philosophy, Cultural and religious sciences, Information Technology, Interdisciplinary Program "Society of the Future", Legal Sciences.
O2_O1	Correlation of university research areas with priorities in European and world science.	Publishing and reviewing activity of the most outstanding scientists from the Jagiellonian University in the highest-quoted magazines. Main research directions of the most

Code	Factors in SWOT analysis	Selected detailed data justifying POB Antrophocene
		outstanding scientists of the Jagiellonian University, including: • prof. dr hab. Piotr Kuśtrowski (Heterogeneous catalysis, Chemical technology, Chemical methods of environmental protection, Design and synthesis of porous materials, Study of the correlation between the composition and state of the surface and its reactivity in sorption and catalytic processes, Methods of testing the surface of functional materials, Spectroscopy of photoelectrons induced by radiation). • prof. dr hab. Alfred Uchman (Ichology, Palaeoenvironmental Analysis, Sedimentology), • prof. dr hab. Zbigniew Ustrnul (Climate change and variability, Extreme meteorological and climatic phenomena) • Professor dr hab. Piotr Zgliczyński (Qualitative theory of differential equations, Computer-supported evidence in dynamic systems) • Dr Katarzyna Ostapowicz (Better understanding of complex dependencies and interaction systems between humans and the environment, especially in mountainous areas, Application of geographic information theory and technologies (GIS & T) in environmental research with particular emphasis on land cover change detection and land use using remote sensing data and technologies (teledetection "Big data", methods in the field of training machines), Assessment of changes in biodiversity with particular emphasis on the assessment of fragmentation and communication at the level of species and landscape, Mathematical and statistical modeling of past and future environmental changes)
O2_O2	Emerging research areas of a global character.	According to expert opinions, the progress of science, technology and medicine raises opportunities not seen in

Code	Factors in SWOT analysis	Selected detailed data justifying POB Antrophocene
		the history of mankind, but also the threats, including overpopulation, depletion of natural resources, industrial pollution, global climate and environmental changes, socio-cultural changes related to digital society and the development of internet cyberspace, maladjustment of public institutions, enterprises and non-governmental organizations to the above-mentioned challenges. We need a holistic view of the causes, course and effects of changes taking place in the modern world, both natural and social, legal and technological.
O2_O3	The development of international university networks focused on conducting research.	Development of current networks in which the Jagiellonian University is a member, including: UNA EUROPA, Coimbra Group, The GUILD, Baltic University Program, and joining new networks.
O3_O6	Increased interest in studies in Poland in the countries of Eastern Europe and Central Asia.	In 2016 - 2018, the number of foreigners from Eastern Europe and Asia increased in the full cycle from 1306 to 1737. Most students were from Ukraine, Belarus and Russia.

Justification of POB range and recommended course of action

POB name
Anthropocene
Justification of POB name
Rapid progress of science and technology, unprecedented centuries ago, is the result of human activity. Hence the modern era is called the Anthropocene, a period in which human activity, as never before, reflects its mark virtually in every area of life. Human activity is not limited only to achieving positive effects for the Earth and its inhabitants. The negative effects of the progress of science and technology are increasingly and more clearly noted. We are currently witnessing many new unfavorable phenomena, such as overpopulation, limited resources, raw materials, increasing pollution levels. The modern world, in addition to undoubted benefits, faces the necessity of solving global problems whose complexity requires not only cooperation between states, but

the preparation and implementation of long-term recovery plans to reduce the negative effects of technological development. Long-term solutions require the development of new approaches in the field of politics, institutional solutions in the area of: social, economic, ecological, ethical and other. The above considerations directly related to the need to deliberately direct the development of the world require priority treatment. The scope of work carried out under this POB will involve various fields and disciplines of science, such as humanities, social sciences, and exact sciences, such as physics, materials science, chemistry, and mathematics. The results of these works are characterized by application and inter-departmental results aimed at developing the best solutions in two main directions: sustainable development and counteracting the negative effects of anthropocene.

Proposed course of action within the framework of strengths in SWOT analysis

Increasing the impact on the development of world science

1. Undertaking activities aimed at searching for and participating in international research projects related to sustainable development and counteracting the negative effects of anthropocene.
2. Activities supporting publishing the results of research works in the area of the smallest research area in the first quartile of the most frequently quoted periodicals.
3. Striving to obtain the application character of the results of the work of inter-disciplinary research.
4. Activities facilitating the involvement of many different scientific disciplines to create the interdisciplinary potential of scientific research in the modern world of anthropophen.

Increasing international research cooperation

5. Establishing cooperation in the field of active participation in the work of international and inter-disciplinary university networks.
6. Focusing research work on obtaining tangible results of international research cooperation in the field of sustainable development (publications and grants).

Improving the quality of education

7. Developing measures to increase the internationalization of the learning process in English in connection with leading international universities.
8. Organizing educational programs responding to the challenges related to the thematic scope of the research area, which will enable raising the level of professional and language competences of students as well as teaching competences of academic teachers.
9. Promoting in the motivational system publications of co-authoring international students and doctoral students on the subject of this research area.
10. Developing activities supporting and developing access to high-class teaching infrastructure.
11. Developing programs to improve teaching competences in the field of optimal relationship between science and students and doctoral students.
12. Activities aimed at maintaining a high grade in the university rankings (PKA).

Scientific development of employees

13. Development of comprehensive programs containing actions targeting young scientists on continuous improvement of competences and increase of participation in international research on sustainable development and solving anthropocene problems, related to the appropriate redirection of dedicated funding streams.

Improving the quality of university management

14. Inclusion in the further development of IT systems supporting management of facilitation in the management of inter-subject international projects on the subject of anthropocene.

Justification of course of action resulting from strengths in SWOT analysis

Researchers from the Jagiellonian University, representing many fields and disciplines within the scope of this research area, create research projects of international and global importance on topics related to sustainable development and ways to counteract the negative effects of anthropocene. It is necessary not only to sustain them, but also to involve a greater number of young research staff and to continue to gain new contacts with the most important scientific institutions in the world as well as global corporations in the area of developing projects related to anthropocene. Although the effects of anthropocene are currently visible, they mainly concern the future. For these reasons, all forms of improving the competences of the teaching and didactic staff and the involvement of students and doctoral students in research related to the subject of anthropocene are of greater importance. In order for the research effect to be positive and sustainable, long-term action plans for raising the level of engagement should be developed. In these works, improvements should be included regarding the adaptation of IT management systems to the needs of conducting cross-disciplinary projects. For such complex research activity it is necessary to ensure a stable and dedicated stream of financing.

Proposed course of action within the framework of weaknesses in SWOT analysis

Increasing the impact on the development of world science

1. Actions aimed at increasing the number of: employees undertaking challenges to participate in international research projects and obtained prestigious international grants regarding issues related to the Anthropocene phenomenon.

2. Scheduled activities reducing the burden of didactic and administrative activities for employees undertaking cooperation in international research teams dealing with the issues of sustainable development and negative effects of anthropocene.

Increasing international research cooperation

3. Development of comprehensive activities in the scope of greater and more effective promotion of research results and academic offer of the university.

4. Developing programs to raise the level of competence in building international relations with significant foreign universities and global corporations in the area of establishing cooperation in the field of this research area.

Improving the quality of education

5. Organizing educational programs responding to the challenges related to the thematic scope of the research area that is not sufficient to enable financing as part of the preparation of diploma theses.

Scientific development of employees

6. Development of support programs for the development of young scientists in connection with significant international universities dealing with issues related to anthropocene.

7. Undertaking activities aimed at greater use of advanced modern technologies in the area of improving the scientific competence of employees.

Improving the quality of university management

8. Development of activities aimed at improving the integration of university management elements for a more efficient management of complex, international cross-disciplinary projects.

9. Actions aimed at simplifying and making organizational procedures more flexible in the scope of establishing inter-departmental projects related to threats resulting from the anthropocene phenomenon.

10. Development of activities aimed at improving the integration of university management elements for a more efficient management of complex, international cross-disciplinary projects.

Justification of course of action resulting from weaknesses in SWOT analysis

Preparing the organization to establish and manage inter-subject research projects related to anthropocene, indicated in the directions of undertaken activities based on the strengths of the university, provides a solid basis for effectively overcoming weaknesses.

On the other hand, as a complement to the above activities, ways to facilitate networking and cooperation with external stakeholders, global corporations and universities should be developed. In this context, it also includes simplifying and making organizational procedures more flexible in the scope of establishing inter-departmental projects, including improving the integration of university management elements. In connection with the appropriate long-term funding stream, the above directions of activities lead to a steady improvement in the level of competence in building international relations within this research area, which is important because it can be expected that further development of science and technology will also cause negative effects anthropocenu.

Proposed course of action within the framework of opportunities in SWOT analysis

Increasing the impact on the development of world science

1. Developing activities aimed at increasing the number of research projects carried out in cooperation with the fastest growing industries and international scientific centers in the field of anthropocene-related topics.

Increasing international research cooperation

2. Development of action programs aimed at greater correlation of the research areas of the university with the priorities in European and global science.

3. Developing ways to identify priority research areas of a global nature related to this research area and give it priority importance as research areas of the university.

4. Planning and undertaking activities aimed at participating in research works of university networks of international renown.
5. Planning activities to facilitate the acquisition and use of information technologies in establishing international contacts and reducing language barriers.
6. Increasing the use of Cracow's exceptional industrial environment in establishing cooperation in the field of this research area between the university and global companies from the high-tech industry.

Improving the quality of education

7. The use of a convenient location of the university in the vicinity of scientific and research units and other domestic and foreign universities in the field of didactic cooperation related to the subject of sustainable development and the effects of anthropocene.

Scientific development of employees

8. Preparation of activities aimed at greater use of academic staff support programs.
9. Actions aimed at using the increase in the flexibility of public subsidies to establish and conduct research in the field of this research area.
10. Undertaking activities aimed at greater use of advanced modern technologies in the area of improving the academic competences of employees.

Improving the quality of university management

11. Activities aimed at integrating the university management information system (university digitization).
12. Actions facilitating the use of the possibilities of diversifying the sources of university funding for establishing and conducting research works in the field of this research area.

Justification of course of action resulting from opportunities in SWOT analysis

Emerging new opportunities to increase the use of different sources of financing research activities provide opportunities for the development of a plan for focusing research spending dedicated to the creation of interdisciplinary projects on issues related to anthropocene. In connection with the use of existing contacts with world-leading research centers and selected sectors and industries in the correlation of research, a research and teaching offer should be prepared, the content of which will be to recognize trends and priority research areas of a global nature, related to the anthropocene theme. An important facilitation to be used in these activities is also the convenient location of the university.

Proposed course of action within the framework of threats in SWOT analysis

Increasing the impact on the development of world science

1. Developing activities aimed at concentrating the ways and sources of obtaining very limited financial resources for research, in order to reduce dissonance in relation to other European Union countries in this research area.
2. Developing activities aimed at retaining talented young scientists at the university.

3. Offers of better working conditions and scientific development as counteracting competitive pressure from other scientific centers.

Increasing international research cooperation

4. Activities that intensify establishing contacts with universities and research centers as well as global enterprises emerging in new competitive geographic regions within the thematic scope of this research area.

5. Actions promoting in the political and economic sphere the need to establish research projects in the field of anthropocene, as counteracting the risk of divergence of Poland's economic and foreign policy with identified global trends.

Improving the quality of education

6. Developing system solutions limiting the growing bureaucratisation of didactic processes.

7. Developing system and legal solutions that will increase flexibility in creating study programs related to anthropocene.

Scientific development of employees

8. Activities aimed at a significant improvement of the remuneration of scientific employees in obtaining the results of research at the highest world level, related to the subject of anthropocene.

9. Preparation of activities aimed at solving problems related to higher education's "work-life balance".

10. Developing system and legal solutions in the field of age management for higher education, introduction of activities taking into account the diversity of roles of young scientists and older people of science.

Improving the quality of university management

11. Actions promoting in the political and economic spheres the need to establish inter-departmental research projects in the field of anthropocene, as counteracting the volatility of legal provisions.

Justification of course of action resulting from threats in SWOT analysis

Achieving research results at the highest international level, in particular in inter-subject projects related to anthropocene, requires a sufficiently high level of funding. In the case of a shortage of expenditures, it is necessary, indicated in the area of opportunities, to prepare consolidation activities, various new sources of financing. In this way, the university can counteract the phenomenon of relative reduction of the attractiveness of work at the university. However, in these activities a significant threat may be the lack of interest in Poland's economic policy in this research area. Therefore, it is necessary to transmit scientifically verified messages to appropriate social environments in order to force democratic changes to due care of these issues related to anthropocene and to counteract the high volatility of legal provisions regarding the conduct of inter-departmental research projects.

4.2.3. BioS

Selected data justifying POB ((Priority Research Area)

Code	SWOT Factors	Selected data justifying POB BioS
STRENGTHS		
O1_S1	Research competences of academic staff members.	University Faculties were classified with Category A+ or Category A by the Ministry of Science and Higher Education (Category A: Faculty of Biology, Category A+: Faculty of Biochemistry, Biophysics and Biotechnology). According to Scopus, normalized impact factor over the years 2013-2017 equals 1.50 for the university in general, whereas the same factor aggregated for the POB categories is 1.07.
O1_S2	Increasing efficiency in obtaining both Polish and international grants.	For the Jagiellonian University: Between 2014-2018 it is possible to observe growing trends in the number of research projects commenced each year. These trends concern a total number of projects, a number of international projects as well as a number of projects within Horizon 2020 program. • Number of projects initiated between 2014-2018 is 308, 248, 302, 351, 331 (+35), respectively. • Number of international projects initiated between 2014-2018 is 23, 18, 34, 19, 30, respectively. • Number of projects initiated within Horizon 2020 program between 2014-2018 is: 0, 5, 3, 5, 10., respectively.
O1_S3	Publications in the first quartile of journals most often cited.	For the Jagiellonian University: article indicator in the first quartile between 2013-2017 is 53.%. Aggregated indicator for the POB categories between 2013-2017 is 56.8% (Scopus).
O1_S4	Infrastructure and technology facilitate research.	Modern research within JU infrastructure: National Synchrotron Radiation Centre – Solaris, in particular the experimental patch for biological research, which uses synchrotronic radiation, and an advanced cryogenic microscope Titan Krios, the only one in Poland.
O1_S5	University multidisciplinary generates potential for interdisciplinary research.	According to experts, the research in biology, biochemistry and biophysics requires complementary activities in Sciences and Natural Sciences: all these disciplines are represented by the Faculty of Biology and the Faculty of Biochemistry, Biophysics and Biotechnology.

Code	SWOT Factors	Selected data justifying POB BioS
O1_S6	The application character of re-search results.	Advanced research generates patents due to translating the re-search results into application objectives. According to Thomson Reuters Ranking Top 100: Europe's Most Innovative Universities 2019, the Jagiellonian University was located at the 90th position in this ranking as the only university from Poland and also as the only university from the Middle –East European countries.
O2_S1	Participation in international university networks.	Jagiellonian University Membership in The Coimbra Group, The GUILD.
O2_S2	Measurable results of international research cooperation (publications and grants).	According to Scopus, the percentage of research articles published as a result of international cooperation between 2013-2017 aggregated for the POB categories is 39.30%, whereas a normalized index factor for research articles published as a result of international cooperation between 2013-2017 is 1.52. Between 2014-2018 the Jagiellonian University (without Collegium Medicum) accomplished 248 international projects, mainly research and educational ones . 10 research projects out of 248 relate to the trends identified in SWOT analysis, which justifies the identification of POB. Examples of such projects: • Hear on chip based on human-induced pluripotent stem cell technology for personalized medicine. • Visible attributes through genomics. • The ubiquitin-proteasome system and the coupling of ubiquitin-like proteins pathways in non-genotoxic cancer therapy. • Proposal to establish the Strategic Development Installation Grants Special Projects. • Consequences of the disturbed electron transfer induced by asymmetrical cytochrome bc1 in mitochondrial diseases and aging.
O2_S3	Recognition of selected Polish scientists on the international arena.	Achievements and cooperation. Examples: • Professor Jan Potempa (member of editorial boards for: <i>Biological Chemistry</i>, <i>Journal of Innate Immunity</i>, <i>Molecular</i>

Code	SWOT Factors	Selected data justifying POB BioS
		<i>and Oral Microbiology, FEBS Open Bio, Journal of Oral Microbiology</i>, reviewer in assessing academic achievements in the recognized academic centers). • Professor Ewa Zuba-Surma (member of experts groups and European programs (Society for Extracellular Vesicles (ISEV); participation in establishing research in guidelines na EVs (incl. MISEV 2018 guidelines in: Extracell Vesic 2018, 7(1)). • Professor Ryszard Laskowski (member of Scientific Panel on Plant Protection Products and their Residues (PPR) of the European Food Safety Authority (2012-2018), Member of the Editorial Advisory Board of the journal <i>Applied Soil Ecology</i>: since 1997). • Professor Stefan Chłopicki (member of Scientific Council of International Society for Heart Research – European Section (ISHR-ES) (2006-2010), member of COST ACTIONS management committee). • Doctor Sebastian Glatt (member of Young Academy of Europe (YAE), President of EMBL Postdoc Association 2009 – 2011, supervisor of EMBL Heidelberg High-Throughput Crystallization Facility (2010 - 2015)).
O2_S4	Academic staff members' experience in international project management.	Between 2014-2018 university members of the academic staff supervised 16 international projects in which the university is a leader (e.g. Faculty of Biology); they were in charge of various managerial tasks in international projects also outside this period. Examples: • Professor Jan Potempa (project financed from EU TRIGGER: King of hearts, joints and lungs; periodontal pathogens as etiologic factor in RA, CVD and COPD and their impact on treatment strategies. European Commission FP7: HEALTH-2012-INNOVATION-1-306029-2, 2013/04/01 – 2017/03/3; funded by National Institutes of Health, USA, Protease – protease inhibitor system of <i>Tannerella forsythia</i>. NIH/NIDR: R21 DE026280. 2016/09/20 – 2018/08/31).

Code	SWOT Factors	Selected data justifying POB BioS
		• Professor Ewa Zuba-Surma (<i>Mesenchymal stem cell therapy for infarct repair in diabetes</i> - NIH, NCRR, USA (COBRE award) (2008-2013)). • Professor Ryszard Laskowski (Horizon 2020: EcoStack – Stacking of ecosystem services: mechanisms and interactions for optimal crop protection, pollination enhancement, and productivity; EC 7th Framework Project “CREAM - Mechanistic Effect Models for Ecological Risk Assessment of Chemicals”, EC 6th Framework Project “ALARM – Assessing LArge-scale environmental Risks with tested Methods”). • Professor Stefan Chłopicki (Vascular endothelium in lifestyle diseases: from basic research to the offer of an innovative endothelium-targeted therapeutic 2009/03 2015/09; National Centre for Research and Development; European Regional Development Fund, Operational Program – Innovative Economy, Action 1.1.2; allocated funds: 62 606 924,14 PLN; Prostacyclin, nitric oxide and carbon monoxide-based pharmacotherapy of endothelial dysfunction and platelet activation novel strategy to inhibit cancer metastasis; National Centre for Research and Development; Polish Strategical Framework Program STRATEGMED; 2015/07 – 2019/06; allocated funds: 22 350 000,00 PLN;) • Anita Bokwa, Assistant Professor, Climate in Central Europe cities and global climate changes.
O2_S6	Number of agreements between the Jagiellonian University and foreign research centers.	For 1/April/2019: 343 bilateral agreements, 1567 Erasmus+ KA 103 agreements, 48 Erasmus+ Ka 107 agreements.
O3_S1	Internationalization of teaching/learning process; degree courses offered in English.	• For the Jagiellonian University: 15 degree courses within 17 specializations are run in English. 1218 – number of students (13 June 2019) • Degree courses in English and a number of foreign students: Ecology and Evolution (16); Molecular Biotechnology (14). Additional data for the University :

Code	SWOT Factors	Selected data justifying POB BioS
		- In 2016/2017 and in 2017/2018 a number of students studying abroad for minimum 3 months increased from 792 to 815. A number of foreign students studying at the university for minimum 3 months increased from 933 to 1029. - In 2016/2017 and in 2017/2018 a number of doctoral candidates studying abroad for minimum 3 months increased from 87 to 111. A number of foreign doctoral candidates studying at the university for minimum 3 months increased from 21 to 28. - In 2016/2017 and in 2017/2018 a number of academic teachers staying at foreign universities increased from 1295 to 1574 (regardless of the length of mobility). A number of foreign academic teachers staying at the university increased from 152 to 158 (regardless of the length of mobility).
O3_S4	Access to high quality research and didactic infrastructure.	Equipment according to high-value infrastructure log. Examples: confocal microscopy (Malopolska Centre for Biotechnology), an analyzer for measurement of the cell mitochondrion's activities, (Jagiellonian Centre for Experimental Therapeutics (JCET); flow cytometry LS Fortessa with the accessories and a violet laser 405nm with 6 photomultipliers (Faculty of Biology); electron microscopy JEOL JEM2100 HT CRYO LaB6 (Faculty of Biology).
O3_S6	Top positions in Polish university ranking lists; distinguished grades awarded by the Polish Accreditation Board.	- Academic Ranking of World Universities (Shanghai Ranking): Biology: 301-400; Biotechnology: 401-500 - QS World University Rankings: Biology: 351-400, - Polish Weekly <i>Perspektywy</i> ranking 2018: No 1: JU Biotechnology.
Opportunities		
O1_O1	Dynamic development of selected economy sectors, which are related to the research project areas .	According to experts, there is a dynamic development of a biotechnological branch and a pharmaceutical branch. This is related to the research carried out within university faculties under the supervision of distinguished scientists, including among others, the following professors: Jan Potempa, Ewa Zuba-Surma, Ryszard Laskowski, Stefan Chłopicki, Sebastian Glatt.
O1_O3	development of cooperation with world-leading research centers.	The development of already established cooperation with numerous research centers and research groups, including those from Shanghai Ranking, e.g. Oxford University (UK), University of

Code	SWOT Factors	Selected data justifying POB BioS
		Sydney, (Australia), University of Vrije (Belgium), University of Pittsburgh (USA), University of Bonn (Germany), University of Bern (Switzerland), University of Sheffield (UK), Cardiovascular Research Institute (CVRI), Kansas University Medical Center (KUMC) Ka, USA.
O1_O4	Social and economic trends enhance the demand for research.	According to experts, civilization diseases generate a need to design therapies, which is to be supported by structural research. More specifically, in cell biology animal models will make unique material for research into the grounds of such civilization diseases as: Parkinson disease, obesity, psoriasis, epilepsy, sepsis or different kinds of cancer. Big data (BigData), which are provided by genomic research together with machine learning enhance recognizing the functions of genes and their variants, which leads to the development of personalized healthcare and consequently to the improvement of the quality of life. The research into the mechanisms of dying out of the pollinators and the impact of intensive agriculture on biodiversity as well as into the methods fostering the limitation of their negative results are of particular importance. Such research makes the foundation for designing a strategy the application of which would limit the impact of anthropogenic factors on biodiversity and on the functioning of ecosystems and the whole biosphere.
O1_O5	Kraków unique industrial surroundings and the cooperation with a high-tech branch.	Kraków, with its numerous economic zones (e.g. the zone managed by Kraków Technology Park), the space for co-working, and various types of funds, including seed funds (e.g. Innoventure, Augere, ABAN, HumanAlfa), is one of the Polish cities that enhances establishing start-ups.
O1_O6	Participation of Doctoral Schools in research.	Doctoral studies: Biology, Biochemistry Biophysics, Molecular Biology, Biotechnology; PhD Program in Biology in English.
O2_O1	Correlation of the university research areas with the priorities in Europe and the world.	Publishing and reviewing by the most eminent university researchers in the most often cited journals, including <i>Nature</i>, <i>Science</i>, <i>Nature Communications</i>, <i>Science Advances</i>. Main lines of research of the university researchers: Professor Jan Potempa (focuses on the discovery and characterization of new factors in virulence of periodontal pathogens and

Code	SWOT Factors	Selected data justifying POB BioS
		the examination of the mechanisms by means of which these new factors contribute towards the pathogenesis of inflammation of the periodontium. Here <i>T. forsythia</i> is of interest, which secretes proteolytic enzymes and their inhibitors, The network of protease-inhibitor interactions in periodontal pockets is a fascinating subject of research in the perspective of the pathogenicity of periodontitis, and explanation of the mechanisms of periodontopathogen virulence factors in the context of periodontitis and linking this disease with RA and AD. These ambitious studies are conducted using a range of methods, from animal models to the most advanced molecular biology techniques. The results have already shown that gingipain may be responsible for the cause-effect relation between the periodontal infection of <i>P. gingivalis</i> and AD. On the other hand, peptidylarginine deiminase, another enzyme unique to <i>P. gingivalis</i> discovered and characterized by J. Potempa, seems to be responsible for overcoming immune tolerance and development of RA, thus explaining the epidemiological link between periodontitis and RA). Professor Ewa Zuba-Surma (focus on the biology and functions of various subpopulations of stem cells and progenitor cells with diverse development potential in the context of the potential use of these cells and their nano-derived in regenerative medicine, in particular in cardiology and orthopedics In their study E. Zuba-Surma uses both stem cells isolated from mature tissues - including mesenchymal stem cells (MSCs) from various sources, broadly used in clinical trials today, as well as embryonic cells, including induced Pluripotent stem cells (iPSCs) ,which are a potential source of autologous cells for autografts. E. Zuba-Surma's research also includes interdisciplinary projects in which she is looking for new, optimized strategies for combining stem cells and their derivatives with biocompatible biomaterial scaffolds, in order to achieve optimal regenerative effects.). Professor Ryszard Laskowski (Population ecology, ecology of ecosystems, ecotoxicology)

Code	SWOT Factors	Selected data justifying POB BioS
		Professor Stefan Chłopicki (focuses on Interdisciplinary pharmacology of vascular endothelium, in particular on research on prostacyclin-dependent pharmacotherapeutic mechanisms (PGI₂), nitric oxide (NO), carbon monoxide (CO) and others. Development of functional and biochemical profiling of the vascular endothelium in animal models that may find use in clinical trials; Vascular endothelial pharmacotherapy in atherosclerosis, cancer metastasis or metabolic syndrome, dependent on the systemic effects of PGI₂, adenosine, or hepatoselective action of NO donors; Research on the role of NO, PGI₂ and platelet activation in exercise in mice, towards new understanding of the mechanisms of adaptation of the vascular endothelium to physical exercise; development of a panel of analytical and functional methods for the assessment of vascular endothelial function and cardiovascular function (endothelial profiling); Prof. Chłopicki 's achievements includes both scientific papers, over 310 publications, including 240 original works, as well as patent applications and patents: 81 patent applications and 46 patents in 12 "families"). Dr Sebastian Glatt, (Structural biology).
O2_O2	Emerging new research areas of global nature and importance.	According to experts, cryo-electron microscopy (cryo-EM) is gaining significance. The Jagiellonian University becomes a leader in this research area, which is translated into the most recent publications in <i>Nature Communications</i>, <i>Science Advances</i> and <i>Nature</i>. New technologies of DNA sequencing enables the development of large scale genomic research. The development in the area of genomics and bioinformatics offers new opportunities for biomedical research, the research on humans and other organisms, evolution and new medical therapies. In the area of cell biology, plant models will be used to examine cell processes and signaling pathways, which are important in the process of plants' adaptation to changing climate conditions. In research into cell biology, techniques from the borderline of biochemistry, physics and biology will be applied (e.g.: tran-

Code	SWOT Factors	Selected data justifying POB BioS
		scriptome, proteome, and metabolome analyses of a cell). Evolutionary biology and biodiversity apply advanced methods that came from geo-statistics, comparative population genomics, machine learning, ecotoxicology, ecological modelling and qualitative synthesis.
O2_O3	Development of international academic networks focused on conducting research.	The development of already existing networks with the University membership, e.g.: UNA EUROPA, Coimbra Group, The GUILD, Baltic University Program; access to new networks.
O3_O2	The location of the university close to the technological park and science and research institutions.	University research units cooperate with the Jagiellonian Center of Innovation, which was established by the Jagiellonian University as non-profit institution in 2004 with the intention of promoting technology transfer between the university and industry. The Jagiellonian Center of Innovation accomplishes its goals by managing Park Life Science located in the immediate neighborhood of the University Campus, where research is carried out in life sciences by such companies as: Biocentrum, Dersmithson, Exec Mind, F1, Pharma, Innovalab, Merit, Miraculum, Selvita, Selvita Services or Ardigen.
O3_O3	Immediate business neighborhood offering attractive work places for the university graduates.	According to the university Careers Service, between 2016-2018 university graduates were employed by such companies as Perkin Elmer or Malopolska Centre of Biotechnology. Labour market expectations are constantly growing due to the development of the branches that use biotechnologies.
O3_O6	Growing interest in degree courses in Poland and in the countries in Eastern Europe and Central Asia.	In 2016 – 2018 there was an increase in the number of foreign students at full degree courses from Eastern European countries and Asia from 1306 to 1737. Most students come from Ukraine, Belarus and Russia.

POB
BioS
Justification of POB range
The proposed research area covers numerous problems related to structural biology, life mechanisms at the atomic level, genetics including the DNA structure and sequencing, cell biology, evolutionary biology as well as biodiversity and designing new pharmaceuticals and therapies. These are key problems not only for Poland: they also make leading global research areas. Research work naturally requires substantial investment into the development of researchers' competences, but equally importantly into material infrastructure, namely most advanced technologies, analytical and measurement equipment, as well as advanced IT software solutions. Therefore, financing research in this area creates a great challenge that the university has to face while trying to gain stable sources of funding.
Proposed directions of activities in range of the strengths of the SWOT analysis
Increasing the impact on the development of global science 1. Providing support for continuous development of academic staff members' research competences at the international level. 2. Taking actions to maintain and develop publishing in most often cited scholarly journals. 3. Taking actions conducive to obtaining research results of applicable character, i.e. feasible to be applied in medical practice. 4. Planning actions of continuous character aiming at obtaining modern research equipment that would foster research processes, including obtaining Polish and international grants. Increasing international research cooperation 5. Establishing cooperation in the field of active participation in the work of international and inter-disciplinary university networks. 6. Establishing a university administrative unit that would foster international cooperation. Improving the quality of education 7. Developing activities that would increase the internationalization of the education process in English in connection with leading international universities. 8. Organizing educational programs responding to the challenges related to the thematic scope of this research area, which will allow raising the level of professional and language competences of students as well as teaching competences of academic teachers. 9. Promoting in the motivational system the joint-authorship publications of international undergraduates and PhD students on the subject of this research area. 10. Creating activities supporting and developing access to high-class teaching infrastructure. 11. Developing programs to improve teaching competences to maintain an optimal relationship between academic staff members and undergraduates and PhD students. 12. Activities aimed at maintaining high position in the university rankings (PKA).

Scientific development of the employees

13. Development of comprehensive programs including actions targeting young scientists for continuous improvement of their competences and the increase of their participation in international research.

15. Maintenance and development in the range of access to the university's infrastructure and research equipment.

Improving the quality of university management

16. Improving management procedures with the use of IT systems supporting conducting international research projects in this research area.

Justification of the choice of courses of action resulting from the strengths of the SWOT analysis

The academic staff members of the Jagiellonian University and Collegium Medicum participate in research projects of global importance. The use of the strengths lies in intensifying this participation by developing activities aimed at involving a bigger number of young research staff members, including the most talented undergraduates and PhD students in the conducted research work. Research programs should take into account the facilitation from the administrative structure regarding faster publication of co-authored work results (academics with undergraduates and doctoral students) on the international forum, including participation in international scientific conferences. To strengthen this effect in the long-term perspective, the focus should be on adjusting IT management systems to the needs of international projects. For such a complex research activity, it is necessary to ensure a stable and dedicated source of financing.

Justification of the choice of courses of action, resulting from the weaknesses of SWOT analysis**Increasing the impact on the development of world science**

1. Activities aimed at increasing the number of employees undertaking the challenges to participate in international research projects and obtaining prestigious international grants.

2. Scheduled activities reducing teaching load and administrative duties for the employees undertaking cooperation in international research teams that deal with the issues of this research area.

Increasing international research cooperation

3. Activities aimed at increasing the number of research workers undertaking the challenge of participating in international research teams through actions to reduce the teaching and organizational load and making additional funding streams accessible.

4. Developing programs to raise the level of competences in building international relations with leading foreign universities and global corporations to establish cooperation in the field of this research area.

Improving the quality of education

5. Development of the university systemic programs that would support the competition for the best candidates for studies.

5. Development of teaching syllabuses that would respond to the challenges related to this research area, which would be financed within the process of preparation of graduation/ diploma work.

Scientific development of the employees

6. Developing activities aimed at changing the dominant systemic solution, which implies subordinating the path of development of young scientists to scientific advancement, and not the development of international research work.

Improving the quality of the university management

7. Development of activities aimed at correction of the incentive system, which includes participation in international research projects.

8. Integrating the university management units to facilitate more efficient international project management.

Justification of the choice of courses of action, resulting from the weaknesses of SWOT analysis

Reducing or eliminating the impact of weaknesses will require planning and implementation of activities related to: increasing a number of employees undertaking international participation challenges, reducing teaching and administrative load for these employees who participate in international projects, increasing a number of employees that would participate in international research teams, and making additional streams of funding accessible for international projects. Teams. It is advisable to design programs for the development of competences necessary to build international relations with leading foreign universities and global corporations and undertaking systemic actions that would support competition for best candidates for studies. As for teaching syllabuses, it is advisable to facilitate financing selected projects in the process of preparation of graduation/ diploma work. All these actions should be planned as long-term. They can be systemic solutions aimed at gaining funds from outside the university sources, such as corporations. The above mentioned actions can be facilitated by better integration of the university management units.

Proposed directions of activities in the range of opportunities of the SWOT analysis

Increasing the impact on the development of world science

1. Actions aimed at greater use of national scientific policy, preferring concentration of inputs in units taking part in international research projects.

2. Activities aimed at greater use of the convenient industrial environment of Krakow and establishing cooperation between universities and global high-tech enterprises in research.

3. Developing activities aimed at increasing the number of research projects carried out in cooperation with the fastest growing industries and international scientific centers in of this research area.

The increase of international research cooperation

4. Development of action programs aimed at greater correlation of the research areas of the university with the priorities in European and global science and the challenges of the future society.

5. Developing ways of identifying priority research areas of a global nature related to this research area and giving it priority importance as research areas of the university.

6. Planning and undertaking activities aimed at participating in research works of university networks of international renown.

7. Planning activities to facilitate the acquisition and use of information technologies in establishing international contacts and reducing language barriers.

8. Increasing the use of Cracow's exceptional industrial environment in establishing cooperation in the range of this research area between the university and global enterprises from the high-tech industry.

Improving the quality of education

9. Undertaking activities aimed at greater use of advanced modern technologies in the didactic process.

10. Preparation of activities using the growing interest in studies in Poland in the countries of Eastern Europe and Central Asia.

Scientific development of the employees

11. Preparation of activities aimed at greater use of support programs for the academic staff.

12. Undertaking activities aimed at recognizing and applying the EU recommendations regarding the development of scientific staff.

13. Actions aimed at using the increase in the flexibility of public subsidies to establish and conduct research in the field of this research area.

14. Undertaking activities aimed at greater use of advanced modern technologies to improve the research competence of the employees.

Improving the quality of university management

15. Actions aimed at integrating the university management information system (university digitalization).

16. Actions facilitating the use of the possibilities of diversifying the sources of financing of the university for establishing and conducting research works in the field of this research area.

Justification for the choice of course of action, in the range of opportunities of the SWOT analysis

New emerging opportunities in the range of increasing the use of different sources of financing research activities create chances for the development of a plan of concentration of research expenditure dedicated to the establishment of international projects in the field of the subject of this research area. This will allow for greater recognition of priority research areas of a global nature and the correlation of research areas with priorities in European and global science. Research has revealed a growing chance of engaging in the research work the high-tech enterprises in the pharmaceutical industry, which is associated with the convenient location of the university. The above actions should take into account the use of the growing availability of information and communication technologies. Their use is based on: more efficient establishing of international contacts and reducing language barriers as well as activities aimed at raising the academic competences of the employees and students in the didactic process.

Proposed directions of activities in range of threats of the SWOT analysis

Increasing the impact on the development of the world science

1. Developing activities aimed at concentrating the ways and sources of obtaining very limited financial resources for research, in order to reduce dissonance in relation to other European Union countries in this research area.

2. Developing activities aimed at retaining talented young scientists at the university.

3. Offers of better working conditions and scientific development as counteracting competitive pressure from other scientific centers.

The increase of international research cooperation

4. Activities that intensify establishing contacts with universities and research centers as well as global enterprises emerging in new competitive geographic regions within the thematic scope of this research area.

5. Actions promoting in the political and economic sphere the need to establish research projects in the range of this research area, as counteracting the risk of divergence of Poland's economic and foreign policy with identified global trends and the needs of the future society.

Improving the quality of education

6. Developing system solutions limiting the growing bureaucratisation of a didactic process.

Scientific development of employees

7. Activities aimed at a significant improvement of the salaries of researchers in obtaining research results at the highest global level.

8. Preparation of activities aimed at solving problems related to higher education's "work-life balance".

9. Developing system and legal solutions in the range of age management for higher education, introduction of activities taking into account the diversity of roles of young scientists and older people of science.

Improving the quality of university management

10. Activities aimed at preparing the offer of better working conditions and scientific development for the most talented students and improving the attractiveness of work at the university in relation to jobs in industry.

Justification of the choice of courses of action, resulting from the threats of the SWOT analysis

Achieving research results at the highest international level, in particular in the projects related to this research area, requires a sufficiently high level of funding. In the case of a shortage of expenditures, it is necessary, as indicated in the area of opportunities, to prepare consolidation activities and various new sources of financing. In this way, the university can counteract the phenomenon of relative reduction of the attractiveness of work at the university. Actions should be taken to develop a better, more attractive job offer, effectively manage the age issues of academic staff members, and reduce the growing bureaucratisation of a teaching process.

4.2.4. DigiWorld

Selected data justifying POB (Priority Research Area)

Code	Factors in SWOT analysis	Selected detailed data justifying DigiWorld
Strengths		
O1_S1	Research competence of the scientific staff	Departments have the A + or A category of the Ministry of Science and Higher Education (Faculty of Physics, Astronomy and Applied Computer Science A +, Faculty of Chemistry A +, Faculty of Mathematics and Computer Science A +, Faculty of Biochemistry, Biophysics and Biotechnology A +, Faculty of Philosophy A +, Faculty of Geography and Geology A, Faculty of Management and Social Communication A). According to Scopus, the normalized citation rate for 2013-2017 is generally 1.50 for a university, and the same aggregate indicator for categories assigned to POB is 1.51.
O1_S2	Increasing efficiency in obtaining national and international grants.	- In general, for the Jagiellonian University: In the years 2014-2018, it is possible to observe upward trends in the number of research projects commenced in individual years, this applies to the total number of research projects, the number of international projects and the number of projects under the Horizon 2020 Program in the years 2014-2018 amounted to: 0,5,3,5,10 respectively. - The number of research projects started in 2014-2018 amounted to 308, 248, 302, 351, 331 (+35), respectively. - The number of international projects launched in the years 2014-2018 was 23, 18, 34, 19, 30 respectively. For example: 126 research grants (only WFAIS UJ), about 20 patents in the last 5 years, coordination of three projects from Polish Road Map of Research Infrastructure. . Thematic grants in the scope of AI acquired recently: FNP TEAM-Net (J. Tabor, MA Nowak , T. Marek) "Artificial biologically inspired neural networks", TEAM-Net (M. Kuś, K. Życzkowski, Z. Puchała) "Quantum computers in the near future: challenges, optimal implementations and practical applications".

O1_S3	Publishing activity in the first quartile of the most-cited magazines.	In general, for the Jagiellonian University, the value of the item index in the first quartile in 2013-2017 is 53.1%. The value of the aggregate ratio for the categories assigned to the OP for the period 2013-2017 is 62.6% (Scopus).
O1_S4	Infrastructure and scientific apparatus supporting research processes.	Apparatus in accordance with the specification of high-value infrastructure, including, for example: an integrated test stand using transcranial magnetic stimulation with neuronavigation and a set of presentation of multimodal stimuli (Faculty of Philosophy); integrated stand for EEG spectroscopic-electroencephalographic research with hardware and computer equipment (Faculty of Philosophy, FAIS Faculty); equipping the SOLARIS Synchrotron Radiation Center; fMRI dense recording (Faculty of Management and Social Communication), 4 supercomputer positions (FAIS Faculty), ATOMIN laboratory base, positron emission tomography (Jagiellonian PET).
O1_S5	The presence of many scientific disciplines that creates the potential for interdisciplinary research.	According to experts, currently research on machine learning and AI simulations requires complementary activities in the field of sciences: computer science and mathematics, physical sciences; in the field of technical sciences (technical informatics and telecommunications), the field of humanities (linguistics), field of social sciences (geography and spatial economy, information technology, psychology, legal sciences), and all these areas are represented by faculties of the Jagiellonian University.
O2_S1	Active participation in the work of international university networks.	Membership of the Jagiellonian University in, among others: UNA EUROPA, Coimbra Group, The GUILD Baltic University Program.
O2_S2	Measurable results of international research cooperation (publications and grants).	According to Scopus, the percentage of scientific articles in international cooperation for the years 2013-2017 aggregated for the categories assigned to POB is 57.00%, while the normalized quotation rate for scientific articles in international cooperation 2013-2017 is 2.1. In the UJ scale (the list does not include CM) in 2014-2018, 248 international projects were completed, including mainly research and education projects. In this group there are 9 research projects related to the trends identified in the SWOT analysis chances and which justify the selection of POB. For example: Planar electronic devices on a molecular scale. Beamline for Tomography at SESAME - BEATS

		Design and construction of microwave bridge for EPR spectrometer for dosimetry purposes.
O2_S3	Recognition of selected scientists on the international arena.	Achievements and cooperation of the most outstanding scientists, including: Professor dr hab. Karol Życzkowski (WoS: Index h = 38, 5569 citations (no self-citations), is or was a member of the editorial board: Journal of Physics A: Mathematical and Theoretical (2004-10), Quantum (from 2016), Open Systems and Information Dynamics (since 2003); Professor dr hab. Jacek Tabor (WoS Index h = 10, 347 citations, no self-citations) Professor dr hab. Maciej Andrzej Nowak (Index h = 24, 1600 citations, no self-citations, Reviewer in all major journals in the field of theoretical physics and complexity theory) Professor dr hab. Tadeusz Marek, (WoS: Index h = 21, citation - 3641, Member of the International Scientific Boards of the International Conference of Applied Human Factors and Ergonomics - 2008, 2010, 2012, 2015).
O2_S4	Employees' experience in managing international projects.	In 2014-2018, the Jagiellonian University staff were managers in 16 major international projects, in which the Jagiellonian University has a leading position (Faculties: Mathematics and Information Technology, Physics, Astronomy and Applied Computer Science, Philosophy, Philology, Geography and Geology). In addition, during the period other than the above, the employees held managerial positions in various international projects. Sample experience: Professor dr hab. Karol Życzkowski (Grants SFB Transregio-12 (2011-14 - head of the Polish node).
O2_S6	Number of cooperation agreements concluded with foreign research centers.	At the level of the Jagiellonian University, the number of international agreements as of 01/04/2019: 343 bilateral agreements, 1567 Erasmus + KA 103, 48 Erasmus + Ka 107 contracts.
O3_S1	Internationalization of the educational process, including didactic offer in English.	Generally at the Jagiellonian University: • In 2016/2017 and 2017/2018, the number of undergraduates leaving for a period of at least 3 months increased from 792 to 815, and students coming for a period of at least 3 months increased from 933 to 1029.

		• In the years 2016/2017 and 2017/2018, the number of doctoral students leaving for a period of at least 3 months increased from 87 to 111, and doctoral students coming for a period of at least 3 months increased from 21 to 28. • In 2016/2017 and 2017/2018, the number of outgoing academic teachers (regardless of the duration of mobility) increased from 1295 to 1574, and incoming academic teachers (regardless of the duration of mobility) increased from 152 to 158.
O3_S4	Access to high-class teaching and scientific infrastructure.	Many faculties of the Jagiellonian University are placed in the modern Campus of the Jagiellonian University (e.g. Faculty of Physics, Astronomy and Applied Computer Science, Faculty of Mathematics and Computer Science, Faculty of Management and Social Communication, Faculty of Chemistry, Faculty of Geography and Geology, Faculty of Biochemistry, Biophysics and Biotechnology).
O3_S6	Leading places in national university rankings and distinguishing marks of the Polish Accreditation Committee.	• The Shanghai ranking: Mathematics, computer mathematics: 151-200. • QS World University Rankings: Literary Studies: 151-200. • Place in the Outlook of Prospects 2018: Environmental protection: 1. • Polish Accreditation Commission: distinctive assessment (Environmental protection, computer science, applied computer science, computer games, analytical informatics, Faculty of Management and Social Communication).
Opportunities		
O1_O1	Dynamic development of selected sectors and industries related to the directions of scientific research.	According to experts, there is a dynamic development, among others the machine learning industry and artificial intelligence. They are related to the directions of research at the faculties, including the majors of the most outstanding scholars such as: dr hab. Karol Życzkowski, Professor dr hab. Jacek Tabor, Professor dr hab. Maciej Andrzej Nowak, prof. dr hab. Tadeusz Marek.
O1_O3	Development of cooperation with world-leading research centers.	Cooperation with many centers and teams, including those from the Shanghai list, e.g.

		Princeton University, (USA), University of Oslo, (Norway), University of Michigan, (USA), Durham University (UK), Humboldt University Berlin, Stony Brook University (USA), Max Planck Institute, Dresden, Kings College London, Univ . Pierre et Marie Curie Paris, Charles University in Prague (Czech Republic), Simons Center for Geometry and Physics (New York, USA), University of Wisconsin-Oshkosh, (WI, USA), Center for Complex Systems and Brain Sciences Universidad Nacional de San Martín, (Argentina), Federation University (Australia).
O1_O4	Social and economic trends stimulating the demand for research.	According to expert opinion, machine learning and AI simulations - including image perception and recognition modeling cognitive human abilities, processing of collected knowledge, planning and inference - are currently the subject of unlimited applications in the organization of social life, culture and economy, highly recognizable in the proposals of National Smart Specializations. Memory, calculation, learning and intelligence are the subject of many basic research of fundamental importance for the development of humanity.
O1_O5	The unique industrial surroundings of Krakow and the cooperation of the university with companies from the high-tech industry.	• Cracow is perceived as a center of the "Polish Silicon Valley"; is one of the leading places in Poland conducive to the creation of startups with numerous special economic zones (eg managed by KPT), spaces for coworking and many capital funds, including seed funds (eg Innoventure, Augere, ABAN, HumanAlfa). • Małopolska is a region of the IT industry (Ericsson, Nokia, Motorola) and game-ing. • Małopolska as the fourth voivodship in Poland in terms of the total number of economic entities included in the creative industries and as the voivodship with the highest growth dynamics of this sector in Poland, the most distinguished by a large number of companies from the computer games and software industry.
O1_O6	Participation of doctoral schools in research processes.	Doctoral programs: earth and environmental sciences, physical sciences (physics of complex systems), computer science, biological sciences, doctoral program in biochemistry, biology and biophysics
O2_O1	Correlation of university research areas with priorities in European and world science.	Publishing and reviewing activity of the most outstanding scientists from the Jagiellonian University in high-circulation magazines. Main research directions of the most outstanding scientists of the Jagiellonian University, including:

		• Professor dr hab. Karol Życzkowski (Nonlinear Dynamics, Classical and Quantum Chaos, Quantum Information Theory, Quantum Entanglement, Fundamentals of Quantum Mechanics, Applied Mathematics, Methods of Statistical Physics in Social Sciences, Theory of Social Choice and Voting). • Professor dr hab. Jacek Tabor (Information Theory, Machine Learning, Deep Learning - Methods of Classification and Clustering) • Dr hab. Marcin Kozik (Universal algebra, Computational complexity, The problem of satisfying constraints). • Professor dr hab. Maciej Andrzej Nowak (Theory of random matrices, Free probability, Stochastic processes, Interdisciplinary application of advanced methods of physics, statistical in neuro-biological sciences, Applications of random matrices in telecommunications and machine learning). • Professor dr hab. Tadeusz Marek, (Neurocognitive science, Neurocognitive science, Neuroergonomics, Chronobiology, Chronopsychology, Stress and burnout, Neural networks of the brain in the perspective of artificial intelligence).
O2_O2	Emerging research areas of a global character.	According to experts machine learning technologies that use advanced algorithms and systems to improve and expand knowledge based on massive data (Big Data) are a sub-domain of artificial intelligence (Artificial Intelligence, AI), successfully used and developed in almost all branches of science.
O2_O3	The development of international university networks focused on conducting research.	Development of current networks in which the Jagiellonian University is a member, including: UNA EUROPA, Coimbra Group, The GUILD, Baltic University Program, and joining new networks.
O3_O2	The location of the university surrounded by a technology park and scientific research units.	In Cracow, there is Kraków Technology Park and other scientific and research units, in particular the AGH University of Science and Technology, institutes of the Polish Academy of Sciences (IFJ, IKiFCH), CYFRONET computational centers, and the games industry is developing rapidly.
O3_O3	A direct business environment offering attractive jobs for graduates.	According to the Career Office of the Jagiellonian University in 2016-2018, university graduates found work for such companies as, for example: Ericsson, Motorola Solutions, IBM, Saber Poland. The

		labor market expectations related to the development of industries using digital technologies are also growing.
O3_O6	Increased interest in studies in Poland in the countries of Eastern Europe and Central Asia.	In 2016 - 2018, the number of foreign students from Eastern Europe and Asia increased on the full cycle of education from 1306 to 1737. The largest number of students were from Ukraine, Belarus and Russia, studies in computer science and applied informatics as well as computer science are eagerly undertaken.

Justification of POB range and recommended courses of action

Name of POB	
DigiWorld	
Justification of the POB range	
The ongoing process of digitization of life is currently no secret to anyone. It covers an increasing scope not only of socio-economic life, but also of scientific activity. The proposed research area covers a wide range of issues related to, among others: development of machine learning technology, creation of advanced algorithms and analysis systems (Big Data) and works aiming at the development of artificial intelligence. Its scope covers issues related not only to IT, mathematics and physics, but also the recognition and control of complex systems, both at the level of atoms, as well as living organisms. The contemporary development of science and technology is not conceivable without taking into account in the research work of the digital world. It is currently one of the most important research directions in the world. The analog world slowly goes into oblivion, it is consistently replaced with the digital world. Developing new digital technologies, which is nowadays particularly visible in communication technologies, require an adequate and long-term financing stream.	
Proposed directions of activities in range of strengths of the SWOT analysis	
Increasing the impact on the development of the world science 1. Providing support for the continuous improvement of research competence of scientific staff at the international level. 2. Undertaking activities leading to obtaining results of application research, possible to be used in medical practice. 3. Planning continuous activities for acquiring modern scientific equipment, supporting research processes, including obtaining national and international grants. Increasing the international research cooperation 4. Establishing cooperation in the field of active participation in the work of international and inter-disciplinary university networks.	

Improving the quality of education

5. Developing activities that increase the internationalization of the education process in English in connection with leading international universities.
6. Organizing educational programs responding to the challenges related to the thematic scope of this research area, which will allow raising the level of professional and language competences of students as well as teaching competences of academic teachers.
7. Promoting in the motivational system the joint-authorship publications of international undergraduates and PhD students on the subject of this research area.
8. Creating activities supporting and developing access to high-class teaching infrastructure.
9. Developing programs to improve teaching competences in the area of optimal relationship between science people and undergraduates and PhD students.
10. Activities aimed at maintaining high grade in the university rankings (PKA).

Scientific development of employees

11. Development of comprehensive programs including actions targeting young scientists for continuous improvement of competences and the increase of participation in international research.
12. Maintenance and further development in the range of access to the university's infrastructure and research equipment.

Improving the quality of university management

13. Improving organizational procedures in the area of establishing and conducting international research projects, targeted financing of international scientific research with the use of IT systems supporting management in conducting international research projects.

Justification of the choice of courses of action, resulting from the strengths of the SWOT analysis

The activity of the scientific staff in particular social sciences disciplines involved in research projects belonging to this research area includes participation in research projects of international and global importance. The use of the strengths lies in intensifying this participation by developing activities aimed at involving a greater number of young research staff, including the most talented undergraduates and PhD students in the conducted research work. Research programs should take into account the facilitation from the side of the administrative structure regarding faster publication of co-authored work results (academics with undergraduates and doctoral students) on the international forum, including participation in international scientific conferences. In order for the research effect to be positive and sustainable, long-term action plans for raising the level of engagement should be developed. In this work, improvements should be included in the adaptation of IT management systems to the needs of international projects. For such complex research activity it is necessary to ensure a stable and dedicated stream of financing.

Proposed directions of activities in range of weaknesses of the SWOT analysis

Increasing the impact on the development of world science

1. Activities supporting the improvement of the publication activity in the most-cited magazines (the first decile of the journals WoS and Scopus).
2. Activities aimed at increasing the number of employees undertaking challenges to participate in international research projects and obtained prestigious international grants.
3. Developing activities aimed at intensifying contacts with social organizations and global enterprises operating in the university's environment.
4. Scheduled activities reducing the burden of didactic and administrative activities for employees undertaking cooperation in international research teams dealing with the issues of this research area.
5. The need to plan actions to make the age structure more flexible and to make more optimal use of the scientific staff, in particular in the field of international cooperation.

The increase of international research cooperation

6. Development of activities aimed at increasing the attractiveness of the university's offer addressed to foreign researchers.
7. Development of comprehensive activities in the range of greater and more effective promotion of research results and academic offer of the university.
8. Activities aimed at improving the international image and recognition of the university.
9. Activities aimed at increasing the number of research workers undertaking the challenge of participating in international research teams through actions to reduce the teaching and organizational burden and making available additional funding streams.
10. Developing programs to raise the level of competence in building international relations with significant foreign universities and global corporations in the range of establishing cooperation in the field of this research area.

Improving the quality of education

11. Development of activities aimed at making the study programs more flexible, which will take into account individual approach to learning paths.
12. Preparation of new solutions (incentives) in the university's motivational system in the area of improving the quality of didactic work.
13. Preparation of activities aimed at obtaining greater activity of academics in the range of academic mobility.
14. Organizing educational programs that respond to the challenges related to the thematic scope of this research area which enable financing within the stage of preparing thesis.

Scientific development of employees

15. Developing a new system of researching the needs and satisfaction of employees.
16. Developing activities aimed at changing the dominant systemic solution, which imply subordinating the path of development of young scientists to scientific advancement, and not the development of international research works.

Improving the quality of university management

17. Undertaking activities aimed at agreeing system of periodic employee evaluations with the path of their professional development.
18. Development of activities aimed at improving the integration of university management elements for a more efficient management of complex international research projects.
19. Developing activities aimed at greater support in making important decisions, including IT tools for management support.

Justification of the choice of courses of action, resulting from the weaknesses of the SWOT analysis

The university's weaknesses require planning and undertaking long-term activities. In the context of this research area, it is advisable to: increase the attractiveness of the university's offer, increase and more effective promotion of research results and academic offer, improve the international image and recognition of the university, increase the number of researchers undertaking the challenge of participating in international research teams, make study programs more flexible. In the incentive system, there are no measurable incentives that would be a real incentive to improve the quality of didactics. At the same time, there is a lack of a system of researching the needs and satisfaction of employees at the university. Periodic evaluation of the scientific activity of employees should be more consistent with the path of their scientific development. At the same time, there is subordination of the path of development of young scientists to scientific advancement, and not conducting research in international relations. It is also an area where appropriate action should be taken. However, an IT system for university management could be equipped with analytical tools to support decision making. In the above-mentioned activities, it will be helpful to improve the integration of university management elements in the aspects of the activity mentioned above.

Proposed directions of activities in range of opportunities of the SWOT analysis**Increasing the impact on the development of world science**

1. Developing activities aimed at increasing the number of research projects implemented in cooperation with social organizations and the fastest growing industries, in particular with global high-tech enterprises from the university environment and international research centers in the field related to this research area.
2. Taking measures to take greater account of social and economic trends in scientific research belonging to this research area.
3. Undertaking activities aimed at increasing the participation of doctoral students in research projects.

The increase of international research cooperation

4. Development of action programs aimed at greater correlation of the research areas of the university with the priorities in European and global science and the challenges of the future society.
5. Developing ways of identifying priority research areas of a global nature related to this research area and giving it priority importance as research areas of the university.
6. Planning and undertaking activities aimed at participating in research works of university networks of international renown.

7. Planning activities to facilitate the acquisition and use of information technologies in establishing international contacts and reducing language barriers.

8. Increasing the use of Cracow's exceptional industrial environment in establishing cooperation in the range of this research area between the university and global enterprises from the high-tech industry.

Improving the quality of education

9. Undertaking activities aimed at greater use of advanced modern technologies in the didactic process.

10. Undertaking activities aimed at better and more looked for by employers preparation of graduates to work in the business environment of the university.

11. Preparation of activities within the framework of popularizing university studies at the national and international level.

Scientific development of employees

12. Undertaking activities aimed at recognizing and applying EU recommendations regarding the development of scientific staff.

13. Undertake activities aimed at increasing the use of internships in non-academic organizations.

14. Undertaking activities that increase the knowledge and application of good practices from the business environment of the university.

Improving the quality of university management

15. Actions aimed at integrating the university management information system (university digitalization).

16. Actions facilitating the use of the possibilities of diversifying the sources of financing of the university for establishing and conducting research works in the field of this research area.

Justification of the choice of courses of action, resulting from the opportunities of the SWOT analysis

Emerging new opportunities to increase the use of different sources of financing research activities provide opportunities for undertaking actions aimed at increasing the number of research projects implemented in cooperation with entities belonging to the fastest growing industries and international scientific centers. The thematic scope of research should make greater use of social and economic trends and be characterized by a greater correlation of research areas of universities with priorities in European and world science. It is also necessary to intensify the participation of doctoral students in research projects. The use of the unique environment of the university gives the opportunity to undertake more intense contacts with global high-tech enterprises, recognize and use good practices, and make greater use of advanced modern technologies in the didactic process. In the field of scientific staff development, actions should be taken to identify and apply EU recommendations regarding the development of scientific staff.

Proposed directions of activities in range of threats of the SWOT analysis

Increasing the impact on the development of the world science

1. Developing activities aimed at concentrating the ways and sources of obtaining very limited financial resources for research, in order to reduce dissonance in relation to other European Union countries in this research area.

2. Developing activities aimed at retaining talented young scientists at the university.

3. Offers of better working conditions and scientific development as counteracting competitive pressure from other scientific centers.

The increase of international research cooperation

4. Activities that intensify establishing contacts with universities and research centers as well as global enterprises emerging in new competitive geographic regions within the thematic scope of this research area.

5. Actions promoting in the political and economic sphere the need to establish research projects in the range of this research area, as counteracting the risk of divergence of Poland's economic and foreign policy with identified global trends and the needs of the future society.

Improving the quality of education

6. Undertaking activities in raising the level of knowledge of candidates for studies.

7. Developing system and legal solutions that will increase flexibility in shaping study programs.

8. Developing system solutions limiting the growing bureaucratisation of didactic processes.

Scientific development of employees

9. Activities aimed at a significant improvement of the salaries of researchers in obtaining research results at the highest global level.

10. Preparation of activities aimed at solving problems related to higher education's "work-life balance".

11. Developing system and legal solutions in the range of age management for higher education, introduction of activities taking into account the diversity of roles of young scientists and older people of science.

Improving the quality of university management

12. Activities aimed at preparing the offer of better working conditions and scientific development for the most talented students and improving the attractiveness of work at the university in relation to jobs in industry.

13. Development of guidelines for activities aimed at maintaining uniformity and IT compatibility of the university system.

Justification of the choice of courses of action, resulting from the threats of the SWOT analysis

The scattering and low level of financing of scientific activities leads to the preparation of a plan of concentration of research expenditures dedicated to the establishment of international projects in the range of the subject of this research area. A larger stream of funding will allow for taking actions to minimize the impact of threats and aiming at intensifying establishing contacts with the socio-economic stakeholders of the university, which will allow identification and selection of research topics related to the quality of life. It is also necessary to develop activities that will increase flexibility in shaping study programs. Improvement in the quality of didactics can be achieved by preparing system solutions to limit the growing bureaucratisation of didactic processes.

4.2.5. qLife

Selected data justifying POB (Priority Research Area)

Code	Factors in SWOT analysis	Selected data justifying qLife POB
Strenghts		
O1_S1	Research competence of the scientific staff	The faculties have the category A + or A Ministry of Science and Higher Education (Faculty of Medicine, Jagiellonian University Medical College - A, Faculty of Pharmacy, Jagiellonian University Medical College - A +, Faculty of Health Sciences, Jagiellonian University Medical College - A). According to Scopus, the normalized citation rate for 2013-2017 is generally 1.50 for the university, and the same aggregate indicator for categories assigned to POB is 1,76).
O1_S2	Increasing efficiency in obtaining national and international grants.	Generally, for the Jagiellonian University: In the years 2014-2018, it is possible to observe upward trends in the number of research projects commenced in individual years, this applies to the total number of research projects, the number of international projects and the number of projects under the Horizon 2020 Program. • The number of research projects started in 2014-2018 amounted to 308, 248, 302, 351, 331 (+35), respectively. • The number of international projects started in the years 2014-2018 amounted to: 23, 18, 34, 19, 30. • The number of projects of the Horizon 2020 Program in the years 2014-2018 amounted to: 0, 5, 3, 5, 10. For example: only in 2019, researchers from the Jagiellonian University won in one hand 16 grants (OPUS, PRELUDIUM, SONATA) from NCN - for a total amount of approx. 19 million PLN.
O1_S3	Publishing activity in the first quartile of the most-cited magazines.	The value of the aggregate ratio for the categories assigned to the OP for the period 2013-2017 is 49.3% (Scopus). In Medical Sciences, the works of researchers of the Jagiellonian University are published in journals with the highest value of five-year Impact Factor, e.g. NEJM, Lancet, JAMA, Nature Genetics, Journal of Clinical Oncology, BMJ, JACC, Circulation Research, Journal of Allergy and Clinical Immunology, Blood, Annals Of The Rheumatic Diseases, Annals Of Neurology, PNAS, Leukemia. In the field of pharmacy, publications appear in periodicals: Journal of

		Medicinal Chemistry, Drug Discovery Today, Reviews in Drug Delivery.
O1_S4	Infrastructure and scientific apparatus supporting research processes.	Previously used elements of high-value infrastructure and equipment that allowed to join the European leaders in some research areas, eg a multi-functional NMR spectroscopy system in the search and development of new drugs (Pharmaceutical Faculty), a biomedical research scanning station (Jagiellonian Center for Drug Development), a sequencer of the new Generation Nextseq 500 Sequencing System / NGS (Faculty of Medicine).
O1_S5	The presence of many scientific disciplines that creates the potential for interdisciplinary research.	According to experts, it is possible to maximize interdisciplinary cooperation with researchers from other university and non-university units, in particular in the areas of: Medical biology and biotechnology, Computational technologies (including BigData / Data Mining systems), Humanities and social Sciences. Example: the project "PharmOPTIM.PL - center of optimization and pharmacology individualization, pilot concept and implementation", financed within the DIALOG program of the Ministry of Science and Higher Education aims to prepare cooperation schemes for specialists in various fields allowing for the development and implementation of solutions whose primary beneficiaries will be patients. The task is carried out in cooperation with the AGH University of Science and Technology, the Warsaw Medical University and the Grochowski Hospital in Warsaw.
O1_S6	The application character of conducted scientific research.	Setting for the application character based on the translation pathway in biomedical research (includes stages of identifying health needs, studying disease mechanisms, selecting new therapeutic targets and bioactive molecules and their verification in <i>in silico</i>, <i>in vitro</i> and <i>in vivo</i> models, and designing and conducting phase I clinical trials for selected drug candidates). Example: financed by the NCRD project "Regeneration of ischemic damage to the cardiovascular system using Wharton jelly as an unlimited source of therapeutic stem cells" (32 million PLN). The consortium includes UJ CM as the leader, the Polish Stem Cell Bank, John Paul II's Krakow Specialist, AGH University of Science and Technology, Medical University of Silesia and the Jagiellonian Center for Innovation.

O2_S1	Active participation in the work of international university networks.	Membership in, among others: Coimbra Group, The GUILD, EAFP (European Association of Faculties of Pharmacy). Example: UJ CM acts as the Coordinator (grant holder) of COST 15105 Action - European Cooperation in the Field of Scientific and Technical Research - researching the solution of the drug shortage problem for patients in Europe and associating researchers from 29 countries.
O2_S2	Measurable results of international research cooperation (publications and grants).	According to Scopus, the percentage of scientific articles in international cooperation for the years 2013-2017 aggregated for the categories assigned to the POB is 32.60%), while the normalized quotation rate for scientific articles in international cooperation 2013-2017 is 3.97. Projects of the Jagiellonian University CM associated with the trends identified in the SWOT analysis chances and justifying the selection of POB are, for example: • OMICRON: Creating a center of advanced molecular technologies with high efficiency at the Faculty of Medicine of the Jagiellonian University Medical College (7 Framework Program / 7 PR) • IPROCOM: Construction of in silico models of the granulation process in a roller compactor (7 Framework Program / 7 PR) • ATHLOS: Health-related aging trajectories: long-term opportunities and synergies (H2020-EU.3.1.1. - Understanding health, wellbeing and disease; PHC-01-2014 - Understanding health, aging and disease: determinants, risk factors and pathways) • EUThyroid: Striving to eliminate iodine deficiency and other thyroid diseases that can be prevented in Europe (H2020-EU.3.1.2 - Preventing disease; PHC-06-2014 - Evaluating existing screening and prevention programs) • PREVENTOMICS: Prevention of diseases associated with improper diet through the use of personalized nutrition based on the OMICS study (H2020-EU.3.2.2.1. - Informed consumer choices / H2020-EU.3.2.2.2. - Healthy and safe foods and diets for all DT -SFS-14-2018 - Personalized Nutrition)

		• GRAN-T-MTC: The first phase of a clinical trial using a new peptide analogue for CCK-2 / gastrin receptor for personalized diagnosis and therapy in patients with recurrent or mediated thyroid medullary cancer (ERA-NET on Translational Cancer Research (TransCan)) • PLAQUEFIGHT: New approaches to treating atherosclerosis in coronary heart disease by inhibiting neuroimmunological interactions (ERA-CVD Cardiovascular Diseases) • FRAILTOOLS: Comprehensive validation of fragility assessment tools in screening and embrittlement diagnostics in a variety of clinical and social settings, and provision of integrated care instruments for the elderly (3rd Health Program) Mobility support, e.g. • TRANS SENIOR: Education network for health care innovators in the field of transitional care for the elderly (H2020-EU.1.3.1. - MSc-ITN-2018 - Innovative Training Networks) • LungCARD: Blood test to monitor the efficacy of therapy for patients with non-small cell lung cancer (H2020-EU.1.3.3 - Stimulating innovation by means of cross-fertilization of knowledge; MSCA-RISE-2016 - Research and Innovation Staff Exchange).
O2_S3	Recognition of selected scientists in the international arena.	Achievements and cooperation of the most outstanding scientists, including: • Professor dr hab. Tomasz Guzik (Board) European Society of Cardiology 2018-2020, Editor-in-Chief: Cardiovascular Research, IF 6.3; Section / Speciality Editor: European Heart Journal, IF 23.0; Member Editoriale Board: Hypertension; Clinical and Experimental Pharmacology and Physiology; Journal of Stomatology). • Prof. dr hab. Anetta Undas (Member of the editorial board of Thrombosis Research, panelist of the European Research Council LS4). • Professor dr hab. Grażyna Jasińska (member of the editorial board of the American Journal of Physical Anthropology, Interna-

		tional Journal of Environmental Research and Public Health, Evolution, Medicine, and Public Health, American Journal of Human Biology). • Dr Mateusz Holda in 2018 was on the list of 30 young Europeans who are leaders in their fields, which was announced by Forbes magazine - 30 under 30.
O2_S4	Employees' experience in managing international projects.	Employees have experience in managing Polish teams in international projects, e.g. • Professor dr hab. Tomasz Guzik (European Research Council Consolidator Grant - Inflammation; University of Glasgow; University of Oxford, UK) • Professor dr hab. Gabriel Nowak (ERA-NET Neuron II, "Hyperforin analogues, zinc and TRPC6 channels - a new antidepressant concept", 2014-2017, German-French-Polish grant, head of the Polish side) • Professor dr hab. Stefan Chlopicki, [Eldorado] Effect of Low Doses of low-LET Radiation on impaired vascular Endothelium. • Professor dr hab. Alicja Hubalewska-Dydejczyk, GRAN-T-MTC: Phase I clinical trial using a novel CCK-2 / gastrin receptor-localizing radiolabelled peptide probe for personalized diagnosis and therapy of patients with progressive or metastatic medullary thyroid carcinoma
O2_S6	Number of cooperation agreements concluded with foreign research centers.	At the level of the Jagiellonian University, the number of international agreements as for the date of 01/04/2019: 343 bilateral agreements, 1567 Erasmus + KA 103, 48 Erasmus + Ka 107 contracts.
O3_S1	Internationalization of the educational process, including didactic offer in English.	Generally, at the Jagiellonian University, programs in English are run in 15 fields within 17 specialties. In total, (as for the date of 13.06) 1218 students on English-language programs study here. Generally at the Jagiellonian University: In the years 2016/2017 and 2017-2018, the number of students leaving for a period of at least 3 months increased from 792 to 815, and students coming for a period of at least 3 months increased from 933 to 1029. In the years 2016/2017 and 2017-2018, the number of PhD students leaving for a period of at least 3 months increased from 87 to 111,

		and PhD students coming for a period of at least 3 months increased from 21 to 28. In 2016/2017 and 2017-2018, the number of academic teachers going away (irrespective of the duration of mobility) increased from 1295 to 1574, and academic teachers coming (regardless of the duration of mobility) increased from 152 to 158. Since 1998, the Medical School for Foreigners has been operating at the Faculty of Medicine, where MD is taught (over 750 students from, among others, Norway, USA, Germany, Sweden, Malaysia) and DDS (Doctor of Dental Surgery, over 100 students). Example: studies in English: Drug Discovery and Development conducted by the Faculty of Pharmacy. Example: The EUROPUBHEALTH + project (first prize from the Association of Public Health Schools in the European Region for the best educational program in the field of public health in the European region) - implemented by the Institute of Public Health in a consortium with: EHESP School of Public Health in Rennes (France), University of Sheffield's School of Health and Related Research (United Kingdom), University of Granada - Andalusian School of Public Health (Spain), University of Rennes 1 (France) and Maastricht University (Netherlands). The EUROPUBHEALTH + program is a two-year master's program operating within the framework of the Erasmus Mundus program educating in the field of public health. Example: Systematic Review Center at the Faculty of Medicine - Polish branch of Cochrane Collaboration, an international network of cooperation of independent scientists, specialists and people interested in health issues, whose goal is, among others, promoting decision-making based on reliable and up-to-date information and scientific evidence (Evidence-based medicine). The Center organizes workshops on methodology of systematic reviews for research workers with the participation of Polish and foreign lecturers, and also prepares lectures for UJCM PhD students. Example: Jagiellonian University Collegium Medicum - as the only university from outside the USA - was invited to cooperate within the framework of the "Global Health Education" project realized by the Cleveland Clinic.
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O3_S4	Access to high-class teaching and scientific infrastructure.	The emerging Medical Campus - Krakow Prokocim and the facilities of the University Hospital and the University Children's Hospital will provide opportunities for access to high-class teaching and clinical infrastructure (with the growing need for proportional development of research infrastructure). Currently, in the field of research infrastructure - highly qualified staff has access to selected methods based on specific, strategic apparatus that represents selected areas of translational methodology. Previously used elements of high-value infrastructure, eg ultrasound device with real-time elastic imaging Aixplorer + videoprinter (Faculty of Medicine), Example: Center for Experimental and Innovative Medicine - a joint unit of the University of Agriculture and the Jagiellonian University, operating within the inter-university University Center of Veterinary Medicine and enabling scientific research led jointly by physicians and veterinarians, as well as students.
O3_S6	Leading places in national university rankings and distinguishing marks of the Polish Accreditation Committee.	• Shanghai ranking: pharmacy: 51-75, public health: 201-300, electroradiology: 201-300. • QS World University Rankings: Medical direction: 251-300. • Polish Accreditation Commission: distinctive mark (Nursing). • Ranking of Prospects 2019: First places for 9 medical and health majors (Medical Analytics, Dietetics, Pharmacy, Medical, Medical-Dentistry, Cosmetology, Nursing, Midwifery, Public Health). The best medical school in Poland. • First place in Poland for graduates of the medical faculty in the results of the Medical Final Examination (LEK) in 2018. • International accreditations: Medical direction - Medical Board of California Accreditation (MBC); and National Committee on Foreign Medical Education and Accreditation (NCFMEA) - U.S. Department of Education all programs; Medical Council of India (MCI); Malaysian Medical Council). Example: The Faculty of Medicine was the leader of the "Pro bono Collegii Medici Universitatis Jagiellonicae" project, co-financed from EU funds. The aims of the project were to start studies in the "dietetics" (1st and 2nd degree), to enrich the educational offer for people from outside the academic environment and improve the qualifications of the didactic staff of the Jagiellonian University,

		through the organization of courses and the realization of international internships. Example: As part of the KNOW status, in 2012-2017 133 short-term trips (up to 4 weeks), 73 medium-term (several months) and 7 long-term (several months) to the leading research centers in Europe, the USA and Asia were financially supported at the Faculty of Medicine. The subsidy also covered co-financing of specialist courses and trainings in the field of various scientific methods (molecular biology and systems biology, biostatistics, clinical trial methods, regenerative medicine research methods, diagnostic methods used in the clinic) for 167 people. Dozens of young science employees received support from the KNOW means for fees for participation in postgraduate studies thematically related to the scientific and didactic work performed at the Faculty. The vast majority of conference trips supported by the KNOW means (507 trips to present their results) concerned young researchers. Example: The Faculty of Health Sciences received in 2018 4 million PLN for the "Develop and work" project (POWER Operational Program, Ministry of Health) covering the development of nursing services and assuming the increase in the number of graduates in nursing and obstetrics and the development of graduates of these majors, whose competences and skills are adapted to the changing epidemiological and demographic needs in Poland.
Weaknesses		
O1_W2	Low activity in obtaining prestigious international grants and a small number of them.	According to the opinion of the team of experts, weaker than expected from the leading European university, the activity in managing and participating in prestigious projects is conditioned by the basic infrastructural and equipment limitations of preclinical units (dispersed infrastructure requiring modernization and retrofitting) and limitations in clinical infrastructure - no experimental therapy research department. The dynamic development of infrastructure in the field of natural sciences has not been accompanied in recent years by investments in research infrastructure in the field of medical sciences. Currently, after completion of the construction of the new headquarters of the University Hospital, the primary need is a radical improvement of the infrastructure of preclinical research facilities of medical sciences - replacing dispersed, old infrastructure

		(the current base is historic buildings of over 100 years of history) with modern and focused, enabling synergy of work, as well as retrofitting it in modern equipment adequate to the potential and needs of researchers.
Opportunities		
O1_O1	Dynamic development of selected sectors and industries related to the directions of scientific research	According to the opinion of the team of experts composed of representatives of various fields and disciplines, there is dynamic development of, among others, pharmaceutical and biomedical industry related to the directions of research at the faculties of the Jagiellonian University, including the majors of the most outstanding scholars such as: prof. dr hab. Tomasz Guzik, prof. dr hab. Grażyna Jasieńska, prof. dr hab. Gabriel Nowak, prof. dr hab. Andrzej Pająk, dr Mateusz Hołda.
O1_O3	Development of cooperation with world-leading research centers.	Previous cooperation with the most prestigious centers and teams, e.g. Stanford University, USA; Harvard University, USA; Yale University, USA; Vanderbilt University, USA; University of Minnesota, USA; University of Manchester, UK; University of California, USA - David Geffen School of Medicine; Roswell Park Comprehensive Cancer Center in Buffalo, USA.
O1_O4	Social and economic trends stimulating the demand for research.	The results of research in the fields of biomedicine, pharmacy and health sciences have a special meaning: they can directly affect the health of the population. The aging of the population, the increasing burden of civilization diseases and reproductive health disorders are the most important challenges for the biomedical sciences, pharmaceuticals and health sciences.
O1_O5	The unique industrial surroundings of Krakow and the cooperation of the university with enterprises from the high-tech industry.	Krakow is one of the leading places in Poland conducive to the creation of startups with numerous special economic zones (e.g. managed by KPT), spaces for co-working and many capital funds, including seed funds (e.g., Innoventure, Augere, ABAN, HumanAlfa). Selvita (extensive research cooperation and as part of commercial services), intoDNA (employee spin-out), Adamed, Certara, Neurolix.
O1_O6	Participation of doctoral schools in research processes.	Modern and individual doctoral dissertation programs focusing on individualization and interdisciplinary education in the field of the Doctoral School of Medical Sciences and Health Sciences: in the discipline of medical, pharmaceutical and health sciences.

O2_O1	Correlation of university research areas with priorities in the European and world science.	Publishing and reviewing activity of the most outstanding scientists from the Jagiellonian University in the highest-quoted magazines. Main research directions of the most outstanding scientists of the Jagiellonian University, including: • Professor dr hab. Anetta Undas (Fibrin properties in cardiovascular disease and diseases associated with an increased risk of thromboembolic events; prothrombotic mechanisms in fresh thrombosis and pulmonary embolism; New post-thrombotic mechanisms in diabetes; NET formation in atherosclerotic vascular disease; aortic stenosis - its compounds with the activation of blood coagulation and fibrinolysis; Congenital thrombophilia - searching for new underlying mutations; Mechanisms of action of direct thrombin inhibitors and active factor X and their use in therapy; Mechanisms of procoagulopathy in neoplastic disease) • Professor dr hab. Tomasz Guzik (Understanding inflammatory mechanisms of arterial hypertension; Determining the mechanisms of oxidative stress and vascular dysfunction in blood vessels and especially in patients undergoing chemotherapy; Clinical mechanisms of residual cardiovascular risk: thrombotic and inflammatory; Meaning of periodontitis as a risk factor for atherosclerosis and hypertension; Cardiovascular diseases as co-morbidities in immune-mediated diseases (RA, AS, etc.); Mechanisms of oxidative stress in abdominal aortic aneurysms) • Professor dr hab. Gabriel Nowak (Multidirectional research on mechanisms related to pathophysiology and depression therapy; The role of the glutamatergic system and its relationship with the immune and antioxidant system.) The role of NMDA receptor in depression: the mechanism of therapeutic action of ketamine (and its metabolites), tiletamine and other ligands of this receptor. Importance of NMDA receptor interaction (lanicemine, zinc) and TRPC6 channel (hyperphorin) in depression. Natural NMDA, zinc and magnesium receptor antagonists. Pathophysiology of depression as a state of activation of pro-inflammatory processes, oxidative stress and excitotoxicity. Evaluation of antidepressant properties (in vitro) and in vivo) newly synthesized compounds - 5HT1A and 5HTT ligands.)
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		• Professor dr hab. Grażyna Jasieńska (Women's health, fertility, breast cancer prevention, influence of early development conditions on health) • Dr Mateusz Holda (Anatomy, histology, molecular biology, radiology, cardiology, electrophysiology, cardiosurgery. Cardiovascular system, in particular its clinical anatomy and morphological changes of the heart in various disease entities; considering the anatomy important from the point of view of invasive cardiology and electrocardiology of human heart areas (cardioanatomy), Imaging of the myocardium using echocardiography and computed tomography and determination of the usefulness of these techniques to visualize the anatomical details of the heart, three-dimensional reconstruction and printing of 3D heart models; building heart valves (aortic valve, pulmonary trunk and mitral); mapping (macroscopic, microscopic and molecular) of the stimulatory-conducting system of the heart and determining the microvasculature patterns of its individual e - understanding the impact of pulmonary hypertension on the morphology of the right and left ventricles, and in particular the molecular mechanisms responsible for the disappearance of the left ventricle in end-stage pulmonary hypertension; The use of computer microtomography enhanced with inorganic contrast and specific antibodies labeled with gold for imaging the internal structure of the heart.) • Dr Andrzej Galbarczyk (Public Health, Reproductive Health, Evolutionary Medicine, Reproduction Costs). The research proposed within the POB is included in the key areas of the Horizon 2020 program, i.e.: (a) an excellent scientific base; (b) a leading position in industry; (c) social challenges, including health, demographic change and well-being (including 6 specific actions: (i) understanding of determinants of health, improved health promotion and better disease prevention, (ii) knowledge of diseases, (iii) development of effective prevention and screening programs and improvement of assessing disease susceptibility), (iv) improvement of diagnosis and prognosis, (v) improvement of health information and better use of health data, (vi) use of in silico medicine to improve disease management and prognosis. Also in the Horizon
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		Europe program synergies will be promoted in the field of health research and innovation, in particular with the Health component of the European Social Fund Plus.
O2_O2	Emerging research areas of a global character and meaning.	According to expert opinions, despite conducting many valuable research in the field of pre-clinical and clinical sciences, the basic obstacle to achieving the global level of quality of biomedical research is currently lack of continuity and consistency of research determining the correct and complete course of the medical translation path - therefore there is a need to take multi-directional actions to create an interdisciplinary platform enabling effective design and implementation of translation paths for research carried out in strategic priority areas: • social and civilization diseases (central nervous system, cardiovascular system, metabolic) and interdisciplinary areas including these disorders (cardiometabolic, neuroendocrine, cardio-oncological issues), • reproductive health, • regenerative medicine. Research areas that are particularly important for the health status of the population are: optimization of therapy (in the path from verification of therapeutic goals to early assessment of activities in patients); assessment of drug toxicity and safety; biopharming; Pharmacoeconomics and Health Technology Assessment; e-Health; models of coordinated / team care over the patient.
O2_O3	The development of international university networks oriented at conducting research.	Development of current networks in which the Jagiellonian University is a member, including: UNA EUROPA, Coimbra Group, The GUILD, Baltic University Program, and joining new networks.
O3_O2	The location of the university surrounded by a technology park and scientific research units.	The Jagiellonian University is a partner of the Life Science cluster. Jagiellonian Center of Innovation - a park of companies from the life science industry, including medical and pharmaceutical. AGH University of Science and Technology in Krakow. Institutes of the Polish Academy of Sciences, eg Institute of Pharmacology, Institute of Catalysis and Surface Chemistry, Institute of Nuclear Physics.

O3_O3	A direct business environment offering attractive jobs for graduates.	According to the statistics of the Career Office of the Jagiellonian University in 2016-2018, 6.1-6.3% of the university graduates surveyed found a job in health care, medicine, and pharmacy. The labor market expectations related to the development of the medical and pharmaceutical industry are also growing.
O3_O6	Increased interest in studies in Poland in the countries of Eastern Europe and Central Asia.	In 2016 - 2018, the number of foreigners from Eastern Europe and Asia increased in the full education cycle from 1306 to 1737. Most students were from Ukraine, Belarus and Russia.

Name of POB
qLife
Justification of POB range
Interdisciplinary and scientific translation are the basic features of modern biomedical research. The subject of research undertaken within this research area should reflect the expectations and needs of the society. There is a significant relationship between the quality of life and research undertaken by science centers, including universities. The concentration of research work on social challenges indicates, but also facilitates more effective use of research in social life. Contemporary society needs are not limited to research conducted by individual disciplines of science, hence this research area requires close scientific cooperation between the three faculties of the Jagiellonian University - Collegium Medicum. Researchers at the Jagiellonian University represent the international level of research results in the presented scope. These studies concern: health protection, preventing the emergence of diseases, creating new, faster and more efficiently diagnosing various types of diseases and more effective drugs and therapies. Research will focus, among other things, on issues related to the treatment of social and civilization diseases, support for interdisciplinary medical research and therapy optimization. Research work requires considerable investments not only in the area of raising the competences of people of science, but also appropriate material equipment in the form of the latest, most advanced analytical and measurement equipment as well as IT solutions (computer programs).
Proposed directions of activities in range of strengths of the SWOT analysis
Increasing the impact on the development of the world science 1. Undertaking activities aimed at searching for and participating in international research projects on quality of life. 2. Actions facilitating the involvement of many different scientific disciplines to create the potential of interdisciplinary research related to the quality of life. 3. Striving to obtain the application character of the results of scientific research. 4. Planning activities for acquiring modern scientific equipment and for developing access to high-quality research infrastructure supporting research processes. Increasing the international research cooperation 5. Establishing cooperation in the field of active participation in the work of international and inter-disciplinary university networks. 6. Focusing research work on obtaining tangible results of international research in the field of sustainable social development (publications and grants). Improving the quality of education 7. Developing activities that increase the internationalization of the education process in English in connection with leading international universities.

8. Organizing educational programs responding to the challenges related to the thematic scope of this research area, which will allow raising the level of professional and language competences of students as well as teaching competences of academic teachers.
9. Promoting in the motivational system the joint-authorship publications of international undergraduates and PhD students on the subject of this research area.
10. Creating activities supporting and developing access to high-class teaching infrastructure.
11. Developing programs to improve teaching competences in the area of optimal relationship between science people and undergraduates and PhD students.
12. Activities aimed at maintaining high grade in the university rankings (PKA).

Scientific development of employees

13. Development of comprehensive programs including actions targeting young scientists for continuous improvement of competences and the increase of participation in international research.
14. Maintenance and further development in the range of access to the university's infrastructure and research equipment.

Improving the quality of university management

15. Improving organizational procedures in the area of establishing and conducting international research projects, targeted financing of international scientific research with the use of IT systems supporting management in conducting international research projects.

Justification of the choice of courses of action, resulting from the strengths of the SWOT analysis

The activity of the scientific staff in particular social sciences disciplines involved in research projects belonging to this research area includes participation in research projects of international and global importance. The use of the strengths lies in intensifying this participation by developing activities aimed at involving a greater number of young research staff, including the most talented undergraduates and PhD students in the conducted research work. Research programs should take into account the facilitation from the side of the administrative structure regarding faster publication of co-authored work results (academics with undergraduates and doctoral students) on the international forum, including participation in international scientific conferences. At the same time, in the long-term perspective, the focus should be on research topics directly related to the challenges of the future society. For such complex research activity, it is necessary to ensure a stable and dedicated stream of financing. The basic and necessary condition for undertaking such activities is a thorough and rapid improvement of the research infrastructure by creating a modern research base of the Medical-Prokocim Campus, ensuring synergy of the use of highly qualified research staff and interdisciplinary research.

Proposed directions of activities in range of weaknesses of the SWOT analysis

Increasing the impact on the development of world science

1. Activities supporting the improvement of the publication activity in the most-cited magazines (the first decile of the journal Scopus).
2. Activities aimed at increasing the number of employees undertaking challenges to participate in international research projects and obtained prestigious international grants.

3. Developing activities aimed at intensifying contacts with social organizations and global enterprises operating in the university's environment.
4. Scheduled activities reducing the burden of didactic and administrative activities for employees undertaking co-operation in international research teams dealing with the issues of this research area.
5. The need to plan actions to make the age structure more flexible and to make more optimal use of the scientific staff, in particular in the field of international cooperation.

The increase of international research cooperation

6. Development of comprehensive activities in the range of greater and more effective promotion of research results and academic offer of the university.
7. Activities aimed at improving the international image and recognition of the university.
8. Activities aimed at increasing the number of research workers undertaking the challenge of participating in international research teams through actions to reduce the teaching and organizational burden and making available additional funding streams.
9. Developing programs to raise the level of competence in building international relations with significant foreign universities and global corporations in the range of establishing cooperation in the field of this research area.

Improving the quality of education

10. Development of activities aimed at making the study programs more flexible, which will take into account individual approach to learning paths.
11. Preparation of new solutions (incentives) in the university's motivational system in the area of improving the quality of didactic work.
12. Preparation of activities aimed at obtaining greater activity of academics in the range of academic mobility.

Scientific development of employees

13. The need to develop mentoring programs for young scientists.
14. Development of activities aimed at changing the dominant systemic solution, which implies subordinating the path of development of young scientists to scientific advancement, development of international research works, and not scientific advancement.
15. Creating support programs for the development of young scientists in connection with significant international universities dealing with issues related to this research area.

Improving the quality of university management

16. Development of activities aimed at correction of the incentive system, which includes participation in international research projects.
17. Undertaking activities aimed at agreeing system of periodic employee evaluations with the path of their professional development.

Justification of the choice of courses of action, resulting from the weaknesses of the SWOT analysis

Reducing or eliminating the impact of weaknesses will require planning and implementation of activities related to: greater support for publication activity in the most-cited magazines, increasing the number of employees undertak-

ing international participation challenges, intensifying contacts with social organizations and global enterprises operating in the environment for better understanding of the subject concerning the development of the future society. Raising the quality of education can be achieved by reducing the burden of organizational and administrative activities, making the age structure more flexible and making more optimal use of the academic staff. Methods of intensifying the participation of research workers in international research teams and programs in raising the level of competences of young researchers should also be developed. The more developed incentive system and mentoring programs for young researchers may encourage more active participation in research.

Proposed directions of activities in range of opportunities of the SWOT analysis

Increasing the impact on the development of world science

1. Developing activities aimed at increasing the number of research projects implemented in cooperation with social organizations and the fastest growing industries, in particular with global high-tech enterprises from the university environment and international research centers in the field related to this research area.
2. Actions aimed at greater use of national scientific policy, preferring concentration of inputs in units taking part in international research projects.
3. Taking measures to take greater account of social and economic trends in scientific research belonging to this research area.
4. Undertaking activities aimed at increasing the participation of doctoral students in research projects.

The increase of international research cooperation

5. Development of action programs aimed at greater correlation of the research areas of the university with the priorities in European and global science and the challenges of the future society.
6. Developing ways of identifying priority research areas of a global nature related to this research area and giving it priority importance as research areas of the university.
7. Planning and undertaking activities aimed at participating in research works of university networks of international renown.
8. Planning activities to facilitate the acquisition and use of information technologies in establishing international contacts and reducing language barriers.
9. Increasing the use of Cracow's exceptional industrial environment in establishing cooperation in the range of this research area between the university and global enterprises from the high-tech industry.

Improving the quality of education

10. Undertaking activities aimed at greater use of advanced modern technologies in the didactic process.
11. The use of a convenient location of the university in the vicinity of scientific and research units and other domestic and foreign universities in the field of didactic cooperation related to the subject of this research area.
12. Preparation of activities within the framework of popularizing university studies at the national and international level.
13. Preparation of activities using the growing interest in studies in Poland in the countries of Eastern Europe and Central Asia.

Scientific development of employees

14. Preparation of activities aimed at greater use of support programs for the academic staff.
15. Undertaking activities aimed at recognizing and applying EU recommendations regarding the development of scientific staff.
16. Actions aimed at using the increase in the flexibility of public subsidies to establish and conduct research in the field of this research area.
17. Undertaking activities aimed at greater use of advanced modern technologies in the range of improving the scientific competence of employees.

Improving the quality of university management

18. Actions aimed at integrating the university management information system (university digitalization).
19. Actions facilitating the use of the possibilities of diversifying the sources of financing of the university for establishing and conducting research works in the field of this research area.

Justification of the choice of courses of action, resulting from the opportunities of the SWOT analysis

The use of opportunities to increase the funding stream of research activities requires preparation of measures consolidating various sources of its origin. A larger stream of funding, in turn, creates opportunities for an increase in the number of research projects carried out in cooperation with entities belonging to the fastest growing industries and international scientific centers and other social organizations within the university environment. The thematic scope of research should take more advantage of the needs of the future society and economic trends, as well as be characterized by a greater correlation of the research areas of the university with the priorities in European and world science. It is also necessary to intensify the participation of doctoral students in research projects. The use of the unique environment of the university also gives an opportunity to use modern technologies more in the didactic process. In the range of scientific staff development, actions should be taken to identify and apply EU recommendations regarding the development of scientific staff.

Proposed directions of activities in range of threats of the SWOT analysis

Increasing the impact on the development of the world science

1. Developing activities aimed at concentrating the ways and sources of obtaining very limited financial resources for research, in order to reduce dissonance in relation to other European Union countries in this research area.
2. Developing activities aimed at retaining talented young scientists at the university.
3. Offers of better working conditions and scientific development as counteracting competitive pressure from other scientific centers.

The increase of international research cooperation

4. Activities that intensify establishing contacts with universities and research centers as well as global enterprises emerging in new competitive geographic regions within the thematic scope of this research area.
5. Actions promoting in the political and economic sphere the need to establish research projects in the range of this research area, as counteracting the risk of divergence of Poland's economic and foreign policy with identified global trends and the needs of the future society.

Improving the quality of education

6. Developing system solutions limiting the growing bureaucratisation of didactic processes.

7. Developing system and legal solutions that will increase flexibility in shaping study programs.

Scientific development of employees

8. Activities aimed at a significant improvement of the salaries of researchers in obtaining research results at the highest global level.

9. Preparation of activities aimed at solving problems related to higher education's "work-life balance".

10. Developing system and legal solutions in the range of age management for higher education, introduction of activities taking into account the diversity of roles of young scientists and older people of science.

Improving the quality of university management

11. Activities aimed at preparing the offer of better working conditions and scientific development for the most talented students and improving the attractiveness of work at the university in relation to jobs in industry.

Justification of the choice of courses of action, resulting from the threats of the SWOT analysis

The scattering and low level of financing of scientific activities leads to the preparation of a plan of concentration of research expenditures dedicated to the establishment of international projects in the range of the subject of this research area. A larger stream of funding will allow for taking actions to minimize the impact of threats and aiming at intensifying establishing contacts with the socio-economic stakeholders of the university, which will allow identification and selection of research topics related to the quality of life. It is also necessary to develop activities that will increase flexibility in shaping study programs. Improvement in the quality of didactics can be achieved by preparing system solutions to limit the growing bureaucratisation of didactic processes.

4.2.6. FutureSoc

Selected data justifying POB (Priority Research Area)

Code	Factors in SWOT analysis	Selected data justifying FutureSoc POB
Strengths		
O1_S1	Research competence of the scientific staff	The faculties have the category A + or A Ministry of Science and Higher Education (Faculty of Law and Administration A, Faculty of Philosophy A +, Faculty of Management and Social Communication A, Faculty of International and Political Studies A, Faculty of Geography and Geology A). According to Scopus, the normalized citation rate for 2013-2017 is generally 1.50 for the university, and the same aggregate indicator for categories assigned to POB is 0.70).
O1_S2	Increasing efficiency in obtaining national and international grants.	Generally, for the Jagiellonian University: In the years 2014-2018, it is possible to observe upward trends in the number of research projects commenced in individual years, this applies to the total number of research projects, the number of international projects and the number of projects under the Horizon 2020 Program. • The number of research projects started in 2014-2018 amounted to 308, 248, 302, 351, 331 (+35), respectively. • The number of international projects started in the years 2014-2018 amounted to: 23, 18, 34, 19, 30. • The number of projects of the Horizon 2020 Program in the years 2014-2018 amounted to: 0, 5, 3, 5, 10.
O1_S3	Publishing activity in the first quartile of the most-cited magazines.	Generally, for the Jagiellonian University, the value of the article index in the first quartile in 2013-2017 is 53.1%. The value of the aggregate ratio for the categories assigned to the POB, for the period 2013-2017 is 44.6% (Scopus).
O1_S4	Infrastructure and scientific apparatus supporting research processes.	Apparatus, e.g.: research laboratories with access to dEEG, fMRI, systems for oculographic and psychophysiological research (Faculty of Management and Social Communication)
O1_S5	The presence of many scientific disciplines that creates the potential for interdisciplinary research.	According to experts, the scope of thematic areas related to the functioning of the society in the future includes, inter alia, Area Studies, Business, Management and Accounting, Computer Science, Decision Sciences, Economics, International Relations, Law, Neuroscience, Political Science, Psychology, Security Studies, Social Sciences. Research in these areas is undertaken at the Faculty

		of Law and Administration, the Faculty of Philosophy, the Faculty of Management and Social Communication, the Faculty of International and Political Studies, the Faculty of Geography and Geology, Copernicus Center for Interdisciplinary Studies.
O2_S1	Active participation in the works of international university networks.	Membership of the Jagiellonian University in, among others: UNA EUROPA, Coimbra Group, The GUILD Baltic University Program.
O2_S2	Measurable results of international research cooperation (publications and grants).	According to Scopus, the percentage of scientific articles in international cooperation for the years 2013-2017 aggregated for the categories assigned to the POB is 23.50%, while the normalized quotation rate for scientific articles in international cooperation 2013-2017 is 1.59. 248 international projects, mainly research and educational projects. In this group there are 10 research projects related to the trends identified in the SWOT analysis chances and which justify the selection of POB. For example: • Community-Based Policing and the reform of police in countries where war conflicts have taken place • Gender Equality Network in the European Research Area. • The Post-crisis Legitimacy of the European Union • The Multilingual Mind.
O2_S3	Recognition of selected scientists in the international arena.	Achievements and cooperation of the most outstanding scientists, including: • Professor dr hab. Zdzisław Mach, (Member of the Executive Committee EUROPÆUM, Reviewer of VolkswagenStiftung research projects, Reviewer of the framework programs of the European Commission, Reviewer in promotion procedures in the US, Great Britain and Ireland, a former member of the International Scientific Council of the Max Planck Institute in Halle (2 terms)). • Prof. dr hab. Bartosz Brożek, editor of the Cambridge Studies in Law and the Cognitive Sciences (Cambridge University Press) series, member of the Board of Directors of the Law and Cognitive Sciences Network, guest editor in the journals: Artificial Intelligence and Law and Revus). • Professor dr hab. Wojciech Czakon (former Vice President of EURAM European Management Academy (2014-2016), Editor and

		reviewer in Long Range Planning (since 2019), Industrial Marketing Management (since 2016), Journal of Family Business Strategy (since 2014), International Journal of Contemporary Management (since 2018), Master of Business Administration Central Europe (since 2015), Journal of Entrepreneurship, Management and Innovation (since 2016), Journal of Economics and Management (editor in chief, 2013-2016). • Dr hab. Grzegorz Micek, prof. of the Jagiellonian University (Reviews for National Research, Development and Innovation Office (NKFIH, Hungary) and Czech Science Foundation, 8 scientific journals from the Web of Science list, Ashgate and Routledge monographs). • Prof. dr hab. Małgorzata Kossowska, (Member of the Executive Committee of the European Association of Social Psychology (2017-2022), Associate editor of the European Review of Social Psychology, An associate editor of the European Journal of Social Psychology and Journal of Social and Political Psychology (2015-2018), member of the editorial board of Behavioral Sciences of Terrorism and Political Aggression). • Dr Regina Lenart-Gansiniec (Board Member of the International Research Society for Public Management, member of the board of the journal Business and Management Studies, The Innovation Journal: The Public Sector Innovation Journal).
O2_S4	Employees' experience in managing international projects.	In 2014-2018, the Jagiellonian University staff were managers in 16 major international projects, in which the Jagiellonian University has a leading position (including departments such as: Philosophy, Law and Administration, International and Political Studies, Philology, Geography and Geology). In addition, during the period other than mentioned above, the employees held managerial positions in various international projects. Sample experience: • Dr Dariusz Kasprzycki, LIDER, China Intellectual Property Management Network. • Professor dr hab. Zdzisław Mach (The Post-crisis Legitimacy of the European Union European Training Network - PLATO, EC, HORIZON 2020, (2017-2020));

		• Professor dr hab. Bartosz Brożek (executive director of the grant "The Limits of Scientific Explanation" (John Templeton Foundation)). • Professor dr hab. Wojciech Czakon (2015-2017, STARTIFY7 project financed from the resources of the Horizon 2020 program). • Dr hab. Grzegorz Micek, prof. UJ (One of the main executants of The Moving Frontier: The Changing Geography in Labor Intensive Industries of the 6th Framework Program of the EU). • Prof. dr hab. Małgorzata Kossowska, (Motivational, affective, interpersonal and intergroup phenomena.) MAESTRO Grant, 2011 / A / 02 / HS / 000155 the National Science Centre (2012-2018).
O2_S6	Number of cooperation agreements concluded with foreign research centers.	At the level of the Jagiellonian University, the number of international agreements as for the date of 01/04/2019: 343 bilateral agreements, 1567 Erasmus + KA 103, 48 Erasmus + Ka 107 contracts.
O3_S1	Internationalization of the educational process, including didactic offer in English.	• Generally, at the Jagiellonian University, programs in English are run in 15 fields within 17 specialties. In total, (as for the date of 13.06) 1218 students on English-language programs study here. • Studies in English and the number of foreign students: International Relations and Area Studies (123), Global and Development Studies (5), European Studies (33), Business and Finance Management (124), International Security and Development (41), Intellectual Property and New Technologies (25), Trans-Atlantic Studies (22). In addition, generally at the Jagiellonian University: • In the years 2016/2017 and 2017-2018, the number of students leaving for a period of at least 3 months increased from 792 to 815, and students coming for a period of at least 3 months increased from 933 to 1029. • In the years 2016/2017 and 2017-2018, the number of PhD students leaving for a period of at least 3 months increased from 87 to 111, and PhD students coming for a period of at least 3 months increased from 21 to 28. • In 2016/2017 and 2017-2018, the number of academic teachers going away (irrespective of the duration of mobility) increased

		from 1295 to 1574, and academic teachers coming (regardless of the duration of mobility) increased from 152 to 158.
O3_S6	Leading places in national university rankings and distinguishing marks of the Polish Accreditation Committee.	• Shanghai ranking: (Psychology: 301-400). • QS World University Rankings: (Geography and spatial economy, e-spatial planning: 151-200, Law: 201-250). • Place in the Perspectives ranking: (Law: 1, Administration: 1, Geography and spatial management, e-spatial economy: 2, Political science: 2). • Polish Accreditation Commission: distinctive assessment (Psychology, Law, Faculty of Management and Social Communication, Faculty of Law and Administration, Faculty of International and Political Studies).
Weaknesses		
O1_W1	Publishing activity in the first decile of the most-cited magazines.	Aggregated indicators for categories assigned to POB: percentage of scientific articles in the upper decile of 2013-2017: 5.30% (Scopus), number of scientific articles in the upper decile: 61 (Scopus).
Opportunities		
O1_O1	Dynamic development of selected sectors and industries of economy related to the directions of conducted scientific research.	According to experts, there is a dynamic development of, among others, multifaceted consulting services. They are related to the directions of research at faculties, including the research directions of the most outstanding scholars such as, for example: Prof. dr hab. Zdzisław Mach, prof. dr hab. Bartosz Brożek, Professor dr hab. Wojciech Czakon, Dr hab. Grzegorz Micek, prof. UJ, prof. dr hab. Małgorzata Kossowska, dr Beata Jałocha.
O1_O3	Development of cooperation with world-leading research centers.	Based on previous cooperation with the most prestigious centers in Europe and the United States, including the ones from the Shanghai list: Harvard University, University of Bologna, London School of Economics, Ghent University, University of Maryland, Maastricht University, EUI, Universite de Montpellier, Chinese University of Hong Kong, National University of Singapore, Technical University of Berlin, University of Kiel.
O1_O4	Social and economic trends stimulating the demand for research.	According to experts, it is necessary to anticipate short and long-term social changes related to the development of modern technologies and their widespread use.
O1_O6	Participation of doctoral schools in research processes.	PhD programs: "Society of the Future" interdisciplinary program, Management and quality sciences, Socio-economic geography and

		spatial management, Legal sciences, Sociological sciences, Political and administration sciences, Social communication and media, Psychology, Pedagogy
O2_O1	Correlation of university research areas with priorities in European and world science.	Publishing and reviewing activity of the most prominent scientists from the Jagiellonian University in highly quoted magazines. Main research directions of the most outstanding scientists of the Jagiellonian University, including: • Professor dr hab. Zdzisław Mach, (Cultural identity construction, Collective memory and cultural heritage, Importance of the Holocaust in modern Europe, European migration, Ethnicism and nationalism, Democracy and civil society in Europe, Social aspects of European integration, Populism). • Prof. dr hab. Bartosz Brożek, (Law and cognitive sciences, Law and new technologies, Theories of legal reasoning, Legal and moral cognition, Theories of rationality). • Professor dr hab. Wojciech Czakon, (Strategic management, Behavioral determinants of establishing cooperation relations with competitors, Inter-organizational networks, Cognitive determinants of the strategy, Methodology of research in management and quality sciences). • Dr hab. Grzegorz Micek, prof. of the Jagiellonian University (Development of information society and knowledge-based economy, The influence of various dimensions of proximity on knowledge flows in enterprises, Changes in the position of enterprises in global production networks) • Prof. dr hab. Małgorzata Kossowska, (He examines the processes (cognitive, motivational) underlying the complex social phenomena (radical ideological beliefs, prejudices and social conflicts), identifies factors conducive to mental closure, stiffness and invincibility of views).
O2_O2	Emerging research areas of a global character and meaning.	According to experts, the development of social sciences and human behavior includes many complementary and interdisciplinary issues of global significance, in particular regarding cognitive science, law, security, politics, management transformation, modern universities or spatial planning.
O2_O3	The development of international university networks oriented at conducting research.	Development of current networks in which the Jagiellonian University is a member, including: UNA EUROPA, Coimbra Group, The GUILD, Baltic University Program, and joining new networks.

O3_O2	The location of the university surrounded by a technology park and scientific research units.	The Krakow Technology Park operates in Krakow.
O3_O3	A direct business environment offering attractive jobs for graduates.	According to the statistics of the Jagiellonian University Careers Office in 2016-2018, university graduates found work at such companies as: HSBC, Capgemini, State Street Bank Poland, AON Hewitt, Accenture, IBM BTO Consulting Services, Deloitte Tax Advisory Services, EY. The labor market expectations related to the development of the consulting industry are also growing.
O3_O6	Increased interest in studies in Poland within the countries of Eastern Europe and Central Asia.	In 2016 - 2018, the number of foreigners from Eastern Europe and Asia increased in the full cycle from 1306 to 1737. Most students were from Ukraine, Belarus and Russia.

Justification of POB range and recommended courses of action

Name of POB	
FutureSoc	
Justification of POB range	
The rapid development of technologies and the progressing process of digitalization cover more and more areas of social life. The result of these dynamic phenomena is the variability of people's traits, attitudes and behaviors. Issues related to social security, non-adaptation of people to changing conditions, legal variability, which must also keep up with technological innovations and the need to develop a management manner at the level of countries as well as socio-economic entities are becoming important from the point of view of the future of societies. Changes in the field of technologies that affect the social sphere imply the necessity to develop all disciplines belonging to the social sciences. Proper and sustainable development of the society in the future is conditioned not only by the application of technology, but also the setting of new legal boundaries as well as ethical and social values.	
Proposed directions of activities in range of strengths of the SWOT analysis	
Increasing the impact on the development of the world science 1. Undertaking activities aimed at searching for and participating in international interdisciplinary research projects thematically related to this research area. 2. Activities supporting publishing the results of research works in the range of the smallest research area in the first quartile of the most frequently quoted periodicals. 3. Actions facilitating the involvement of many different scientific disciplines to create the potential of interdisciplinary research related to the development of the society of the future.	

4. Striving to obtain the application character of the results of interdisciplinary scientific research.

Increasing the international research cooperation

5. Establishing cooperation in the field of active participation in the work of international and inter-disciplinary university networks.

6. Focusing research work on obtaining tangible results of international research in the field of sustainable social development (publications and grants).

7. Active search and acquisition of scientific staff participation in international research projects.

Improving the quality of education

8. Developing activities that increase the internationalization of the education process in English in connection with leading international universities.

9. Organizing educational programs responding to the challenges related to the thematic scope of this research area, which will allow raising the level of professional and language competences of students as well as teaching competences of academic teachers.

10. Promoting in the motivational system the joint-authorship publications of international undergraduates and PhD students on the subject of this research area.

11. Creating activities supporting and developing access to high-class teaching infrastructure.

12. Developing programs to improve teaching competences in the area of optimal relationship between science people and undergraduates and PhD students.

13. Activities aimed at maintaining high grade in the university rankings (PKA).

Scientific development of employees

14. Development of comprehensive programs including actions targeting young scientists for continuous improvement of competences and the increase of participation in international research.

15. Maintenance and further development in the range of access to the university's infrastructure and research equipment.

Improving the quality of university management

16. Improving organizational procedures in the area of establishing and conducting international research projects, targeted financing of international scientific research with the use of IT systems supporting management in conducting international research projects.

Justification of the choice of courses of action, resulting from the strengths of the SWOT analysis

The activity of the scientific staff in particular social sciences disciplines involved in research projects belonging to this research area includes participation in research projects of international and global importance. The use of the strengths lies in intensifying this participation by developing activities aimed at involving a greater number of young research staff, including the most talented undergraduates and PhD students in the conducted research work.

Research programs should take into account the facilitation from the side of the administrative structure regarding faster publication of co-authored work results (academics with undergraduates and doctoral students) on the international forum, including participation in international scientific conferences. At the same time, in the long-term

perspective, the focus should be on research topics directly related to the challenges of the future society. For such complex research activity, it is necessary to ensure a stable and dedicated stream of financing and establishing permanent contacts with the socio-economic environment of the university.

Proposed directions of activities in the field of weaknesses of the SWOT analysis

Increasing the impact on the development of world science

1. Activities supporting the improvement of the publication activity in the most-cited magazines (the first decile of the journals WoS and Scopus).
2. Activities aimed at increasing the number of employees undertaking challenges to participate in international research projects and obtained prestigious international grants.
3. Developing activities aimed at intensifying contacts with social organizations and global enterprises operating in the university's environment.
4. Scheduled activities reducing the burden of didactic and administrative activities for employees undertaking cooperation in international research teams dealing with the issues of this research area.
5. The need to plan actions to make the age structure more flexible and to make more optimal use of the scientific staff, in particular in the field of international cooperation.

The increase of international research cooperation

6. Development of comprehensive activities in the range of greater and more effective promotion of research results and academic offer of the university.
7. Activities aimed at improving the international image and recognition of the university.
8. Activities aimed at increasing the number of research workers undertaking the challenge of participating in international research teams through actions to reduce the teaching and organizational burden and making available additional funding streams.
9. Developing programs to raise the level of competence in building international relations with significant foreign universities and global corporations in the range of establishing cooperation in the field of this research area.

Improving the quality of education

10. Development of activities aimed at making the study programs more flexible, which will take into account individual approach to learning paths.
11. Preparation of new solutions (incentives) in the university's motivational system in the area of improving the quality of didactic work.
12. Development of systemic programs of the university that would support the competition for the best candidates for studies.
13. Developing system solutions in the field of talent management.
14. Preparation of activities aimed at obtaining greater activity of academics in the range of academic mobility.

Scientific development of employees

15. Developing a new system of researching the needs and satisfaction of employees.
16. The need to develop mentoring programs for young scientists.

17. Developing activities aimed at changing the dominant systemic solution, which imply subordinating the path of development of young scientists to scientific advancement, and not the development of international research works.

18. Creating support programs for the development of young scientists in connection with significant international universities dealing with issues related to this research area.

Improving the quality of university management

19. Development of activities aimed at correction of the incentive system, which includes participation in international research projects.

20. Undertaking activities aimed at agreeing system of periodic employee evaluations with the path of their professional development.

Justification of the choice of courses of action, resulting from the weaknesses of the SWOT analysis

Reducing or eliminating the impact of weaknesses will require planning and implementation of activities related to: greater support for publication activity in the most-cited magazines, increasing the number of employees undertaking international participation challenges, intensifying contacts with social organizations and global enterprises operating in the environment for better understanding of the subject concerning the development of the future society. Raising the quality of education can be achieved by reducing the burden of organizational and administrative activities, making the age structure more flexible and making more optimal use of the academic staff. Methods of intensifying the participation of research workers in international research teams and programs in raising the level of competences of young researchers should also be developed. The more developed incentive system and mentoring programs for young researchers may encourage more active participation in research.

Proposed directions of activities in the field of SWOT analysis opportunities

Increasing the impact on the development of world science

1. Developing activities aimed at increasing the number of research projects implemented in cooperation with social organizations and the fastest growing industries, in particular with global high-tech enterprises from the university environment and international research centers in the field related to this research area.

2. Actions aimed at greater use of national scientific policy, preferring concentration of inputs in units taking part in international research projects.

3. Taking measures to take greater account of social and economic trends in scientific research belonging to this research area.

4. Undertaking activities aimed at increasing the participation of doctoral students in research projects.

The increase of international research cooperation

5. Development of action programs aimed at greater correlation of the research areas of the university with the priorities in European and global science and the challenges of the future society.

6. Developing ways of identifying priority research areas of a global nature related to this research area and giving it priority importance as research areas of the university.

7. Planning and undertaking activities aimed at participating in research works of university networks of international renown.

8. Planning activities to facilitate the acquisition and use of information technologies in establishing international contacts and reducing language barriers.

9. Increasing the use of Cracow's exceptional industrial environment in establishing cooperation in the range of this research area between the university and global enterprises from the high-tech industry.

Improving the quality of education

10. Undertaking activities aimed at greater use of advanced modern technologies in the didactic process.

The use of a convenient location of the university in the vicinity of scientific and research units and other domestic and foreign universities in the field of didactic cooperation related to the subject of this research area.

11. Preparation of activities within the framework of popularizing university studies at the national and international level.

12. Preparation of activities using the growing interest in studies in Poland in the countries of Eastern Europe and Central Asia.

Scientific development of employees

13. Preparation of activities aimed at greater use of support programs for the academic staff.

14. Undertaking activities aimed at recognizing and applying EU recommendations regarding the development of scientific staff.

15. Actions aimed at using the increase in the flexibility of public subsidies to establish and conduct research in the field of this research area.

16. Undertaking activities aimed at greater use of advanced modern technologies in the range of improving the scientific competence of employees.

Improving the quality of university management

17. Actions aimed at integrating the university management information system (university digitalization).

18. Actions facilitating the use of the possibilities of diversifying the sources of financing of the university for establishing and conducting research works in the field of this research area.

Justification for the choice of courses of action, resulting from the SWOT analysis opportunities

The use of opportunities to increase the funding stream of research activities requires preparation of measures consolidating various sources of its origin. A larger stream of funding, in turn, creates opportunities for an increase in the number of research projects carried out in cooperation with entities belonging to the fastest growing industries and international scientific centers and other social organizations within the university environment. The thematic scope of research should take more advantage of the needs of the future society and economic trends, as well as be characterized by a greater correlation of the research areas of the university with the priorities in European and world science. It is also necessary to intensify the participation of doctoral students in research projects. The use of the unique environment of the university also gives an opportunity to use modern technologies more in the didactic process. In the range of scientific staff development, actions should be taken to identify and apply EU recommendations regarding the development of scientific staff.

Proposed directions of activities in the field of SWOT analysis threats

Increasing the impact on the development of the world science

1. Developing activities aimed at concentrating the ways and sources of obtaining very limited financial resources for research, in order to reduce dissonance in relation to other European Union countries in this research area.
2. Developing activities aimed at retaining talented young scientists at the university.
3. Offers of better working conditions and scientific development as counteracting competitive pressure from other scientific centers.

The increase of international research cooperation

4. Activities that intensify establishing contacts with universities and research centers as well as global enterprises emerging in new competitive geographic regions within the thematic scope of this research area.
5. Actions promoting in the political and economic sphere the need to establish research projects in the range of this research area, as counteracting the risk of divergence of Poland's economic and foreign policy with identified global trends and the needs of the future society.

Improving the quality of education

6. Developing system solutions limiting the growing bureaucratisation of didactic processes.
7. Developing system and legal solutions that will increase flexibility in shaping study programs.

Scientific development of employees

8. Activities aimed at a significant improvement of the salaries of researchers in obtaining research results at the highest global level.
9. Preparation of activities aimed at solving problems related to higher education's "work-life balance".
10. Developing system and legal solutions in the range of age management for higher education, introduction of activities taking into account the diversity of roles of young scientists and older people of science.

Improving the quality of university management

11. Activities aimed at preparing the offer of better working conditions and scientific development for the most talented students and improving the attractiveness of work at the university in relation to jobs in industry.

Justification of the choice of courses of action, resulting from the threats of SWOT analysis

The scattering and low level of financing of scientific activities leads to the preparation of a plan of concentration of research expenditures dedicated to the establishment of international projects in the range of the subject of this research area. A larger stream of funding will allow for taking actions to minimize the impact of threats and aiming at intensifying establishing contacts with the socio-economic stakeholders of the university, which will allow identification and selection of research topics related to the quality of life. It is also necessary to develop activities that will increase flexibility in shaping study programs. Improvement in the quality of didactics can be achieved by preparing system solutions to limit the growing bureaucratisation of didactic processes.

4.2.7. Heritage

Selected data justifying POB (Priority Research Area)

Code	Factors in SWOT analysis	Selected data justifying Heritage POB
Strengths		
O1_S1	Research competence of the scientific staff	The faculties have the category A + or A Ministry of Science and Higher Education: (Faculty of Philosophy A +, Faculty of Philology A, Faculty of History A, Faculty of Polish Studies A, Faculty of Law and Administration A, Department of International and Political Relations A, Faculty of Management and Social Communication A). According to Scopus, the normalized citation rate for 2013-2017 is generally 1.50 for a university, and the same aggregate indicator for categories assigned to POB is 0.64).
O1_S2	Increasing efficiency in obtaining national and international grants.	Generally, for the Jagiellonian University: In the years 2014-2018, it is possible to observe upward trends in the number of research projects commenced in individual years, this applies to the total number of research projects, the number of international projects and the number of projects within the Horizon 2020 Program. • The number of research projects started in 2014-2018 amounted to: 308, 248, 302, 351, 331 (+35 contracts signed in 2019). • The number of international projects started in 2014-2018 amounted to: 23, 18, 34, 19, 30. • The number of projects of the Horizon 2020 Program in the years 2014-2018 amounted to: 0, 5, 3, 5, 10.
O1_S3	Publishing activity in the first quartile of the most-cited magazines.	Generally, for the Jagiellonian University, the value of the item index in the first quartile in 2013-2017 is 53.1%. The value of the aggregate ratio for the categories assigned to the POB for the period 2013-2017 is 29% (Scopus).
O1_S4	Infrastructure and scientific apparatus supporting research processes.	Collections of the Jagiellonian Library (the largest library in Poland that has, for example, unique old prints, manuscripts and other rare collections).
O1_S5	The presence of many scientific disciplines that creates the potential for interdisciplinary research.	According to experts, an integral approach to heritage and cultural diversity requires a combination of many methodological perspectives and interdisciplinary cooperation among scholars. What is important, are the issues related to the management of heritage, cultural diversity and its protection, as well as language and cultural

		creation. The Jagiellonian University has faculties that enable such interdisciplinary research. Faculties: Philosophy, Philology, History, Polish Studies, Law and Administration, International and Political Studies, Management and Social Communication.
O2_S1	Active participation in the works of international university networks.	Membership of the Jagiellonian University in, among others: UNA EUROPA, Coimbra Group, The GUILD Baltic University Program.
O2_S2	Measurable results of international research cooperation (publications and grants).	According to Scopus, the percentage of scientific articles in international cooperation for the years 2013-2017 aggregated for the categories assigned to POB is 14.60%), while the normalized quotation rate for scientific articles in international cooperation 2013-2017 is 2.33. 248 international projects, mainly research and educational projects. In this group there are 7 research projects related to the trends identified in the SWOT analysis opportunities and which justify the selection of POB. For example: • Transmitting Contentious Cultural Heritages with the Arts: From Intervention to Co-Production • (Re) constructing the Karaim Bible. New methods of research on biblical manuscripts as sources of knowledge about the early history of the Karaim language (GRANT ERC-2018-STG) • Heritage formation processes. Religion as a heritage and sacralization of heritage in contemporary Europe.
O2_S3	Recognition of selected scientists in the international arena.	Achievements and cooperation of the most outstanding scientists, including: • Professor dr hab. Marcin Fabiański (Publications in international journals, Review of works for international journals repeatedly (Artibus et Historiae - list A), "Peer review" of the Charles University in Prague). • Dr hab. Jan Rybicki (Representative of the Republic of Poland in the Governing Council of COST Action CA16204 "Distant Reading for European Literary History", Numerous guest lectures and lectures at conferences and summer schools in Europe, North America, Asia and Australia). • Dr hab. Jakub Niedźwiedź, prof. of the Jagiellonian University (lecture at the invitation of Mahindra Humanities Center, Harvard University, Cambridge MA (the USA), Member of the Scientific

		Council "Europe in between: Histories, cultures, and languages from Central Europe to the Eurasian Steppes"). • Professor dr hab. Krystyna Chojnicka, (Historical and Legal Journal - chairman of the Scientific Council, Krakow Studies in State and Law History - member of the Scientific Council, Erasmus Studies Wratislaviensia - member of the Scientific Council, Historian - member of the Editorial Committee). • Professor dr hab. Zdzisław Mach (Representative of the Jagiellonian University in the COIMBRA Group (since 1991, membership of the Executive Committee of EUROPÆUM; Former member of the International Scientific Council of the Max Planck Institute in Halle - 2 terms; Member of the European Academy of Sciences and Arts (since 2018)).
O2_S4	Employees' experience in managing international projects.	In 2014-2018, the Jagiellonian University staff were directors in 16 major international projects, in which the Jagiellonian University has a leading position (including departments: Philosophy, Law and Administration, International and Political Relations, Philology). In addition, during the period other than the one mentioned above, the employees held managerial positions in various international projects. Sample experience: • Dr Michał Németh, LEADER, (Re) constructing the Karaim Bible. New methods of research on biblical manuscripts as sources of knowledge about the early history of the Karaim language (GRANT ERC-2018-STG). • Professor dr hab. Zdzisław Mach (Creative Economy and Culture International Link (REACTIK), EACEA, ERASMUS + (JEAN-MONET) (2018-2021)). • Professor dr hab. Irena Borowik (Grant from the European Union within the 6th Framework Program: "Welfare and Values in Europe: Transition Related to Religion, Minorities and Gender", No. Contracts 0286321. Head of the research team in Poland, implementation period - February 2006 -March 2009 .) • Dr Anna Góral (head of the Polish research team: THETRIS. THEmatic Touristic Route development with the Involvement of local Society - research and development project (project number: 4CE466P4, source of financing: Interreg Central Europe 2007-2013)).

O2_S6	Number of cooperation agreements concluded with foreign research centers.	At the level of the Jagiellonian University, the number of international agreements as for the date of 01/04/2019: 343 bilateral agreements, 1567 Erasmus + KA 103, 48 Erasmus + Ka 107 contracts.
O3_S1	Internationalization of the educational process, including didactic offer in English.	• Generally, at the Jagiellonian University, programs in English are run in 15 fields within 17 specialties. In total, (as for the date of 13.06) 1218 students on English-language programs study here. • • Studies in English and the number of foreign students, e.g.: Studies in Central and Eastern Europe: Histories, Cultures and Societies (45); Comparative Heritage Studies (23), European Studies (82), Business and Finance Management (124). • In addition, generally at the Jagiellonian University: In the years 2016/2017 and 2017-2018, the number of students leaving for a period of at least 3 months increased from 792 to 815, and students coming for a period of at least 3 months increased from 933 to 1029. • In the years 2016/2017 and 2017-2018, the number of PhD students leaving for a period of at least 3 months increased from 87 to 111, and PhD students coming for a period of at least 3 months increased from 21 to 28. • In 2016/2017 and 2017-2018, the number of academic teachers going away (irrespective of the duration of mobility) increased from 1295 to 1574, and academic teachers coming (regardless of the duration of mobility) increased from 152 to 158.
O3_S4	Access to high-class teaching and scientific infrastructure.	Apparatus in accordance with the specification of high-value infrastructure, including, for example, the scanning electron microscope VEGA 3 XMU with instrumentation and computer hardware (Faculty of History).
O3_S6	Leading places in national university rankings and distinguishing marks of the Polish Accreditation Committee.	• QS World University Rankings: (Archeology: 101-150, philosophy: 151-200, foreign language philologies: 201-250). • Place in the Perspectives ranking: (Law: 1, philosophy: 2, History: 3, archeology: 3). • Polish Accreditation Commission: distinguishing mark (Law, Administration, Faculty of Management and Social Communication, Faculty of Law and Administration).

Weaknesses		
O1_W1	Publishing activity in the first decile of the most-cited magazines.	Aggregated indicators for categories assigned to POB: percentage of scientific articles in the upper decile of 2013-2017: 3.40% (Scopus), number of scientific articles in the upper decile: 22 (Scopus).
Opportunities		
O1_O1	Dynamic development of selected sectors and industries related to the directions of scientific research.	According to experts, there is a dynamic development of, among others tourism, including cultural tourism and leisure time industries. They are related to the directions of research at the faculties, including the research directions of the most outstanding scholars such as: Prof. dr hab. Marcin Fabiański, Dr hab. Jan Rybicki, Professor dr hab. Krystyna Chojnicka, Dr hab. Jakub Niedźwiedź, prof. UJ, Prof. dr hab. Zdzisław Mach, prof. UJ, Dr Anna Góral.
O1_O3	Development of cooperation with world-leading research centers.	Previous cooperation with various centers and teams, e.g. University of California, Berkeley (USA), Utrecht University (Netherlands), Universitat Autònoma de Barcelona, Accademia Ambrosiana (Milan, Italy).
O1_O4	Social and economic trends stimulating the demand for research.	According to experts' opinion, cultural heritage is not only the basis of individual and collective identity, but also determines the ability of individuals and entire societies to take up the civilizational challenges posed by the modern world. It can help to solve emerging problems, but it can also be a factor hampering development.
O1_O5	The unique industrial surroundings of Krakow and the cooperation of the university with enterprises from the high-tech industry.	Krakow - cultural heritage in itself - as a place hospitable to creative industries Małopolska as the fourth voivodship in PL in terms of the total number of economic entities included in the creative industries and as the voivodship with the highest growth dynamics of this sector in Poland.
O1_O6	Participation of doctoral schools in research processes.	Doctoral programs in: archeology, history, philosophy, linguistics, literary studies, cultural and religious sciences, management and quality sciences and art sciences. In addition: an interdisciplinary doctoral program

O2_O1	Correlation of university research areas with priorities in European and world science.	Main research directions of the most outstanding scientists of the Jagiellonian University, including: • Professor dr hab. Marcin Fabiański (Italian renaissance painting, Polish-Italian artistic relations during the Renaissance, Cracow art during the Renaissance, Artistic environment of the last Jagiellonians). • Dr hab. Jan Rybicki (Digital Humanities, Stylometry, Author Attribution, Linguistics, Translation studies). • Dr hab. Jakub Niedźwiedź, prof. of the Jagiellonian University (European Early Modern Literature, Relations of Renaissance Literature and Cartography, Literacy and Multi-Literacy in Pre-modern Poland and Europe, Literary Culture of the Grand Duchy of Lithuania, Emblematics, Polish-language Literature in Russia in the 17th and 18th Centuries, Jesuit Education); • Professor dr hab. Krystyna Chojnicka, (History of political and legal doctrines in Russia in the 18th and 19th centuries, Russian state doctrine of the 15th and 19th centuries, Polish thought and political movements of the interwar period). • Professor dr hab. Zdzisław Mach (Cultural Identity Design, Collective Memory and Cultural Heritage, Importance of the Holocaust in Contemporary Europe, European Migration, Ethnicity and Nationalism, Democracy and Civil Society in Europe, Social Aspects of European Integration, Populism).
O2_O2	Emerging research areas of a global character and meaning.	According to experts, an integral approach to heritage and cultural diversity requires a combination of many methodological perspectives and interdisciplinary cooperation among scholars. The opportunity to make an original, innovative contribution to the world of humanities is seen in research areas such as: the philosophical dimension of heritage; heritage and diversity management; national and ethnic minorities; artistic heritage and protection of monuments; minority and regional languages as well as minority literature and culture; literary communication and correspondence of arts; archaeological heritage; difficult heritage; legal culture as an element of heritage.
O2_O3	The development of international university-oriented networks for conducting research.	Development of current networks in which the Jagiellonian University is a member, including: UNA EUROPA, Coimbra Group, The GUILD, Baltic University Program, and joining new networks.

O3_O3	A direct business environment offering attractive jobs for graduates.	According to the statistics of the Jagiellonian University Careers Office in 2016-2018, university graduates found work in such organizations as: TVN SA, Multikino, Historical Museum of the City of Krakow, National Museum in Krakow, Center for Art Documentation of T. Kantor, Profi Lingua, Youth Cultural Center . K. I. Gałczyński in Krakow.
O3_O6	Increased interest in studies in Poland in the countries of Eastern Europe and Central Asia.	In 2016 - 2018, the number of foreigners from Eastern Europe and Asia increased in the full cycle from 1306 to 1737. Most students were from Ukraine, Belarus and Russia.

Justification of POB range and recommended courses of action

Name of POB
Heritage
Justification of POB range
No nation can fully represent itself without identity, which derives from cultural heritage. This heritage is the basis of activities not only at the level of society, but also the actions of individual people that identify themselves with a specific culture and values. National heritage is the area of interest for disciplines included in the humanities. In this sense, scientific research is aimed at the full recognition and cultivation of this heritage for future generations. The research approach of different disciplines thus reflects the diversity of the research area. We can talk about different dimensions of cultural heritage as philosophical, literary, archaeological, legal culture and art. But the cultural heritage also means art creations and monuments that require proper management. The thematic scope of this area also includes issues related to ethnic and regional diversity. The preservation and development of cultural heritage should be a balancing force for the contemporary, rapid development of technology and the progressive process of digitization which encompass more and more areas of social life.
Proposed directions of activities in the field of strengths of the SWOT analysis
Increasing the impact on the development of the world science 1. Undertaking activities aimed at searching for and participating in international interdisciplinary research projects thematically related to this research area. 2. Planning of continuous activities for acquiring modern scientific equipment, supporting research processes, including obtaining national and international grants. 3. Activities supporting publishing the results of research works in the area of this research area in the first quartile of the most frequently quoted periodicals. 4. Actions facilitating the involvement of many different scientific disciplines to create the potential of interdisciplinary research related to the subject of cultural heritage. 5. Striving to obtain the application character of the results of interdisciplinary scientific research.

The increase of international research cooperation

6. Establishing cooperation in the field of active participation in the work of international and inter-disciplinary university networks.
7. Focusing research work on obtaining tangible results of international research cooperation in issues related to cultural diversity (publications and grants).
8. Active search and acquisition of scientific staff participation in international research projects.

Improving the quality of education

9. Developing activities that increase the internationalization of the education process in English in connection with leading international universities.
10. Organizing educational programs responding to the challenges related to the thematic scope of this research area, which will allow raising the level of professional and language competences of students as well as teaching competences of academic teachers.
11. Promoting in the motivational system the joint-authorship publications of international undergraduates and PhD students on the subject of this research area.
12. Creating activities supporting and developing access to high-class teaching infrastructure.
13. Developing programs to improve teaching competences in the area of optimal relationship between science people and undergraduates and PhD students.
14. Activities aimed at maintaining high grade in the university rankings (PKA).

Scientific development of employees

15. Development of comprehensive programs including actions targeting young scientists for continuous improvement of competences and the increase of participation in international research.
16. Maintenance and further development in the range of access to the university's infrastructure and research equipment.

Improving the quality of university management

17. Improving organizational procedures in the area of establishing and conducting international research projects, targeted financing of international scientific research with the use of IT systems supporting management in conducting international research projects.

Justification of the choice of courses of action, resulting from the strengths of SWOT analysis

The activity of the scientific staff in individual disciplines of humanities involved in research projects belonging to this research area includes participation in research projects of international and global importance. The use of the strengths lies in intensifying this participation by developing activities aimed at involving a greater number of young research staff, including the most talented undergraduates and PhD students in the conducted research work.

Research programs should take into account the facilitation from the side of the administrative structure regarding faster publication of co-authored work results (academics with undergraduates and doctoral students) on the international forum, including participation in international scientific conferences. At the same time, in the long-term perspective, the focus should be on research topics directly related to the challenges of the future society. For such

complex research activity, it is necessary to ensure a stable and dedicated stream of financing and establishing permanent contacts with the socio-economic environment of the university.

Proposed directions of activities in the field of weaknesses of the SWOT analysis

Increasing the impact on the development of world science

1. Activities supporting the improvement of the publication activity in the most-cited magazines (the first decile of the journals WoS and Scopus).
2. Activities aimed at increasing the number of employees undertaking challenges to participate in international research projects and obtained prestigious international grants.
3. Developing activities aimed at intensifying contacts with social organizations and global enterprises operating in the university's environment.
4. Scheduled activities reducing the burden of didactic and administrative activities for employees undertaking cooperation in international research teams dealing with the issues of this research area.
5. The need to plan actions to make the age structure more flexible and to make more optimal use of the scientific staff, in particular in the field of international cooperation.

The increase of international research cooperation

6. Development of comprehensive activities in the range of greater and more effective promotion of research results and academic offer of the university.
7. Activities aimed at improving the international image and recognition of the university.
8. Activities aimed at increasing the number of research workers undertaking the challenge of participating in international research teams through actions to reduce the teaching and organizational burden and making available additional funding streams.
9. Developing programs to raise the level of competence in building international relations with significant foreign universities and global corporations in the range of establishing cooperation in the field of this research area.

Improving the quality of education

10. Development of activities aimed at making the study programs more flexible, which will take into account individual approach to learning paths.
11. Preparation of new solutions (incentives) in the university's motivational system in the area of improving the quality of didactic work.
12. Development of systemic programs of the university that would support the competition for the best candidates for studies.
13. Developing system solutions in the field of talent management.
14. Preparation of activities aimed at obtaining greater activity of academics in the range of academic mobility.

Scientific development of employees

15. Developing a new system of researching the needs and satisfaction of employees.
16. The need to develop mentoring programs for young scientists.
17. Developing activities aimed at changing the dominant systemic solution, which imply subordinating the path of development of young scientists to scientific advancement, and not the development of international research works.

18. Creating support programs for the development of young scientists in connection with significant international universities dealing with issues related to this research area.

Improving the quality of university management

19. Development of activities aimed at correction of the incentive system, which includes participation in international research projects.

20. Undertaking activities aimed at agreeing system of periodic employee evaluations with the path of their professional development.

Justification of the choice of courses of action, resulting from the weaknesses of SWOT analysis

Reducing or eliminating the impact of weaknesses will require planning and implementation of activities related to: greater support for publication activity in the most-cited magazines, increasing the number of employees undertaking international participation challenges, intensifying contacts with social organizations and global enterprises operating in the environment for better understanding of the subject concerning the development of the future society. Raising the quality of education can be achieved by reducing the burden of organizational and administrative activities, making the age structure more flexible and making more optimal use of the academic staff. Methods of intensifying the participation of research workers in international research teams and programs in raising the level of competences of young researchers should also be developed. The more developed incentive system and mentoring programs for young researchers may encourage more active participation in research.

Proposed directions of activities in the field of opportunities of the SWOT analysis

Increasing the impact on the development of world science

1. Developing activities aimed at increasing the number of research projects implemented in cooperation with social organizations and the fastest growing industries, in particular with global high-tech enterprises from the university environment and international research centers in the field related to this research area.

2. Actions aimed at greater use of national scientific policy, preferring concentration of inputs in units taking part in international research projects.

3. Taking measures to take greater account of social and economic trends in scientific research belonging to this research area.

4. Undertaking activities aimed at increasing the participation of doctoral students in research projects.

The increase of international research cooperation

5. Development of action programs aimed at greater correlation of the research areas of the university with the priorities in European and global science and the challenges of the future society.

6. Developing ways of identifying priority research areas of a global nature related to this research area and giving it priority importance as research areas of the university.

7. Planning and undertaking activities aimed at participating in research works of university networks of international renown.

8. Planning activities to facilitate the acquisition and use of information technologies in establishing international contacts and reducing language barriers.

9. Increasing the use of Cracow's exceptional industrial environment in establishing cooperation in the range of this research area between the university and global enterprises from the high-tech industry.

Improving the quality of education

10. Undertaking activities aimed at greater use of advanced modern technologies in the didactic process.

The use of a convenient location of the university in the vicinity of scientific and research units and other domestic and foreign universities in the field of didactic cooperation related to the subject of this research area.

11. Preparation of activities within the framework of popularizing university studies at the national and international level.

12. Preparation of activities using the growing interest in studies in Poland in the countries of Eastern Europe and Central Asia.

Scientific development of employees

13. Preparation of activities aimed at greater use of support programs for the academic staff.

14. Undertaking activities aimed at recognizing and applying EU recommendations regarding the development of scientific staff.

15. Actions aimed at using the increase in the flexibility of public subsidies to establish and conduct research in the field of this research area.

16. Undertaking activities aimed at greater use of advanced modern technologies in the range of improving the scientific competence of employees.

Improving the quality of university management

17. Actions aimed at integrating the university management information system (university digitalization).

18. Actions facilitating the use of the possibilities of diversifying the sources of financing of the university for establishing and conducting research works in the field of this research area.

Justification of the choice of courses of action, resulting from the opportunities of SWOT analysis

The use of opportunities to increase the funding stream of research activities requires preparation of measures consolidating various sources of its origin. A larger stream of funding, in turn, creates opportunities for an increase in the number of research projects carried out in cooperation with entities belonging to the fastest growing industries and international scientific centers and other social organizations within the university environment. The thematic scope of research should take more advantage of the needs of the future society and economic trends, as well as be characterized by a greater correlation of the research areas of the university with the priorities in European and world science. It is also necessary to intensify the participation of doctoral students in research projects. The use of the unique environment of the university also gives an opportunity to use modern technologies more in the didactic process. In the range of scientific staff development, actions should be taken to identify and apply EU recommendations regarding the development of scientific staff.

Proposed directions of activities in the field of threats of the SWOT analysis

Increasing the impact on the development of the world science

1. Developing activities aimed at concentrating the ways and sources of obtaining very limited financial resources for research, in order to reduce dissonance in relation to other European Union countries in this research area.

2. Developing activities aimed at retaining talented young scientists at the university.
3. Offers of better working conditions and scientific development as counteracting competitive pressure from other scientific centers.

The increase of international research cooperation

4. Activities that intensify establishing contacts with universities and research centers as well as global enterprises emerging in new competitive geographic regions within the thematic scope of this research area.
5. Actions promoting in the political and economic sphere the need to establish research projects in the range of this research area, as counteracting the risk of divergence of Poland's economic and foreign policy with identified global trends and the needs of the future society.

Improving the quality of education

6. Developing system solutions limiting the growing bureaucratisation of didactic processes.
 7. Developing system and legal solutions that will increase flexibility in shaping study programs.
- Scientific development of employees
8. Activities aimed at a significant improvement of the salaries of researchers in obtaining research results at the highest global level.
 9. Preparation of activities aimed at solving problems related to higher education's "work-life balance".
 10. Developing system and legal solutions in the range of age management for higher education, introduction of activities taking into account the diversity of roles of young scientists and older people of science.

Improving the quality of university management

11. Activities aimed at preparing the offer of better working conditions and scientific development for the most talented students and improving the attractiveness of work at the university in relation to jobs in industry.

Justification of the choice of courses of action, resulting from the threats of SWOT analysis

The scattering and low level of financing of scientific activities leads to the preparation of a plan of concentration of research expenditures dedicated to the establishment of international projects in the range of the subject of this research area. A larger stream of funding will allow for taking actions to minimize the impact of threats and aiming at intensifying establishing contacts with the socio-economic stakeholders of the university, which will allow identification and selection of research topics related to the quality of life. It is also necessary to develop activities that will increase flexibility in shaping study programs. Improvement in the quality of didactics can be achieved by preparing system solutions to limit the growing bureaucratisation of didactic processes.

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