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ChatMED

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Bridging Research Institutions to Catalyze Generative AI Adoption by the Health Sector in the Widening Countries

"Ss. Cyril and Methodius" University in Skopje
FACULTY OF COMPUTER SCIENCE AND ENGINEERING

Jožef Stefan Institute

Univerzitet u Nišu
MEDICINSKI FAKULTET

TU Graz

Deliverable D3.1

Report on the upgraded infrastructure and knowledge management repository establishment

**Funded by
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Abstract: This deliverable presents the outcomes of benchmarking UKIM's infrastructure against state-of-the-art standards, outlining strengths and opportunities for further enhancement. In line with our commitment to Open Science, it also documents the establishment of a dedicated Knowledge Management Repository. Integrated as an additional module within the project website, the repository aims to facilitate transparent access to project outputs and foster knowledge sharing.

The deliverable is structured into two main sections. Section 1, *Benchmarking Infrastructure Against State-of-the-Art,* is organized into three subsections: 1.1 *Research on SOTA Infrastructure* - a comparative study of four renowned institutions, 1.2 *Questionnaire for FSCE*, designed to critically assess the current state, and 1.3 *Key Findings and Recommendations*. Section 2, *Establishing a Knowledge Management System*, is structured as follows: *2.1 UKIM Institutional Repository (repository.ukim.mk)* - a brief presentation of the current UKIM's institutional repository, *2.2 Zenodo: A Global Benchmark, 2.3 Comparative Analysis* – a comparison of UKIM repository and Zenodo, a global, multidisciplinary repository, *2.4 TriZ-Flow Data Management Unit* – the newly implemented repository, and *2.5 Conclusion*. The deliverable concludes with a summary.

HISTORY OF CHANGES			
Date	**Issue**	**Author**	**Summary of main changes**
25.07.2025		**Iulia Nica**	**Initial draft + extensions**
22.08.2025		**Franz Wotawa**	**Evaluation, textual extensions**
22.08.2025		**Monika Simjanoska Misheva**	**Evaluation, textual extensions**

26.08.2025		Iulia Nica	Textual extensions

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List of Acronyms

FCSE (Faculty of Computer Science and Engineering)
SOTA (State of the Art)
UKIM (Ss. Cyril and Methodius University in Skopje)
TU Graz (Graz University of Technology)
TUM (Technical University of Munich)
ETH Zurich (Swiss Federal Institute of Technology Zurich)
MIT (Massachusetts Institute of Technology)

Introduction

This report deals with benchmarking UKIM's infrastructure against state-of-the-art standards, outlining strengths and opportunities for further enhancement. In line with our commitment to Open Science, it also documents the establishment of a dedicated Knowledge Management Repository. For this purpose, we divided this deliverable into two parts: Part 1 captures the benchmarking itself, where we consider TU Graz, TU Munich, ETH Zurich, and MIT for comparison. In particular, we discuss the support for project management and current metrics like the budget, rankings, the number of publications, and third-party income. We chose the four universities to capture entities of varying sizes, and also universities from different continents. Part 2 provides an overview of the newly implemented Knowledge Management System at FCSE/UKIM, meant to explicitly support data generated within the ChatMED project and to serve as a sustainable foundation for future initiatives.

1. Benchmarking Infrastructure Against State-of-the-Art

The first part of the deliverable is dedicated to benchmarking UKIM's infrastructure against state-of-the-art practices. To establish a solid reference framework, an in-depth research on infrastructure models was carried out through a comparative study of four renowned institutions - three based in Europe and one in the United States. The insights gained from this analysis informed the design of a tailored questionnaire, created to critically assess the current state of the infrastructure at UKIM and to identify areas in need of improvement and modernization. The section concludes with an evaluation of the responses provided by our partners, presenting the key findings and offering recommendations for future strategic interventions.

1.1 Research on SOTA Infrastructure

In order to draw on leading international practices, we selected three European institutions - the *Graz University of Technology (TU Graz)*, the *Technical University of Munich (TUM),* and the *Swiss Federal Institute of Technology Zurich (ETH Zurich)* - together with the *Massachusetts Institute of Technology (MIT)* from the United States.

Organisational Structure

The organizational structures of the selected institutions, while slightly different in design, can be broadly categorized into six types of units, as illustrated in Figure 1. This classification provides a comparative framework that enables a systematic analysis of the institutional organization and highlights both shared and distinctive features across our case studies. **Error! Reference source not found.** and **Error! Reference source not found.** summarize the specific organizational units for all four institutions
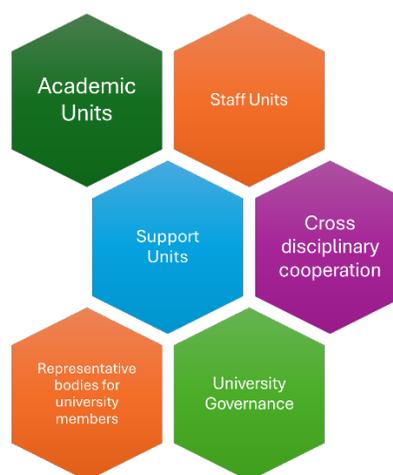

Figure 1 Overview of the six unit types identified within the organizational structure

University	Academic Units	Staff Units	Support Units
TU Graz	**7 faculties with** 100+ institutes	**Staff Units of TU Graz:** • Internal Auditing • Management of Professorial Appointments • Equity, Youth, Care • Quality Management, Evaluation & Reporting • Strategy and Organizational Development • Sustainability • University Legal Office	**Service Departments of TU Graz:** • Alumni Affairs • Buildings and Technical Support • CAMPUSonline • Communications and Marketing • Controlling • Educational Technology • Finance and Accounting • Higher Education and Programme Development • Human Resource Development • International Office – Welcome Center • IT Services • Languages, Key Competencies and In-House Training • Legal Matters & Insurance Management • Library and Archives • Life Long Learning • Personnel Department • Purchasing Service • Registrar's Office • Research & Technology House • Shareholdings and Risk Management
TUM	**7 schools** with 29 departments (2023), **7 integrative research institutes**	**Central administration and staff units of TUM:** • Human Resources • Finance • Real Estate • Legal Office • Diversity & Inclusion • Internal Audit • IT security • Export Control • Sustainability Office	**Administrative Offices of TUM:** • Controlling, Organization and Planning • Corporate Communications Center • Global & Alumni Office • Office for Research and Innovation • Fundraising • Health, Safety and Radiation Protection **Central Service Institutions of TUM:** • University Library • IT Services • Center for Study and Teaching

			• University Sports Center • Language Center • Archive **Institute for LifeLong Learning**
ETH Zurich	16 departments	**Staff units of ETH Zurich:** • Rectors's Staff • Office of Research • Office of Knowledge Transfer and Corporate Relations • Science-Policy Interface • ETH Entrepreneurship • Partnerships for Innovation • ETH transfer – IP & Licensing • National Initiatives for Innovation • Office of the President • Office of Faculty Affairs • Office of Finance and Controlling • Office of Infrastructure • Office of Personnel Development and Leadership • Legal Office	**Administrative departments of ETH:** • Academic Services • Student Services • Teaching and Learning (UTL) • Research Initiatives and Infrastructures • Scientific Integrity and Research Ethics • Grants Office • Corporate Communications • Controlling • Accounting • Procurement and Export Services • Real Estate Management • Facility Services • Campus Services • Engineering and Systems • IT Services • ETH Library • Safety, Security, Health and Environment • HR Consulting • Consulting for Professors • Development and Leadership • Diversity and Collaboration • HR Operations **Teaching and research facilities outside the academic departments:** • Language Center • Congressi Stefano Franscini (the meeting platform of the ETH Zürich) • School for Continuing Education • Institute of Science, Technology and Policy • Wyss Zurich Translational Center • 18 research centers
MIT	5 schools and 1 college	**Staff Resources of MIT:** • Atlas Service Center • Audio-Visual Services (MIT AV) • Conference Services • Disabilities Services (DSMLO) • Human Resources Department (VPHR) • Information Systems and Technology (IS&T) • Institute Discrimination and Harassment Response Office (IDHR) • LBGTQ+ Services • MIT Center for WorkLife and WellBeing • MIT Federal Credit Union (MIT FCU) • Ombuds Office • TechCASH	**Administrative Resources:** • Aeronautics and Astronautics Department (AEROASTRO) • Atlas Service Center • Audio-Visual Services (MIT AV) • Audit Division • Chair of the Corporation • Conference Services • Consortium on Financing Higher Education (COFHE) • Corporate Relations (OCR) • Corporation Joint Advisory Committee on Institute-Wide Affairs (CJAC) • Disabilities Services (DSMLO) • Disability and Access Services (DAS) • Environment, Health, and Safety Headquarters Office (EHS) • Government and Community Relations • Human Resources Department (VPHR) • Institute Events • Institutional Research • Knight Science Journalism Fellowships (KSJ) • Microsystems Technology Laboratories (MTL) • Museum Studio at Compton Gallery

			• Notary Public
			• Office of Graduate Education (OGE)
			• Office of Strategic Alliances and Technology Transfer (OSATT)
			• Office of the Corporation
			• Physics Department
			• Research Administration Services (RAS)
			• Risk Management & Compliance Services
			• Sloan School of Management: Deans & Administration
			• Technology Licensing Office (TLO)
			• Vice Chancellor for Undergraduate and Graduate Education (OVC)
			• Vice President for Finance (VPF)
			• Vice President for Research
			• Vice President for Resource Development (RD)
			• Visiting Committees, Corporation
			• Washington Office
			• Office of Sustainability
			• MIT Professional Education

Table 1 Overview of academic, staff, and support units

University	Cross-disciplinary cooperation	Representative bodies for university members	University Governance
TU Graz	**5 Fields of Expertise:** • Advanced Materials Science • Human & Biotechnology • Information, Communication & Computing • Mobility & Production • Sustainable Systems **6 Research Centers** **Nawi Graz** **BioTechMEd-Graz** **Human-Centered Computing Labs** **12 Christian Doppler (CD) Laboratories**	• Working Group for Equal Opportunities • Disability Liaison Officer • Works Council for Administrative Personnel • Works Council for Academic Personnel • Commission for Scientific Integrity • Ethics Committee • TU Graz Student Union • Young Workers' Council • TU Graz Student Ombudsperson • Arbitration Board of TU Graz	**University Council, Rectorate and Senate** **Rectorate**: Rector, VR for Research, VR for Academic Affairs, VR for Human Resources and Finance, VR for Infrastructure and Sustainability
TUM	• 7 integrative research institutes • 7 corporate research centers • 4 clusters of excellence • **TUM Innovation Networks** **https://web.tum.de/en/inw/home/** • **Mission Networks** **https://www.tum.de/en/research/research-projects#c112484**	• Departmental Student Councils • Student Council • General Student Committee • TUM Graduate Council • Research Associates' Council	**TUM Board of Management:** • President • Presidential Office • Faculty Recruitment, Career Advancement & Dual Career • Strategy and Excellence Development • Office of the Senior Executive Vice President • Delegate Officers of the President **University Boards:** • TUM Extended Board of Management • TUM Board of Trustees • TUM Senate • TUM University Council • Ethics Committee

ETH Zurich	• 8 Competence Centres, e.g., ETH AI center, Energy Science Center, Rehabilitation Engineering Science, World food System. • 7 NCCRs (National Centres of Competence in Research) • ETH Zurich MedLab Fellowship programme	• VSETH (Student Union—official student representation across the institute) • Lecturers' Conference (KdL) • AVETH—Academic Association representing doctoral students, postdocs, and scientific staff • Staff Commission (PeKo) • Ethics Commission • Commission for Good Scientific Practice • Integrity Commission • University Assembly	**Executive Board**: President, Rector, Vice President for Research, Vice President for Knowledge Transfer and Corporate Relations, Vice President for Finance and Controlling, Vice President for Infrastructure, Vice President for Personnel Development and Leadership
MIT	• A network of 28 laboratories, centers and institutes: https://research.mit.edu/labs-centers-and-institutes	• Undergraduate Association (UA) • Graduate Student Council (GSC) • Dormitory Council (DormCon) • Interfraternity Council (IFC) • Panhellenic Association • Association of Student Activities (ASA) • Institute Committees (e.g., Committee on Student Life, Committee on Undergraduate Admissions and Financial Aid, Committee on Discipline, Faculty Policy Committee, Committee on Curricula) • Graduate Student Council Council Representatives • Graduate Student Council Standing Committees • Graduate Student Council Officers (President, Vice President, Secretary, Treasurer)	• Senior Leadership (President=MIT's chief executive officer + Senior administrative officers), Academic Council, Corporation Officers (https://orgchart.mit.edu/)

Table 2 Overview of cross-disciplinary cooperation, representative bodies, and university governance units

The comparative analysis of the organizational structures of TU Graz, TU Munich, ETH Zurich, and MIT highlights several insightful observations. While all institutions ensure representation of students, academic staff, and administrative personnel, the modalities vary significantly. TU Graz emphasizes specialized councils addressing equality, ethics, and arbitration, whereas TUM prioritizes student-led councils and research staff representation. ETH Zurich and MIT, by contrast, employ integrated governance structures that balance the participation of students, staff, and faculty. The study further reveals differing approaches to graduate and doctoral representation, with dedicated councils at TUM, ETH Zurich, and MIT, and a more consolidated model at TU Graz. Additionally, mechanisms for ethics, integrity, and conflict resolution - whether through dedicated commissions or offices such as MIT's Ombuds - emerge as key

enablers of institutional transparency and responsiveness. Overall, these comparisons underscore the importance of clear, inclusive representation, structured yet adaptable governance, and the presence of dedicated units to support equality, integrity, and effective conflict management. Furthermore, in Section 1.2, a direct comparison of TU Graz and UKIM will provide specific guidance for the development of UKIM's organizational framework.

Support Units for Research Applications and Knowledge Transfer

Support units for research applications and knowledge transfer are essential for facilitating high-quality research and promoting industry collaboration. Across TU Graz, TU Munich, ETH Zurich, and MIT, these units assist researchers with funding applications and project proposals, providing guidance on eligibility, submission, and compliance. Dedicated offices also manage knowledge transfer, intellectual property, and partnerships with private and public organizations, supporting the commercialization of research outputs. While TU Graz and TU Munich centralize funding and industry liaison functions, ETH Zurich separates these roles between research administration and knowledge transfer offices. MIT provides integrated support for proposal development, technology licensing, and ethical review via Institutional Review Boards (IRBs). For more information on the services provided by each support unit, we refer the reader to **Error! Reference source not found.**. An in-depth comparison of TU Graz's and UKIM's support units for research, teaching, and innovation can be found in Section 1.2.

University	Support Unit for Research Applications and Knowledge Transfer
TU Graz	Research & Technology House
TUM	TUM ForTe - Office for Research and Innovation
ETH Zurich	Office of Knowledge Transfer and Corporate Relations
MIT	Office of the Vice President for Research

Table 3 Support Units for Research Applications and Knowledge Transfer

University Benchmark Data

- *Academic Staff and Student Composition*

University	Academic Staff	Total Staff	Regular Students
TU Graz	1,932 (270 professors)	3,935	13,443 (incl. international 3,497)
TUM	8,037 (698 professors)	12,299	52,931 (incl. international 23,807)
ETH Zurich	1,465 (519 professors)	10,689	25,380 (incl. international 9,514)
MIT	9,149 (1,090 professors)	17,490	11,886 (incl. international 3,430)

Table 4 Academic Staff and Student Composition

- *University rankings and global standing*

University	Times Higher Education (THE) World University Ranking 2025	QS World University Rankings (2025)	Shanghai Ranking (2024)
TU Graz	601–800	#413	801-900
TUM	#26	#28	#47
ETH Zurich	#11	#7	#20
MIT	#3	#1	#3

Table 5 University rankings and global standing

- *Research output: publications, citations, and impact*

University	Total Publications	Total Citations	Σ H-Index
TU Graz	17,503	800,000	2,740
TUM	129,115	4,700,000	23,803
ETH Zurich	158,366	6,500,000	34,151
MIT	248,652	29,853,691	62,539

Table 6 Research output: publications, citations, and impact[1]

- *Financial and Innovation Metrics*

Metric	TU Graz	TUM	ETH Zurich	MIT
Federal Budget	€208.6 million	€734.5 million (State subsidy)	CHF 1,365 million (~€1,442 million)	no federal "core budget"
Third-Party Funds	€88.4 million	€482.26 million	CHF 383 million (~€395.9 million)	$2,330 million(~€2,05 million)
Patent Applications	25	80	87	362 U.S. patents issued
Start-Up Companies	34 companies – between 2018 and 2021	Over 100 start-ups founded in 2024	37 new spin-offs in 2024	24 companies in 2024

Table 7 Financial and Innovation Metrics

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[1] according to https://research.com/university-rankings/best-global-universities
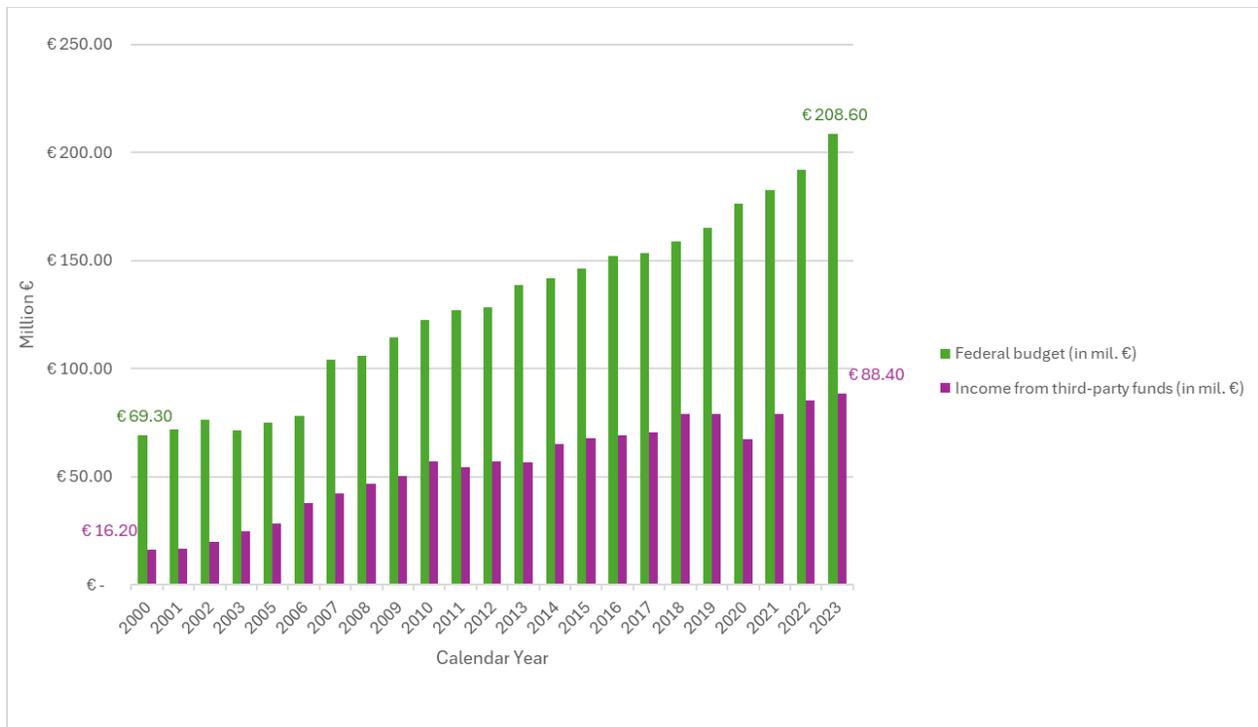
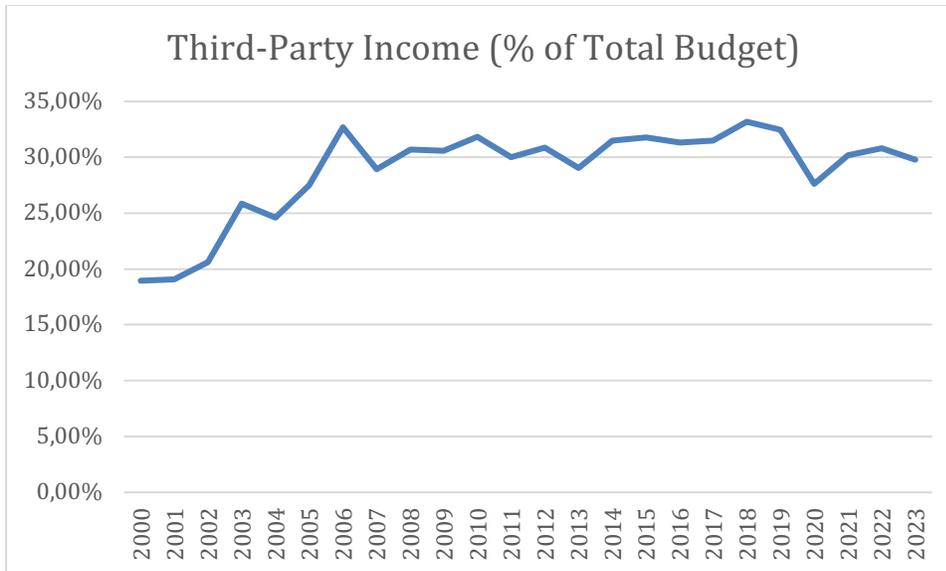*Table 8 TU Graz's Budget Evolution 2000-2023*

Table 9 TU Graz's Third-Party Income Evolution 2000-2023

The four universities represent small ones (TUG with fewer than 300 professors and around 13,000 students) to big ones (TU Munich with almost 700 professors and 53,000 students). MIT is more special because of having the most professors (around 1000), the largest total budget,

but the smallest number of students (about 11,000). Regarding rankings, the universities cover the range from 1 to 900, depending on the type of ranking. The publication metrics – more or less – follow these figures. All of the universities are active in third-party funding research activities, the founding of companies, and the internal support units. Hence, considering the implemented support units as a practical blueprint to foster research and the generation of startups is recommended. Adaptations to cover special regulations and needs might be considered, too.

Following the benchmark results, TUG developed a questionnaire for FSCE to obtain information on the organizational structure and the current state. We report all the information and also further steps in the following subsections of this report.

1.2 Questionnaire for FSCE

    I.   Regarding the **organisational structure** (faculties/schools, institutes/departments, administrative units)

Question 1:
What is the current organisational structure of your university? If possible, please use Table 10 *as guidance.*

TU GRAZ´s Answer:

Academic Units	**7 faculties with** 100+ institutes
Staff Units	Internal Auditing Management of Professorial Appointments Equity, Youth, Care Quality Management, Evaluation & Reporting Strategy and Organizational Development Sustainability University Legal Office
Support Units	Alumni Affairs Buildings and Technical Support CAMPUSonline Communications and Marketing Controlling Educational Technology Finance and Accounting Higher Education and Programme Development Human Resource Development *International Office – Welcome Center* IT Services *Languages, Key Competencies and In-House Training* Legal Matters & Insurance Management Library and Archives *Life Long Learning* Personnel Department Purchasing Service Registrar's Office *Research & Technology House* Shareholdings and Risk Management
Cross-disciplinary cooperation	**5 Fields of Expertise:** • Advanced Materials Science • Human & Biotechnology

	• Information, Communication & Computing • Mobility & Production • Sustainable Systems **6 Research Centers** **Nawi Graz** **BioTechMEd-Graz** **Human-Centered Computing Labs** **12 Christian Doppler (CD) Laboratories**
Representative bodies for university members	Working Group for Equal Opportunities Disability Liaison Officer Works Council for Administrative Personnel Works Council for Academic Personnel *Commission for Scientific Integrity* *Ethics Committee* TU Graz Student Union Young Workers' Council TU Graz Student Ombudsperson Arbitration Board of TU Graz
University Administration	**University Council, Rectorate and Senate** **Rectorate**: Rector, VR for Research, VR for Academic Affairs, VR for Human Resources and Finance, VR for Infrastructure and Sustainability

Table 10 TU GRAZ: Main Units of the Organisational Chart

FCSE's Answer:

Academic Units	28 units: 23 faculties & 5 institutes
Staff Units	Rector's Office General Affairs International Cooperation Teaching Financial, Accounting and Material Operations Science University Computer Centre Public Procurement
Support Units	Buildings and facilities Project Office International Cooperation Office Office of science Office of Teaching Career Centre Alumni network University Computer Centre
Cross-disciplinary cooperation	Centre for Advanced Interdisciplinary Research (CeNIIs) Centre for Advanced and Post-Doctoral Research – CAPRIS Research Centres Research laboratories Business Accelerator UKIM Incubators
Representative bodies for university members	Rector's Board Senate Teaching and Scientific Councils of the faculties Scientific Councils of the institutes Teaching Committee Research Committee

	Finance, Investments, and Development Committee Committee for Cooperation with Universities Domestically and Abroad Publishing Committee Regulatory Affairs Committee Information Technology Committee Student Standards Committee Culture and Sports Committee Housing Committee for Postgraduate and Doctoral Students Evaluation Committee Ethics Committee University Student Assembly
University Administration	Rector Vice-Rector for Teaching Vice-Rector for Science Vice-Rector for International Cooperation Vice-Rector for Finances, Investments and Development Rector's Board Senate Rectorate Secretary General

Table 11 Ss. Cyril and Methodius University in Skopje

II.   Regarding the **support units for research applications and knowledge transfer:**

Question 1:

Do you have a central support unit for research, teaching, and innovation? What services does it provide?

TU GRAZ's Answer:

 Yes, the Research & Technology House.

Research Newsletter	Researchers at TU Graz receive the newsletter F&T News roughly every 2 weeks by e-mail and can directly access the newsletter via the TU4U intranet.
Support of Third Party Funded Projects	The Research & Technology House provides support in choosing a suitable funding programme, submitting applications while taking administrative requirements of the funding body into account, project calculation and making offers.
Research Documentation	TU Graz includes all information regarding research in a database. Entries are used for all types of internal and external inquiries and form the basis of statistical analyses, many of which are compulsory for all universities (Knowledge Survey, R&D survey, internal evaluations, e.g. research figures).
Offers for Post-Docs	The Research & Technology House supports and advises post-docs at TU Graz in planning and acquiring research funding for stays abroad. An overview of the grants and funding programmes for research stays abroad is available online.
Commercialisation of Research Results: Patents, Inventions and Technology Exploitation	The Research & Technology House advises and supports researchers at TU Graz by helping from contract design

	before project start, along generation of an invention as well as with patenting and licensing or selling an invention.
Founding a Company	The Research & Technology House supports students and employees who wish to set up their own company as a start-up or spin-off.

Table 12 TU Graz: Services of the Research & Technology House

FCSE's Answer:

University Bulletin	The University Bulletin is intended for the Researchers at UKIM, in paper format, twice a month, and it is published at the University webpage. In the University Bulletin legal documents and Decisions are published. The monthly University Newsletter provides information about promotional activities and events, minutes of meetings, Deans' reports, and biographies of the selected candidate(s) for appointment to academic titles.
Support of Third Party Funded Projects	The Project Office at the University provides advisory services and support for pre-award and post-award application and support to the researchers to access calls and funding opportunities.
Research Documentation	The University has Repository of Scientific and Artistic Works that represents a digital archive of collections containing records of the University's scientific and artistic output. At the same time, it provides open and controlled access to the available content, enabling its searchability and further easy processing.
Offers for Post-Docs	The University has established a Center for Advanced and Post-Doctoral Research – CAPRIS.
Founding a Company	Several companies have been established at the University.

Table 13 UKIM's Support Unit for Research Applications and Knowledge Transfer

Question 2:
What internal funding programs and prizes are available at your university?

TU GRAZ's Answer:

Initial Funding Program	TU Graz provides funds to support the preparation and development of promising applications for competitive funding programmes. It especially addresses researchers of TU Graz who have little experience in applying for third-party funding.
TU Austria: Initial Funding for Joint EU Proposals	This program supports employees of TU Austria universities in preparing Horizon Europe project proposals.
Lead Projects of TU Graz	In the context of establishing a scientific profile for TU Graz apart from the well-established five Fields of Expertise *well focused excellent fields of research should be identified and developed.*
Award of Excellence	Every year, the Federal Ministry of Education, Science and Research awards prizes for outstanding doctoral theses at

	Austrian universities - the 40 best graduates of doctoral programmes in Austria.
WKO Research Grants	The Styrian Economic Chamber is funding a total of 22 ongoing or completed master theses with strong business references.
Nikola Tesla Medal	In order to honour excellent application-oriented research and to commemorate Nikola Tesla, the Nikola Tesla Medal will be awarded to the TU Graz researcher (currently employed or retired) with the most granted patents within the last five years (minimum of 5 granted patents).
Pilot: Go4EU-Coordination	This funding programme aims at motivating and specifically supporting the researchers at TU Graz to take on the coordination of co-operative EU projects.

Table 14 TU GRAZ: Internal funding programs and prizes

FCSE's Answer:

Annual award	Annual award granted to scientists and artists who demonstrate outstanding achievements in scientific research and artistic activities.
Award of Excellence	**xxx**

Table 15 UKIM: Internal funding programs and prizes

Question 3:
What strategies do you use to attract students to the university?

TU GRAZ's Answer:
Events for prospective students, like the Open Day or the Career information fairs.
Yearly Open Day: At the Open Day, students and lecturers from all bachelor's degree programmes provide advice, and the prospective students become more familiar with the TU Graz campus locations. They also receive a lot of important information and tips that will help them to successfully start their studies.
Career information fairs: TU Graz is represented at all career information fairs and offers interested people information about the fields of study and career prospects, orientation discussions on how to choose a degree programme, chances to talk with students, and much more.
TU Graz's website provides detailed information under the section Advisory Services for Prospective Students.

FCSE's Answer:
The Ss. Cyril and Methodius University has established a Career Center that is an internal organizational unit of the Ss. Cyril and Methodius University in Skopje, which consists of the career centers of the University's units. It organizes workshops for career counselling and development of behavioural skills; promotion of UKIM graduates to the business

community; "Open Days of UKIM" in order to introduce future students to the opportunities for studying at the University; develops a system for establishing an Alumni Association of the University and maintains records of former students (alumni); internships and facilitates students' first access to the labour market and networking; assists students in obtaining information for career planning, career development, professional training, and career counseling; conducts labour market research; performs other tasks related to career counseling.

UKIM organizes events for promotion and to attract students: Open days, Carrer development days and Networking days.

The artistic faculties at UKIM, including the Faculty of Music, Faculty of Drama, and Faculty of Fine Arts, regularly organize events throughout the academic year:
- *Student concerts*
- *Student theatre performances*
- *Student art exhibitions.*

III.   Regarding the **University Benchmark Data**, please complete Table 17 using Table 16 as a reference.

TU GRAZ's Answer:
- *Academic Staff and Student Composition*
- *University rankings and global standing*
- *Research output: publications, citations, and impact*
- *Financial and Innovation Metrics*

Academic Staff	1,932 (270 professors)
Total Staff	3,935
Regular Students	13,443 (incl. international 3,497)
Times Higher Education (THE) World University Ranking 2025	601–800
QS World University Rankings (2025)	#413
Shanghai Ranking (2024)	801-900
Total Publications	17,503
Total Citations	80,000
∑ H-Index	2,740
Federal Budget	€208.6 million
Third-Party Funds	€88.4 million
Patent Applications	25
Start-up Companies	67 (2018 - 2024)

Table 16 TU GRAZ University Benchmark Data 2024

FCSE's Answer:

Academic Staff	2143
Total Staff	2907
Regular Students	27.500
Times Higher Education (THE) World University Ranking 2025	1500+
QS World University Rankings (2025)	440+ (QS Europe University Ranking)
Shanghai Ranking (2024)	/
Total Publications	12,575 (Scopus total)
Total Citations	96,381 (period 2014-2024)
∑ H-Index	155 (UKIM H-Index)
Federal Budget	€49.8 mil
Third-Party Funds	€57.8 mil
Patent Applications	National 10, EU 1, World 2 (last 10 years)
Start-up Companies	18 (10 BAU and other are in technical campus)

Table 17 UKIM University Benchmark Data 2024

1.3 Key Findings and Recommendations

After analysing the responses of our colleagues from Section 1.2, we can point to several areas where UKIM's institutional framework could be further strengthened.

a. Internal Audit Unit

UKIM does **not maintain an independent internal audit department**. UKIM's financial and compliance oversight is primarily conducted through **external audit reports** issued by the **State Audit Office**, which audits faculties and the Rectorate on adherence to financial and regulatory standards.

In our opinion, an Internal Audit Office would complement the limited scope of external audits, by offering ongoing assurance and stronger governance.

b. Office of Sustainability

TU Graz, TUM, ETH Zurich, and MIT have already created **dedicated sustainability units or councils** to steer their institutional efforts:

- TU Graz has set a bold target: becoming a **climate-neutral university by 2030**, underlining the power of institutional leadership and community engagement.

- ETH Zurich is launching a **Sustainability Council** in October 2025, which will advise its Executive Board on sustainable development.
- MIT aims to reach **net-zero campus operations by 2026**, with a long-term goal of **eliminating direct emissions by 2050**.
- TUM Sustainability Office centrally coordinates the implementation of the **TUM Sustainable Futures Strategy 2030**. Additionally, **student-led Green Offices** at multiple campuses implement local sustainability projects and raise awareness among the campus community.

Considering these exemples, we recommend the partner university to establish its own Office of Sustainability.

c. Registrar's Office

At UKIM, the **Student Services Office** within the Rectorate, working through the **iKnow portal**, performs functions comparable to the **Registrar's Office at TU Graz**, managing enrollment, student records, academic administration, and certificate issuance in a digitally supported environment.

To ensure clarity of roles and responsibilities, we recommend that UKIM consider formally integrating a "Registrar's Office" into its organizational structure.

d. Languages, Key Competencies and In-House Training

TU Graz has **its own language center**, offering free elective courses in modern languages. It includes levels A1–C1 in languages such as English, Spanish, Italian, French, Portuguese, Chinese, and Russian. Furthermore, students can complete courses about **key competencies** (soft skills: leadership, communication, conflict management, diversity management or intercultural competence) as free-choice subjects.

Establishing such a dedicated unit/ office would provide a valuable framework for developing essential skills, ensuring structured support for both students and staff of our partner university.

e. Life Long Learning

TU Graz Life Long Learning (LLL) offers part-time continuing education at university-level. In multi-semester master's programmes and university programmes as well as shorter university courses, the program provides courses in the fields of engineering, natural sciences and techno-economics.

MIT Professional Education is an official unit within the MIT School of Engineering, responsible for delivering non-degree educational programs designed for professionals, executives, and organizations worldwide.

At UKIM, formal continuing or lifelong learning programs are **still emerging**, with a few faculty-based initiatives - not yet centralized at the university level.

*A **dedicated central unit** would not only unify the existing efforts but also benefits from being able to coordinate the faculty initiatives, thus ensuring consistency among various courses.*

f.   Web-based Campus Management System

CAMPUSonline was officially introduced at TU Graz in January 1998, making TU Graz the first university in the German-speaking world to adopt a fully web-based campus management system. CAMPUSonline is an academic life cycle management system built by a university for other universities in the higher education sector. From enrolment all the way to graduation, CAMPUSonline covers the entire student life cycle in all administrative matters.
Similar to CAMPUSonline - UKIM's **web-based student management platform**, centered around **iKnow**, provides comprehensive support for academic administration.

An in-depth comparison of the two platforms could assist the maintenance team at UKIM in expanding the functionality of the current management system. The official page of CAMPUSonline can be found at https://www.campusonline.tugraz.at/en/home.

g.   Cross-disciplinary cooperation

CeNIIs is **UKIM's first centralized interdisciplinary research hub**, focused on global collaboration by connecting overseas Macedonian researchers with UKIM's faculty and students. Established in 2021, it serves as a growing platform to build interdisciplinary research clusters within the university, elevating UKIM's visibility in the global academic arena. While it shares common goals with initiatives like **NAWI Graz** or **BioTechMed Graz**, it operates on a different scale, with a *strong international outreach focus rather than integrated degree programs or shared research infrastructure.*

Accordingly, we recommend that our colleagues at UKIM strengthen their cross-disciplinary collaboration by incorporating additional interdisciplinary research programs. Some illustrative examples from TU Graz that may serve as inspiration are summarized in Table 10.

h.   Commercialisation of Research Results: Patents, Inventions and Technology Exploitation

One of the main services provided by TU Graz's Research and Technology House is the commercialization of research results, as shown in Table 12. However, Table 13 provides no information regarding institutional support at UKIM for activities such as patenting, licensing or selling an invention.

We therefore suggest that our colleagues explore further support mechanisms for patenting, licensing, and commercialization, which will enhance the practical impact of their research.

i. Internal Funding Programs and Prizes

Dedicated funding programms like **TU GRAZ's Initial Funding Program, TU Austria: Initial Funding for Joint EU Proposals** or **Pilot: Go4EU-Coordination (**see Table 14 for more details) support researchers in preparing project proposals for competitive funding programms.

To motivate and empower especially young researchers at UKIM, we recommend fostering opportunities for third-party funding, research grants, and excellence prizes, which can both support their work and inspire long-term engagement in innovative research.

2. Establishing a Knowledge Management System

The Ss. Cyril and Methodius University in Skopje (UKIM) operates its own institutional repository (**repository.ukim.mk**) as a central platform for archiving, preserving, and disseminating the scientific output of its faculties, departments, and research institutes. The repository provides long-term preservation of dissertations, articles, monographs, datasets, and other scholarly contributions, while ensuring open access to metadata and full texts under clearly defined institutional policies.

However, as the volume and complexity of scientific data continues to grow, there is a pressing need to move beyond static archiving toward advanced data management models that embed **FAIR principles**, ethical oversight, and lifecycle processing. To illustrate this gap and opportunity, this section compares the current UKIM repository with **Zenodo**, a widely adopted global repository, and presents the rationale for establishing a dedicated **TriZ-Flow Data Management Unit** to explicitly support data generated within this project and to serve as a sustainable foundation for future initiatives.

2.1 UKIM Institutional Repository (repository.ukim.mk)

The UKIM Repository is based on the **DSpace-CRIS platform** and currently aggregates a wide variety of outputs from across the university, including:

- PhD dissertations, master's theses, and undergraduate works
- Journal articles and conference papers
- Books, book chapters, and teaching materials
- Datasets, multimedia files, patents, and project reports

Policies and Access
- **Metadata** is freely available and reusable for any purpose, including commercial, provided attribution and persistent identifiers (OAI handles) are included.

- **Full-text documents** are open for personal, educational, and non-profit reuse with attribution. Commercial reuse requires explicit permission.
- **Preservation** is ensured indefinitely. Items may be withdrawn under valid circumstances (e.g., copyright issues), though "tombstone pages" maintain discoverability.

Current Status

As of recent reporting, the repository contained more than **12,800 items**, though datasets remain underrepresented relative to textual publications. Content is organized by **communities and collections**, reflecting faculties and research units, and offers standard browsing, searching, and export functionalities.

Strengths

- Institutional ownership and long-term preservation
- Transparent access and reuse policies
- Breadth of supported content types

Limitations

- Limited focus on structured **data management and processing**
- Lack of integrated support for persistent identifiers beyond handles (e.g., DOIs)
- Restricted global visibility compared to international repositories

2.2 Zenodo: A Global Benchmark

Zenodo, developed by **CERN** under the **OpenAIRE** initiative, represents a global, multidisciplinary repository. Its key features include:

- **Persistent Identifiers (DOIs)** for every uploaded item
- Support for a broad range of research outputs (datasets, publications, software, presentations)
- **Full FAIR compliance**, ensuring findability, accessibility, interoperability, and reusability
- **Versioning**, licensing (e.g., CC BY), and integration with platforms such as GitHub
- Rich metadata schemas and APIs for programmatic access and interoperability

Zenodo is particularly suited for collaborative, international research projects that require structured data publication, version control, and global visibility. It represents not just a repository but an **active enabler of open science ecosystems**.

2.3 Comparative Analysis

Feature / Platform	UKIM Repository	Zenodo
Platform	DSpace-CRIS (institutional)	InvenioRDM (international)
Scope	Institutional output (articles, theses, limited datasets)	Global, multidisciplinary (data, code, publications)
Identifiers	Handles	DOIs

FAIR Principles	Partial (metadata open, but limited data support)	Fully integrated
Preservation	Indefinite, institutional retention	Long-term archival, versioned
Access / Licensing	Open metadata, controlled text reuse	Fully open licensing options
Integration	Internal, institutional visibility	APIs, OAI-PMH, GitHub, global reach
Data Management	Static preservation	Lifecycle, versioned FAIR data publishing

Table 18 Comparative Analysis UKIM Repository vs Zenodo

The comparison, depicted in **Error! Reference source not found.**, shows that while the UKIM repository is strong for **institutional archiving**, it lacks the advanced, project-level data governance and FAIR-compliant processing capabilities that repositories like Zenodo can offer.

2.4 TriZ-Flow Data Management Unit

To bridge this gap, the project proposes the establishment of a **TriZ-Flow Data Management Unit** within the consortium framework. This unit, described in the Data Management Plan (DMP, DOI: 10.5281/zenodo.16900973), introduces a three-zone model for handling scientific data:

1. **Bronze Zone – Ingestion**

Secure storage of raw, unprocessed data from experiments, clinical trials, or simulations. Ensures authenticity and traceability.

2. **Silver Zone – Transformation**

Cleaning, anonymization, structuring, and standardization. GDPR alignment, informed consent verification, and ethics compliance checks.

3. **Gold Zone – Publication**

Curation into high-quality, FAIR-aligned datasets ready for dissemination. DOI assignment, metadata enrichment, and open access publication (e.g., via Zenodo or UKIM repository).

Governance and Compliance

- **Ethics Advisor oversight** to ensure adherence to GDPR, data minimization, and responsible research practices.
- **Role-based and attribute-based access control (RBAC/ABAC)** to guarantee security and confidentiality.
- **Training modules** to ensure all project partners adopt good data stewardship practices.

Sustainability and Future Outlook

The TriZ-Flow unit is designed not only to serve this project but also to **scale to future initiatives**, ensuring that UKIM and its partners establish a robust, sustainable model for managing sensitive and complex scientific data. By complementing the existing UKIM repository with an active data pipeline, the consortium ensures that outputs are not just preserved but **curated, governed, and made reusable** for long-term impact.

2.5 Conclusion

The UKIM repository provides a strong foundation for archiving and disseminating institutional research outputs. However, its scope remains limited to static preservation, with only partial alignment to modern FAIR data management practices. In contrast, Zenodo illustrates the global standard for open science, offering persistent identifiers, FAIR compliance, and lifecycle data governance.

By introducing the **TriZ-Flow Data Management Unit architecture**, the project brings these advanced principles into practice at the consortium level. This framework will explicitly support the scientific data generated during the project, ensure compliance with ethical and legal standards, and create a **sustainable model** that can be adopted across future projects. In doing so, the consortium strengthens both its institutional and international standing in research data management, ensuring that scientific outputs remain findable, accessible, interoperable, and reusable for years to come.

Summary

In summary, this deliverable benchmarked UKIM's infrastructure against state-of-the-art practices at TU Graz, TU Munich, ETH Zurich, and MIT, combining a review of international standards with evidence gathered through the FSCE questionnaire. The analysis focused on project management support and performance indicators such as budgets, rankings, publications, and third-party income, with the primary aim of identifying gaps and highlighting areas where modernization is required. The results of this analysis are captured in the section on Key Findings and Recommendations, which outlines targeted measures for addressing the identified gaps. In addition, the deliverable documented the establishment of a Knowledge Management System, encompassing a brief presentation of UKIM Institutional Repository, a comparative analysis with Zenodo, and the development of the TriZ-Flow Data Management Unit. Together, these elements provide a comprehensive overview of UKIM's current position, highlighting both the areas in need of enhancement and the newly established structures that can support future institutional development.