KomBEU

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Business model development in a European context

Results of a German-Serbian cooperation project

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BUSINESS MODEL DEVELOPMENT IN A EUROPEAN CONTEXT

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About ISF München

ISF München is one of the leading research institutes in the field of labor and industrial sociology in Germany. Founded in 1965, the independent, non-profit institute conducts research and design projects on the transformation of the working world and economy in close cooperation with companies, associations, trade unions, works councils, and other research institutions. Through its research, it aims to contribute to the humanization of work and the development of a sustainable economy.

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SUMMARY

Each year, universities across the Western Balkans educate a substantial number of highly qualified specialists. However, upon graduation, many are compelled to leave their home countries due to the scarcity of attractive employment opportunities, resulting in a significant loss of the region's innovative capacity. Yet, the ongoing digital transformation of the economy offers new prospects for Eastern European countries to mitigate and potentially reverse this persistent "brain drain".

Through the use of cloud infrastructures and open-source technologies, ideas and concepts for internet-based business models can be rapidly, flexibly, and cost effectively tested, refined, and scaled for global markets. Combined with the increasing availability of venture capital targeting emerging markets, these reduced entry barriers create extensive opportunities for the establishment of startups as well as for business model innovation within established small and medium-sized enterprises (SMEs) and mid-sized firms.

The European research project "Competence Model for Business Development 4.0 in the European Context" (KomBEU), funded by the German Federal Ministry of Research, Technology and Space (BMFTR), seeks to harness the potential of digital transformation to foster the successful creation of start-ups and the implementation of business model innovations within established enterprises in the Western Balkan region. Its primary objective was to develop a competence model for business development and to integrate its core modules into the curricula of Serbian universities.

Findings from the KomBEU project indicate that future university education in the field of business model development should prioritize strengthening the connection between theoretical and practical approaches to teaching and learning. The need for further development is particularly evident in the following areas:

1. Long-term integration of new teaching and learning formats into university education
2. Securing institutional support for the transformation process through the inclusion of key university groups
3. Fostering self-organised student initiative
4. Strengthening the European integration of the Serbian research and innovation system

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We would like to express our sincere gratitude to the Federal Ministry of Research, Technology, and Space (BMFTR), whose support made this joint project possible. Our thanks also go to the DLR Project Management Agency, particularly to Ms. Angi Solymosi and Ms. Maija Buddrich, for their attentive guidance and constructive support throughout the project's duration. We are deeply indebted to all experts who generously shared their time, insights, and experience during interviews and workshops, and who helped connect us with further interlocutors. Thanks to the committed and trusting collaboration among the consortium partners, we were able to translate abstract concepts into tangible prototypes and practical design approaches. We hope that the results of the KomBEU project will contribute to the ongoing transformation of university education by fostering a new synthesis of theory and practice.

Finally, we wish to thank the members of our extended network whose expertise and valuable feedback provided important inspiration along the way. At ISF Munich, special thanks are due to Frank Seiß for his meticulous editing of this report and to Torsten Royère for the design and layout of the study.

1 Introduction — The KomBEU project at a glance (E. Heidling, R. Wagner, A. Ziegler)

Each year, a considerable number of highly qualified professionals graduate from universities across the Western Balkan region. Following graduation, many seek employment opportunities abroad due to the limited availability of attractive professional prospects in their home countries. This dynamic represents a significant challenge to the region's innovation potential. Nevertheless, the digital transformation of the economy offers new avenues for the countries of Southeastern Europe to mitigate and reverse this outward migration of talent. Against this background, the research project KomBEU pursued the objective of strengthening skills related to business model development within the region. The project aimed to identify and mobilise the potential of digital transformation for fostering successful start-up creation and for enabling business model innovation within established enterprises in Serbia.

The notion of the business model encapsulates the interdependence of value proposition, value creation architectures, and revenue logics. Conceptually, business models can be delineated through three core dimensions: first, the articulation of the value generated for customers (the value proposition); second, the configuration of processes through which this value is created; and third, the mechanism by which this value is realised and converted into revenue (the revenue model). As Osterwalder and Pigneur (2010, 14) define it, a business model constitutes "the rationale of how an organizations creates, delivers and captures value." In this context, business models function as institutional mechanisms for transforming technological innovation into commercial success (Teece, 2010), integrating production strategies, innovation processes, and value realisation approaches into a holistic framework (Ziegler, 2020).

The successful development of business models presupposes the presence of entrepreneurial skills, encompassing both domain specific and transversal skills. Central to these skills are cognitive and attitudinal dispositions such as openness to novel ideas, creativity, and a willingness for risktaking.

> "The entrepreneurship key competence refers to an individual's ability to turn ideas into action. It includes creativity, innovation and risk taking, as well as the ability to plan and manage projects in order to achieve objectives. Developing mindsets, generic attributes and skills that are the foundations of entrepreneurship can be complemented by imparting more specific knowledge about business according to the level and type of education." (European Commission, 2012, 5).

Based on these general conceptual definitions, the KomBEU project investigated the central question of whether and how such competences are taught in the Serbian university education system. The underlying assumption guiding the project was that skills in business model development constitute an essential prerequisite for creating attractive local career and development opportunities for students and professionals alike. Such opportunities are crucial for maintaining and expanding forward-looking employment prospects and for fostering the establishment of new enterprises. This, in turn, provides the basis for the unfolding of societal innovation capacities and resources, representing a key factor for dynamic economic development.

The following presentation of the results begins with a brief overview of the Western Balkans Process (chapter 2). This is followed by an overview of the economic situation in Serbia and the Serbian innovation system. This was achieved by reviewing documents and empirical data collected on site in Serbia (chapter 3). The training situation at Serbian universities is then outlined, with a focus on computer science and engineering. The transition from university to career is also discussed (chapter 4). A further focal area of the project concerned the practical exploration and implementation of new approaches aimed at improving the matching between educational and research institutions, on the one hand, and established companies and the start-up ecosystem, on the other. Important reference points in this context included the analysis of the functional mechanisms of successful start-up ecosystems in the context of German universities. Insights from these analyses were incorporated into the KomBEU project through joint workshops with experienced practitioners from these institutions (chapter 5). In addition, the project developed and piloted innovative

university teaching and learning formats, such as hackathons, in close cooperation with Tiba GmbH and the Serbian project partner, Educons University, during the project period (chapter 6). The findings of these investigations formed the basis for the development of a "Skill Model Business Development" as well as for outlining the framework conditions necessary for implementing such a model within the Serbian higher education system (chapter 7). Based on these results, the lessons learned from the work in the KomBEU project were summarised and future fields of action were identified (chapter 8).

Research Design

The research and development activities within the KomBEU project were guided by a qualitative research design, combining expert interviews and workshops as the primary methodological instruments. The semi-structured expert interviews were conducted using interview guides and typically lasted around 1.5 hours each. The quotes from the interviews with the German interviewees were translated into English. Participant observations during workshops and events were documented through notes and protocols. Additional data were collected in the course of the preparation, implementation, and evaluation of the workshops. All interview data were anonymised, transcribed, and subjected to qualitative content analysis in accordance with established methodological approaches (Meuser & Nagel, 2009; Sowa et al., 2013).

In addition, a hackathon was designed and implemented during the course of the project. This event served as a prototype to demonstrate the potential of new formats in university teaching within the field of business development. In this context, a structured questionnaire with closed questions was developed and analysed to evaluate participants' perceptions of the hackathon.

In addition, a comprehensive data analysis was carried out. A particular focus was placed on the review and evaluation of publications by the OECD and the European Union concerning the development of various social and economic sectors in the Western Balkan states, with a specific emphasis on Serbia. Publicly available official Serbian government publications were also included in the analysis.

The following remarks provide an overview of the methodological instruments applied throughout the project.

Expert Interviews: The expert interviews conducted during the project focused on the current state of business model development within the Serbian innovation system, with particular emphasis on the start-up ecosystem. In total, twelve expert interviews were carried out. A number of these interviews

took place during a research stay of several days in Belgrade in 2022. Conducted in close cooperation with, and supported by, the Serbian project partners, the interviews were held at various institutions and universities, providing both a comprehensive overview and indepth insights into the current situation. The following institutions participated in the data collection: Project Management College, Educons University; Research and Development Centre, Faculty of Organizational Sciences (FOS), University of Belgrade; Digital Serbia Initiative; Republic of Serbia Innovation Fund, Science and Technology Park Belgrade; Serbian Chamber of Commerce, Sector for Entrepreneurship; KP Business & Financial Advisory Services Belgrade; Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Private Sector Development in Serbia, Belgrade.

Workshops: In addition to the internal workshops regularly held throughout the project, a series of joint workshops were organized during a research visit by the Serbian project partners in Munich in 2023, lasting several days. These workshops focused on the exchange of good practices from German universities, institutions, and companies within the Munich innovation ecosystem. The activities included indepth discussions with representatives from the Strascheg Center for Entrepreneurship, UnternehmerTUM, as well as with founders and experts from Munich's start-up community (see chapter 5).

Hackathon: The hackathon was organized as part of the 10th IPMA Research Conference 2022 in Belgrade. Its conceptual design aimed to showcase hackathons as a university-based event format for learning new methods of ideation and co-creation, while simultaneously fostering students' competences in transferring newly acquired knowledge into professional practice. A total of 18 students participated in the hackathon. Alongside the organization, implementation, and participant observation of the event, a questionnaire with closed questions was developed to evaluate the participants' perceptions of the hackathon. The results of this evaluation are presented in chapter 6.

Final Conference: The results and experiences of the KomBEU project were presented and discussed at the transfer conference "InnovateSERBIA Transfer Forum – Empowering Entrepreneurial Education", held in 2023 at Educons University in Belgrade. The event attracted more than 40 participants from universities (faculty and students), companies, and professional associations. The first day of the conference, organized around the thematic blocks "Fostering Entrepreneurial Ecosystems in Serbian Universities" and "Exploring Serbian Incubators and Student Start-ups", addressed the question of how the transfer of knowledge and skills from academia to entrepreneurial practice can be effectively achieved. Particular attention was given to the initiation and support of start-up creation. On the second day, under the themes "Building Strong Industry–Academia Partnerships" and "Skill Development", a series of workshops with Serbian students demonstrated in practice how new educational and training formats can be organized, implemented, and evaluated. The concluding start-up pitches revealed that the participating student teams had already made substantial progress in the conceptual development of their projects. The next challenge identified was to refine these concepts to achieve market readiness and enable concrete business formation.

2 The KomBEU project in the context of the Western Balkans Process (E. Heidling, A. Ziegler)

The Western Balkans Process, also known as the Berlin Process, is a diplomatic initiative launched by Germany in 2014. Its overarching aim is to advance the European integration of the Western Balkan countries while strengthening regional cooperation and economic development across the region (Schmälter & Schmitz, 2023). The process encompasses Serbia as well as other Western Balkan countries, including Albania, Bosnia and Herzegovina, Kosovo, Montenegro, and North Macedonia. The central objective of the Berlin Process is to foster regional collaboration and accelerate the integration of the Western Balkan countries into the European Union.

Particular emphasis is placed on supporting reforms in the areas of rule of law, good governance, economic development, and infrastructure. Through the financial support of projects and political initiatives in these domains, the process aims to facilitate the Western Balkan countries' pathway towards EU accession. Annual meetings are held between representatives of EU member states and the Western Balkan countries (see Figure 1). These meetings serve to assess progress achieved, set new priorities, and initiate further projects (Bartlett & Uvalić, 2022).

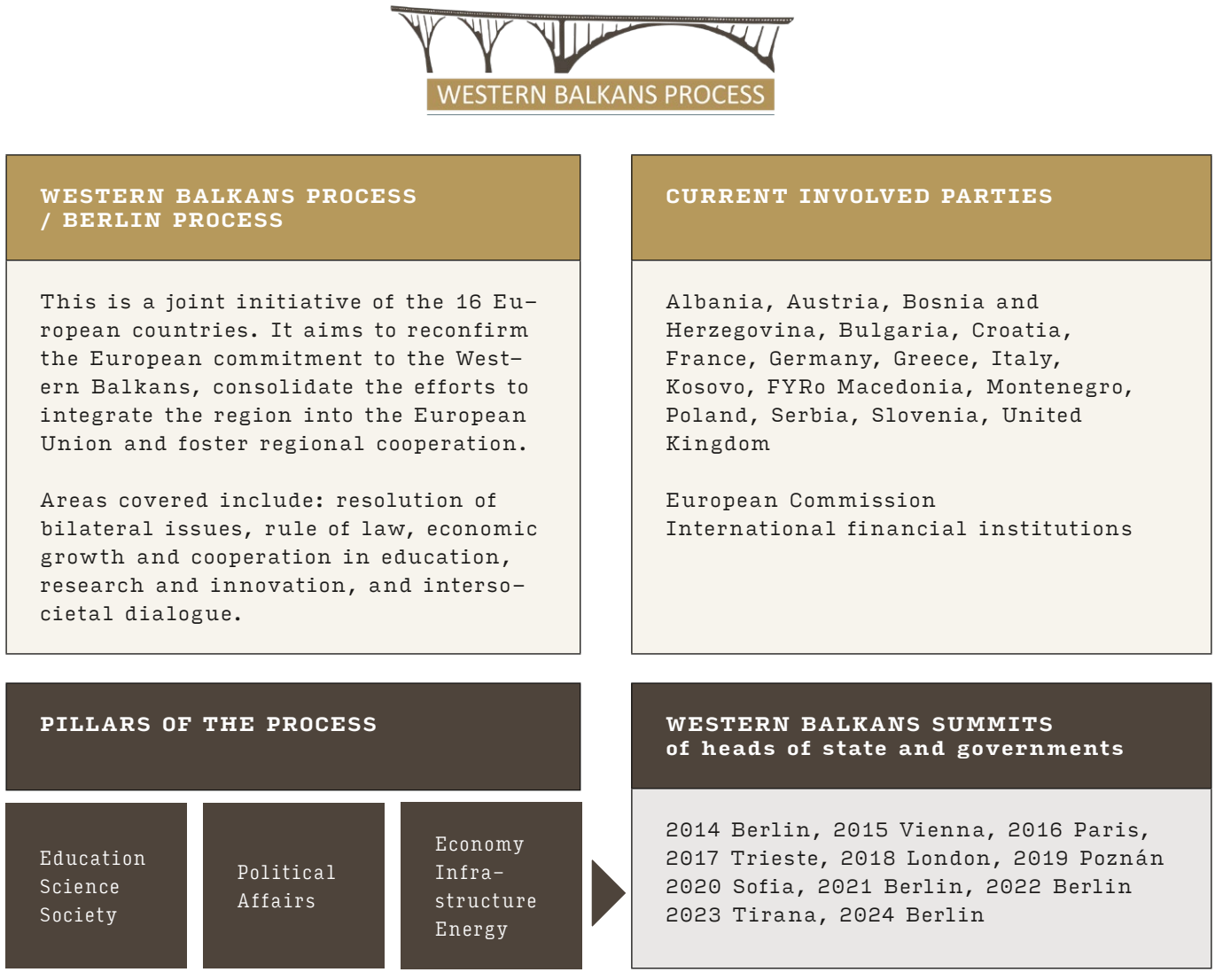


Figure 1: Structure of the Western Balkans Process; own illustration based on Joint Science Conference_Overview, 2017

A significant recent development is the new Growth Plan for the Western Balkans, presented by the European Commission in November 2023, which seeks to intensify the economic integration of the Western Balkan countries with the EU Single Market through enhanced financial and institutional support. With a €6 billion reform and growth package, the plan aims to accelerate economic convergence and to grant the Western Balkan countries selected benefits of EU membership even prior to formal accession (EU, 2024).

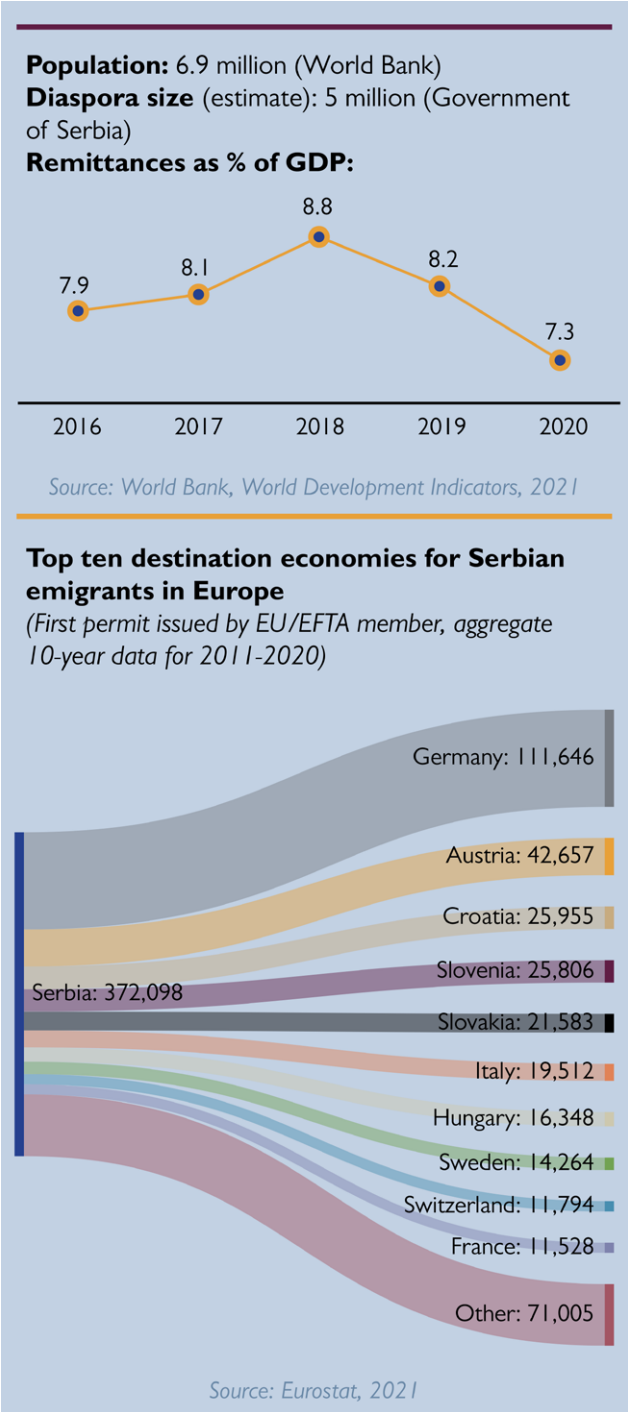
A fundamental obstacle to a more dynamic development of the Serbian economy, however, lies in the persistent brain drain of skilled professionals, a phenomenon that has continued over the past decades. Between 2008 and 2016, Serbia lost approximately 400,000 persons due to emigration to OECD countries — equivalent to about 5.5% of the total population of roughly seven million in 2016 (OECD, 2021, 1744). Overall, the Serbian diaspora, comprising emigrants and their descendants living abroad, is estimated at around five million people (Arifagić & Mitrović, 2022, 42). Popular destination countries include Germany, with over 100,000 Serbian nationals, and Austria, with more than 42,000 (see Figure 2). The trend persisted until at least 2018, with an additional 50,000 to 70,000 individuals leaving Serbia each year. As a result, the country's workingage population declined by approximately 8.5% between 2001 and 2019 due to outward migration.

Relatively better living conditions, more attractive employment opportunities, and higher income levels abroad remain by far the most important drivers of emigration among young people — an assessment also confirmed by the experts interviewed in the course of our research.

> "So brain-drain consists of, let's say, quality of life, money and of course also the opportunity of the city and the startup environment in that city. When you hear the stories about some Serbian companies and guys that succeeded in Berlin and, how to say, when they speak to people here how they succeeded, or in San Francisco, everybody here is like oh, I need to go there immediately". (009CvE)

A substantial proportion of these emigrants consists of university-educated professionals employed in sectors such as information technology, healthcare services, and management. According to estimates quantifying the economic costs associated with the emigration of young and highly skilled individuals, Serbia experienced in 2018 a loss in economic output equivalent to approximately 2% of its gross domestic product (OECD, 2021, 1744 et seq.).

Figure 2: Destinations for Serbian Emigrants; source: Arifagić & Mitrović, 2022, 42



Against the backdrop of these developments, an important objective of the Western Balkans Process within the thematic field "Education, Sciences, Society" is "to tackle brain drain" (Joint Statement, 2019, 1), thereby aiming to slow down or halt the continued emigration of skilled professionals. Within the framework of the process, the domains of education, research, and innovation are considered crucial for advancing and accelerating the integration of the Western Balkan countries into the European Union. "We call for the acceleration and deepening of this integration *by establishing a dedicated Western Balkans Facility for Skills, Research, and Innovation* that will pool funding from all relevant European Union programmes to make the region fit for the future" (Joint Statement, 2024, 1, emphasis original). This goal is to be achieved, among other measures, through investments in the scientific and higher education sectors, including the modernisation of university curricula and the strengthening of cooperation with research institutions in other EU member states. The strategy is to be implemented through cross-border, multilateral "people-to-people research cooperation" initiatives (Joint Statement, 2019, 3).

It is precisely within this context that the KomBEU project positions itself, demonstrating development perspectives through improved local education and training conditions and thereby contributing to slowing the brain drain from the Western Balkan countries, using Serbia as an example.

3 Trends in the Serbian economy and innovation system (E. Heidling, A. Ziegler)

Since 2020, Serbia's industrial policy — similar to that of other Western Balkan countries — has been aligned with the Smart Specialisation Strategy (S3) developed by the European Union in 2010 (Jovanović & Vujanović, 2023). This approach aims to encourage and support European regions in identifying and developing their specific regional and local competitive advantages. As in the EU member states, the Western Balkan countries are expected to rely on research, development, and innovation as core elements in their transformation towards a digital and low- or zero-emission economic development path. This transformation process is characterised by a shift from traditional industries towards knowledge-intensive sectors, reflecting the understanding that a knowledge-based economy can enhance productivity, foster innovation, and strengthen competitiveness. Moreover, the intensification of knowledge-based economic activities has the potential to attract foreign direct investment (FDI) and promote sustainable growth trajectories (Radovanović et al., 2024).

Serbia's industrial policy, guided by the principles of the S3 strategy, was formally adopted by the government in 2020 and covers the period from 2020 to 2027. It defines four strategic priority areas on which development activities are to be concentrated (Jovanović & Vujanović, 2023, 11):

- Information and Communication Technologies (ICT)
- Food for the Future
- Creative Industries
- Future Machines and Manufacturing Systems

The following sections first provide an overview of the current economic development trends in Serbia, followed by an analysis of the evolution of the Serbian innovation system, with particular attention to research and development capacities and collaboration between scientific institutions and enterprises in the creation of new products and services.

The European Union's Smart Specialisation Strategy (S3) is based on three fundamental pillars

- **Localisation:** Smart specialisation is a place-based approach, it builds on the assets and resources available on the territory.
- **Prioritisation:** S3s have to identify and concentrate resources on a limited set of areas, the so-called S3 investment priorities.
- **Participation:** S3s require stakeholders from the quadruple helix (public sector, research, private sector and civil society) to engage throughout the strategy-cycle. Local actors need to support the definition, review, monitoring and implementation of S3 investment priorities.

For the current EU programming period (2021–2027), the European Union has defined thematic priorities within the policy field of European regional cooperation in relation to the implementation of the Smart Specialisation Strategy (S3). These priorities focus on the "good governance of national or regional Smart Specialisation Strategies." In assessing what constitutes good governance, the following criteria are of central importance:

- Up-to-date analysis of challenges for innovation diffusion and digitalisation.
- Existence of competent regional or national institution or body, responsible for the management of the smart specialisation strategy.
- Monitoring and evaluation tools to measure performance towards the objective of the strategy.
- Functioning of stakeholder co-operation ("entrepreneurial discovery process").
- Actions necessary to improve national or regional research and innovation system, where relevant.
- Where relevant, actions to support industrial transition.
- Measures for enhancing cooperation with partners outside a given Member State in priority areas supported by the smart specialisation strategy (European Commission n. d.)

3.1 The current economic situation in Serbia

Serbia represents the largest and most diversified economy among the Western Balkan countries. As in most economies of the region, the services sector dominates, accounting for 51.1% of GDP and 57% of total employment. Industry, including construction, contributes 26% of GDP, with roughly half of this share generated by manufacturing activities, which employ 27.4% of the workforce. The agriculture, forestry, and fisheries sectors have experienced a significant decline in value added over recent years, comprising only 6% of GDP in 2019. Nevertheless, these sectors still employ 15.6% of the total workforce, with estimates suggesting a substantial share of informal employment within these areas (OECD, 2021).

An analysis of Serbia's economic development over the past 15 years shows steady growth, with downturns mainly linked to global market crises. Periods following transnational crises — such as the global financial crisis (2008–2011) and the COVID-19 pandemic (2020–2022/23) – were marked by weak growth and heightened volatility. These effects were partly due to imported shocks from major trading partners in the Eurozone (e.g., the Eurozone crises of 2011 and 2022), and partly to severe flooding in 2014, which affected large parts of the region.

Since 2015, the concerted efforts to restore macroeconomic and fiscal stability have begun to yield results. Private investment has risen by more than 30% since 2014, while inflation has decreased and public debt has been reduced. Increased investment activity has been largely driven by the growth of foreign direct investment (FDI), particularly in export-oriented manufacturing industries, resulting in a significant increase in export performance. Exports from the manufacturing sector grew by almost 52%, representing 65% of total exports in 2019. Service exports, primarily driven by the information and communication technology (ICT) sector, expanded by 16% annually between 2017 and 2019, accounting for 30% of total exports in 2019 (OECD, 2021). For 2023, GDP growth was projected at approximately 2%, with exports rising by 9.4% and imports declining by 5%. The current account balance improved due to reduced energy imports and a further increase in FDI inflows, which grew by nearly 35% to €2 billion (World Bank, 2023).

Despite these advances, Serbia's economic growth continues to be constrained by structural weaknesses. Investment (as a share of GDP) remains lower than in most OECD and EU countries. The steady rise in FDI in recent

years has concentrated in production-oriented and technology-intensive sectors, such as the automotive and electronics industries. However, the overall impact on GDP growth and productivity has been limited due to high import intensity and weak linkages with domestic firms. As a result, labour productivity growth has remained modest: in 2019, productivity levels in industry, construction, and agriculture reached only 25% of the EU average, while the service sector achieved merely 20% (OECD, 2021).

These structural challenges are also reflected in the labour market. While the unemployment rate fell significantly to 9% in 2020, longterm unemployment remains relatively high. Moreover, the share of young people not in employment, education, or training stands at 15.1%, exceeding both the EU and OECD averages, as well as those of emerging economies in Central Europe and the Baltic states. Additional progress is needed to increase labour market participation among women and other disadvantaged groups (OECD, 2021). More recent figures indicate that following the COVID-19 pandemic, unemployment stabilised at around 10%, dropping slightly to 9.6% in the second quarter of 2023, while youth unemployment remained comparatively high at approximately 25% (World Bank, 2023).

In the light of these challenges, existing studies converge on the need for structural measures aimed at fostering economic activities with higher value added and productivity. The following priority areas for policy action are consistently emphasised (World Bank, 2023; World Bank, 2023a; EU, 2024; OECD, 2021):

1. Strengthening the private sector, particularly small and medium-sized enterprises (SMEs), by reducing bureaucratic barriers and improving access to finance for necessary investments.
2. Enhancing research and development capacities through closer cooperation between businesses, universities, and research institutions to facilitate technology transfer and support new business creation.
3. Providing incentives for investment in forward-looking fields such as information and communication technologies, biotechnology, and artificial intelligence.
4. Transitioning from fossil fuel–based economic activities toward decarbonisation by promoting environmentally sustainable technologies in energy production, agriculture, and food manufacturing.

3.2 Development trajectories of the Serbian innovation system

In transforming the Serbian economy — and thereby addressing the challenge of reducing or reversing the ongoing emigration of skilled professionals — the Serbian government has placed strategic emphasis on the sustainable strengthening of innovative sectors, particularly in information and communication technologies (ICT), future-oriented machinery and manufacturing systems, creative industries, and food for the future (Jovanović & Vujanović, 2023).

The initial conditions for implementing this strategy are comparatively favourable. Serbia occupies a leading position within the Western Balkan region's innovation landscape and is classified as an "Emerging Innovator" in the European Innovation Scoreboard 2021. The strong regional standing of Serbia's research and innovation system is further reflected in its dense network of cross-sectoral linkages with other Western Balkan economies. Data indicate that Serbia maintains strong or medium-level exchange relations with its neighbouring countries across numerous economic sectors — including electrical and electronic technologies, energy, environmental sciences and industries, food production, heavy machinery, ICT, and process industries and materials — as well as in societal domains such as "Better Societies" and "Health & Wellbeing" (see Figure 3).

To strengthen these sectors, the expansion of the national innovation system plays a pivotal role.

In Serbia's political system, the Ministry of Science, Technological Development and Innovation is responsible for this. The strategic orientation of this field is based on two pillars: the "Research for Innovation Strategy" (in place since 2016) and the "Smart Specialisation Strategy Serbia (3S)", adopted in 2020. As outlined earlier, this

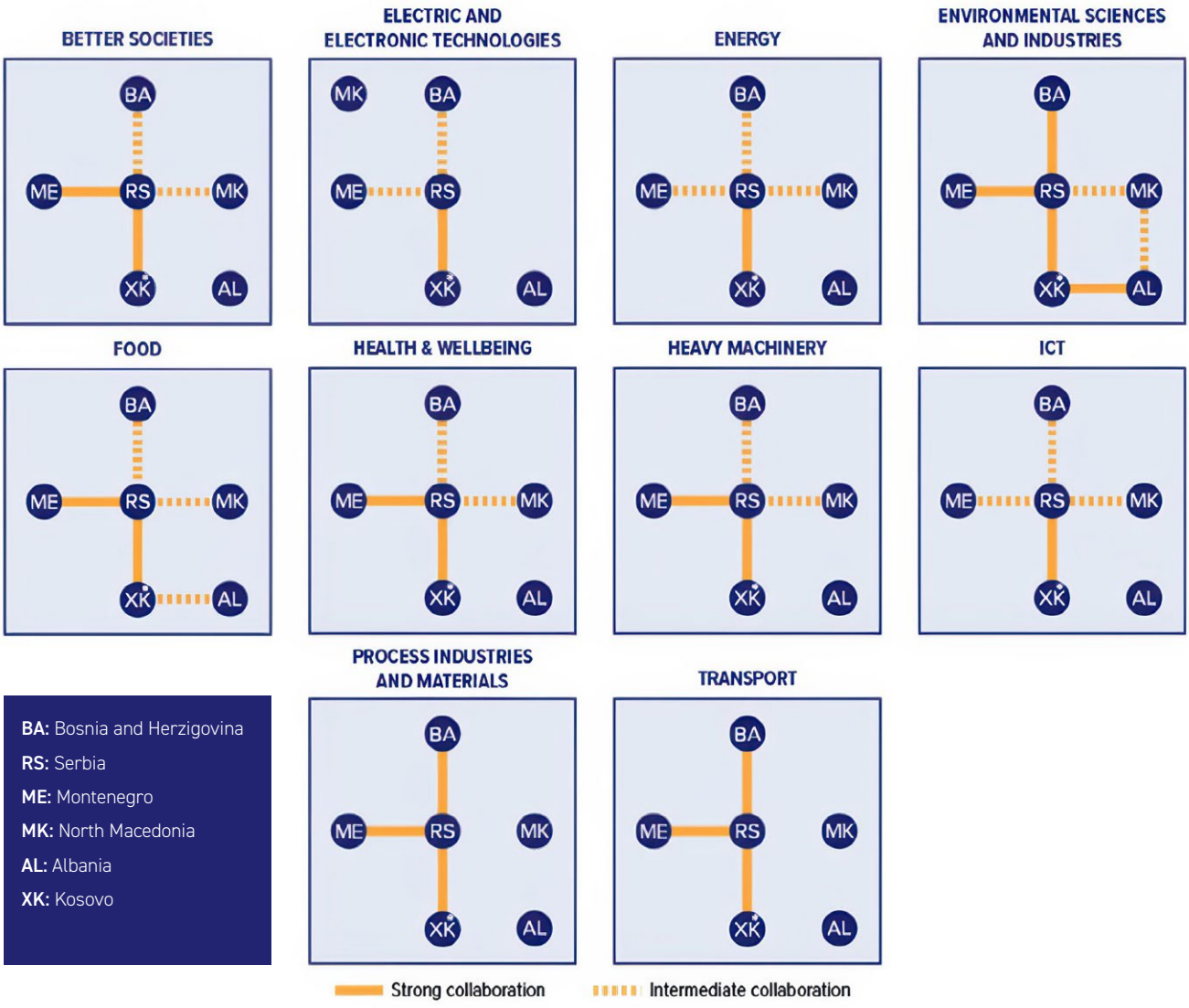


Figure 3: Collaboration network of Western Balkan economies by domain; own illustration based on Radovanovic et al., 2024, 76

strategic framework is clearly aligned with the corresponding strategic development goals of the European Union in this policy area. The key institutions responsible for implementing Serbia's innovation policy are the Innovation Fund and the Science Fund, complemented by government programmes supporting Science and Technology Parks, Business Incubators, and Start-ups.

Innovation Fund: Established in 2010 and legally anchored, the Innovation Fund provides public funding for innovation-related activities aimed at fostering innovative ideas and transforming them into commercial products and services. A particular focus lies on supporting initiatives that strengthen collaboration between universities and enterprises.

To this end, the Innovation Fund offers a range of programmes designed to initiate joint technology projects between companies and research institutions and to develop corresponding business models and market strategies.

The Fund's budget has been continuously expanded. In 2019, the Innovation Fund operated with a budget of €5.5 million. Budget increases were planned for 2022 (€1.7 million) and 2023 (€2.56 million) (Kutlača et al., 2022; OECD, 2021). Since its inception, the Innovation Fund has disbursed more than €31 million in grants under its programmes, supporting 118 projects in total. In addition, through its Collaboration Grant Scheme and Innovation Voucher programmes, 35 projects received a combined total of €5.3 million in funding.

FUNDING INSTRUMENTS AND SELECTION PROCESS OF THE INNOVATION FUND

Our own empirical findings indicate that, since its establishment, the Innovation Fund has provided financial support to approximately 2,000 companies. The majority of funding has been allocated to start-up creation, followed by support for small and medium-sized enterprises (SMEs) operating in traditional economic sectors and for research institutions. The Innovation Fund employs a range of target group–specific funding instruments, designed to address the distinct needs of various actors within the innovation ecosystem. These include long-standing programmes such as Mini Grants, Matching Grants, Collaborative Grants, and Innovation Vouchers, as well as more recent instruments such as the Katapult Programme and the Serbia Ventures Programme.

Funding instrumens

Mini Grants
Since the establishment of the Innovation Fund, its principal funding instrument has been the Mini Grant Scheme, which provides grants of up to €80,000. Applicants are required to contribute 30% of the total project costs from their own resources. A large proportion of applications originate from the start-up sector. According to the experts interviewed, most applications focus on the IT sector, particularly in the areas of software development, artificial intelligence, and blockchain technologies. Additional funding is directed towards the agriculture and food production, biotechnology, and mechanical engineering sectors.

Matching Grants
Another key funding mechanism is the Matching Grant Scheme, which offers grants up to €300,000 per project, again requiring applicants to cofinance 30% from their own funds. If the supported project results in a commercially successful product or service, the beneficiary is required to repay part of the grant to the Innovation Fund over a period of five years. However, if no commercial success is achieved, this repayment obligation is waived.

Collaborative Grants
The Collaborative Grant Scheme is specifically designed to support cooperation between SMEs (as lead partners) and research institutions. As with the Matching Grants, the maximum grant amount is €300,000, with companies contributing 30% in co-funding. An additional condition stipulates that 30% of the project value (up to €100,000) must be transferred by the company to the collaborating research institution. The majority of funding in this category is allocated to the agricultural and food sectors, followed by the IT sector.

Innovation Vouchers
The Innovation Voucher Scheme also promotes collaboration between businesses and the research community, focusing on developing innovative solutions on a smaller scale than the Collaborative Grants. The Innovation Fund covers up to 60% of project costs, with a maximum of €6,500 per voucher. Companies may accumulate several vouchers within a given period, up to a total amount of €20,000. The primary beneficiaries of this programme operate in mechanical engineering, food production, and information technology.

Katapult Programme
Launched in 2021, the Katapult Programme is Serbia's first national accelerator programme aimed at supporting technological development and innovation. The programme is financed by the Government of Serbia, backed by a €7.7 million World Bank loan and a €10 million grant from the European Union. For the 2024 public call, an additional €3 million in state funding has been allocated.

Katapult targets both early-stage start-ups (ideation phase) and scale-up companies with demonstrated market traction seeking to accelerate growth and attract private investment. As in other Innovation Fund programmes, many successful applicants are based in Belgrade and Novi Sad and are active in the ICT sector. According to the experts interviewed, selection criteria are largely consistent with those used for the Fund's other programmes, with up to 20 companies selected per funding cycle. Compared to other instruments, Katapult features graduated funding levels: selected companies initially receive grants ranging from €20,000 to €50,000, intended both to refine their innovation concepts and to facilitate fundraising from external investors such as venture capital funds. The programme's designers expect this mechanism to stimulate fundraising activity, particularly among young start-ups.

A distinctive element of the Katapult Programme is its intensive three-month mentoring component, involving around 30 experienced national and international mentors. These mentors work closely with the supported companies, tailoring guidance to individual needs. Training modules focus on identifying potential investors, building network connections, and preparing innovation concepts for investor presentations. The mentoring phase includes two one-week in-person sessions and ten weeks of remote collaboration. At the end of the three-month programme, participating companies present their innovations to a panel of investors. Companies that successfully secure external investment are eligible to receive additional funding of up to €300,000 from the Katapult Programme. According to our interview partners, this approach has proven effective in previous funding rounds, as mentoring has significantly intensified the fundraising efforts of participating start-ups.

Serbia Ventures Programme
Introduced by the Innovation Fund in 2022, the Serbia Ventures Programme represents a new funding line that, unlike the other instruments, does not directly fund projects but rather provides capital to venture capital (VC) funds. The amount of financing available from the Innovation Fund is up to €5 million per individual VC fund. The mandatory precondition is that the selected VC fund has already commitments from its limited partners/investors to raise at least the same amount of capital within 12 months of achieving its first close. The programme is designed to incentivise private investors, high net worth individuals, and institutions to engage in financing start-ups with high growth potential by incorporating venture capital funds in Serbia. Through this programme, the Innovation Fund will invest into newly established venture capital funds in Serbia in the role of a limited partner and help these funds generate a significant market impact on Serbia's innovation ecosystem.

The selection process

A key criterion for the allocation of funding is that project proposals must aim to develop innovative solutions with a high intellectual property (IP) potential. According to our interview partners, applicants who have already filed a patent for their proposed solution are generally considered to have a significantly higher likelihood of receiving support.

> "Obviously if you have a live patent for instance, that's much better than if you have [...] just a software that is kind of copyrighted which means very little." (012IdE)

Applicants are selected by external experts. Within a peer review procedure, each proposal is first evaluated by two independent reviewers. Following this initial assessment, the Investment Committee examines the technical and formal eligibility of the applications and prepares a shortlist of candidates. Applicants who pass this stage are invited to deliver a 10-minute pitch presentation of their proposals. In addition to assessing the novelty of the proposed solution, the funding authorities place particular emphasis on whether applicants pursue a clear and coherent business model. The reviewers evaluate the applicants' market knowledge, including their understanding of target customer segments, potential competitors, financial frameworks, and the scalability potential of their innovations. Because several months typically elapse between the submission of proposals and the pitch presentations, reviewers also inquire about progress made in the interim period regarding the further development of the proposed solutions. According to our interview partners, the responses to these questions provide important insights into the commitment, seriousness, and perseverance of the applicants in advancing their projects.

The pitch presentations were introduced only a few years ago as part of the selection process and have since become a crucial element in funding decisions. As reported by our interview partners, the quality of the pitches has improved significantly over time. Observations indicate clear differences between the presentation styles of start-up founders from academic backgrounds and those with prior business experience. Academic applicants tend to emphasise the technical functionalities of their solutions, whereas applicants with business experience focus more on the commercial aspects of their innovations. However, according to our interviewees, both groups tend to underemphasise essential elements such as customer needs, marketing strategies, and sales approaches in their presentations.

> "Very often applicants have kind of ideas of their products that are pretty much over-confident and they kind of lack of reality check with regards to their products". (012IdE)

Another interview partner succinctly illustrated the frequent underemphasis on the commercial aspects of innovative solutions through the following comparison.

> "Usually all the pitches are ten minutes, and for everybody else you talk [...] for eight minutes about finance. Cost of it, you know, acquiring the customer, return on investment, cash flows, runways of the cash and all this stuff, and the last two minutes he might mention something about the technology behind the solution. The Balkan person will come out and first tell you how great an engineer that he/she is, how great the technology that he works on, and then what a great product that he made. And maybe the last two minutes will tell you, hey, don't worry about financing, it'll be fine, I'll return your money. And all the finance guys sitting in the audience, who has let this guy in front of us. So the problem of our start-up scene is that for its own sake we have too much of good engineers who have fallen in love with the products". (011FvE)

Science Fund: The Science Fund was established in 2019 with the objective of supporting scientific research activities and the implementation of research projects. Initially equipped with a budget of €4.2 million, the Fund's resources were increased to €7.5 million in 2020. To date, its programme activities have been implemented through five calls for proposals, primarily targeting research institutions. A particular focus has been placed on supporting early-career researchers, with the aim of preventing their emigration. Another key priority concerns the promotion of projects carried out in cooperation with enterprises, specifically those that aim to initiate and prepare joint projects so as to establish a solid foundation for collaboration between research institutions and businesses from the very beginning of the project phase. By strengthening the applied dimension of research, the Fund seeks to accelerate the transformation of research and development outcomes into marketable products and services (Kutlača et al., 2022, 65; OECD, 2021).

Science and Technology Parks: Another important element of Serbia's innovation infrastructure is the establishment of Science and Technology Parks (STPs), initiated in 2015. STPs provide infrastructure and professional services for universities, research and innovation institutions, as well as for high-tech companies and SMEs. Their key objective is to facilitate the networking of academic and industrial actors in order to rapidly translate new technologies into products and services and bring them to market. Serbia currently has four STPs, led by the STP Belgrade, which since its opening in 2015 has supported more than 100 companies, including both start-ups and small technology firms. Additional parks were established in Niš (2020) through cooperation between the Serbian Government, the City of Niš, and the local university; in Čačak (2011) through collaboration between the government, the municipality, the local business association, and the university; and in Novi Sad (2020) on the campus of the local university (Kutlača et al., 2022, 65–66; Government of Serbia, 2021, 23).

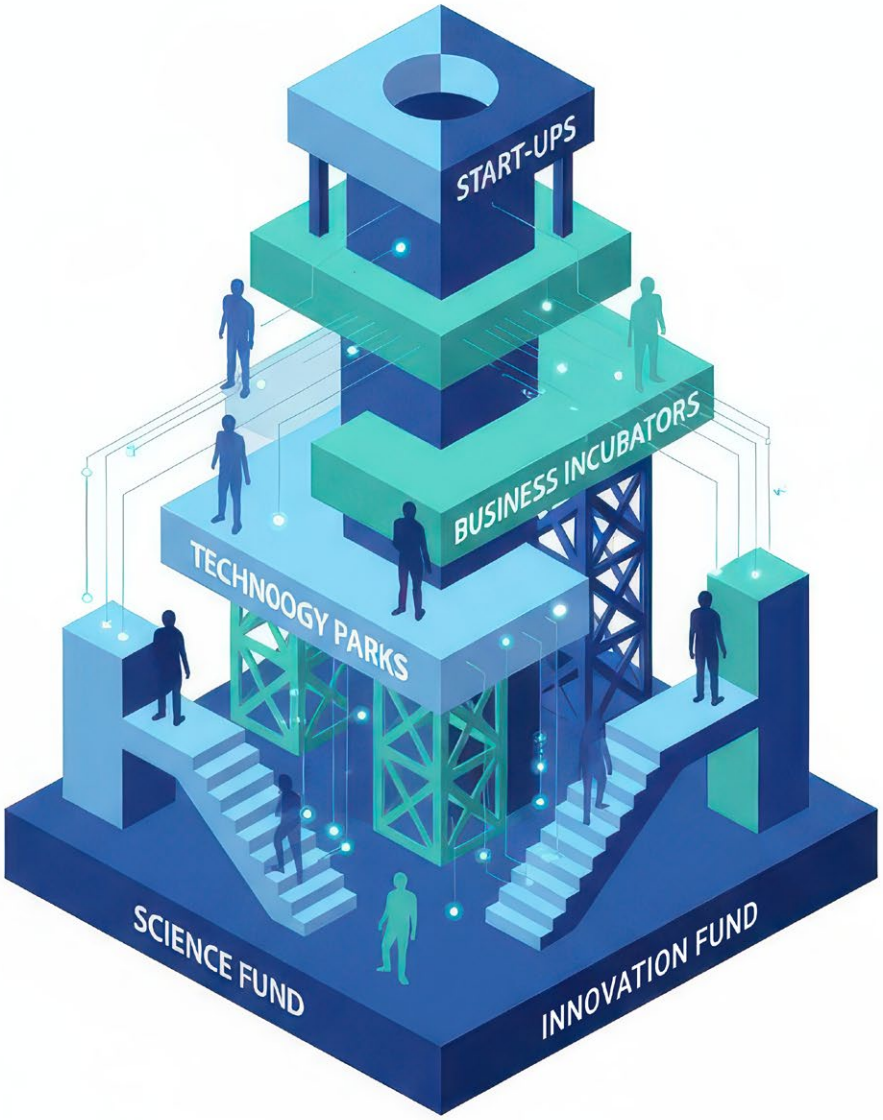
Business Incubators: A further component of Serbia's state-led innovation strategy is the establishment of business incubators. As of 2020, there were around 40 business incubators in operation, with regional concentrations in Belgrade and Novi Sad. Business incubators are typically established with private or public financial support and are funded through project activities and commercial services. Their primary function is to support start-up creation, particularly by assisting new entrepreneurs during the initial business development phase, providing guidance on financial and legal issues related to business modelling. Incubators also offer infrastructural and logistical support for companies and non-profit organisations developing technological innovations in areas such as health, robotics, blockchain, and gaming. Researchers from local universities are often involved in these projects. The first business incubator in Serbia, founded in Belgrade in 2007, has been considered a success: over time, more than 90 start-ups have completed their incubation phase there, with over 80% still active and employing approximately 500 people (Berndt, 2019, 16). However, current assessments suggest that many of these start-ups remain heavily dependent on state subsidies and have not yet developed sustainable business models (Kutlača et al., 2022, 74).

Start-ups: A particularly important element of Serbia's current science, research, and innovation policy is the promotion of start-up creation and the development of associated entrepreneurial ecosystems. At the governmental level, this policy is codified in the "Startup Ecosystem Development Strategy of the Republic of Serbia for the Period 2021–2025", implemented by the Ministry of Science, Technological Development and Innovation. By supporting start-ups — newly established, innovation-driven companies with high growth potential — the Serbian government aims to create high-quality jobs in knowledge-intensive sectors, develop export-oriented products, and generate sustainable economic growth. The strategy is intended to support 800 to 1,200 start-up formations over a five-year period (Government of Serbia, 2021, 2).

Currently, there are an estimated 200–400 active start-ups in Serbia (Government of Serbia, 2021, 16). By 2019, start-up activity had created approximately 1,700 jobs. Most start-ups are located in Belgrade (71%), followed by Novi Sad (15%) and Niš (4%). The combined enterprise value of the start-up ecosystems in Belgrade and Novi Sad was estimated at €434 million in 2020. However, this figure is based on publicly available data and does not include self-funded start-ups or undisclosed investments and exits, suggesting that the actual value could be up to three times higher (Government of Serbia, 2021, 3). The vast majority of start-ups are small enterprises with up to 10 employees (approximately 75%) or up to 25 employees (around 90%). Most operate in software development for business applications, followed by the energy and environmental sectors, video game development, artificial intelligence, and blockchain technologies. Given that most start-ups are concentrated in the IT sector, entry barriers are comparatively low, as initial development steps can

often be carried out by individuals or small teams using only a computer and common software tools (Berndt, 2019, 21 et seqq.).

In summary, progress in new business formation, particularly in the IT sector, has been achieved largely through state support policies. Competitive advantages of the Serbian IT sector are seen in the high quality of its products and services, closely linked to the specialised programming skills of its workforce. However, both Serbian stakeholders and external observers highlight persistent challenges. Key constraints include the shortage of qualified IT professionals, driven in part by labour migration abroad, and insufficient skills in market analysis, customer orientation, marketing, and sales. These deficits often prevent technically sound products and services from achieving market success, due to the lack of viable business models. Another structural weakness lies in the limited networking between enterprises and research institutions, which hampers the continuous development of existing products and the creation of new ones. Only about one-third of companies have established permanent cooperative relationships with the academic sector.



4 Structure of the Serbian university education system in engineering and computer science and the transition to working life

(F. Jovanović, E. Heidling)

This section outlines the Serbian higher education system in the fields of engineering and computer science and examines how the transition from university graduation to employment in companies or the establishment of start-ups is organised.

In Serbia, approximately 250,000 students are currently enrolled at 18 universities, of which 84.5% attend public and 15.5% private institutions. The largest numbers of students are enrolled at the major public universities — the University of Belgrade, the University of Novi Sad, the University of Niš, and the University of Kragujevac. The University of Belgrade is both the oldest and largest university in the country, with nearly 100,000 students. The most popular study areas include engineering, medicine, economics, and computer science, each offering a broad range of faculties and degree programmes.

Regional centres of excellence in information and communication technology (ICT) education are found primarily at the universities of Belgrade and Novi Sad. In 2017, approximately 5,000 students graduated in ICT-related disciplines (Berndt, 2019, 10). Graduates are generally regarded as possessing strong technical skills in programming, problem-solving, and adaptability to emerging technological trends. This is also reflected in the comparatively high income levels within the software sector: while the average national monthly income is around €600, IT professionals earn between €1,600 and €2,400 (Startup Genome, 2024, 120–121).

However, there is a notable lack of entrepreneurial knowledge and skills among IT professionals. Consequently, government initiatives have called for stronger efforts to develop skills in management, sales, marketing, and international business development. Plans are in place to introduce new elective courses in cooperation with industry, focusing on the practical application of such skills, particularly within STEM (Science, Technology, Engineering, and Mathematics) and business disciplines. Moreover, the government has proposed the implementation or expansion of mentoring programmes, in which industry practitioners are actively involved in student training (Government of Serbia, 2021, 39 et seqq.). Findings from the KomBEU project confirm these tendencies. On the one hand, the results demonstrate that university education in Serbia provides a high level of technical and disciplinary qualification. On the other hand, insufficient attention is given to cross-cutting skills such as communication, teamwork, leadership, and project management, which are crucial for later professional success.

Within the framework of the KomBEU project, curricula from various faculties at Serbian universities were analysed, focusing on programmes in engineering, computer science, and business administration. The investigations focused on the curricula and training content of the two largest technical faculties specialising in IT training and the two most important faculties in the field of business administration. The curricula were examined over the entire duration of the study. The findings indicate that IT curricula are broad and technically deep, offering extensive opportunities for acquiring skills in programming languages, software engineering, product design, and system architectures. Further courses include data-bases, data protection, and web technologies. The only non-IT subject identified was an introductory management course, which is offered as optional. Due to this elective status and the heavy workload associated with technically demanding subjects, few students choose to take courses in management. Similar results were found in the engineering disciplines, where curricula are likewise technically comprehensive and up to date, including topics such as Artificial Intelligence, the Internet of Things, blockchain, and biotechnology. However, only two of the 41 courses analysed contained non-technical content: one was a mandatory introduction to economics and finance, and the other an optional management course with elements on business formation. The business faculties examined displayed a broader curriculum, including finance, organisational management, human resources, and project management, alongside basic IT training. A positive feature is the integration of general IT skills, such as programming, with fundamentals of organisational

theory. Nevertheless, entrepreneurship-oriented courses were found to be largely absent.

Overall, the KomBEU project results reveal that graduates in technical disciplines such as computer science and engineering possess strong technical capabilities in product development and software creation. However, significant gaps exist in educational offerings aimed at equipping graduates with entrepreneurial skills, particularly those enabling them to establish and manage their own enterprises, including skills related to project management and business development.

These findings point to two central challenges within the Serbian higher education system:

1. While graduates possess a solid technical education, their knowledge in economics, management, and business model development remains insufficient. Consequently, many encounter difficulties transitioning from university to employment, struggling to meet company expectations and find appropriate positions.
2. For graduates who pursue entrepreneurial ventures, collaboration with investors and financial partners is often hampered by the lack of viable business models. Although technically sound solutions are developed, these frequently fail to reach market maturity due to inadequate business planning or insufficient financing — leading to the premature termination of projects, either during development or before commercialisation.

These challenges can be conceptualised as matching problems in the transition between education and employment. As Kriechel and Vetter (2019, 19) define it: "If there is a difference between the skill level a person has and the skill level perceived to be necessary for a position, we could speak about a skills mismatch." When these problems are combined with the limited linkage between academia and industry, two distinct matching deficits emerge.

- *Graduate-to-labour-market mismatch:* Graduates lack the skills required to apply theoretical knowledge into practice in established companies or to found and manage start-ups.
- *Research-to-market mismatch:* The academic and industrial spheres exhibit insufficient skills for the commercialisation of research outcomes and the development of viable business models.

To address these matching deficits, it is necessary to develop bridging concepts that effectively close these gaps. The first challenge involves improving the alignment between skills supply and demand, ensuring that graduates can find employment opportunities that correspond to their qualifications. The second challenge is for companies to establish closer ties with universities and develop practical training modules.

5 Entrepreneurial universities as key pillars for skills acquisition and knowledge transfer in innovation ecosystems (E. Heidling, A. Ziegler)

Studies on European education systems demonstrate that the development of skills for business model innovation primarily involves teaching learners to identify new business opportunities and translate ideas into viable business models. This perspective expands the traditional mission of universities — focused on teaching and research — by introducing a third dimension: the economic valorisation of scientific knowledge. This idea is encapsulated in the concept of the "entrepreneurial university." As Etzkowitz (2008, 27) notes, "the entrepreneurial university mines research findings for their technological potential and translates them into use."

Entrepreneurial universities act as partners within local and regional innovation ecosystems, collaborating with businesses, government institutions, and civil society actors to jointly develop research, teaching, and service formats. Crucially, these universities must maintain their institutional independence, enabling them to determine their strategic orientation autonomously. At the same time, they define their research agendas and topics in close interaction with external stakeholders, fostering mutual learning processes and bidirectional knowledge exchange.

> "The most important characteristic of the full-fledged entrepreneurial university is that research-problem definition comes from outside sources as well as from within the university and scientific disciplines. In its fullest form the definition of research problems arises as a joint project from an interaction between university researchers and external sources." (Etzkowitz, 2008, 38)

Accordingly, entrepreneurial universities are particularly well suited to fostering skills in business model development. In addition to technical and managerial knowledge, this requires a set of cross-cutting skills often described in terms such as "taking the initiative and risk taking, critical thinking, creativity, and problem solving" (European Commission, 2012, 22). Of particular importance in this context is the development of students' abilities across four key dimensions.

> "(1) *Action*, e.g. the capability to manage time or budgets in projects; (2) *Context* and Outward Orientation, e.g. the capacity to establish contact with others and exchange information; (3) *Creativity*, e.g. the ability to think around corners; and (4) *Mindset*, e.g. the asset to deal with unexpected change". (Mittelstädt et al. 2023, 125, emphasis original)

Entrepreneurship education across these four dimensions requires transdisciplinary approaches that combine knowledge from different academic fields and translate it into practice-oriented outcomes. Central to this process is an outward-looking orientation that extends beyond traditional university structures, fostering project-based collaboration with enterprises.

> "Entrepreneurship education generally builds on active and participatory teaching methods. Its main characteristics are the practical, project-based approach, promoting practical experience through workshops, cooperation with different organisations and enterprises, including learning settings outside school, and last bust not least the hands-on approach of setting up and running student firms." (European Commission, 2012, 24)

At the core of such approaches are process- and practice-oriented forms of learning.

> "Learning through entrepreneurship as a gold standard puts the process character of entrepreneurship projects in the foreground and includes process-oriented learning and simulative approaches to real entrepreneurial situations in teaching. Process-oriented learning creates incidents to provide feedback and embark on methodological teaching". (Mittelstädt et al., 2023, 128)

Against this background, the KomBEU project sought to identify appropriate approaches for teaching fundamental skills in management and entrepreneurship across different academic disciplines, as well as ways to integrate practical training modules into university curricula. As an illustrative case, the project examined the local start-up ecosystem in Munich. Central pillars of this ecosystem are the Technical University of Munich (TUM) and the Munich University of Applied Sciences, both of which have evolved over the past 25 years into entrepreneurial universities.

In collaboration with Educons University and Tiba GmbH, a series of research and transfer workshops were conducted within the Munich ecosystem. These included intensive exchanges with representatives of the Strascheg Center for Entrepreneurship (connected with the Munich University of Applied Sciences), UnternehmerTUM (connected with the Technical University of Munich), as well as founders and experts from Munich's start-up community.

The findings reveal that, on the one hand, top-down initiatives — originating from well-established institutional actors such as universities and companies — have played a major role in initiating and shaping the ecosystem, particularly through new educational programmes, start-up support structures, and funding mechanisms. On the other hand, bottom-up initiatives driven by students have also emerged, in which students, during or shortly after their studies, establish thematic focal points that enable them to prepare for and realise their own entrepreneurial ventures. Both approaches share a common goal: to enable students to gain experience in real working environments during their studies and to better prepare them for the transition into professional roles or for the creation of their own enterprises.

THE MUNICH ECOSYSTEM — A TOP-DOWN PERSPECTIVE

Munich innovation ecosystem

Munich Innovation Ecosystem GmbH was founded in 2015 by UnternehmerTUM GmbH, the Strascheg Center for Entrepreneurship gGmbH (SCE), and Start2 Group GmbH. The Munich innovation ecosystem serves as an umbrella organisation connecting companies, start-ups, academia, and the public sector in Munich to develop technology-based and sustainable innovations and translate them into market-ready products and services. At the core of its activities lies the networking of diverse actors within the local Munich ecosystem, as well as with national and international partners. The organisation hosts a variety of event formats — such as conferences, pitch nights, and meet-ups — that aim to create opportunities for connection and collaboration among ecosystem participants. Today, the Munich innovation ecosystem encompasses more than 2,300 start-ups, collectively employing around 38,000 people.

UnternehmerTUM and Strascheg Center for Entrepreneurship as central actors in the Munich start-up ecosystem

UnternehmerTUM works in close cooperation with the Technical University of Munich (TUM) and is regarded as one of Europe's leading centres for start-up creation and innovation. Founded in 2002, UnternehmerTUM offers training and continuing education programmes focused on business development, as well as a broad range of instruments to support start-up formation among students and graduates. Each year, over 200 start-ups receive support and gain access to a network of more than 1,000 founders, researchers, managers, and investors, who act as mentors throughout the entrepreneurial process. UnternehmerTUM currently employs around 300 staff members. Located in its own facilities on the TUM campus, it provides offices, laboratories, and workshops for students and founders to practically implement their projects. In addition, a wide range of international programmes and exchange initiatives are offered.

The Strascheg Center for Entrepreneurship (SCE), also founded in 2002, is closely affiliated with the Munich University of Applied Sciences and currently employs 45 staff members. As an entrepreneurship centre, the SCE offers educational and research programmes in entrepreneurship, supports start-ups, and promotes innovation processes as well as the development of entrepreneurial mindsets. Similar to UnternehmerTUM, the SCE supports start-up creation during or immediately after students' studies, offering seminars, mentoring, and infrastructural resources. Each year, between 1,500 and 2,000 students participate in entrepreneurship-focused seminars, which are interdisciplinary in composition and combine practical tasks in the form of project-based product and service development. The concepts and prototypes developed in these seminars can be further advanced through applications to SCE's annual start-up programmes, which are also open to external applicants.

Each year, around 40 start-ups are admitted to these programmes, including approximately 15 with an international background. For these activities, the SCE provides dedicated facilities, including workshops and laboratories equipped with 3D printers and laser cutters, allowing participants to experiment, prototype, and implement their ideas.

In addition to their local and regional engagement, both UnternehmerTUM and the Strascheg Center for Entrepreneurship are highly active internationally, expanding their roles as European innovation hubs. For instance, the "Rise Europe" initiative brings together leading start-up founders from European eco-systems for regular exchange. The "AI Launchpad" serves as a European Artificial Intelligence accelerator, connecting AI start-up teams and supporting them in succeeding within a highly competitive AI landscape. Another major initiative is the European programme "Start for Future" (SFF), of which the SCE is a founding member. The SFF has evolved into one of Europe's most dynamic and fastest-growing innovation alliances, bringing together representatives from academia, start-ups, industry, and public institutions to work collaboratively on joint projects. The overarching goal of this cooperation is to advance systemic innovation and generate sustainable societal impact. Within this framework, the SCE regularly launches start-up programmes targeting students and doctoral candidates from across Europe. The thematic focus areas include healthcare, manufacturing, mobility, energy, circular economy, and food.

THE MUNICH ECOSYSTEM — A BOTTOM-UP PERSPECTIVE

Start Munich und student-led initiatives

In addition to well-established institutional actors — such as universities and companies — that promote start-up creation, the Munich ecosystem has, over the past 20 years, witnessed the emergence of numerous student-driven initiatives that pursue the independent preparation and realisation of entrepreneurial ventures from the bottom up. One of the earliest and most prominent examples is Start Munich, a student initiative founded in 2003 to establish and strengthen a network of future entrepreneurs. Organised as a registered association, Start Munich currently has around 250 members. The association supports students in developing their innovative ideas, translating them into practical solutions, and building start-ups. Another important aim is to foster networking both across different faculties within universities and with interested companies, giving students direct access to entrepreneurs and insights into business practice. An additional key task of the initiative is international networking with similar student organisations to enable the pursuit of joint projects.

In recent years, several other student-led initiatives have emerged within the Munich ecosystem, often supported by the Strascheg Center for Entrepreneurship and UnternehmerTUM. Examples include student-founded clubs focusing on artificial intelligence (TUM.ai) and blockchain technology (TUM Blockchain Club), both of which are also registered associations. Each club comprises approximately 40 to 50 members, is self-organised, and formally independent from the university. Nevertheless, they receive institutional support, such as access to university facilities, laboratories, and workshops, as well as the opportunity to draw on academic staff as lecturers or mentors. The clubs pursue three main objectives, (1) to engage deeply with their respective technological fields and acquire the necessary technical expertise; (2) to strengthen networks among students, as well as between academia and industry; (3) to support members in their transition to professional careers or in the creation of their own start-ups. To achieve these goals, the clubs regularly organise topic-specific events with academic instructors and industry representatives, host their own hackathons, participate in international competitions and events, and facilitate internships in partner companies.

6 Hackathons as an element of new teaching and learning methods in university education

(R. Wagner, E. Heidling, A. Ziegler)

Hackathons represent innovative teaching and learning formats used in university contexts to facilitate knowledge acquisition among students. The term "hackathon" is a neologism of "hack" and "marathon." The neologism combines creative action outside established rules ("hack") with the stamina and intensity characteristic of a marathon (Massari et al., 2023). At the centre of this teaching and learning approach is the goal of producing functional designs or prototypes — typically of software or hardware products — within a limited period, usually two to four days. Work is carried out in interdisciplinary teams, making hackathons fundamentally different from conventional models of university teaching and learning.

In traditional university learning models, students first receive the information necessary to understand a given topic, then internalise it, and finally apply it to a specific problem. The learning process is based on a functional approach. In contrast, a hackathon begins with the presentation of a real-world problem to be solved. Students are then required to independently collect relevant information, use it to develop solutions, and create practical outputs, such as a concept or prototype. This systemic learning approach focuses on engaging with real-world challenges. A hackathon typically progresses through several phases: collaborative ideation, project planning, prototyping, and presentation of final results before an interested audience. In many cases, hackathons focus on software development, since such events are relatively easy to organise: beyond a computer, internet access, and programming skills, no substantial material or infrastructural resources are required. Moreover, hackathons can also be conducted virtually, with distributed teams collaborating across multiple locations.

Within the framework of university education, hackathons aim to enable students to adopt a solution-oriented mindset, gain work-relevant experience, and network with peers and potential employers. Research on hackathons as educational formats shows that the rapid idea generation and short innovation cycles facilitate quick decision-making and support the development of project ideas (Gama et al., 2018). Other studies indicate that participation in hackathons strengthens creativity, critical thinking, and innovative behaviour — skills regarded by employers as essential but often underdeveloped among university graduates (Calco & Veeck, 2015).

New teaching and learning formats such as hackathons also involve a significant shift in roles compared with traditional classroom settings. A key characteristic is the high level of self-directed activity among students: they define problems, develop approaches, and present their solutions. Teachers, in turn, become participants in the learning process, acting as advisors or mentors who facilitate learning and guide project development (Massari et al., 2023).

Findings from the KomBEU project on the organisation of university teaching and student-led initiatives within the Munich innovation ecosystem show that a growing number of new teaching and learning models are now being practised, which combine theoretical content with practical implementation. Among these, hackathons stand out for their potential to be structured as competitive events, in which winning teams are awarded or supported. Prizes may take the form of financial incentives or opportunities to further develop prototypes in university workshops or laboratories, often in cooperation with sponsors or interested companies. In the field of business model development, such activities can also lead to new start-up formations, as student teams continue collaborations initiated during hackathons, taking initial steps towards entrepreneurship.

Against this backdrop, the KomBEU project developed, implemented, and evaluated a prototype hackathon format. The event took place as part of the 10th IPMA Research Conference in Belgrade in June 2022, over a period of three days. The goal was twofold: first, to demonstrate new ways of linking theoretical content and practical application in university education within the field of business model development; and second, to support students interested in founding their own start-ups.

The participating teams were composed of students from various faculties of Belgrade universities. Under the overarching theme "Hacking societal challenges in a co-creative way", participants could select one of the following eight thematic focus areas:

1. Climate action
2. Circular economy
3. Community development
4. Smart Cities and Smart Rural
5. E-Governance & Public Service
6. Digital Solutions Fighting COVID-19
7. Projects in the Area of Health Care
8. Mobility Solutions for a New Era

The hackathon was designed to provide participants with shared experiences of co-creative collaboration within a novel educational setting. Participants were asked to develop a concrete solution concept, prototype, or business model, including an approach to market implementation, based on one of the eight themes.

At the start of the event, participants were briefed on the hackathon structure and the evaluation criteria to be used by the jury — which included representatives of the KomBEU project — for assessing the solutions presented. The jury's evaluation was based on the following criteria:

1. Innovation/Originality: How creative is the solution? Does it offer something new and unique?
2. Impact/Business Value: What is the potential impact and value of the proposed solution for business and society?
3. Feasibility/Future Plans: Is the solution viable and marketable? Does it have economic value and long-term sustainability?

At the start of the hackathon, the participants formed four teams. They developed projects on the following topics: "Change the Food Chain," "Circular Economy," "Climate Change – PlanetU," and "The New E-Scooter System." All final presentations included details on the innovative character of the solution, target markets, financing models, and implementation strategies. Through this format, students were able to gain first-hand experience in early project phases, from ideation to prototyping, and to develop results in a competitive, team-based environment. For the majority of participants, this was their first hackathon experience, which was evaluated favourably (for more detailed information on the hackathon see box).

HACKATHON DURING THE KOMBEU PROJECT

A total of 18 students from universities in Belgrade participated in the hackathon. Roughly half of the participants were enrolled in economics-related programmes, and the other half in IT-related fields. The group was gender-balanced, consisting of approximately equal numbers of men and women, and most participants were between 20 and 24 years old.

To document and analyse the course of the event as well as to capture participants' assessments and their perceived need for integrating such new teaching and learning formats into university curricula, a questionnaire was designed by the KomBEU project partners. Participants completed the questionnaire in written form at the end of the event. The results and analyses of both the event's organisation and the participants' evaluations were subsequently incorporated into the further work of the KomBEU project.

The questionnaire consisted of two sections. The first section included demographic questions (age, gender, university affiliation, current study programme, previous work experience) and questions concerning skills relevant to business model development (IT skills, project management, leadership, teamwork, presentation and creativity techniques). This section was completed by 13 of the 18 participants. The second section was addressed to the three participating teams and focused on questions related to the organisation and dynamics of the hackathon, the quality of team collaboration, the learning experiences, and the perceived need for integrating such formats into university education.

The following summary of findings highlights several notable trends.

The vast majority of participants reported no prior experience with hackathons, and this format is not currently included in their degree programmes (see Fig. 4).

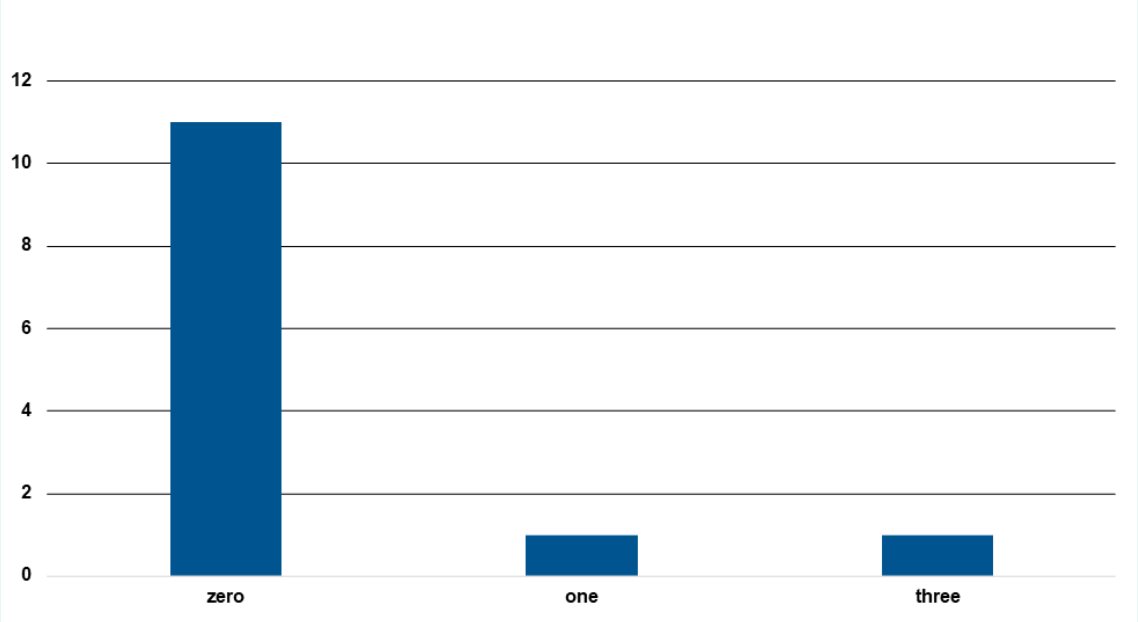


Figure 4: How often have you taken part in a hackathon? (individual answers, N = 13), own illustration

The participants evaluated the hackathon format predominantly favourably, with responses from three of the four participating teams included in the analysis. The positive assessments primarily related to learning gains in the areas of business development, project management, teamwork, and leadership. In addition, participants valued the opportunity to apply creative thinking and problem-solving skills, and noted that the event was enjoyable and motivating (see Fig. 5).

We have learned more about business development	Strongly agree	2	Rather agree	1
We have learned more about project management	Strongly agree	2	Rather agree	1
We have learned more about teamwork	Strongly agree	3		
We have learned more about leadership	Strongly agree	2	Rather agree	1
We have improved our pitching skills	Strongly agree	1	Rather agree	2
We have improved our creativity skills	Strongly agree	3		
We had fun	Strongly agree	3		

Figure 5: Learnings from participating in the hackathon (team answers, N = 3), own illustration

Participants also highlighted the rapid and effective team-building process, which was facilitated by open discussions and mutual support throughout the hackathon. In this context, the most valuable experience reported was the productive exchange among team members and the associated learning outcomes. The main challenges identified included time constraints in achieving the desired results, as well as deficiencies stemming from limited prior knowledge and experience in the areas of project management and the organisation of efficient project workflows (see Fig. 6).

	Team 1	Team 2	Team 3
How did the team ensure a supportive culture for ideation and co-creation?	All team members were flexible and ready to listen to constructive critics and other people ideas	Very open to discussion; worked together as a team; enjoyed talking	Ensured a supportive culture by building a community of ecologically aware and concerned people
What were the greatest difficulties you encountered with your projects along the course of the hackathon?	It seemed really hard to make profitable business that would be using circular business model	Lacked a member for the first day; did not have the time in the end	Difficult time managing the project
Which skills were crucial in mastering those difficulties for your projects?	Process of creating good ideas was very long and hard; most important is to be very well informed and to be able to do good research	Knowing the project sequence	Project management
What did you like most about the IPMA Hackdays?	Teamwork and communication with new people	Enjoyed the atmosphere; grateful for the comments and feedback; would love to do it again	Working with friends; the learning experience

Figure 6: Challenges, important skills and the best experiences during the hackathon (team answers, N = 3), own illustration

In connection with these deficits, participants emphasised that the hackathon made them aware of gaps in their own knowledge and skills. They expressed a strong need for additional skills, particularly in the areas of financial management, project management, business model development, and effective presentation of project ideas. Based on these insights, participants concluded that formats such as hackathons should be integrated into university curricula, and several indicated their intention to propose this within their respective faculties (see Fig. 7).

	Team 1	Team 2	Team 3
What training needs did you identify among yourselves?	Need training in financial analysis	Business model development	Project management training
What did you experience along the course of the hackathon that you wish to include in your future studies?	Know more about financial analysis	Live discussion talking about the project from start to finish, and being open to work with different people	Team building experience
In what areas of your education do you think it makes sense to apply the hackathon method?	It makes sense to apply hackathon in management oriented colleges	In every one! Each subject we study at the university would improve by using hackathon method. We would pitch this idea to our professors	Project management training; software development
How can the results of hackathons be carried on further after the hackathon?	By developing that idea in real life	Continuing to work on the project implement this method in more areas of our lives	We got great experience in field of working as a team

Figure 7: Future skills requirements (team answers, N = 3), own illustration

In summary, the implementation of this pilot event within the KomBEU project demonstrates promising approaches for integrating new teaching and learning formats into university curricula. The advantages of hackathons lie in their capacity to promote practice-oriented learning, foster creative collaboration within teams, and address real-world challenges. The hackathon format is characterised by a simulated competitive environment. On the one hand, teams compete within a project-like framework, working under constraints of time, quality, and budget toward a defined outcome. On the other hand, because the competition takes place within a playful or simulated context, it has no direct real-world consequences. This permits the learning effects associated with hackathon participation to take centre stage. From this perspective, hackathons can stimulate "outside-the-box" thinking and contribute to the development of creative concepts, prototypes, and new business ideas. Moreover, they can strengthen collaborative networks and play a key role in reshaping the roles of educators and students in the learning process. A major challenge, however, lies in introducing and embedding such innovative teaching and learning formats on a broader scale in traditionally structured university systems, ensuring their long-term institutional integration.

7 Skill model business development and framework conditions for implementation

(E. Heidling, A. Ziegler)

The pilot hackathon conducted during the KomBEU project reinforces the findings outlined earlier (see Chapter 4): Serbian students possess strong technical qualifications in disciplines such as information technology, mechanical engineering, and electrical engineering, as well as in economics-related programmes, while at the same time exhibiting significant gaps in skills related to business model development. The following section builds on the educational offerings identified at the universities and associated institutions within the Munich ecosystem — specifically UnternehmerTUM and the Strascheg Center for Entrepreneurship (see Chapter 5) — to present in greater detail a set of curricular skill modules relevant to business model development. These findings are then synthesised into a proposed "Skill Model for Business Development." Subsequently, the discussion turns to the question of how such a skill model could be implemented within the Serbian higher education landscape, taking into account institutional conditions, curricular frameworks, and potential transfer mechanisms.

7.1 Good practices for innovative teaching and training modules in the field of business development

The investigations carried out at the institutions associated with universities in the Munich ecosystem reveal a wide range of innovative teaching and learning formats designed to convey entrepreneurial skills and to explore new approaches to teaching through a closer integration of theoretical and practical components. Both the teaching programmes and the initiatives supporting business start-ups involve participants from different disciplines. A defining feature is the close interlinkage between theoretical instruction and its practical application, extending to the development of prototype solutions. As demonstrated by the findings of the KomBEU project, courses in the field of business development at universities within the Munich ecosystem are from the outset characterised by the integration of research questions with practical implementation, often leading to the creation of prototypes and the first steps towards entrepreneurial ventures. Another key feature lies in the involvement of practitioners — representatives from companies and associations — who contribute their practical expertise and act as mentors to support students in planning their own business start-ups. A typical structure of such business development learning formats usually consists of three phases.

1 Market and Trend Research: At the outset, students identify a promising technology or emerging trend with potential future relevance. Over a period of five to six weeks, they analyse development opportunities, addressing both research-oriented and practical questions — for example, whether start-ups could be established in this area and which business ideas might succeed. A central task in this phase is to identify potential customer groups and to specify their expectations and needs.

2 Product Development: In the next step, students refine their ideas and develop concrete projects that are translated into prototype products or services. Frequently, these involve a combination of hardware and software components. The range of topics covered extends from business and technology to healthcare. Beside the technical and economic requirements, it is crucial to systematically integrate customer insights. Projects are typically carried out in interdisciplinary teams of five to six students, enabling them to draw on knowledge from diverse technical and economic domains. The outcome is a proto-typical solution.

3 Business Strategy: In the final phase, teams develop a business strategy to position their prototype successfully in the market. This involves acquiring detailed knowledge of the target industry and its specific demands, identifying the Unique Selling Propositions (USPs) of their solution, and creating a financial model for commercialisation. In addition, students test and refine presentation techniques to effectively communicate their business ideas to potential customers and investors.

These teaching formats are characterised by a close coupling of theoretical knowledge, practical application, and self-organised teamwork. The involvement of experienced professionals, business representatives, and association experts alongside academic staff enables students to engage regularly with practitioners through workshops, mentoring sessions, and peer-learning activities. This provides comprehensive support in managing the complexity inherent in innovation and entrepreneurship. As shown by the KomBEU project workshops with organisers and participants of such programmes, these new learning formats are highly valued by students, who particularly emphasise the importance of practical implementation. Based on theoretical foundations, the practical component is regarded as essential for achieving substantial learning effects. According to our interview partners in the KomBEU project, a 20% theory to 80% practice ratio represents an effective balance between academic instruction and hands-on experience, ensuring sustainable learning outcomes in business development. The strong practical orientation of these learning environments is further illustrated by the fact that some student teams continue to develop their ideas and concepts beyond the course duration, ultimately transforming them into independent start-up ventures.

CURRICULAR TRAINING PROGRAMMES IN THE FIELD OF BUSINESS DEVELOPMENT

The curricular training programmes in business development offered by the universities and institutions examined within the KomBEU project in the Munich ecosystem are team-centred, practice-oriented, and interdisciplinary in nature. They promote entrepreneurial thinking and action, the development of shared visions, and the ability to deal with uncertainty. In addition to theoretical knowledge, the practical implementation and testing of ideas and concepts play a central role. Consequently, these courses are characterised by a strong focus on real-world problem-solving, often in cooperation with industry partners addressing current challenges in their respective sectors.

The range of teaching formats extends from seminars and lectures to "real projects" developed in collaboration with industrial partners. The business ideas explored in these projects cover a wide spectrum of sectors and innovation levels — from products and services to high-tech and low-tech solutions, and from software to hardware. Furthermore, students have the opportunity to meet and engage with successful entrepreneurs at networking events and interdisciplinary lecture series, gaining insights into real entrepreneurial experiences.

The following examples illustrate various formats for developing business development skills within the Munich ecosystem. These include: Semester-long courses focused on developing a business plan, a seminar series featuring successful company founders who share their experiences with students, and a three-semester Master's programme leading to the certificate "Master of Entrepreneurship and Digital Transformation."

Example 1 — Business Plan Seminar (Source: UnternehmerTUM Academy for Innovators)

FORMAT:
1 Semester (12 weeks), 7–10 hours per week

TARGETED GROUP:
PhD Students, Students

LEARNING GOALS:
Develop skills in business creation, business plan development and feedback-driven working. Navigate entrepreneurship confidently, craft effective strategies, and adapt swiftly to market changes.

PROGRAM:
Welcome to our Business Plan Basic Seminar, where we empower entrepreneurs like you to embark on a successful entrepreneurial journey. Our 6 ECTS program integrates agile working methodologies and customer-centric approaches to guide you through every step of building a robust business plan. As the Business Plan Basic Seminar is conducted completely online, you can take part wherever you are currently located (teamwork can be done on-site if the team wishes).

Understanding Customer Problems & Needs: Dive deep into identifying and understanding your customers' pain points and needs through problem-focused interviews.

Solution Development & Prototyping: Learn to develop prototypes that address your customers' needs effectively. Our hands-on approach emphasises prototype development tailored to your target audience.

Market Analysis & Competitive Positioning: Gain insights into your industry landscape and differentiate your business idea from competitors. We'll guide you through market estimation and competitive positioning strategies.

Business Model Creation: Develop a first financial model based on insights from customer interviews and educated assumptions. We'll help you craft a business plan that reflects your vision and potential.

Presentation Training: Prepare to deliver a compelling presentation that showcases your business idea effectively. Receive personalised support and feedback from professional presentation trainers and coaches.

The seminar emphasizes iterative approaches and includes regular peer pitching to ensure that you refine your business idea progressively. With personalised support throughout the process, you'll gain confidence in your entrepreneurial journey.

Example 2 — Innovative Entrepreneurs (Source: UnternehmerTUM Academy fo Innovators)

TARGETED GROUP:
PhD Students, Students

ECTS:
6 ECTS

LEARNING GOALS:
Understand the entrepreneurial mindset, personality development through a self-leadership challenge, develop and strengthen self-reflection as an important leadership competence.

PROGRAM:
Outstanding founders, managers, and investors covering a wide range of industries talk about their entrepreneurial career paths. During the lecture, students can ask guest speakers questions and discuss with them. In addition to listening to our entrepreneurial guest speakers, attendees will engage in an inner-development project. This allows participants to develop new ideas and discover new skills.

Join us for an inspiring lecture series featuring outstanding founders, managers and executives from a variety of industries. Our guest speakers will share their wealth of knowledge on various aspects of entrepreneurship and leadership, from identifying opportunities to managing innovation and growth. By gaining practical insights into the diversity of entrepreneurial life, personalities, skills and motivations, you will be equipped to think outside the box and develop an entrepreneurial mindset. In our courses, we believe in active learning, and we want you to take the first step towards becoming an entrepreneurial leader – whether you will have founded your own company or will be employed. The final exam is an individual project that challenges you to step out of your comfort zone and explore your potential. By developing your personality alongside your studies, you will be better equipped to positively influence others and make a meaningful impact on the world. As such, our course aims to equip you with the skills and mindset to tackle novel and complex challenges across a range of fields.

Example 3 — Master of Entrepreneurship and Digital Transformation (Source: Strascheg Center of Entrepreneurship)

Entrepreneurship and Digital Transformation is a full-time master programme designed to take three semesters.

TARGET GROUP:
international students with a bachelor degree / (HM) students / high potentials

DURATION:
3 Semesters (18 Month)

FORMAT:
Fulltime in person

ECTS:
90

PROGRAM:
The interdisciplinary master program Entrepreneurship and Digital Transformation enables graduates to either start their own digital business or lead corporate digital transformation projects to success.

Designing sustainable solutions for the digital world

Digital technologies such as Artificial Intelligence, Internet of Things, or Blockchain will continue to revolutionise business models of established industries. Many start-ups build their value proposition on these new technologies. This digital revolution asks for qualified employees and passionate founders to design innovative solutions that improve our business and personal lives.

Our Approach:
Through a learning-by-doing approach with the right balance between theory and practice, you will acquire the necessary knowledge and skills to start your own business or innovate in an organisational environment.

1st semester: Project I; Entrepreneurship I; Research Methods
2nd semester: Project II; Entrepreneurship II; Digital Business Models; Elective Course I
3rd semester: Master Thesis; Elective Course II

Benefits:
- project work at the core of the study program
- interdisciplinary and international teams
- individualised study plan
- safe environment for experimentation
- building strong networks
- a University Masters Degree within 3 semesters

7.2 Skill Model Business Development

The studies of the Serbian university education system have shown that the provision of qualifications in the IT sector is relatively broad and of high quality. In addition, other technical disciplines such as mechanical and electrical engineering, as well as business-related degree programmes, also exhibit a solid level of qualification (see Chapter 4). These disciplinary qualifications provide a strong foundation for the development of new business models, which are often characterised by the combination of established and emerging digital technologies. However, the findings of the KomBEU project, as well as recent studies, indicate that high-quality education in an increasingly digital world requires a broader range of skills.

> "In a fast-moving digital landscape [...] skills can be considered as follows: first foundational skills [science, numeracy and reading] [...]; second, [...] computer skills [...]. In addition, complementary skills such as teamwork, autonomy, problem solving, creative thinking." (OECD, 2024, 71)

With regard to the development of new business models, this indicates that, alongside technical qualifications, the ability to design and coordinate cross-sectoral and interdisciplinary collaboration is of particular importance. As the business development training programmes within the Munich innovation ecosystem demonstrate, this encompasses two main areas of skills. The first concerns methodological knowledge, including the analysis of target markets, the identification of customer needs, and expertise in project management. The second relates to transversal skills, particularly collaboration and networking skills for engaging with stakeholders, clients, and research institutions, as well as communication abilities to effectively convey the distinctive qualities of one's ideas, concepts, and prototypes.

Analytically, these diverse skill domains can be synthesised into a "Skill Model Business Development". This model is characterised by a core–satellite structure, comprising a disciplinary and methodological core complemented by flexible, modular extensions in the form of knowledge and skill satellites. Conceptually, the model links disciplinary expertise as a foundational qualification with adaptable and content-specific knowledge and skill modules, enabling responsiveness to the rapid technological and organisational changes in the field of business model development. Furthermore, the model integrates a learning perspective that extends beyond formal university education, recognising that in light of accelerating

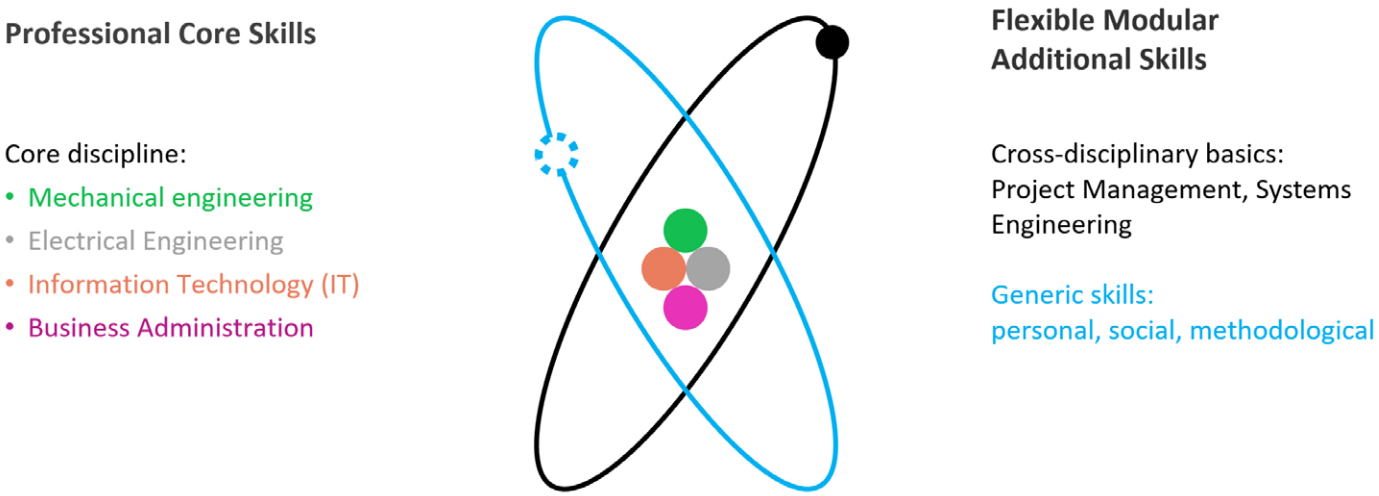


Figure 8: Skill Model Business Development, own illustration

technological change it is essential to dynamically update and interlink different skill areas through lifelong learning processes. Consequently, the Skill Model Business Development can be applied both to learning situations within initial university education and to various continuing education formats (see Fig. 8).

For the development of a new business model based on a technical solution — whether in the field of hardware, software, or the integration of both — *solid technical expertise* in a core discipline is fundamentally required. This may relate to mechanical engineering, electrical engineering, or computer science, or alternatively to business administration. A second element comprises *specific methodological skills* that function as modular extensions of the respective core discipline. Central to these are analytical abilities for identifying, understanding, and interpreting processes and systems in their logics and complexity. Consequently, knowledge in areas such as project management and systems engineering is essential. This also includes methodological skills in organisation, planning, control, and monitoring throughout project development, supported by formalised procedures such as risk identification, risk analysis, supervision, and evaluation. Specialised knowledge of project management is particularly important to ensure that individual work steps are carried out on time, within budget, and at the required quality level. These process-oriented and systemic skills are becoming increasingly significant as digital connectivity and the reorganisation of workflows create greater complexity not only in development and production, but also in related corporate areas such as services, sales, logistics, and procurement. A third component, as an additional modular complement, consists of *personal and social skills*. Business model development largely takes place in teams of specialists from different disciplinary domains. A key challenge, therefore, lies in integrating these discipline-specific modes of thought and action into the business model development process while staying within available resources. Other crucial factors for successful business model development include autonomy and intrinsic motivation, learning and adaptability, openness to innovation, and creativity. Moreover, strong interaction skills are vital for building and maintaining networks with stakeholders, customers, and research institutions. These skills are particularly important in situations where start-up teams must convincingly present their prototypes to clients or investors, in order to advance development work and secure the necessary funding.

As demonstrated by the business development training formats in the Munich ecosystem, traditional teaching methods — such as conventional lectures or instructor-centred learning — are no longer sufficient to convey these diverse skills areas. Instead, interactive learning formats and a closer integration of theory and practice are required. This approach can be described as "transdisciplinary learning" (Philipp & Schmohl, 2023, 14), implying fundamental demands on the structure, organisation, and content of teaching and learning processes.

1. In transdisciplinary learning processes teachers must be willing to reduce their control if they want to allow a free interplay of creative forces.
2. Transdisciplinary work requires a commitment to active participation and co-creation on the threshold.
3. It is essential to acknowledge the plurality of knowledge paths and to embrace failures, set-backs and detours of students and teachers.
4. Transdisciplinary practices will change given structures in universities and contribute to dismantling hierarchies and extending collective responsibility.
5. Reflective practices must be established, respected, and defended.
6. Transdisciplinary practices require systematic feedback to ensure theat lessons are learned from cooperation with the practical sphere and adequate measures are taken to meet future educational challenges. (Philipp & Schmohl, 2023, 14)

In "transdisciplinary learning settings", not only does the role of instructors change — since they relinquish control and increasingly act as facilitators of learning — but the role of students also undergoes transformation. As learners, they must still acquire the established content and methods of their respective disciplines ("Students are audience"). However, this rather passive role is expanded through active, self-directed, and research-oriented engagement ("Students are participants") (see Fig. 9).

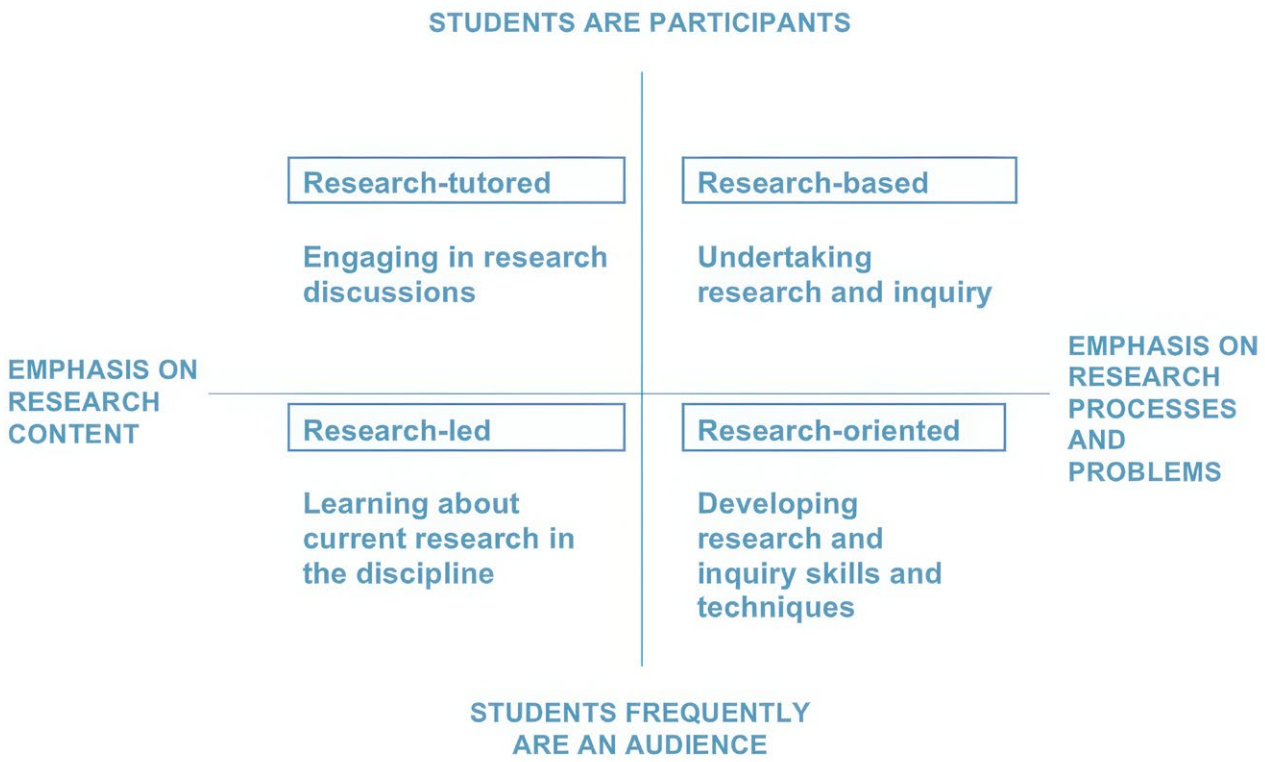


Figure 9: Learning through teaching research and research-based teaching; source: Healy & Jenkins, 2009, 7

To establish effective qualification strategies for skills in business development within university teaching, it is essential to link concrete problem experiences with the students' own development of solution approaches, thereby triggering active learning processes. Through "teaching-based research" or "research-based learning", students are encouraged and motivated to engage in hands-on activities, to solve problems independently, to generate insights, to conduct their own research, to analyse collected data, and to translate their findings into prototype solutions.

7.3 Framework conditions for implementation and the role profile "Innolauncher"

Framework conditions for implementation

As evidenced by the surveys, workshops, and the organisation and evaluation of the hackathon conducted within the KomBEU project, teaching and learning formats aligned with the perspective of transdisciplinary learning have thus far been scarcely embedded in the Serbian university education system. The "Skill Model Business Development" provides initial findings that address the identified deficiencies and the associated matching problems in linking theoretical and practical learning contents within Serbian higher education (see Chapter 4).

This raises the question of the necessary framework conditions for implementing such innovative teaching and learning formats. Establishing suitable framework conditions requires, first and foremost, institutional strategies that anchor the early integration of learning and research within university-based forms of knowledge transfer. The following fields are of particular relevance in this context.

A. Develop supportive institutional strategies and policies

1. Integrate the combination of learning and research into the transfer of knowledge to students in the university's vision.
2. Develop supportive institutional curricula frameworks and structures.
3. Link student research and inquiry to institutional policies for employability.
4. Link student research and inquiry to institutional policies for civic and community engagement.

B. Encourage and support student awareness and experience of research and inquiry

1. Embed research and inquiry from day students enter university.
2. Raise students' awareness of research.
3. Provide opportunities for students to undertake research and inquiry within and outside the curriculum.
4. Value the role that student organisations can play in supporting research.
5. Provide support and encouragement to students undertaking research and inquiry.

C. Ensure institutional practices support student research and inquiry policies

1. Ensure quality assurance, quality enhancement and institutional assessment processes and policies support students as researchers.
2. Ensure appropriate learning spaces are available to support student research and inquiry.
3. Align student support from library, information and communication technology services and laboratories with needs of students undertaking research and inquiry.

D. Encourage academic staff awareness and support amd reward engagement with student research and inquiry

1. Increase academic staff awareness of student research and inquiry.
2. Provide support to academic staff with regard to professional development so that they are encouraged to become engaged in student research and inquiry.
3. Provide incentives and rewards for academic staff to support student research and inquiry, particularly through workload planning, institutional and departmental recruitment, criteria for appointment, performance review and promotion processes.

Figure 10: Institutional strategies to mainstream student research and inquiry; source: Healey & Jenkins, 2009, 80 et seq., own illustration

Successful matching processes depend on cross-institutional networks between universities and companies. As the preceding analyses have shown, the absence of such interlinkages represents one of the key obstacles to improving the development of the Serbian innovation eco-system. One of our interview partners summarised this succinctly:

> "The main problem is the poor communication and coordination between different institutions. That means that despite having technology parks or incubators, we have not succeeded in ensuring that academia communicates with industry — nor with the start-up scene or the various digital initiatives — and integrates this exchange into relevant programmes. What is also missing, of course, is communication between the business sector, especially traditional industries, and the start-up IT community. [...] This leads to a truly paradoxical situation: Serbian companies purchase knowledge, processes, and all sorts of services from abroad; meanwhile, our start-ups and IT firms sell their services and products abroad — yet they are located in the same city and simply do not collaborate." (013ZdB)

Functioning networking processes are essential for the development of effective innovation ecosystems. This is also reflected in the programmatic statements of the institutions examined within the KomBEU project that are part of the Munich innovation ecosystem.

> "Whether national or international in origin, good ideas emerge from networks. Co-creation, collaborative innovation processes, or simply good quality projects and concepts: these all take shape in networks. By cooperating with our partners both we and our partners can expand, update and scale our offers, whether applied to qualification, start-up support or research. Therefore regional, national and international partnerships are very important to SCE, be they with universities, businesses, or institutions." (Strascheg Center for Entrepreneurship, 2023).

Initiating such an institutional transformation of traditional university structures encounters a wide range of obstacles. These include limited material resources, high student numbers, and inadequate student–faculty ratios resulting from an insufficient number of teaching staff, as well as cultural differences between academic disciplines. The restructuring of study programs toward a stronger integration of theory and practice — and, in parallel, the development of ecosystems that foster closer collaboration between universities and industry — requires time and patience. It is important to experiment

with new formats on a small scale, thereby creating crystallisation points that can subsequently be expanded (Selje-Aßmann et al., 2018). Crucially, transformation processes within universities must be initiated by individual actors or small groups taking the lead. This is also illustrated by the findings from our analyses of the Munich innovation ecosystem.

> "So you have to really see where you have early adopters. This would be my suggestion because to make a transformation on the level of the entire university [...] is a lengthy process. [...] And that's why I said you really have to consider who are your early adopters, where do you have supporters of this? [...] You have to incentivise people to make this community start. [...] And [...] it's not just the financial support, it's really about the mental support of people because they are then the pioneers, they are the entrepreneurs in their organisation." (018XvW)

The analyses of the Munich ecosystem further revealed that such "early adopters" are not found solely among teaching staff. Rather, they can just as well be small groups of students who initiate such endeavours.

> "Starting point is personal initiative exchange. [...] if you [...] have some kind of let's say topics of interest [...], it is, I think, enough in the beginning to be three, five people [...] we want to start something, some kind of initiative, then that is completely doable." (020SdS)

Role profile: Innolauncher

These experiences demonstrate that processes of change can be initiated despite numerous obstacles and challenges. Building on this insight, the KomBEU project outlined the role profile of the Innolauncher. This actorcentred approach highlights the crucial importance of key individuals for establishing and maintaining networks — both within universities through cross-faculty collaboration and between universities and companies. The goal associated with this role profile is to bridge and gradually reduce the persistent gap between the academic and corporate spheres in Serbia through practical measures and concrete good-practice approaches to business model development.

The core task of the Innolauncher is to interconnect the most important actor groups across institutional boundaries. This includes universities with their teaching staff and students, established companies and start-ups, as well as the public and semi-public institutions that make up the Serbian innovation system. The Innolauncher should be institutionally anchored within the university environment. The focus of his networking activities lies in mediating innovative approaches from science and academia to companies — particularly the start-up scene — on the one hand, and translating the needs and requirements of companies into new teaching and learning formats in higher education on the other.

The central requirement of the Innolauncher is to initiate interactive coordination among these actor groups and to sustain their collaboration over time. This involves performing what Huchler et al. (2019, 122) term "coordination work". Characteristic of such coordination work is its interactive orientation, which forms the foundation for building and stabilising networks. At its core lies active matching — the process of connecting and aligning the participating actors. This work aims at fostering cross-organisational and multidisciplinary cooperation within complex, interlinked constellations of actors. The objective is to connect experts operating independently within their respective fields of competence, to establish object-related collaborative relationships, and to consolidate these structures over time. The overarching task of the Innolauncher within this matching process is to formulate shared objectives in such a way that all actors support the associated efforts and resource commitments. It is essential to create balanced processes of mutual give-and-take that can trigger a positive spiral of reciprocity, forming the basis for building and strengthening mutual trust.

In relation to the enhancement of skills for business development, the Innolauncher particularly focuses on the following fields of activity:

- Mediating and supporting innovative teaching and learning approaches within universities (e.g., hackathons).
- Supporting university-based start-up creation through systematic exchange with technology parks and incubators.
- Establishing connections between innovative working groups of students and faculty members and established companies.
- Creating international linkages with groups, projects, and regional ecosystems pursuing similar goals.
- Adapting international good practices to the specific Serbian context.

To fulfill these tasks, the Innolauncher requires not only formal qualifications in engineering or IT but also specific skills associated with networking activities. These encompass a wide range of abilities:

- The capacity to adopt an integrative perspective that transcends individual viewpoints;
- the ability to deal constructively with conflicting and competing perspectives and interests and to balance them effectively;
- the ability to anticipate shared interests and goals, coupled with a high sensitivity to the overall atmosphere within the network — since negative moods can rapidly obstruct collaboration, whereas a positive collective atmosphere significantly enhances the speed and quality of goal attainment.

In the further elaboration and implementation of the Innolauncher role profile, three key priorities should be pursued:

1. For successful network collaboration, the Innolauncher must identify suitable actors from the cooperating partner institutions and develop shared objectives.
2. Effective collaboration requires that all participating actors commit to a dual orientation — representing the perspectives and needs of their own institutions while simultaneously pursuing and integrating the overarching goals of the network.
3. The Innolauncher should identify and establish zones of cooperation that ensure continuous collaboration and enable all actors to benefit from the outcomes of their joint work.

8 Lessons learned and future fields of action

(E. Heidling, R. Wagner, A. Ziegler)

The findings of the KomBEU project indicate that university education in the field of business development in Serbia is characterised, on the one hand, by a strong level of technical and subject-specific qualification. On the other hand, there remains a considerable need for practical training modules during the course of study to better prepare graduates for the labour market and facilitate their transition from academia to professional life.

Building on the insights and experiences from the Munich ecosystem, the results of the hackathon conducted as part of the KomBEU project highlight the significant potential of new teaching and learning formats for imparting innovative qualifications and skills in the field of business development. These formats not only convey new types of content but also foster collaboration among students from different disciplines. As demonstrated by the "Skill Model Business Development" developed within the KomBEU project, this approach enables the integrated transmission of both disciplinary and cross-disciplinary skills. In implementing such transdisciplinary learning settings, the interactive design of teaching should be further strengthened. The focus should be on linking concrete problem experiences with students' independent development of solution approaches, thereby generating deep learning processes. From the instructors' perspective, this entails embedding theoretical content within concrete implementation processes and application contexts. Through "research-based learning" or "teaching-based research", students can be empowered to acquire knowledge more independently and to develop their own learning capacities. This, in turn, increases the likelihood that they will found their own enterprises during or shortly after their studies, thereby unlocking new value creation potentials for the region.

Future developmental priorities for strengthening skills for business development lie particularly in the following areas:

1. **Long-term integration of new teaching and learning formats into university education:** Integrating new teaching and learning formats, such as hackathons, into traditional Serbian university structures is a long-term process. According to the experiences gained so far, the initiation of such transformation processes depends strongly on individual initiative. It is therefore advisable to identify early adopters among both teaching staff and students and to implement cross-faculty pilot projects with them to practically test new learning formats. The attractiveness of these events can then foster the gradual dissemination of such innovative approaches.

2. **Securing institutional support for the transformation process through the inclusion of key university groups:** All major university stakeholder groups should be involved in the transformation process toward new teaching and learning formats. This requires intensive communication and measures to enhance networking among diverse actors and groups. The initiation and implementation of these networking processes represent a key task for the Innolauncher role. The objectives and implementation of new teaching and learning formats should be communicated and adjusted across faculty boundaries. On the one hand, the goal is to create synergies through shared structures and over-arching organization; on the other hand, it is crucial to maintain flexibility in accommodating the specific characteristics of individual disciplines.

3. **Fostering self-organised student initiatives:** As demonstrated by the hackathon carried out within the KomBEU project, there is growing interest among students at Serbian universities in developing their own ideas in future-oriented fields. These ideas may range from sustainable models in food production to new mobility concepts and climate-related solutions. Serbian universities should actively support these initiatives by providing suitable infrastructure — such as dedicated spaces, workshops, equipment, and materials — and by encouraging faculty members to take on mentoring roles. This could open up new opportunities to accelerate the expansion of start-up creation, a goal also emphasised by the Serbian government.

4. **Strengthening the European integration of the Serbian research and innovation system:** As the results of the KomBEU project indicate, there is a growing trend toward greater networking of national innovation ecosystems at the European level. The aim is to intensify the transnational exchange of experiences in improving business model development across European regions, linking academia, established enterprises, and start-ups. A concrete example is the European Start for Future (SFF) program, in which the Strascheg Center for Entrepreneurship participates and which is also open to Serbian academic institutions and students. Owing to its relatively low entry barriers, participation is feasible for Serbian students. Successful applicants in such programs can obtain financial support for their ideas, concepts, and prototypes. For Serbian universities, participation in these European initiatives offers valuable opportunities to connect with other regions, facilitating productive exchanges of good practices in business model development and in the creation of local innovation ecosystems.

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