



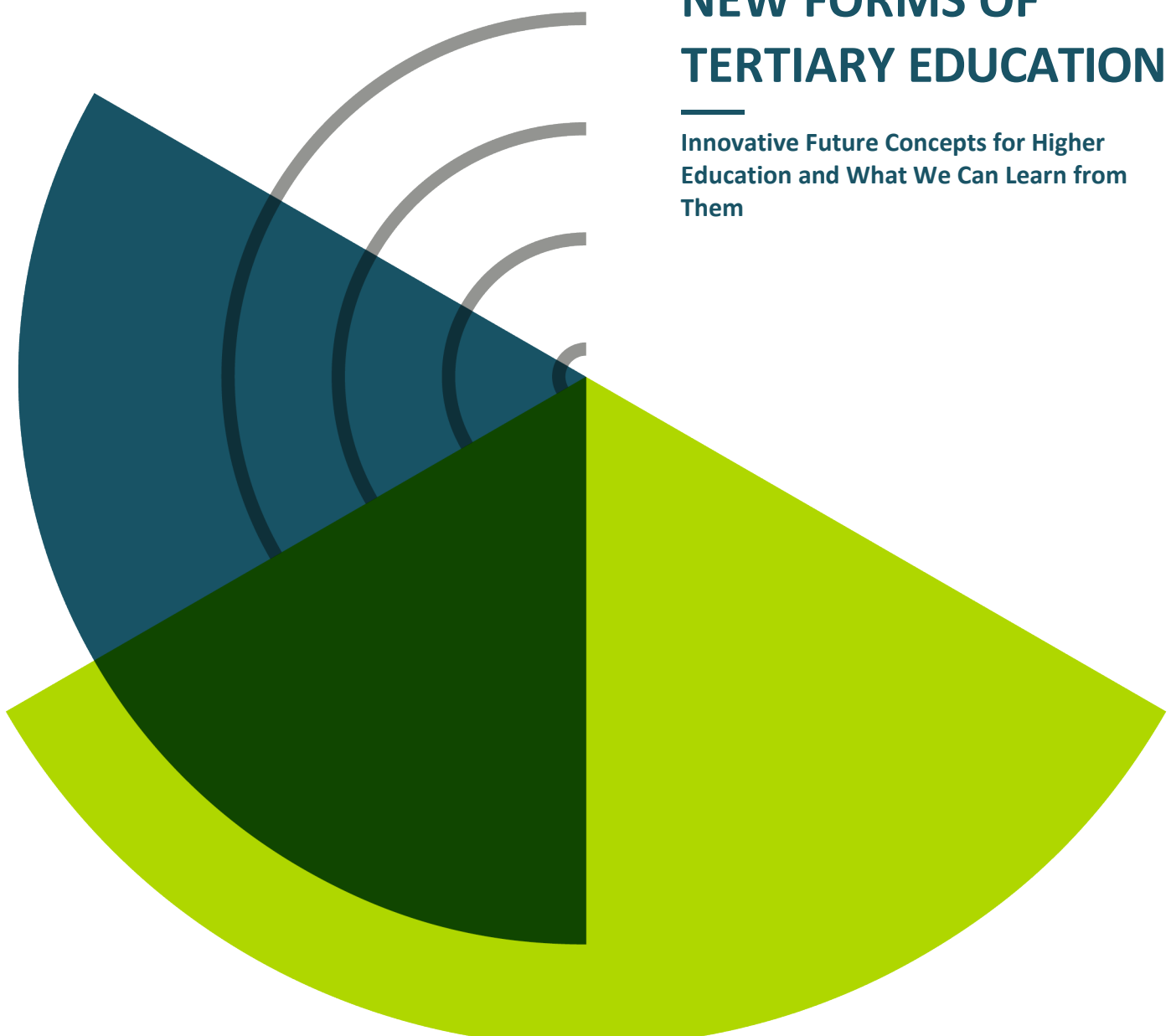
STIFTERVERBAND

Heinz Nixdorf Stiftung

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NEW FORMS OF TERTIARY EDUCATION

Innovative Future Concepts for Higher
Education and What We Can Learn from
Them



In Kooperation mit:

technopolis
group 





STIFTERVERBAND

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1. FOREWORDS

Foreword by the Stifterverband and the Heinz Nixdorf Foundation

"The best way to predict the future is to create it."

There's no doubt about it: the world is changing. And universities play a special role in this. As places of research and teaching, but also as centres of a culture of exchange oriented towards the common good, they are predestined to help shape social and technical transformations from within.

Even today, numerous stakeholders at universities - university management, teaching staff, support staff and students - demonstrate on a daily basis that they are not paralysed by the abundance and complexity of challenges. It is thanks to their commitment that we do not have to be "afraid of the blank page" when dealing with futures - which, as the plural is intended to suggest, are not a matter of fate, but a space for creativity. It is important to make the remarkable achievements of innovators at universities visible and to strengthen them as much as possible in their endeavours for sustainable higher education.

This study offers the opportunity to examine, also with a view to international examples, where effective and exciting future concepts for addressing systemic challenges are already being implemented, and the opportunity to learn from them. We invite you to see this study as an exploratory study that not only provides inspiration, but also opens opportunities and room for discussion. We are aware that very different universities with their specific circumstances were considered. However, we are convinced that it is precisely the necessary transfer efforts that invite productive discussions.

There is particularly great potential in cooperation between universities and their interaction with stakeholders from business and civil society. Universities can act as catalysts for transformation here - and as multipliers for a culture of co-creative, collaborative and vision-led cooperation. We call on you to take the next steps and - in line with the Future Mission for Education - to act together, pool resources and achieve impact.

Our special thanks go to all those who helped shape this study, especially the study advisory board and the many (international) experts who shared examples via a crowdsourcing survey and interviews. This shows the great interest and commitment with which university development is being driven forward together.

*Dr Volker Meyer-Guckel, Secretary General of the Stifterverband
Dr Horst Nasko, Chairman of the Heinz Nixdorf Foundation*

Foreword by members of the study advisory board

"The greatest danger in times of turbulence is not the turbulence itself, but to act with yesterday's logic."

Peter Drucker (1980): *Managing in Turbulent Times*

For centuries, universities have researched people in particular and society in general, exchanging their findings in academic circles and learning from each other. Far too rarely, however, have universities succeeded in making their own educational concepts the subject of this exchange in order to adapt them in time and ensure that the findings are effectively channelled back into society as a transfer of research and education.

In times of complex challenges, we need universities that enable themselves and their students to take on a courageously reflective role in actively shaping the urgently needed social change.

This study "New forms of tertiary education" presents selected educational institutions that have developed and implemented exemplary approaches to improve higher education and thus have an impact on society - and have succeeded in rethinking aspects of higher education organisation and education in a remarkable way.

As members of the scientific advisory board, we have critically monitored the development of the study. We are convinced that, together with our institutions, we need to take bold steps towards the future instead of just focusing on gradual improvements. We can learn a lot from each other if we are prepared to be inspired by innovative examples and - instead of listing why this or that approach cannot be implemented here - ask the question: What would it take to make this approach possible in our country? This is not always about a direct transfer of overall concepts, but often just about the creative transfer of individual aspects to the framework conditions of our own university.

This study aims to initiate a fruitful discussion and promote a willingness to act by analysing the challenges and fields of action and describing exemplary institutions that have developed functioning solutions. The approaches are intended to provide inspiration, demonstrate feasibility and help convince all those who want to bring about change at their universities.

Anyone who reads it with curiosity and drive can use it as a tool to work towards the necessary changes in their own environment that will make our universities and our society fit for the future.

Manuel Dolderer, Co-Founder of Code University

Prof Dr Susanne Staude, President of Ruhr West University of Applied Sciences

Wibke Matthes, Managing Director of the Centre for Key Qualifications, Christian-Albrechts-Universität zu Kiel

2. INTRODUCTION

Against the backdrop of rapid technological change, demographic developments and global polycrises, familiar challenges in the organisation of higher education are taking on a new urgency. It cannot be assumed that the social transformation in the production and dissemination of knowledge will stop at universities. Universities will have to change to remain centres of education, research and innovation.

In the context of the “Zukunftsmission Bildung” (Future Mission for Education)¹, the Stifterverband and the Heinz Nixdorf Foundation therefore commissioned an international exploratory study to present solutions for systemic challenges ("pain points") in the organisation of studies and teaching:

- access and integration of an increasingly heterogeneous student body
- the adaptation of teaching and learning content to changing skills requirements
- the innovative design of effective learning experiences
- the organisation of universities for more structural and institutional agility

The study was supported by a committed university community, implemented by the Technopolis Group from October 2023 to June 2024 and accompanied by a study advisory board of university experts. Almost 170 global innovation examples were compiled using a crowd-sourcing approach. Seven case studies were selected from these.

The exploratory study thus systematically picks up on existing debates and discusses innovative approaches in terms of their effectiveness and transferability to the German higher education system based on the summarised challenges. The practical examples include both proven and promising new approaches. They focus primarily on the potential for adaptation in existing institutions, but also provide inspiration for new foundations. Finally, recommendations for universities and higher education policy are derived on this basis.

EXECUTIVE SUMMARY

- The innovative strength across the board of the German higher education system, which is required to overcome current and future challenges, is too low. The German higher education system can learn from sustainable models in Germany and abroad. The case studies analysed in this exploratory study show different *levers for change* in order to overcome four selected systemic challenges, which are not only "painful" for universities, but also for society if they are not solved.
- The *reorganisation of the initial study phase and recognition practice* represents a lever for change for a heterogeneous student body: Approaches in which universities focus less on formal qualifications and more on individual competences promote access to higher education for non-traditional students and their academic success, for example through innovative admission procedures (gamified tests such as at 42 Heilbronn) or the recognition of informally acquired competences through portfolios and interviews (College Unbound).
- The establishment of *microcredentials* - in collaboration with partners from education, business and society - can be an effective lever for dynamically adapting teaching and learning content to new skills requirements (see European Consortium of Innovative Universities (ECIU)). Degrees in the form of micro- and nanodegrees also create an opportunity to lower access barriers and diversify study programmes.

¹ Zukunftsmission Bildung is a joint initiative launched by the Stifterverband and its partners in February 2024. Following the motto "Acting together, pooling resources, achieving impact", new and strong alliances from business, science, civil society and politics are to enable the education system to train and educate more people with the necessary skills for the transformation. More information on the Zukunftsmission Bildung can be found at <https://www.zukunftsmission-bildung.de/>.

- The use of *learning analytics and adaptive learning systems* (see Arizona State University) as a strategic tool can help universities increase access and learning success for a diverse student body and enable personalised, flexible learning pathways.
- New network and organisational structures can act as a lever for change in order to promote educational and teaching innovations at universities in a more agile and sustainable way. Promising model approaches include interlinked, inter- and transdisciplinary *innovation units* in the areas of course development, research and learning infrastructure (see Arizona State University) or *organisation in departments* (see IT:U or UTN).

3 BACKGROUND TO THE STUDY

Universities are facing fundamental challenges more than ever before. The dynamics of technological developments (such as generative Artificial Intelligence) are overlapping with socio-economic trends (shortage of skilled labour, decreasing student numbers) and are increasing the pressure to reform traditional self-images and the pace of change at (German) universities. At the same time, universities as research and educational institutions have unique potential for shaping a future worth living and can, like no other social institution, offer orientation, create spaces for discourse and drive social progress.

In many places, committed innovators at universities are showing how the transformation of their institutions and society can be courageously shaped from within. However, an analysis of the status quo, which also represents the initial diagnosis of this study, shows that the innovative strength across the board in the German higher education system, which is required to overcome current and future challenges, is clearly too low.

One reason for this is that the *speed of change* at universities, particularly in the areas of study and teaching, is often too slow. Although the developments in the higher education sector tracked by the Stifterverband, for example in the Higher Education Report, show positive developments, for example in the area of international and quaternary education, reforms often only take place gradually and are not actively driven forward by the entire spectrum of higher education institutions. As a result, universities have enormous difficulties in keeping up with the pace of social and technological change - for example, in successfully integrating a more diverse student body into the higher education system or dynamically implementing reforms in studying, teaching and continuing education.

In addition to the speed of change, the frequently *limited frame of reference of change impulses* also represents an obstacle to innovation. Experimentation with innovative educational and collaborative structures often takes place within the framework of pilot initiatives which, due to their financial, temporal and structural limitations, do not touch the core of higher education and therefore find it difficult to bring about change.

But how exactly can universities remain adaptable in the face of complex social challenges and a globalised educational environment? How can we respond to technological developments in terms of didactics and content? How can new effective learning experiences be developed for an increasingly diverse student body?

The associated need for transformation and securing the innovative strength of our higher education system, also in the coming years and decades, requires a self-critical examination of the central challenges facing the higher education system and the courageous exploration of innovative approaches that go well beyond the current status quo.

This is where the exploratory study "New forms of tertiary education" comes in. The guiding thesis was that the "universities of tomorrow" already exist today and that global research and a targeted broadening of one's own perspective in the search for innovation and transformation models in tertiary education is worthwhile. The aim of the study is, on the one hand, to inspire universities with the help of future-oriented approaches that fundamentally change higher education and to provide them with concrete implementation impulses in order to fully utilise their design and innovation potential in studying and teaching. On the other hand, it is intended to initiate a debate on possible innovative concepts and their feasibility and pursues a decidedly explorative and implementation-orientated approach, which is also reflected in the methodological procedure.

The study focuses on four central challenges and highlights these so-called *pain points* that the German higher education system is currently facing. In particular, however, it explores creative, innovative and effective strategies and instruments for overcoming these pain points from the German and international

context. These approaches are analysed in terms of their effectiveness, their conditions for success and their transfer potential. Recommendations for universities and political actors are then derived. The study thus provides suggestions on how new approaches in tertiary education can be effectively implemented in Germany, but also internationally, and what the German education system can learn from them - in order to increase innovation in higher education, to creatively meet current challenges and to strengthen our education system and thus the country as a whole. It is aimed at universities, politicians and all those who want to help shape the future of the German higher education system.

4. METHODOLOGY

4.1 Conceptual framework: Pain points of the German higher education system

Our higher education system faces numerous systemic challenges, on which there are many comprehensive studies and numerous position papers (see bibliography). This study focuses on four challenges (*pain points*) to which the German tertiary education system does not yet provide sufficient answers and shows where new approaches and innovations are needed to solve these central problems. It does not claim to be a conclusive, universally valid summary of all the challenges facing the German higher education system. Therefore, everyone reading the exploratory study is encouraged to critically evaluate and interpret the results presented here within the broader landscape of educational discourse and research. It is important to bear in mind that different aspects necessarily overlap and interlock and that the perspectives and interpretations of different stakeholders in relation to these challenges may diverge.

4.2 Selection of case studies

In line with its explorative approach, the study focuses on individual, particularly promising solutions. Using seven case studies, it zooms in on future concepts that are already being effectively implemented and thus show how the universities of tomorrow can be shaped today.

The selection of case studies is based on desk research and the results of a crowdsourcing survey of people with expertise in the German and international tertiary education context. Over a period of four weeks, the higher education community was able to inform the study team of interesting innovations via this survey. As a result, the team was able to identify 165 cases. On this basis, in a second stage, an internal evaluation of the approaches regarding their potential to solve the pain points and their degree of innovation was carried out by the project team, the Stifterverband and the study advisory board. The following points were defined as criteria for assessing the degree of innovation in close consultation with the Stifterverband:

Novelty: The approach is not common or known in the German tertiary education landscape.

Transformative: The approach has a formative effect beyond its own institution (on society and/or the economy).

(Estimated) adaptability: The approach is flexible and can be adapted dynamically to different conditions.

Realisability: The approach can be implemented in Germany and/or has scaling potential.

Effectiveness: The approach provides preliminary indications of effectiveness or the measurability of effectiveness.

The 20 most suitable approaches were then presented to the study advisory board as part of a workshop, discussed regarding the above-mentioned criteria and evaluated by them. Based on these evaluations and in consultation with the Stifterverband, seven case studies were selected. Primarily, approaches were selected that had already been in existence for some time and therefore offered a certain amount of data for assessing their effectiveness. One case study was deliberately used to shed light on approaches that have not yet been tried and tested but could nevertheless contribute to future debates on structural change (case study 7 on the Interdisciplinary Transformation University (IT:U) and the Technical University of Nuremberg (UTN)). The research showed that while there are already interesting approaches within the German education system, it is nevertheless worth looking beyond national borders. As a result, the selection of cases is characterised by a high degree of diversity in terms of the size and age of the respective implementing organisation, its geographical location, the organisational framework (e.g. legal form, financing), etc. At the same time, it can only represent a selection. At the same time, it is only a selection and, in view of the enormous diversity and dynamic development of educational approaches, can only refer to a limited extent to existing German institutions that are already pursuing (parts of) the selected approach.

4.3 Development of the case studies

The information in the case studies was compiled based on desk research and one or two interviews with key strategic stakeholders (e.g. university management) at each institution and validated by the respective interview partners. The case studies contain an empirically based assessment of the effectiveness of the respective example (with reference being made to any insufficient data availability).

As the case studies involve approaches from institutions that are exposed to very different contextual conditions (in terms of size, regulatory environment, funding, etc.), their transferability to the German context (and the diversity of the German public higher education landscape) must be assessed on a case-by-case basis. This categorisation and an assumption of the expected effectiveness in the German higher education context were also made in the case study chapter and based on desk research.²

They go beyond the demonstrable effectiveness of the respective example: the assessment of transfer possibilities to the German context took into account the existing systemic and social conditions in Germany, existing initial examples (scaling possibilities), expected resource expenditure and the need to involve various stakeholders, for example in the federal education system. The expected effectiveness was categorised in terms of the expected contribution of the approach to addressing the respective pain point. This means that if the effectiveness is high, significant changes can be expected with regard to the pain point (for example, in Pain Point 1, significantly higher numbers of students/graduates from previously underrepresented groups can be expected). The lower the expected effectiveness of the approach is assessed, the more additional/flanking measures would have to be taken. These classifications based on desk research serve the plausibility of impact assumptions for the purpose of stimulating discussion and are therefore not to be understood as empirically reliable analyses.

² For better readability, the sources used are not referenced directly in the case study, but are summarised at the end of the report.

5. PAIN POINTS OF THE GERMAN HIGHER EDUCATION SYSTEM

Numerous challenges for studying and teaching have existed in the German higher education system for years and decades and have already been discussed intensively in many places. However, against the backdrop of decreasing student numbers, a growing shortage of skilled labour and overlapping global crises, familiar challenges are taking on a new urgency and creating increased pressure to act.

As part of this study, key challenges in the area of studying and teaching were identified on the basis of a meta-analysis of various sources, with the involvement of an advisory board of experts and condensed into four pain points. The selection should not be regarded as exhaustive but does address particularly central points in the field of studying and teaching.

5.1 Insufficient access and integration of underrepresented student groups

What approaches are there to increasing access to higher education and mastering more heterogeneity in the higher education sector - while at the same time increasing student success?

The higher education sector is faced with the question of how *access and integration* of an increasingly heterogeneous student body can be improved: How can more *first-generation students*, immigrants without strong German language skills, people with caring or parenting responsibilities, or non-traditional students who want to continue their education while working be educated? How can the influence of socio-economic background on access to and success in education be reduced? These questions are by no means new but are becoming increasingly relevant and urgent in light of demographic developments (e.g. decreasing student numbers) and the shortage of skilled labour. Targeted solutions are therefore needed more than ever.

In order to achieve true equality of opportunity, institutions must proactively work towards removing informal barriers in the education system in particular, which continue to hinder the participation or success of underrepresented groups. In addition to the social dimension of equitable access, the creation of broader and fairer access to higher education also harbours potential solutions to the pressing problem of **skills shortages** - particularly in **STEM subjects**, but also in social professions. The current underrepresentation of certain demographic groups in STEM disciplines therefore threatens to further exacerbate the shortage of qualified specialists in these sectors. Creative ideas to address this *pain point* are more than urgently needed.

In response to new and rapidly changing requirements in the labour market (for example, in the context of the emerging possibilities of artificial intelligence), universities must provide significantly more learning opportunities after a first academic degree than they have in the past. The terms *lifelong learning* and *quaternary education* stand for opportunities for further education during a professional career. By creating flexible structures, universities can provide continuous learning opportunities that are in line with professional development and the interests and needs of learners. In view of the fact that participation rates in continuing education programmes remain below average in a European comparison, the greater integration of lifelong learning programmes into the "standard offer" of German universities is a central task: it not only improves the employability of people in Germany, but also expands the target group from traditional to non-traditional learners and contributes to the inclusivity of the higher education system.

5.2 Lack of dynamism in adapting teaching and learning content to new skills requirements

How can learning and teaching content be adapted so that it can be orientated more quickly and purposefully to changing and future needs?

Universities must increasingly be able to react quickly to social and technological transformation processes within the framework of their study programmes. This requires teaching and learning content to be flexibly adapted to new requirements - also in constant feedback with social stakeholders. In addition, the acquisition of interdisciplinary competences required for the future (so-called future skills) must be consistently taken into account. In this context, traditional disciplines of higher education must be expanded and supplemented, for example, with problem-solving-oriented teaching methods, modules on creative and entrepreneurial thinking or digital skills (see, for example, the [Future Skills Framework of the Stifterverband](#)). The dynamic adaptation of study content is a long-standing challenge, but one that is of crucial importance in order to enable people to actively shape the society of the future after graduation.

At the same time, these new teaching and learning contents must also be reflected in *re- and upskilling* formats, especially with regard to their relevance for the new (skills) requirements of the labour market mentioned above. The acquisition of future skills for the self-determined and value-reflecting ability to act must be seen as an ongoing task of universities.

5.3 Lack of innovation in the design of learning experiences

What new technological or didactic approaches can be used to supplement and replace traditional teaching formats and methods to improve the learning experience? How can innovative learning experiences be made possible for students with limited time and financial resources?

Technological progress and social change require not only an adaptation of educational content, but also new forms of teaching and learning. These must help to quickly train and educate more people with the necessary skills. The design of innovative learning experiences is necessary in order to contribute to the flexibilisation and personalisation of learning and to support the development of skills in the best possible way. Didactic concepts for learner-centred learning spaces and settings must be designed in such a way that students can learn in an active, collaborative and self-directed manner. Examples of this include *inverted classroom* approaches and *blended learning*. If used in a targeted manner, AI-supported instruments (for example as learning analytics tools) could contribute to increasing academic success. Learning experiences and learning objectives can be designed in an adaptive and personalised way and made more targeted.

5.4 Insufficient structural and institutional agility

How can the structures of educational institutions be designed to flexibly master current and future challenges? What incentive mechanisms and governance models are needed to enable the "right" people at universities to flexibly make the "right" adjustments?

In addition to adapting educational content, formats and methods, the higher education system as a whole must create the opportunity for *faster adaptability* of its own structures. Impetus for change is often driven by individual players, in projects or within other silos and is therefore not structurally anchored in the institution. Whether within an established university, via spin-offs from universities, via radically rethought approaches from an EdTech start-up or via cooperation among all of these players: educational innovation can emerge in a variety of ways. The systemic and structural openness of the higher education system and

its institutions for adapting traditional paths to new realities is of central importance (however challenging).

5.5 Conclusion

The pain points outlined here are neither fundamentally new nor do they cover all the needs for innovation in the German education and research landscape. However, they are discussed in many academic studies and policy papers on the (German) higher education system. In this respect, this exploratory study systematically picks up on existing debates on studying and teaching.

What is new, however, are the ways and means by which stakeholders within and outside Germany are responding to the pain points presented here. Some particularly innovative approaches are presented in this exploratory study - as inspiration for other universities and the associated intention to initiate the transfer of innovation to the wider German higher education system.

6. CASE STUDIES

6.1 Arizona State University (ASU) - Student accomplishment as a model for success

Arizona State University: Key data

Formal framework	University (accredited), over 180,000 students, 450,000 learners ³
Location	Phoenix, Arizona, US
Foundation	1886
Innovation	<ul style="list-style-type: none">• Promoting fairer access to higher education• Use of digitalisation for academic success
Systemic embedding	Incremental innovation in an existing institution
Link	www.asu.edu

In focus: Which pain points of the university system does Arizona State University address?

- Universities must increasingly ensure access to higher education for previously underrepresented groups and actively support them throughout their studies. ASU's primary goal is to include as broad a student body as possible while at the same time ensuring student success. To achieve this, ASU uses learning analytics, among other things, which uses collected data to create student profiles that help to support learners.
- Ideally, universities must be able to act and react flexibly. This requires the right structures. ASU's decentralised bodies are systematically geared towards innovation in teaching.⁴ In addition, the University has various offices that are specifically responsible for innovation. This enables the University to adapt quickly to developments and challenges.
- As part of prioritising student success, ASU is breaking new ground in establishing innovative learning experiences that incorporate the latest technological developments, such as augmented and virtual reality formats or artificial intelligence.

What makes Arizona State University innovative?

Over the past 20 years, ASU has not only grown remarkably quickly to become one of the largest universities in the USA, but has also reinvented the University's mission for itself in the process. President Michael Crow summarises his institution's self-image that also takes central place in ASU's charter, as follows:

*"We decided [...] to focus on inclusion and success of our students as the means by which we measure our institutional success, as opposed to exclusion of incoming students [...]."*⁵

³ Learners are defined as individuals at ASU who take advantage of learning opportunities that do not necessarily lead to a degree. For example, learners may be individuals learning about AI technology to be more successful in their jobs, high school students taking college courses at ASU, or retirees enrolled in philosophy courses. Addressing these learners is an important part of ASU's mission that is not covered by the term "students" alone.

⁴ Innovations encompass the university as a whole, i.e. research as well as teaching, for example. However, this case study focuses on teaching.

⁵ ASU Online. (19.08.2016). What is the Action Lab for student success? | ASU Online. YouTube. <https://www.youtube.com/watch?v=U96jdJ9ux7s>

Learning analytics for academic success

Learning analytics is a key innovation for increasing student success at ASU. The University systematically collects student data at all stages of the learning process. To this end, there are many different integrated data systems, from the Enterprise Resource Planning System (ERP) to the Learning Management System (LMS) and various instances of Salesforce, which collect and analyse data in order to help students and learners in concrete ways. The data not only provides information on the demographic characteristics of learners (as is common in the USA and required by various laws and regulations), but also creates an educational pathway that includes information on the modules taken, attendance, learning behaviour or the respective achievements.

At the same time, the data collected in the respective modules is used to improve the courses down to the individual assignments. Course performance is tracked, including student performance over the years, teaching and learning materials used, and retention and pass rates. Posts in discussion forums and written exam performance are also semantically analysed. By combining and integrating these data sets, the foundations for effective, integrated teaching and learning research are created: the Action Lab for Student Success unit is one of the various units at ASU that act as an internal think tank and conduct research into new insights into student learning behaviour in the field of digital teaching and learning science. It provides fundamental insights into how people learn. The anonymised data and findings are also accessible to external parties for the purpose of research and innovation.

At the same time, the findings from learning analytics are used to increase the academic success of students at ASU in a targeted manner. In 2015, the University introduced *Adaptive Courseware and Pedagogy* in a large number of modules. The adaptive learning system allows teaching resources to be specifically tailored to the individual progress and learning needs of each student. Pedagogical measures are adapted in real time; students then have access to the exact content and materials they need in a specific learning situation. The entire implementation process of adaptive learning involves a complex system of project management teams in collaboration with course leaders, external technology providers, various sponsors, student and technology support services, individuals with expertise in research and analysis, and other stakeholders.

ASU uses the knowledge gained to ensure access and academic success. The example of maths courses, in which the University introduced such software back in 2011, shows that the retention rate of students and learners in these courses has increased from 64.5 to 75 per cent as a result.⁶ The University is counteracting drop-outs and performance losses with additional measures such as *success coaches* who are in contact with learners in personal virtual meetings and via messaging services. The data collected enables support to be more personalised and effective. Even if students have left the University without a degree, a *re-entry team* helps them find their way back to university and still achieve their diploma. The team offers financial counselling and administrative support, among other things.

Skills transfer before the start of studies

ASU endeavours to expand access to the University to the widest possible group of students, including people who traditionally do not have access to higher education. As part of corporate partnerships, for example with Uber and Starbucks, the University works with companies that pay the tuition fees for their employees or their family members to study online. In addition, the University supports students with digital programmes such as the "Study Hall" platform, which offers low-threshold and free access to the learning content of introductory courses at university level on YouTube. ASU provides resources to future students in the secondary education phase: students enrol in college-level Universal Learner Courses, and the University already supports middle school students in STEM subjects with the Maths, Computer Science and Statistics (MACS) Accelerator. ASU considers students and learners from low-income households and traditionally underserved populations when developing new solutions to facilitate their access to higher education.

⁶ See Hernández-De-Menéndez, M., Morales-Menendez, R., Escobar, C. A. & Mendoza, R. A. R. (2022). Learning analytics: state of the art. *IJIDEM*, 16(3), 1209-1230. <https://doi.org/10.1007/s12008-022-00930-0>

Institutional anchoring of innovation

ASU's academic and research units are structured with a focus on access and student success, so that they can work more flexibly towards these goals. The institutions focus on interdisciplinary problem areas. The ASU follows an entrepreneurial approach. Three *enterprises* work in parallel and in dialogue with the faculties:

The *Academic Enterprise* is responsible for all academic programs at ASU, including the development and implementation of academic policies, faculty recruitment and accreditation process development, and academic programme assessment and improvement to maintain and enhance the academic quality of ASU programmes.

The *Knowledge Enterprise* has the task of driving research and innovation throughout the University, for example by promoting interdisciplinary research collaborations or facilitating technology transfer.

The *Learning Enterprise* is responsible for ASU's educational programmes and initiatives for learners and focuses on lifelong learning opportunities. This includes curriculum development, course design, learner support services and the delivery of learning content in online, hybrid and face-to-face modalities.

Entrepreneurial thinking is expected of every faculty and staff member at ASU. Institutionally, the University's commitment to change and innovation manifests itself in up to 40 offices spread across the various enterprises. These offices operate under various names such as "Strategic Initiatives", "Office of Applied Innovation" or "University Design Institute" and deal with the development and implementation of initiatives in the areas of responsibility of the individual Enterprises and across the board. The teams are usually interdisciplinary and, depending on the office, work on administrative innovations, innovations in teaching or learning or on cross-structural topics.

Thanks to the enterprise structure, the offices work outside of traditional academic structures, allowing the units to (re-)act more flexibly. Ideas can be initiated by all those involved in the units or find their way into the institution from outside, as the offices also work together with partners outside the University. Similarly, the offices are independently responsible for realising their ideas and, for example, acquiring the necessary financial resources, just like companies. The initiatives are therefore at different stages of development and are supported in their scaling by offices that operate across the board.

Technological innovations at ASU primarily serve the University's goal of improving access and student success. With regard to the latter, the University is trialling entirely new teaching and learning methods and testing their effectiveness. In addition to the adaptive learning formats already mentioned, ASU uses the "flipped classroom" approach in some courses: students work on the content outside of the classrooms, while the activities in the classrooms are designed to be interactive and practically orientated. The content is taught in online formats or online assignments. In some courses, ASU takes an even more creative approach: In the introductory biology course, for example, students learn via virtual reality formats created in cooperation with Walter Parks and the company Dreamscape Learn.⁷

Is the approach effective and adaptive?

ASU's measures allow for a constant review of the effectiveness of new teaching formats or initiatives designed to simplify access to higher education. Concrete figures suggest that the University has been able to significantly improve student success in recent years through the introduction of adaptive courses and tracking systems from 2015. In algebra courses, for example, success rates (measured by the proportion of students with a grade of C or better) increased by 17 percentage points between 2015 and 2019 (from 68 to 85 per cent), while the figure for introductory biology courses rose by 18 percentage points (from 72 to 90 per cent). Dropout rates in adaptive courses also fell by 11 percentage points, as did the overall

⁷ Dreamscape Learn is based on the original VR experience "Alien Zoo" by Dreamscape Immersive, which puts users in a virtual biology lab where they can act as field biologists and solve novel life science problems. In the introductory biology course, students can experience complex concepts in a new and interactive way.

university dropout rate by 11 per cent between 2001 and 2018. Compared to national rates of how many people successfully complete their studies, ASU also performs strongly.

There is also data for the biology programme using virtual reality, which not only reflects ASU's efforts to test the success of its teaching and learning formats, but also indicates a demonstrable effect of the tool. Students who took part in this format achieved significantly better results in subsequent tests than those who took part in conventional teaching formats⁸. They also showed greater commitment to the content through personal identification with their character in the virtual world and exhibited a higher level of co-operation with their fellow students.

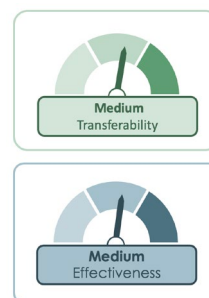
ASU is currently working with the company OpenAI (ChatGPT) to utilise artificial intelligence in a university context. The collaboration is university-wide and comprises at least 50 projects on a wide range of topics. One project involves the endeavour to use artificial intelligence to provide a personalised learning tutor not only for administrative questions but also for course content. As AI-mediated content provides access to a much broader student body, this also demonstrates the University's willingness to adapt new technologies and utilise them to achieve its goals.

Finally, ASU has enormous transfer potential for science and industry thanks to its internal thought and research structure. The data collected can be used internationally and the innovations at ASU represent verifiable pilot projects for the future of higher education.

How could German universities utilise Arizona State University's approach?

Learning analytics for academic success

ASU's radical rethinking of the mission of universities and its central focus on students and their specific, individual needs can also serve as a model for German universities if higher education is to be organised more fairly and the shortage of skilled workers counteracted. There are already examples here, such as the International University (IU), which also place the needs of students at the centre of the agenda. Due to their proven effectiveness in the American context, the implementation of such a goal should also be orientated towards the technologies used at ASU.



Nevertheless, there are limits to the use of learning analytics, especially in Germany. Adaptive learning systems based on personal student data, for example, are not widespread in this country, partly due to data protection concerns, but are certainly being developed at some universities. Experts were also able to prove that teaching staff relied almost entirely on the technology's recommendations when using learning analytics with regard to their impression of students or their assessment, although the teaching staff had hardly any information about how the technology works. This is fundamentally at odds with the traditional role and self-image of a teacher. At the same time, it is known that algorithm-based tools can often have systematic biases. It is therefore important to constantly scrutinise the technology, also in order to avoid any unintended negative learning effects. Against the background of these challenges, a rather limited data basis is to be expected. Accordingly, universities may be able to draw on few precise results (*medium effectiveness*).

For use at German universities, teaching staff who are well trained in the functioning and use of algorithms are required, as well as appropriate technical systems and teaching methods with which the necessary data can be generated. An appropriate system also requires curricula and tools to be designed in such a way that

⁸ Comparing the overall percentage of points achieved on eleven comparable examination tasks between students in the DSL (Dreamscape Learn) lab groups and students in the non-DSL lab groups, it was shown that DSL learners' results were significantly dependent on whether or not they had attended the DSL group. When controlling for other variables (such as honours student status or academic level (e.g. first year of study)), attendance in the DSL learning group had the greatest impact on exam results, with the mean score of students in the DSL groups being 8 per cent higher than the mean score of students in the non-DSL courses, see Dreamscape Learn Compendium: BIO 181, Spring 2022, <https://drive.google.com/file/d/1NJHPnXkGyJV0rRMThSBoP47Y2dspGr4b/view>

relevant information is centralised - taking into account data protection⁹. Accordingly, a good IT infrastructure and permanent personnel structures are needed to develop, implement and operate these. In view of these expected costs, a **medium level of transferability** to the German university context can be expected.

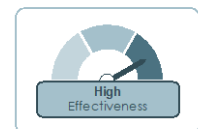
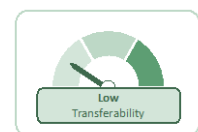
Skills training before starting the studies

In terms of promoting access to universities, the German system can learn above all from ASU's consistent teaching of study skills before the start of studies through digital courses and initiatives such as the Study Hall Initiative. The so-called orientation semester at CODE University or existing student universities show that similar initiatives can already be implemented with a relatively low threshold in the German context (**medium to high transferability**). However, the effectiveness of such measures in terms of their actual contribution to broader access to universities in Germany also depends on whether a heterogeneous and broad student body is actually addressed in this context.¹⁰ Strategic cooperation between universities and schools could contribute to **medium to high effectiveness**.



Institutional anchoring of innovation

With regard to the structural orientation of the University towards innovation, ASU has shown that the entrepreneurial organisational structure allows a high degree of flexibility, which means that innovations can be implemented efficiently (**high effectiveness**). In general, such a structure could also be successful in Germany, but such structural changes to the University organisation are associated with major upheavals and must realistically be regarded as long-term, complex processes (**low transferability**). However, the model can provide orientation, especially for newly founded universities. A large part of the flexibility of the ASU also stems from the fact that the innovative initiatives are financed by the entrepreneurs themselves. Independence from state funding also means greater freedom. At the same time, however, ASU also benefits from its size and the associated financial resources, which are also drawn from high tuition fees (although these are rather low compared to other universities in the USA and, in case of students from low-income households, are compensated by scholarships). The financing of such models in Germany and especially for smaller universities requires creative solutions.



Conclusion

ASU offers an example of the creative innovations that are possible in an existing institution when the success of students and their access to tertiary education take centre stage. It also shows that universities can be places where new formats and technologies are developed and tested. The use of learning analytics requires well-trained teaching staff, a solid IT infrastructure, but also careful consideration of data protection aspects.

⁹ Data protection aspects must be taken into account for all of the suggestions presented here, but cannot be systematically covered in the course of this case study - especially in view of the diversity of the status quo and the heterogeneity of the university system.

¹⁰ By heterogeneous student body, we mean a "cultural, religious and social heterogeneity of students" (Stifterverband 2019)

6.2 Erasmus University Rotterdam (EUR) - Innovation and continuous improvement of teaching

Erasmus University Rotterdam: Key data

Formal framework	University (accredited), over 180,000 students, 450,000 learners
Location	Rotterdam, NL
Foundation	1913
Innovation	<ul style="list-style-type: none">• Strategic institutional innovation• Innovation in teaching formats and content
Systemic embedding	Innovation in an existing institution
Link	www.eur.nl

In focus: Which pain points of the higher education system does Erasmus University Rotterdam address?

- (German) universities must adapt education and teaching to the needs of the future. Through community-focused internal exchange processes and structures, EUR has managed to adapt teaching/learning formats to the needs of students (personal and professional development) in an innovative and future-oriented way and to qualify lecturers for their use. Here, educational and teaching innovation focuses on 1) exchange, 2) further education and (3) educational research; also in tandem with students. This constant structural adaptation to new realities can be a challenge for universities. EUR anchors systemic and structural openness and an overarching focus on innovation and sustainability in its university strategy and internal initiatives and structures.

What makes Erasmus University Rotterdam innovative?

In its strategy, the EUR has set itself the goal of anchoring and living innovation institutionally. For EUR, this includes designing teaching formats and content in a future-oriented way. To this end, the University founded the *Community for Learning and Innovation (CLI)* in 2019, which promotes innovation in education in collaboration with the faculties. The CLI sees itself as a network with the aim of *exchanging knowledge and experience* between as many university employees as possible, both at teaching and management level. For example, the CLI organises weekly meetings in which innovative ideas and proposed solutions to specific challenges in teaching practice are discussed. Overall, the focus of CLI can be summarised in three points: (1) promoting the personal and professional development of students; (2) innovative capacity of lecturers and (3) solutions for improvements in online teaching or learning.

In addition to the aforementioned focus on networking and exchanging experiences, the CLI organises programmes/courses to continuously improve the quality of teaching. Regular University Teaching Qualification courses¹¹ encourage participants to reflect on their own teaching skills and vision of education and to further develop their own competences with the support of professional education coaches. Last but not least, the CLI also promotes *research into educational innovations* in order to improve its own project and course work on the basis of evidence. Recent CLI Fellowship research topics have included, for example, the

¹¹ These courses are offered for lecturers, faculty management and university management.

effectiveness of learning games and apps, the effectiveness of (peer) feedback and alternative approaches to formative assessment and feedback. Students are actively involved and supported in implementing their own improvements. Part of the CLI includes *Students for Students (S4S)*. Within this framework, students carry out projects that contribute to improving the quality of education for students. The CLI supports and promotes students by funding projects, counselling and mentoring, training courses and workshops as well as networking.

Among other things, the current university strategy focuses on innovation and collaboration (internal and external), sustainability and social impact as well as student and staff engagement. These elements can be found in the CLI and interviewees emphasise that continuous innovation and disruptive thinking are maintained through various individual and lighthouse projects. The *ErasmusX initiative*, for example, focuses on researching new technological and social developments outside the University that could have an impact on education and can be utilised for it. In this context, ErasmusX is researching the use of artificial intelligence or virtual reality glasses, for example. Campus and city are to be connected through community-orientated and technology-supported projects with the support of partners in science and society. The initiative also includes projects such as "The HefHouse", in which students explicitly address social problems in local communities.

The project-based *Impact at the Core programme* also promotes the exchange and involvement of other stakeholders. In the course of various projects - thus in line with the challenge-based learning approach - students work together with fellow students, teachers and experts from the field as well as civil society actors to develop the building blocks for possible social solutions. The programme also aims to achieve a positive impact on society in all educational programmes. In practice, students carry out (short-term) internships as part of their Bachelor's programme, which respond to problems from the city/region¹² (in the long term, the approach is to be extended to international NGOs). This requires a new type of teaching - which places practical experience and problem-solving skills at the centre of learning - and often includes IT-related aspects.

Is Erasmus University Rotterdam effective and adaptive?

By anchoring (educational) innovation in EUR's strategic goals, the University should constantly adapt to innovations and integrate them into teaching and research. Successful adaptivity therefore depends on the establishment of EUR's goals and focus on innovation. The CLI has played a central role in transforming the University's approach to education, research and social impact. Two areas of impact can be particularly emphasised here:

Shift from disciplinary specialisms to transdisciplinary approaches: Traditionally, universities have worked within disciplinary boundaries. However, the CLI promotes transdisciplinary research and education and fosters collaboration between disciplines. Transformative research at the CLI transcends traditional academic silos and holistically addresses the current challenges faced by practice partners.

Action-orientated academic approaches: Rather than "just" imparting knowledge, the CLI actively engages in social change. This includes working with external stakeholders, policy makers and social actors. The focus of transformative education is on preparing students for social change and providing them with the skills to tackle social challenges.¹³

CLI currently measures its success using typical *quantitative indicators* such as the number of faculty members, students and staff actively involved in CLI initiatives; the (steadily growing) number of participants in workshops, webinars and innovation projects; the number of innovation projects initiated (e.g. curriculum redesign, digitalisation measures or student engagement initiatives); the number of joint initiatives or collaboration between different faculties. In addition to these quantitative indicators, the focus of measuring

¹² The collaboration can take place in the Erasmus Hub! Rotterdam, a place with learning and working spaces in the centre of Rotterdam that is open to project participants and is intended to build a bridge between the university and the city.

¹³ The teaching of skills for overcoming social challenges is implemented through the strategic orientation described above and a range of programmes and initiatives. These include, for example, interdisciplinary teaching approaches, practice-oriented projects and internships, community engagement programmes and transdisciplinary research centres.

success and impact is also on *qualitative aspects*. In the long term, improvements in teaching quality and innovation as well as renewal in terms of teaching content are to be evaluated by students (or by future employers). In this sense, future feedback in surveys, interviews and focus groups will provide valuable insight into impact (for example, student engagement, student retention and overall satisfaction). Evaluation of the results of educational research and innovation projects carried out by faculty members will also be assessed qualitatively in the future.

How could German universities utilise the Erasmus University Rotterdam approach?

Community for Learning and Innovation

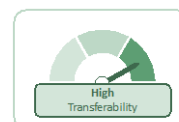
The EUR shows innovation opportunities in an existing institution and on three levels: 1) *exchange on teaching innovation*, 2) *further training* and 3) *educational research*. The various approaches can - under the right conditions - be transferred to German universities (**high transferability**). The CLI promotes exchange between faculties, teachers and students. They share knowledge, experience and best practice. The creation of similar network structures - focusing on internal educational innovation - could also promote knowledge exchange and the creation of new teaching formats and content at German universities (**high effectiveness**). Further training and research on teaching innovation and teaching quality are also addressed at German universities and should be expanded - although these elements are more resource-intensive than the creation of exchange formats / network structures.

Prerequisites or framework conditions that must be fulfilled or considered at (German) universities and that have favoured implementation at the EUR:

Funding networks and innovation projects and implementing innovative teaching methods requires investment in technology, training and staff. Universities must ensure that sufficient resources are available, allocate budgets for educational innovation and/or seek support from government agencies / funding organisations.

A strategically prioritised culture of innovation is needed, as well as the appropriate (management) staff to pursue and implement the strategy. This means that managers must prioritise innovation and institutional transformation, make time for it and be able to convince others of their innovative vision.

The acceptance of innovation projects depends on the culture of the university. On the one hand, an open *culture of innovation* is therefore beneficial / necessary, and, on the other hand, a cultural switch is required with regard to the participation of students, lecturers and employees.



Conclusion

The EUR shows that transformation can take place on the basis of networks and structures within the institution and that teaching formats can be adapted to different needs in an innovative and future-oriented way through exchange, further training and educational research.

The adaptation of teaching and learning content to practical and social challenges can also be an inspiration for universities. The German higher education landscape could benefit from this approach by creating similar networks for the exchange of knowledge, institutionalising innovative teaching methods and actively involving students in the improvement of teaching.

6.3 European Consortium of Innovative Universities (ECIU) - European Micro-Credentials & Challenge-based Learning

European Consortium of Innovative Universities: Key data

Formal framework	University alliance of 14 universities funded under the EU's "European Universities" programme ¹⁴
Location	DE, DK, FR, IE, LT, SE, PL, FI, ES, PT, NO, IT, NL, (MX)
Foundation	1997
Innovation	<ul style="list-style-type: none">• European micro-credentials system• Challenge-based learning with partners from education, industry and society
Systemic embedding	Inspiration for a structure or model that makes micro-credentials flexibly accessible to a large number of students
Link	www.eciu.eu

In focus: Which pain points of the higher education system does the European Consortium of Innovative Universities address?

- Universities must adapt teaching and learning content dynamically and innovatively to changing skills requirements. ECIU positions itself as an agile experimental platform for new transnational educational programmes. European micro-credentials and the challenge-based learning approach are at the heart of ECIU's educational programme.
- Within the existing structures of (German) universities, the challenge is to test and implement new learning experiences and to effectively and efficiently organise the exchange between the education system and the labour market. ECIU's micro-credentials approach meets this need by enabling flexible, personalised professional skills development in direct collaboration with partners from education, business and society. Learners can acquire specific competences that are relevant to their careers and improve their employability.

What makes the European Consortium of Innovative Universities innovative?

Challenge-based learning (CBL)

ECIU is a university alliance consisting of 14 European universities and is funded by the EU's European Universities Initiative. ECIU is a leader in educational innovation and emphasises personalised learning and close links with industry and society. At the centre of ECIU is a *challenge-based learning approach* in which multidisciplinary teams work together on real-life challenges and develop ideas and solutions together. This approach encompasses the areas of education, research and innovation. The challenges arise from a *structured dialogue with key stakeholders at regional level* (including representatives from academia, industry, government and civil society). Through twelve Local Partnership Arenas (LPAs), ECIU identifies, specifies and facilitates challenge-based learning for students and academic staff. The approach follows a three-tier structure: 1) Engage: The challenge motivates students; 2) Explore: Students explore the "big idea"

¹⁴ Consortium Members: Aalborg University (Denmark), Dublin City University (Ireland), Linköping University (Sweden), Tampere University (Finland), University of Aveiro (Portugal), University of Stavanger (Norway), University of Twente (Netherlands), University of Trento (Italy), University of Vilnius (Lithuania), University of Wrocław (Poland), Hamburg University of Technology (Germany), Kaunas University of Technology (Lithuania), Tecnológico de Monterrey (Mexico), University of South-Eastern Norway (Norway)

associated with the challenge (for example, health or public transport); 3) Act: Students develop proposed solutions and take action themselves.

ECIU Micro-Credentials

The ECIU *micro-credentials system* enables learners to close specific knowledge gaps and expand their own competences in a targeted manner. While ECIU issues the micro-credentials, the micro-credentials are awarded by the various ECIU universities and describe the competences acquired in detail.¹⁵ The corresponding learning offer can be accessed via ECIU's *central Engage platform* and is designed to develop new skills and competences in a targeted and flexible manner. ECIU has also introduced a centralised MC system that is electronically sealed by ECIU and issued using the EDC (European Digital Credentials). Accordingly, learners receive tamper-proof micro-credentials that comply with European standards for digital credentials and whose quality is assured by ECIU. Although many alliance partners will issue the micro-credentials through their own university or national systems, the centralised solution of the Engage platform removes many bottlenecks for member universities. Learners can store, access and manage micro-credentials on the *Europass platform* - which acts as a 'digital wallet' for the credentials - at any time.

The ECIU is actively committed to promoting the introduction and implementation of micro-credentials in Europe. It openly communicates that targeted (financial) support is needed to accelerate the introduction of (jointly developed) micro-credentials. A good knowledge base, human capital, policy research and a focus on pedagogy and technology are cited as success factors for the ECIU. At a political level, the ECIU emphasises the importance of harmonised national legislation and common guidelines in education and training. The removal of system-level barriers to the seamless introduction of micro-credentials across Europe is also repeatedly emphasised. An ECIU position paper on micro-credentials was well received by international experts and over 200 participants discussed implementation and corresponding policy objectives.

Is the European Consortium of Innovative Universities effective and adaptive?

As part of the CBL approach, over 160 challenges from more than 100 partners were selected and addressed in the local partnership arenas (LPAs). Approximately 600 learners worked on 120 challenges and dealt with real-life challenges. At the same time, 150 teachers were involved in the challenges. The LPAs also facilitated 285 micro-credentials.

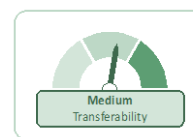
In relation to the micro-credentials approach, quantitative KPIs are being collected and a qualitative impact framework for the MC system is currently being developed. As most universities in Europe do not yet fulfil the requirements to issue MC themselves, the creation of the ECIU's own platform on which micro-credentials and common challenges are managed can be seen as a kind of shortcut for the ECIU institutions. Overall, the ECIU MC team sees itself as very adaptable when it comes to adapting to the constantly changing framework conditions at EU, national and institutional level with regard to micro-credentials. As the different institutions and countries work in different technical/digital environments and in different pedagogical and linguistic contexts and depend on different lending organisations, *flexibility and adaptability* are very important factors.

¹⁵ All transcripts of records contain information on the competence levels and correspond to the European Skills, Competences and Occupations (ESCO) framework.

How could German universities utilise the approach of the European Consortium of Innovative Universities?

Challenge-based learning (CBL)

CBL enables the development of students' competences in direct cooperation with partners from education, politics, business and society. The **transferability** of the CBL approach to the German higher education system can be assessed as **medium (to high)** depending on the exposure and degree of interaction with external stakeholders (for example, Universities of Applied Sciences are usually already strongly connected with industry and (regional) stakeholders). Other relevant factors for implementation are the further training of teaching staff (and the associated resources and corresponding commitment), in-depth cooperation with external partners (which is usually advanced at German universities) and dealing with the inertia of representatives of "traditional teaching and learning methods". The expected **effectiveness** of the approach to address the pain point can be considered **high**, as CBL promotes the development of students' skills in line with professional requirements. It also contributes to the integration of research and teaching by promoting innovative approaches and adapting teaching and learning content.



ECIU Micro-Credentials

The ECIU approach provides valuable insights into how individual (German) universities can become structurally more agile and effectively develop micro-credentials to improve the learning experience of students (**high effectiveness**). Before starting such a process, an "institutional readiness check" must be carried out, as the scope and individual starting points of each university are very different. German universities have a certain amount of room for manoeuvre, but the successful adaptation of micro-credentials requires cooperation, representation of interests and the "persuasion" of numerous stakeholders (**medium transferability**).¹⁶

Universities must therefore pursue a coordinated approach that involves all relevant stakeholders:

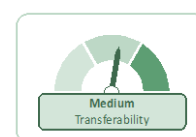
University and faculty management: ECIU dialogue partners emphasise that a clear vision and the support of university management (including rectors and deans) are important factors. This level of management must be committed to innovative approaches and provide the appropriate resources. At the same time, teaching staff need to be convinced of the benefits of micro-credentials, as their involvement in the design and implementation of micro-credentials approaches is crucial.

Students and learners: On the one hand, students are increasingly demanding innovation in education and, on the other, they need to be convinced that micro-credentials offer flexible and targeted learning opportunities. Student representatives should therefore be involved and their feedback incorporated into the design phase.

Industry and employers: Employers value customised and directly applicable skills and competencies. The involvement of industry is therefore essential for the development of relevant micro-credentials.

Political and regulatory environment: German universities operate within a national and regional framework in which they have fundamental autonomy in the design of curricula and educational programmes. Coordination with higher education policy at a strategic level is nonetheless central to structurally anchoring new approaches in the higher education system.

Quality assurance and accreditation bodies: Accreditation bodies that ensure the quality of programmes and compliance with guidelines need to be convinced of the quality and relevance of micro-credentials. The development of guidelines for the assessment and accreditation of micro-credentials is crucial.



¹⁶ Various pilot projects and initiatives are currently underway to support and introduce micro-credentials (e.g. by the European Commission). These projects and initiatives show promising approaches to flexibilising and diversifying the education system by demonstrating alternative ways of recognising competences. However, despite their potential, there is still a gap between these innovative initiatives and the widespread use of micro-credentials in the education mainstream.

Digital technology and infrastructure providers: The ECIU interview partners describe the establishment of a micro-credentials system as a "huge technical undertaking" that relies on IT expertise and corresponding infrastructures. Adapting or developing the infrastructure for issuing, storing and verifying micro-credentials is a correspondingly important step.

While the ECIU approach provides valuable insights, successful transferability to the German higher education system depends on aspects such as *strategic orientation*, the *financial underpinning* and *co-operation efforts*. With the right framework conditions, micro-credentials could become more popular in the German education landscape. At a national level, there are several prerequisites that the *political level* should address:

Prioritising higher education policy: Over the past year, political decision-makers, institutions and national regulatory authorities have stepped up their activities in relation to micro-credentials. This sets the stage for a possible strengthening and adaptation in the German context.

Financial support and infrastructure: The ECIU emphasises the need for targeted financial support to accelerate the introduction of micro-credentials. In addition, the ECIU calls for a more comprehensive expansion or adaptation of the infrastructure to facilitate the introduction of micro-credentials on a large scale. In Germany, securing funding and creating the necessary infrastructure would be crucial for successful implementation.

Harmonised legislation and guidelines: Removing system-level barriers to the adoption of micro-credentials is essential. Germany could benefit from harmonising its regulations (e.g. with European standards) to seamlessly support micro-credentials.

Conclusion

The case study shows examples of the application of challenge-based learning and micro-credentials. For both elements (CBL and micro-credentials), strategic alignment within the university, financial support and collaboration need to be addressed. The German higher education system could benefit from strengthening political willingness and commitment, securing specific financial support and harmonising regulations (especially for the introduction of micro-credentials). The case study suggests that successful adaptation of micro-credentials in Germany will require the collaboration, advocacy and persuasion of multiple stakeholders, including policy makers, higher education leaders, faculty, accreditation bodies and technology partners.

6.4 42 Heilbronn - Learning without teachers in coding training

42 Heilbronn: Key data

Formal framework	Private programming school (gGmbH), approx. 300 students
Location	Heilbronn and 36 other locations in the international network of 42
Foundation	42 Heilbronn: 2021 42 (Paris): 2013
Innovation	<ul style="list-style-type: none">• Independent peer learning• Motivation-orientated admission
Systemic embedding	Start-ups with disruptive concepts and simultaneous approaches to integration with established players
Link	www.42heilbronn.de

In focus: Which pain points of the higher education system does 42 Heilbronn address?

- Particularly in STEM subjects, universities are faced with the challenge of providing access and appropriate support to an increasingly diverse student body. 42 is accessible free of charge to anyone who successfully completes the admissions process, even without relevant prior experience. 42 Heilbronn also shows how self-determined, flexible learning paths can be made possible without a timetable or lecturers, primarily through peer learning and peer evaluation, but also accompanied by subject experts and educators and integrated into an entrepreneurial ecosystem.
- Universities need to meet the demand for future skills and improve the learning experience according to the latest standards in didactics and technology. 42 is a successful example of the comprehensive teaching of future skills (coding) and the use of project-based peer learning in a physical location. The shortage of skilled labour in the IT sector is thus successfully addressed without the use of standard testing procedures and teaching methods.
- Although this is a newly founded start-up, this case shows that it is possible to integrate these approaches into the higher education landscape through cooperation with established universities.

What makes 42 Heilbronn innovative?

42 Heilbronn is a programme school in which students learn in a project-based and self-managed way without lecturers. No certificates, degrees or previous knowledge are required for admission. Half of the students have no programming experience prior to their training at 42. Instead, 42 assesses the suitability of applicants online using logic games and interviews as well as in a four-week boot camp ("Piscine"), in which the basics of the C++ programming language are learnt. Instead of a timetable, students are guided by a platform that tracks their learning progress and sets projects. In contrast to the usual teaching and examination systems at universities, it is the fellow students who support and evaluate each other over 2-5 years (peer learning and evaluation). At the 42 Heilbronn site, it is important that they do not work together online, but in shared, permanently open rooms.¹⁷ To support social interaction, there are accompanying

¹⁷ For the 42, it was measured comparatively in Wolfsburg that people learn around 30 per cent faster on-site than digitally. Mutual physical presence will therefore be seen as an important factor for effective and sustainable peer learning and perseverance.

facilities such as event rooms, sports facilities and cafés. The learning environment is actively supervised by community managers. Finally, part of the training programme is close contact with companies that are part of the 42 network and offer mandatory internships.

The learning and testing model of 42 Heilbronn differs from conventional university programmes as it is strongly oriented towards the realities and requirements of modern tech companies and start-ups.¹⁸ This can also be explained by the founding history of the 42 network, of which 42 Heilbronn is a part: Xavier Niel, a French tech entrepreneur, founded 42 because he and other companies lacked suitable IT specialists. Thomas Bornheim, founder of the 42 Heilbronn spin-off, also comes from the IT private sector (Google) and was inspired by this working environment. 42 Heilbronn is largely financed by the Dieter Schwarz Foundation as the main sponsor. In addition, companies such as Audi, Porsche and MHP as well as other partners contribute to the financing of 42 Heilbronn. The programme is free of charge for students and can also be supported with an 18-month scholarship.

Is 42 Heilbronn effective and adaptive?

How effective is 42 Heilbronn's approach with regard to the goal of developing future skills for future-proof IT specialists? Internal evaluations of 42 show: Graduates of 42 successfully acquire specialist skills and are in demand in the labour market even without an accredited degree. 80 percent of students receive a job offer before the end of their training and all graduates find employment (30 percent start their own company). Among companies, 42 Heilbronn records a high demand for co-operation.

Although student numbers in computer science are increasing, there is still a shortage of skilled labour in the sector. Universities can help to reduce this by training previously underrepresented groups (e.g. women (22 per cent of graduates are female)) or people who were previously not admitted to university and reducing the drop-out rate. At 20 per cent, the drop-out rate at 42 Heilbronn is significantly lower than in traditional computer science studies, where the drop-out rate is around 40 per cent. However, with a view to enabling a more diverse student body to enter a tech degree programme, 42 Heilbronn is only effective to a limited extent. The fact that there are no tuition fees, no coding experience and no degree required means that students come from a wide range of age groups and personal backgrounds (including around 50 per cent with a migration background). The demand for graduates of 42 on the labour market is also an indicator of the acceptance of the open admissions approach in the economy. However, the effect, for example in the form of a higher female student body, is not significant. This indicates that the change in admission requirements cannot necessarily neutralise other factors that contribute to the low proportion of women in the tech sector (e.g. the school system, other social factors). For this reason, 42 Heilbronn intends to develop further measures in the future through marketing and cooperation with schools.

42 Heilbronn has so far been able to adapt effectively to changing contexts, such as those that exist in the IT sector: Through Network 42, 42 Heilbronn can access an updated curriculum every month, which a team of educators in Paris is responsible for. However, by coordinating the content centrally, 42 Heilbronn partly has to sacrifice its own flexibility.

How could German universities utilise the 42 Heilbronn approach?

The 42 model has proven its scalability and is now used in 36 training centres in 20 countries worldwide. In addition to 42 Heilbronn, there are two other locations in Germany in Wolfsburg and Berlin. However, the scalability of the disruptive overall concept could be further enhanced through collaboration with the existing university system. The transfer of individual elements of the approach to other institutions could also be improved.

Corresponding concepts for implementation are currently being developed in cooperation with Heilbronn University (HHN). Through this cooperation, students of 42 Heilbronn can take supplementary business courses at HHN and even obtain a university degree. In future, students at HHN will also be able to obtain

¹⁸ In France in particular, there are other examples of comparable learning models in the tech sector, such as École 2600 and Holberton. In Germany, the CODE University of Applied Sciences also pursues an open, multi-stage selection and learning approach.

ECTS points for 42 modules. The functionality of this cooperation and the challenges of combining traditional teaching with peer learning approaches are still largely under scrutiny. However, the project shows that integration is conceivable for universities in Germany if the existing room for manoeuvre on the part of the universities is used.

Both the approach of new admission procedures and the integration of project-based peer learning also harbour further potential for the German higher education landscape:

Innovative admission procedures

The formal higher education system in Germany requires a higher education entrance qualification or training with demonstrable professional experience. This means that the adoption of the exclusively test-based admissions system, as with the 42, cannot be transferred without further ado. Nevertheless, universities could take inspiration from the 42's gamified tests and assessment centres. While some subjects with restricted admission already use test procedures (e.g. medicine), other disciplines and even those without admission restrictions (this applies in particular to technical fields) could also use such admission procedures in a more targeted manner in order to more adequately assess the applicants' ability to study and better prepare them for their studies in order to reduce drop-out rates. Since the introduction of such a selection procedure is expected to require more resources, especially for degree programmes without admission restrictions, the **transferability is considered to be medium**.

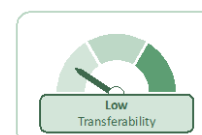


As in the case of 42, the expected **effectiveness** of new admission procedures on the composition of student bodies (and thus on more trained (STEM) specialists) is highly dependent on the specific subject context, which is why it can be categorised as **medium**. If the admission requirements have previously been highly restrictive and primarily focused on academic performance, for example, a skills-based selection process can be expected to increase the diversity of the student body in terms of socio-economic backgrounds. A smaller effect is to be expected for degree programmes with previously low hurdles. *Accompanying (advertising) measures* are therefore worth considering to increase the effectiveness of the approach in order to achieve greater diversity among students, particularly in STEM subjects but also in the teaching profession.

Peer learning and evaluating approaches

Peer learning and project-based elements also exist in "traditional" universities, for example in team projects such as business plan competitions in entrepreneurship degree programmes or in collaborative learning projects in teacher training courses. However, the consistent alignment of an entire degree programme with this approach - including appropriate supervision and without timetables and grades - is a radical implementation and requires great effort. Even if the lack of teaching staff saves costs, the design and regular updating of the curriculum as well as the supervision of students and business partnerships require resources and specific expertise that could exceed those of conventional universities. Analogous to the 42 network, however, it would be conceivable for various universities to centralise these tasks in a network and with relevant personnel (from industry) and thus realise synergies.

However, the strong orientation towards the workplace requirements of programmers, which enables this form of independent collaboration between students, cannot be easily transferred to other specialist and work cultures. For example, unlike computer scientists, medical professionals cannot fall back on the culture of a coding portfolio, which can replace quality checks by teachers and convince companies. 42's peer learning approach also benefits from the culture of the IT community to help each other, for example via GitHub, and to deal openly with their own code products. A creative interpretation of the approach in other specialist contexts, at least in individual project-based modules, is nevertheless conceivable, for example in disciplines such as law, where work is case-based. To summarise, despite the savings in teaching staff, only a **low level of transferability** is to be expected, as a high level of resources will be required to transfer



the approach to other disciplines and to develop and maintain a comprehensive peer learning approach (even if they are shared). The approach should initially be piloted in individual modules.

If such an approach is implemented consistently (in a network or on a university-by-university basis), a **high level of effectiveness** can be expected - analogous to the monitoring data from 42 Heilbronn - in terms of better and sustainable learning success, more perseverance and ultimately a higher number of graduates. Since not every subject area has a comparatively high demand for skilled labour like the tech sector, a lower start-up and employment rate can be expected in some disciplines. However, with more sustainable learning successes and possibly coupled with company cooperation in the curricular projects, an increase can still be assumed.

Conclusion

42 Heilbronn shows that, at least in the software sector, an innovative type of STEM specialist training can be very effective if it is consistently focusing on students and their future working environment. The admissions model, including the awarding of scholarships to students, can also contribute (to a limited extent) to diversity and equal access in the higher education sector.

Especially for "shortage subjects", higher education policy stakeholders could offer universities more legal and funding policy freedom for admission procedures in order to enable the testing of innovative models. Universities and individual departments could integrate peer learning and peer evaluating into curricula not only through cooperation with 42, but also independently and in other subject areas even more comprehensively and with appropriate pedagogical support, for example in the form of entire modules.

6.5 College Unbound (CU)- Overcoming barriers to learning through "Credits for Life Experience"

College Unbound: Key data

Formal framework	University (accredited), approx. 450 students
Location	Providence, Rhode Island, US, further students in Philadelphia, PA, Camden, NJ, and Chicago, IL
Foundation	2009
Innovation	<ul style="list-style-type: none"> • Specialisation for adults who want to complete their discontinued college education • Recognition of non-university experience as credits
Systemic embedding	New foundation
Link	www.collegeunbound.edu

In focus: Which pain points of the higher education system does College Unbound address?

- Universities must remove barriers that prevent or impede access to higher education for suitable students. CU enables adult learners who were unable to complete their university studies due to a wide range of barriers to catch up on their Bachelor's degree through a comprehensive system of recognition of university and non-university achievements.
- Universities must provide flexible teaching and learning opportunities for continuing education in the spirit of lifelong learning. CU students, who are generally employed, can acquire the skills and knowledge relevant to them through personalised and interest-based learning plans in the programme Organisational Leadership and Change.

What makes College Unbound innovative?

New crediting systems

CU is an accredited university and offers the Bachelor's programme "Organisational Leadership and Change" as its only degree programme. The University differs from conventional universities primarily in terms of its target group: CU explicitly addresses people who were unable to complete their university studies due to *social barriers*. To make it easier for them to return to university, CU offers students a range of measures. Firstly, students can transfer their previous academic achievements to the new degree programme following a review by the University. At the same time, so-called LIP credits ("Learning in Public") can be recognised through proof of a portfolio, an interview or written work. The students' experience is assessed by two experts. This means that non-university experience, for example gained in the workplace or in voluntary work, is also included in the assessment. In this way, CU not only takes into account students' *existing life plans*, but also makes them the core of the degree programme.

CU also actively counteracts the *financial barrier*, which is an obstacle for many students in the USA. With a cap of \$10,000 per year, the tuition fees for the programme are affordable compared to other American universities. The recognition system allows students to graduate faster and save financial resources - the average time to graduation is only 1.8 years. Students also benefit from personalised financial advice on scholarships and government financial aid from the University.

CU also creates the organisational framework that allows students to integrate their studies into their everyday lives. Through a combination of online teaching and just one fixed weekly course per semester, students can complete their degree alongside a full-time job. Students also do not have to be continuously enrolled. At the same time, the "World & Workplace Lab" offers students a place with catering and childcare where they can work together on projects. Another supportive element is the division of students into **cohorts** for the duration of the programme according to their personal interests and experience. In this way, CU aims to ensure student success through a consolidated, personalised learning environment that is mutually supportive.

Teaching and learning content for lifelong learning

CU does not separate academic work from non-academic contexts, but integrates them during admission, but also through problem- and project-based and thus *personalised learning plans*. At the heart of the Organisational Leadership and Change programme is the design and implementation of a *community service project*. By gearing these projects towards the goals and interests of the students, the programme aims to integrate the realities of the students' lives into the course content.

Students should acquire the necessary knowledge and skills in the modules. Examples include the courses "Writing for Change", "Contextualising Work", "Reframing Failure" and "Civic Engagement". Students are not assessed in traditional examination formats, but rather, for example, in the form of learning exhibitions, by professional mentors or by the students themselves.

This course content is geared towards achieving the so-called "Big 10 Leadership & Change Competencies", ten key leadership competencies: Accountability, Advocacy for Self and Others, Collaboration, Communication, Creativity, Critical Thinking, Intercultural Engagement, Problem Solving, Reflection, Resilience. These are considered qualifications for graduation and lie at the centre of every course. For credit transfer, students must also demonstrate that a particular activity has contributed to one or more of these competencies and demonstrate how the learning process has been organised. Ultimately, the focus should be on personal initiative and the realisation of one's own goals, so that students are empowered to realise their visions and strengthened in their self-efficacy.

Is College Unbound effective and adaptive?

The fact that CU manages to appeal to non-traditional students is reflected in the student statistics. These show an above-average proportion of women, people from ethnic minorities, students of colour and students with children.

A study by the American Council of Education also measures the success of the University model by the high graduation rate of 83 per cent. 65 per cent of CU students are subsequently enrolled in a master's programme, and 20 per cent of graduates transfer to graduate school within three years of graduation. The percentage of students who were able to advance to a better professional position at their workplace or join another employer during their first year at the University is also 83 per cent. An internal survey of alumni shows that graduate students earn an average of \$14,400 more annually after graduation than they did before graduation. This suggests that students were able to gain the necessary skills and knowledge during the programme to make a positive contribution in their workplace.

73 per cent of graduates continue their civil society graduation projects after completing their studies. The fact that the majority of graduates pursue their projects in the long term indicates CU's success in strengthening the social embedding and self-empowerment of students. At the same time, CU contributes to social transformation by successfully initiating long-term social projects: Students base the design of their projects on existing regional problems or needs where they see themselves and the people in their community affected. One example is the project of a graduate campaigning for the free removal of lead-contaminated and therefore highly harmful water pipes in the state of Rhode Island.

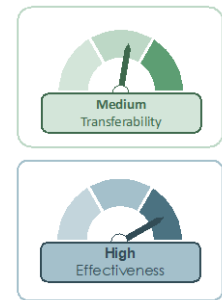
In just a few years, CU has grown from a local initiative in Rhode Island to a model existing in eight different states. More than 450 students are now involved overall. The University is also incrementally developing its own approach by addressing specific problems in individual initiatives. For example, there is the "TA to BA" programme, which is explicitly aimed at teaching assistants. These are often well qualified for the teaching profession thanks to their professional experience, but have no career opportunities in the USA without a Bachelor's degree. In addition, the CU regularly has learning cohorts made up of prison inmates as part of the "Prison Education Programme", who can obtain a degree despite their incarceration status. The programme initially grew from a course offering at prisons in 2015 and is intended to reflect CU's mission to enable knowledge and further education across learning barriers. The online modules and the flexibility of the study model allow the programme to be delivered in prisons. The establishment of different learning cohorts at different locations demonstrates the scalability of the approach, which explicitly does not take the path of increasing the size of the initial institution.

Although CU only offers a single degree programme, there is room for adaptation by aligning the course content with specific skills. For example, the Big 10 have been adapted to a changing society in consultation with teaching staff over the last few years. Consideration is currently being given to including health (understood individually and culturally) as a critical skill.

How could German universities utilise the College Unbound approach?

New crediting systems

As a model, CU harbours various transfer potentials for the German higher education system. Particularly in view of the current shortage of skilled labour in Germany, universities must lower the barriers to higher education and also motivate non-traditional students to graduate. The aim here is not only to counteract drop-outs, but also to pave the way to higher education for a heterogeneous group. To achieve this, the self-image of universities must fundamentally change. CU President Adam Bush hopes that "*College Unbound serves as a model for adaptation as an institutional ethic that can drive continuous development and iterative assessment in response to student needs, exemplifying a commitment to the common good that shifts the focus on higher education from 'how it is' to 'how it could be'.*"



Consideration of students' existing experiences and life plans should therefore be at the centre of course structure and content and is the first task for German universities.

As a concrete measure for this goal, the CU *credit transfer system*, for example, could be a promising option in the German system.¹⁹ In the German context, this could make it easier for refugees and migrants in particular to obtain a university degree. If previous non-formal or informally acquired skills²⁰ are taken into account, people can be integrated into the labour market more quickly and gain long-term career prospects with a university degree. A higher education system that recognises diverse skills as academic achievements could also establish itself as an attraction factor for people from abroad, who are so urgently needed in the German labour market. To date, Germany has strict requirements that restrict the recognition of *foreign academic achievements*, even if they are proven with foreign educational certificates. As a result, these people often work in underqualified jobs or have to repeat their studies after a long diversion. The recognition of *skills and knowledge acquired outside of university* for a university degree programme has also been possible in principle since the 2002 resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Federal states in Germany, but is less or not at all widespread at universities, even though universities are generally obliged to credit up to 50 percent of study achievements for skills and knowledge acquired outside of university.²¹ The reasons for this are a lack of knowledge about this possibility on the part of learners as well as reservations and rejection on the part of the universities. In terms of implementation, it could be expedient to orientate study objectives more towards skills, which may be easier to demonstrate than content. In the case of CU, the fact that competences are generally regarded as learning objectives simplifies recognition.

In general, it can be seen that a paradigm shift towards a stronger link between professional experience at universities could make simplified recognition possible in principle. At the same time, qualified staff are needed at universities for this (**medium transferability**). Targeted education on the part of politicians about what is already possible can and must contribute to such a change as a first step. The reasons mentioned above indicate that although the introduction of a recognition system based on the CU model is not entirely trivial, the potential for **high effectiveness in terms of reducing educational barriers** is certainly there.

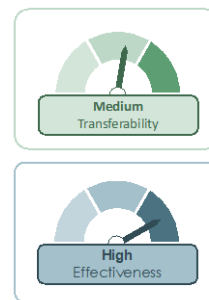
¹⁹ CODE University also pursues innovative recognition processes: here, recognition of informally and non-formally acquired skills is made possible through targeted interviews or oral examinations, code reviews and portfolio analyses. These recognition methods are used, for example, in the non-degree programme for people with a migration or refugee background.

²⁰ According to the HRK, non-university competences can be divided into non-formal (acquired in undocumented but planned learning formats, for example in-company further training) and informal (acquired in professional practice, not intended or organised).

²¹ HRK (2024) ANI Recognition and credit transfer in degree programmes

Teaching and learning content for lifelong learning

German universities can also learn from the alignment of teaching and learning content with the requirements of the labour market. By imparting professionally relevant skills to adult learners, CU fulfils the task of "re- and upskilling" in the sense of lifelong learning (high effectiveness). Corresponding measures such as freedom of choice with regard to study modules or the implementation of own projects are also becoming increasingly common in degree programmes in this country. What is special, however, is the embedding of this content in a programme that is explicitly aimed at adult learners. This combination also seems to make sense for German universities. With its model, CU shows that both can work at the same time: To explicitly promote access to tertiary education for those social groups that have previously faced considerable barriers, and at the same time to impart professionally relevant skills in the sense of continuing education. In doing so, CU redefines the concept of lifelong learning: for the university, this primarily means meeting people where they currently stand in their lives and careers. The fact that such a focus on the reality of learners goes hand in hand with measurable inclusion and high academic success must also be considered groundbreaking for the German higher education system. The greatest challenge in that sense is not the legal or financial hurdles, but the need for a fundamental perspective change regarding the institution of universities and their mission (medium transferability).



Conclusion

College Unbound demonstrates that non-traditional students can also study successfully if they are actively considered and explicitly addressed by the higher education system. Offering an accessible and affordable study format for adult learners that fits into the existing reality of students' lives describes a lifelong learning strategy that can be easily replicated. For the German higher education system, the recognition system offers orientation for the necessary change towards a coexistence of professional and academic achievements.

6.6 Minerva University - Experiential learning in international metropolises

Minerva University: Key data

Formal framework	Private accredited university with exclusively online teaching and student residences distributed across the city, approx. 600 students
Location	San Francisco Other locations: Seoul, Taipei, Hyderabad, Buenos Aires, London, Berlin
Foundation	2012 (first class in 2014)
Innovation	<ul style="list-style-type: none"> • Cross-institutional & competence-orientated curriculum and performance measurement • Internationally changing living and learning locations for students & location-based projects
Systemic embedding	Accredited since 2021 Transfer of own approach via Minerva Project
Link	www.minerva.edu

In focus: Which pain points of the higher education system does Minerva University address?

- How can teaching content be dynamically adapted and geared towards the successful teaching of future skills? Minerva's interdisciplinary curriculum is an example of a radical orientation towards transversal competences that enable students to constantly adapt to an ever-changing world. The teaching content and performance assessments, which are designed to be coherent across institutions, are regularly revised on the basis of scientific research.
- Trying out new learning experiences with innovative teaching methods is a challenge for traditional universities. Minerva offers its students new learning experiences by rethinking the place of teaching and learning, for example through online teaching combined with social embedding of the learners in the student community at changing international locations. The example shows how universities can fundamentally redesign their infrastructures (in a lean way) and successfully train students to become sought-after specialists and leaders through (locally embedded) experiential learning.

What makes Minerva University innovative?

Minerva University is a private American university that does not have a campus in the traditional sense, i.e. with physical teaching locations. Instead, courses are taught exclusively in virtual rooms on an *Active Learning Platform*, while students live together at one location in a student residence (*hybrid residential model*). Over the course of their studies, students move between Minerva locations in seven different countries each semester. They are supported by a local Residential Life Manager. Despite online teaching, the aim is to strengthen the social network between the respective cohorts (peer network). The changing "exposure" to international metropolises is also intended to shape students into "global citizens". As the students are expected to use the facilities in the respective cities, such as public libraries, costs are also saved that are incurred at traditional universities.

The concept of a distributed student body is combined with an *interdisciplinary curriculum and competency-based performance assessment* as well as a strongly *project-based didactic approach* (experiential learning). Minerva's curriculum and performance assessment are based entirely on a taxonomy of transversal competences, the so-called "Habits of Mind and Foundational Concepts (HC)". These cognitive skills include critical thinking, creative thinking, effective communication and effective interaction. In practice, this means that the first year of study focuses entirely on the basic teaching of these skills and is the same for all students ("Foundation Year"). In the following three years of study, a major subject is chosen in which the content from the first year is tested and applied ("active learning pedagogy"). However, the major subject is also very broadly defined, in Arts & Humanities, Business, Computational Sciences, Natural Sciences or Social Sciences. The final year concludes with a capstone project, in which students pursue a topic of their choice (for example, developing a business plan for a social project). Minerva thus stands in stark contrast to conventional, discipline-oriented degree programmes, which focus on imparting certain specialist knowledge and discipline-specific methods, meaning that the specific structure of teaching and skills profiles differs from discipline to discipline.

Teaching takes place in small, exclusively digital seminar formats and is supplemented by local project tasks at the respective location ("co-curriculars and location-based assignments"). The *online learning platform "Forum"* is used for the former. It is not only used for the interactive communication of learning content, but also for data collection. Individual study performance is tracked in detail via the platform, for example by tracking speaking times and the quality of speeches. Teachers then evaluate the collected performance indicators using the HC. The supplementary *local civil society tasks ("civic projects")* are coordinated with the teaching content and implemented with local partners, for example NGOs, companies or research

laboratories. They are identified and supported by local Minerva employees (three people per location) and a global Student Affairs team.

Is Minerva University effective and adaptive?

With the concept of the *hybrid residential model and the competency-based curriculum*, Minerva aims to successfully equip students with the skills necessary for future-relevant tasks (especially adaptability) and to promote student satisfaction. Minerva University has so far graduated three undergraduate and three graduate classes (more than 400 alumnae and alumni), so the data on effectiveness is limited. The high graduation rate of 90 per cent gives an initial indication that the new learning experiences Minerva creates through its pedagogical approach leads to low drop-out rates. The transition into the labour market is also successful (69-80 percent of graduates have a career-relevant job within six months after graduation)²² and could indicate that the course content has strengthened relevant skills. However, the graduation and employment figures could also be explained by the fact that Minerva sets a particularly competitive admission quota and therefore selects students who are already expected to be successful.²³ Student and alumni surveys on skills development are therefore likely to be more meaningful. While Minerva has only just piloted the latter, the alumni surveys already show that 33 per cent of alumni use the HCs regularly or often; for 79 per cent, their current profession is linked to the practical elements of the Minerva training programme (civic project, research project, internship, etc.).

Minerva aims to constantly adapt and develop its own teaching content and methods and to promote institutional learning. This is ensured by the fact that the *reward system for teaching staff* is strongly focused on teaching (for example, contract extensions for staff, most of whom are employed on a temporary basis, depend on teaching evaluations) and not on academic performance. This is reflected, for example, in the fact that teaching staff are constantly undergoing further training and taking part in or setting up conferences or working groups, for example on artificial intelligence in higher education. The revision of the curriculum is always a holistic process, as it follows holistic principles and assessment mechanisms in contrast to discipline-specific curricula.

How could German universities utilise Minerva University's approach?

From the very beginning, the founder of Minerva University, Ben Nelson, formulated the claim that Minerva should be a role model for existing universities. With his company *Minerva Project*, which set up Minerva University, he continues this claim in an entrepreneurial way and supports universities in adopting Minerva's approaches. Minerva has been able to demonstrate scalability here, particularly with regard to the curriculum, which the University of Miami (US) and Zayed University (UAE), for example, have adapted. Minerva has also been able to integrate itself systemically into the American higher education context over time; it has been independently accredited since 2021.

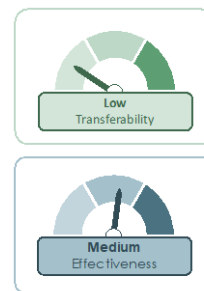
Institution-wide agile competence framework (in interdisciplinary fields of study)

Competence-orientated curricula are not a new concept in the German higher education system, at least not since the Bologna reform. The number of interdisciplinary degree programmes is also steadily increasing in Germany. However, it is the institution-wide harmonised design of a competency framework with a focus on transfer competencies and its adaptability that could be an inspiration for German universities.

²² The data is based on survey results conducted by Minerva among the graduating classes of 2019-2022. It also shows that they occupy very diverse positions and industries: the majority (32 per cent) work in the tech industry; 13 per cent are employed in education and 10 per cent in the financial sector. Most alumni are software engineers or data analysts (15.9 per cent, 7 per cent).

²³ The three-part admission process is based on the fulfilment of challenges, the assessment of previous achievements (school grades etc.) and an interview process. The acceptance rate is around 1.2 per cent.

For German universities, however, high hurdles are to be expected if they want to utilise the approach for themselves (**low transferability**). The Minerva case shows on the one hand that the adaptability of teaching content is heavily dependent on the incentive systems for teaching staff. A comparable incentive system is particularly difficult to implement at universities with a limited teaching load and is only used selectively through funding programmes for teaching innovation. It can also be assumed that training in a Minerva degree programme might not be sufficient for professional fields that require particularly subject-specific knowledge, such as cancer research. Universities or higher education policy stakeholders wishing to approach a comparably interdisciplinary curriculum should therefore examine in detail which industry challenges and future social fields of action they can address with their programme.

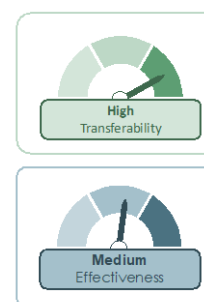


According to the interview, Minerva's approach is effective in terms of dynamic adaptation thanks to the strong incentive structures for teachers. However, whether Minerva's interdisciplinary curriculum effectively trains the right future skills cannot be proven due to a lack of data and in view of a possible selection bias, but it seems at least plausible that the strengthening of transfer competences (initial measurements are available here) has promoted students. As a result, a **medium level of effectiveness** can therefore be assumed.

Cohort-wise stays abroad and local project work

The approach of rotating students between international campuses already exists in the German higher education system in some cases, for example for degree programmes offered by university alliances. For example, students on the Erasmus Mundus Joint Master's degree programme [MARIHE](#) rotate between campuses in Finland, Austria and China/India.²⁴ However, the combination with cohort accommodation is less common - an approach that could be more strongly integrated into a wide range of cross-institutional degree programmes. Outside of dedicated research stays (for example as part of a qualification thesis), collaboration with local stakeholders via (curricular) project work during stays abroad has rarely been used in the German higher education system, especially in less application-oriented degree programmes. It would be conceivable to combine both approaches (rotation and "glocal" project work).

Depending on the context, there are few hurdles for both approaches at German universities, which is why they are characterised by a **high degree of transferability**. This applies in particular to international degree programmes that already take place across universities, as they build on existing collaborations and are therefore likely to face fewer administrative hurdles (e.g. with regard to overlapping semester times). Faculties that already maintain existing international university partnerships for student mobility could also utilise these for cohort-based exchanges or project work. Nevertheless, additional resources must be expected: International, locally anchored project work requires good support from trained staff on site. Organisationally, the cohort-based accommodation of entire degree programmes is also likely to involve greater administrative effort (other mobility hurdles such as visa allocation, differences in accommodation costs, etc.). This is also likely to increase if the approaches are developed outside of existing internationalisation partnerships (administrative hurdles of different university systems, establishment of a trusting partnership).



Due to a lack of reliable data from the case study, the effectiveness of both approaches can only be estimated. On the one hand, it can be assumed that the more targeted use of the "stay abroad" instrument combined with new learning experiences (especially in the case of cohort-based travel) should lead to an increased attractiveness of study programmes. Stronger local roots and embedding abroad should also plausibly lead to improved learning experiences, which in turn should promote a strengthening of

²⁴ Further examples of international rotation, challenge-based learning and projects with local stakeholders can be found in the programmes of the various European University Alliances (e.g. [CHARM-EU](#)).

competences and higher numbers of graduates. Since, on the other hand, stays abroad are unlikely to influence overall academic success, a **medium level of effectiveness** is assumed.

Conclusion

For German universities, Minerva University is an example of how innovation can also be possible with regard to the place where students teach and learn. The implementation of a more institutionally coherent curriculum with an interdisciplinary orientation based on Minerva's model could above all lead to improved adaptability (as a competence) and student satisfaction. However, the latter in particular would pose various challenges for the German higher education system. Above all, the institutionalised incentive systems for teaching innovations require university policy and financial support.

6.7 Interdisciplinary Transformation University Austria (IT:U) and Nuremberg University of Technology (UTN) - Structural agility for the foundation of a transformational university

Interdisciplinary Transformation University Austria and Nuremberg University of Technology: Key data

Formal framework	Publicly funded universities under construction
Location	Linz, Austria Nuremberg, Germany
Foundation	IT:U: 2022 (under the name IDSA); first PhD year planned for winter semester 2024/25 UTN: 2021; first year WiSe 2023/24
Innovation	<ul style="list-style-type: none"> • Agile department structures for interdisciplinary research and teaching • Diverse and flexible job formats
Systemic embedding	Model character in Germany and Austria Separate legal basis in each case
Link	www.it-u.at www.utn.de

In focus: Which pain points of the higher education system are addressed by the Interdisciplinary Transformation University Austria and the Technical University of Nuremberg?

- IT:U and UTN are approaches to start-ups that have not yet been extensively tested, but are promising and have the potential to trigger debates on structural changes and university start-ups.
- Long-established, institutionalised and codified forms of universities in Germany stand in the way of the aspiration to transform universities in a dynamic and future-oriented way. The development ideas and experiences of the newly founded universities IT:U and UTN show how a lean administration and departmental structures can potentially favour a rapid and interdisciplinary adaptation of teaching and the entire institution to changing requirements and needs.
- The structural challenges facing universities also include adapting as an employer to the standards of flexible working contexts and attractive alternatives, particularly in the technical field. The new universities UTN and IT:U also aim to recruit international, high-performing lecturers. IT:U is trialling new formats such as lighthouse, dual, and practice professorships, supplemented by external teaching staff.

IT:U and UTN are the largest university start-ups in Austria and Germany in recent years. As such, both pursue the goal of serving the respective national higher education system as a transformative model for a sustainable higher education landscape and regularly exchange ideas with each other. Both universities are in the process of being established, which means that their planned or chosen approaches cannot yet be tested for effectiveness. The comparative examination of their partly similar, partly different approaches and challenges also offers existing universities the opportunity to benefit from concrete lessons learned from the development and implementation of new concepts for higher education organisational structures.

Context: Status of university foundations

The founding of IT:U in Linz, Upper Austria, was announced by the Austrian federal government in 2020 and enshrined in a separate federal law (2022). The establishment was supported by scientific expertise. A founding convention is currently working together with a founding president on the further organisation of the University (including defining strategic principles and a provisional statute). In cooperation with the municipal company Ars Electronica, IT:U is also working with the "Founding Lab" workshop series with the participation of students and other stakeholders on the orientation of the study and research programme. Ten professorships and other positions are currently being advertised; the first doctoral places are to be offered in 2024 and the first Master's degree programme in 2025.

In its strategic principles, IT:U emphasises that it takes into account the experience of similar projects such as the UTN. This is not surprising, as the UTN was announced just a few years before the IT:U (2017), was founded in a similar timeframe (2021) and is planning for a similar student capacity of 5000-6000 places. The founding of the UTN was also politically initiated. It is part of an education investment package of the Bavarian state government, and a separate state law was also passed in the case of the UTN. The implementation status of the UTN is more advanced than that of the IT:U. Not only has the campus been under construction since 2022, but several founding professors and vice presidents have already been appointed. The first cohort of students began their Master's degree programme in the 2023/24 winter semester. Nevertheless, both institutions are signalling their openness to mutual inspiration and the UTN also emphasises that it is following the developments at IT:U.

What makes the IT:U and UTN concepts innovative?

In addition to the goal of creating modern model universities, the IT:U and the UTN are united by their emphasis on *structurally anchored interdisciplinarity and flexibility*. IT:U focuses on interdisciplinarity through its thematic concentration on "digital transformation". At the same time, it primarily aims to train

generalists who combine interdisciplinary aspects in a solution-orientated way and thus have future skills. In other words, the main aim is to attract students who are not considering taking up a purely technical degree programme. Structurally, this should be made possible by *flat and flexible university organisational structures*, among other things. The aim is therefore not to establish traditional chairs, but rather temporary links, so-called "affinity groups" and "communities of practice", which should be able to react to the global "knowledge market" in a demand-orientated manner. Comparable structures, which are still at the conceptual stage at IT:U, already exist in part at the UTN.

The UTN has a comparatively broad disciplinary self-image in the sense of a technical university and does not focus on a term such as digital transformation. Instead, seven so-called fields of activity have been developed. These include Biosystems, Autonomous Systems, Health Care and Civil Security. These cross-cutting topics, which are supposed to remain relevant for 10-20 years, represent the reference framework for interdisciplinary collaboration between research and teaching. Instead of individual chairs organised in departments, there will be professorships at the UTN that are organised in departments (such as Computer Science, Biological Engineering, Humanities and Social Sciences). All departments work in research and teaching in each of the fields of activity and are thus interlinked with them. For teaching, for example the development of degree programmes, this means that at least 20 percent of each degree programme must be allocated to the humanities and social sciences. Different departments must therefore work together for a degree programme that focuses on at least one of the fields of activity. The departments are supported by a central unit, the School of Students and Young Researchers (StaRs for short, previously "Graduate School"). In addition, the departments manage the personnel and material costs of their professorships, which do not have their own support capacities, so that flat hierarchies, flexible adaptation options and a cross-institutional identity are also to be structurally strengthened.

When designing the IT:U and the UTN, a major role was also played by how the universities recruit and deploy *professorial and teaching staff* in order to fulfil their own requirements in terms of agility and teaching quality. Both universities are initially planning with a high supervision ratio, with UTN envisaging 25-30 students per professorship and IT:U even only 5 students per supervision unit (not necessarily professorship). In its concept, the UTN focuses primarily on transparent career paths. It therefore provides for the three professorial categories of tenure track Assistant Professor, Associate Professor and Full Professor, which are awarded on the basis of merit.

IT:U is (prospectively) breaking new ground by focusing on agility both in the employment of staff and in the demand-dependent variance of professorship types. IT:U is subject to less strict legal requirements, meaning that employees are not covered by the collective labour agreement for universities in Austria and can primarily be employed on a temporary basis. A distinction is also made between traditional, specialised professorships and lighthouse, dual and practice professorships. *Lighthouse professorships* are personalised and can be awarded to particularly renowned individuals without a call for applications and the associated appointment committee.²⁵ *Dual professorships* enable professors to divide their teaching and research workload equally between another university and IT:U. Such a procedure could prove to be particularly useful for new university start-ups, as it makes it easier to acquire renowned professors who are involved elsewhere. The call for applications for *practical professorships* is in line with IT:U's business and practice-orientated approach and its intention to cooperate with local institutions. They are awarded to people from companies and other institutions without a traditional academic background who are expected to provide high-quality teaching in a specific field. In principle, practice professorships are personalised and temporary. By means of these special types of professorship, IT:U lays the foundations for the *most flexible possible recruitment of a broad group of people*.

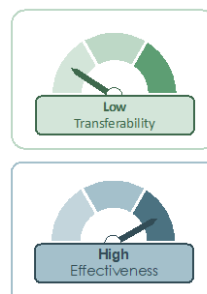
²⁵ The UTN is pursuing a similar approach. This concept is likely to be easier to implement at universities that are being established and have political and financial backing than at existing universities with limited resources.

How could German universities utilise the concepts of the Interdisciplinary Transformation University Austria and the Technical University of Nuremberg? ²⁶

Key innovative elements of IT:U and UTN are agile organisational structures and new job models for professors and teaching staff.

Agile department structures

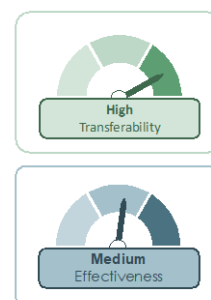
The idea of setting up departmental structures to replace chairs has been implemented many times at international level and is also being discussed politically in Germany and has already been introduced to varying degrees (including at the University of Mannheim, University of Rostock, Eberswalde University for Sustainable Development and the Technical University of Munich). However, the UTN and, in the long term, the IT:U are examples of a *comprehensive* application of the model that demonstrate the potential for interdisciplinary collaboration. A stronger application of departmental models across faculties could therefore be a path that established universities could also consider if the two cases²⁷ are evaluated positively. As this implies that university structures would have to be reorganised administratively, it is difficult to imagine a comprehensive implementation during the ongoing operation of a university (**low transferability**). A step-by-step implementation and testing would be worth considering here, starting for example as part of a cross-faculty excellence initiative.



Even if the departmental structure is still being developed at the UTN and its effectiveness cannot yet be measured, international experience with a consistently implemented (Anglo-Saxon) departmental model and the assessment of the German Council of Science and Humanities²⁸ indicate that this approach could also potentially be **highly effective** at other German universities. Stronger interdisciplinary cooperation between subjects would also plausibly be strengthened at other German universities if degree programmes were developed and implemented jointly and supported by a central unit (Graduate School in the UTN model). The customisable interlinking of departments with fields of activity would in turn enable German universities to react more flexibly to changing environmental situations. The centralised management of resources in the departments instead of at chairs should lead to greater (resource) efficiency.

Diverse professorship models

Various types of professorships already exist within the German and Austrian university system. The practical professorships and the generalist approach of the IT:U can be compared with teaching at Universities of Applied Sciences (UAS). It must therefore be considered to what extent a practice-based reform of university teaching in Germany affects the distinguishing feature of UAS or to what extent a greater practical orientation must necessarily be anchored in the personnel structures. Lighthouse or dual professorships, on the other hand, could also open up new recruitment opportunities for existing universities and Universities of Applied Sciences in Germany. In the case of UAS, new professorship models are already being tested on a large scale as part of the federal-state programme "FH-Personal". The decision-making competences do not have to (and cannot) be pooled as radically among a few people as the IT:U makes possible (currently with the founding convention and the founding president). However, the example shows the (potential) advantages that streamlining processes and making options more flexible can have in terms of implementation. The idea of dual professorships in particular (as have been trialled at some Swiss universities and also exist in Germany in cooperation with non-university research institutions) could enable smaller universities or universities in the process of being established to attract renowned professors who are already involved in other institutions. For special roles such as the practice professorship, probably no legal precedent would need to be created in Germany, as the Federal Higher Education Framework Act (HRG) does not require a habilitation for a professorship, but only a completed university degree (**high transferability**).



²⁶ As IT:U and UTN are new institutions and the effectiveness of their approaches could not yet be measured, no assessment of effectiveness is made here.

²⁷ These are planned, but more detailed concepts for monitoring have not yet been developed.

²⁸ WR (2020): Statement on the concept for the foundation of the Technical University of Nuremberg

So far, both the UTN and the IT:U have shown that appointment procedures are a key challenge, even (and especially) for new, well-resourced universities. This is also due to the fact that it is not only the professorship model that influences a successful appointment, especially for international candidates, but that other contextual factors are also relevant. In the case of newly founded universities, it is additional tasks and a lack of structures that initially confront newly appointed professors and can influence interested candidates in their decision. However, here and at existing universities, other motivations can be the location, appointment conditions, competition with the industry and other factors. The introduction of new professorship models can therefore be expected to be *moderately effective*.

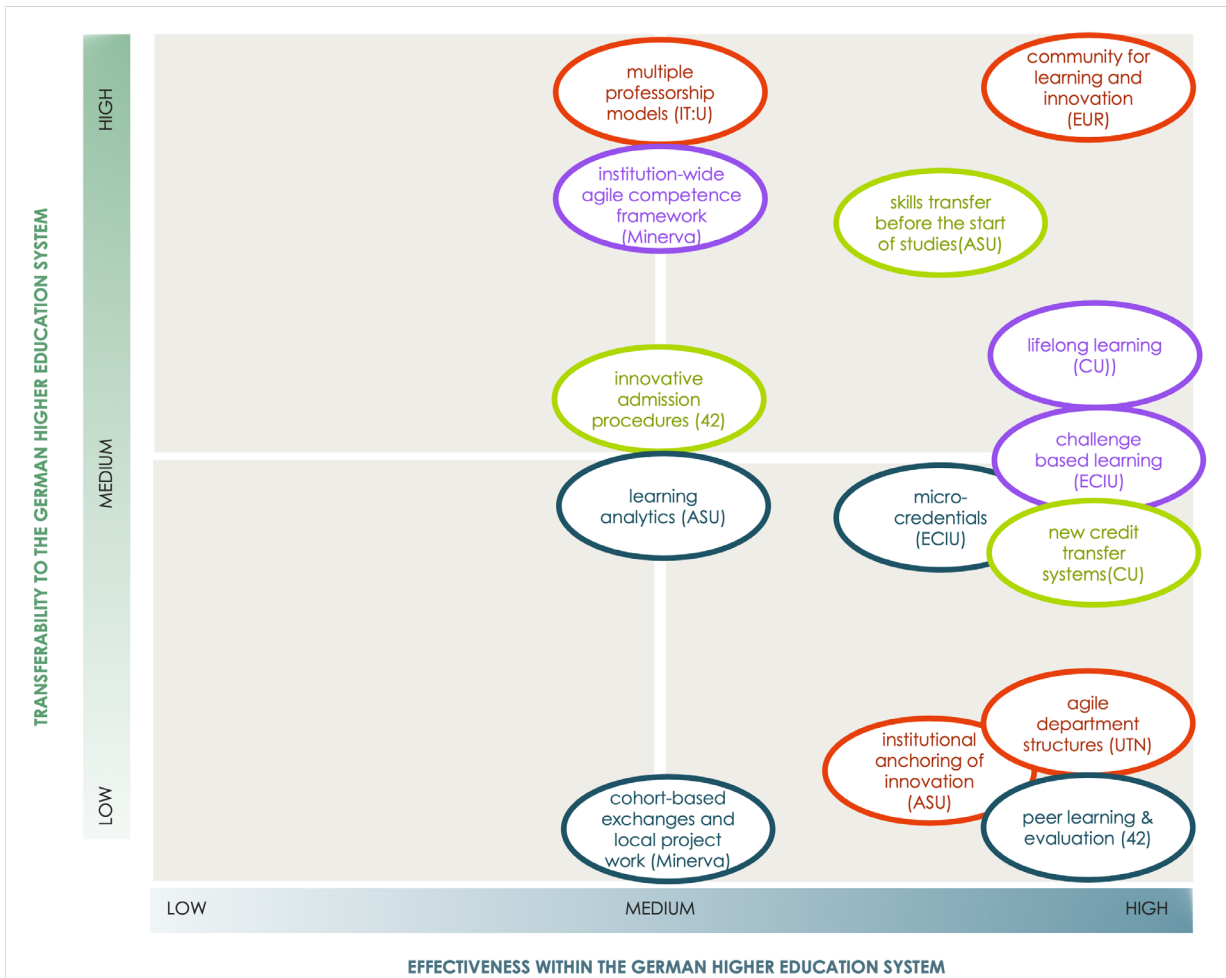
Conclusion

As wildcards, IT:U and UTN illustrate the potential and challenges of current university start-ups. They should be regarded less as examples of innovations that have already been realised and more as an opportunity to learn from the experience gained there. However, some aspects, such as the special legal basis of IT:U and the resources available to start-ups, are difficult to transfer to the entire university landscape. However, the testing of interdisciplinary organisational structures at UTN and the diversity of different types of professorships at IT:U enable the piloting of approaches that could strengthen international competition for professorial staff and the structural agility of universities in the future. Ultimately, both cases show that structural innovations "out of the box" are also conceivable in the DACH context.

6.8 Overarching categorisation of innovative approaches

The international and German innovation approaches explored in the case studies harbour various potentials for the German higher education landscape as a whole. Figure 1 provides an overview of how the study team classifies the identified approaches in terms of their expected transferability and effectiveness in the German higher education system (see the relevant case study chapters for the respective categorisations). This categorisation can support higher education institutions in weighing up the respective advantages and disadvantages of the approaches and is explained in more detail in the respective case studies.

Illustration 1 Matrix presentation of innovative approaches according to transferability and effectiveness



Grade: PainPoint 1 (Insufficient access/inclusion) | PainPoint 2 (Lack of adaptation of teaching and learning content) | PainPoint 3 (Lack of innovation in learning experiences) | PainPoint 4 (Insufficient structural agility)

The comparative analysis initially shows that all identified approaches could be worthwhile for implementation in terms of their potential effectiveness according to the assessment of the study team. The approaches for learning experiences & teaching/learning methods (Pain Point 3, shown in dark green) are the most difficult to transfer to the German context according to the study team's assessment, while Pain Point 1 (inclusion and diversity) and Pain Point 2 (teaching and learning content) can be addressed comparatively more easily with the three approaches proposed in each case. Approaches that are easy to implement/scale and at the same time particularly effective ("low hanging fruits") are, above all, the teaching formats for strengthening study skills (CU, PP 1) and the community-focused exchange processes and structures for innovation and quality in teaching (EUR, PP 4).

Irrespective of their categorisation in terms of transferability and effectiveness, the introduction of each approach and thus the addressing of pain points requires an active approach and design by universities and higher education policy stakeholders. The recommendations formulated below provide inspiration and guidance for this.

7. RECOMMENDATIONS ALONG THE PAIN POINTS

In the following, recommendations are derived along the pain points and per innovative approach for universities as well as for the higher education policy level. Due to the provisions of the Grundgesetz, the recommendations for higher education policy are primarily addressed to the state level - e.g. with regard to aspects such as professorial staff or higher education structures. In many cases, however, federal-state cooperation for cross-state networking and the exchange of experience or cooperation on the basis of Article 91b of the Grundgesetz, for example, is just as important. The recommendations are to be understood as suggestions, i.e. universities can use them to develop their own approaches, depending on which "pain point" they wish to address individually.

7.1 Pain Point 1: Insufficient access and integration of underrepresented student groups

The innovative approaches in this area address access to higher education, the diversity of the target group in the higher education sector and the integration of an increasingly diverse student body.

7.1.1 Case study: Arizona State University, approach: Skills transfer before the start of studies

As at Arizona State University, access to the higher education system could be effectively promoted through the teaching of skills before the start of studies by means of digital courses (see case study chapter 6.1).

Recommendations for universities	<ul style="list-style-type: none">• Universities should create more (digital) offerings in order to equalise unequal prerequisites in the study ability of applicants and thus make it easier for them to start their studies. Measures for this could include, for example, student mentoring groups, assessments and the provision of digital learning opportunities.• Universities should intensify cooperation with educational institutions in the secondary sector through strategic partnerships to facilitate transitions into the higher education system.• Universities should expand cross-university cooperation and initiatives, for example to jointly implement bridging courses, study information days, taster courses and counselling services (see, for example, the MINT-Kolleg Baden-Württemberg).
Recommendations for the higher education policy level	<ul style="list-style-type: none">• Higher education policy should promote the expansion of digital teaching/learning opportunities and initiatives for teaching study skills by actively supporting close cooperation between and with universities and schools (see, for example, the "Mathe-AG At Home" programme, which is funded by the federal government, among others). The BMBF's "Mein Bildungsraum" networking infrastructure offers completely new opportunities for cross-sectoral cooperation.• Higher education policy should lower barriers and create incentives for increased public-private learning platforms.

7.1.2 Case study: 42 Heilbronn, approach: innovative admission procedures

In view of the shortage of skilled labour, particularly in the STEM fields, innovative admission procedures, for example gamified tests such as those at 42 Heilbronn, could lead to more non-traditional students starting and progressing their studies (see case study chapter 6.4).

Recommendations for universities	<ul style="list-style-type: none">• Wherever possible, universities should focus less on formal qualifications and more on competences when admitting students. Innovative methods such as gamified tests could be used to reduce barriers to admission, particularly in STEM subjects with a high shortage of skilled labour.• In addition, universities should develop targeted communication measures to inform non-traditional students about the new admission procedures and access opportunities to higher education.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy should promote diversity and subject-specific adaptation of innovative admission procedures by commissioning feasibility and good practice studies, providing financial support measures for the development of procedures, developing quality standards and creating legal scope to initiate admission procedures for people without traditional admission qualifications at selected universities with greater discretionary powers for the university.• Higher education policy should examine whether the current (formal) accreditation criteria for radically innovative institutions, such as 42 Heilbronn, should be revised.

7.1.3 Case Study: College Unbound, approach: New Credit Transfer Systems

In order to successfully address a more diverse student body, universities could, as with College Unbound, take greater account of professional and voluntary achievements and informally acquired competences for the provision of academic services in the future (see case study chapter 6.5).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should advocate even better recognition of non-formal and informal achievements and competences acquired outside of school (e.g. via portfolios, interviews, written work). To this end, the long-standing best practices of private universities and the recognition procedures developed in relevant federal funding programmes can also be used.• Higher education institutions (especially universities, not just Universities of Applied Sciences) should increase transparency about existing opportunities for the recognition of informal and non-formal extracurricular achievements through target group-oriented campaigns and marketing measures.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy and the accreditation system must create a framework that allows all universities, regardless of their status, to organise credit transfer modalities of study and examination regulations more flexibly. Advertising and information initiatives such as the HRK's "AN!" programme should be expanded and promoted equally at UAS and universities.• In addition to the change in favour of increased sovereignty in the design of higher education curricula, higher education policy should promote the development of the necessary organisational capacities and skills for curriculum design. Relevant further training courses and the commissioning of experts from the field who also have experience in the recognition of credits earned abroad are suitable for this purpose.

7.2 Pain point 2: Lack of dynamism in adapting teaching and learning content to new skills requirements

The innovative approaches identified in this area explore ways to make the adaptation of teaching and learning content more dynamic and to specifically develop the knowledge and skills required for the future (future skills).

7.2.1 Case study: European Consortium of Innovative Universities, approach: challenge-based learning

The ECIU consortium's challenge-based learning approach enables skills development in direct cooperation with partners from education, business and society and thus adapts the teaching content to the challenges of society and industry (see case study chapter 6.3).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should promote challenge-based learning by establishing or expanding strategic collaborations with (regional) partners from education, business and society.• Universities should organise curricula and teaching content flexibly through open, competence-oriented module descriptions and regularly adapt them to take account of current (e.g. social, scientific or industry-relevant) issues.• Universities should develop and implement strategies for the systematic development and assessment of future skills.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy should continue to initiate targeted funding programmes for universities and practice partners that implement the challenge-based learning approach. These programmes should be in line with existing German and European initiatives. It is important that the funding programmes focus on concrete activities in multi-stakeholder initiatives, for example the joint adaptation of learning content and curricula or cooperative implementation projects.• Higher education policy should support the development and expansion of platforms and peer-to-peer structures for networking. These should bring together educational institutions, companies and social partners in order to jointly identify challenges and initiate projects. Such initiatives should take place both nationally and regionally in order to address specific local needs. A platform could also promote the exchange of best practices. These activities must be accompanied by a political will to bridge sectoral boundaries.

7.2.2 Case study: College Unbound, approach: teaching and learning content for lifelong learning

Career-relevant skills can be taught to adult learners in the spirit of lifelong learning via personalised curricula or project-based content such as College Unbound. The focus here is particularly on the inclusion of adults along their individual career paths and the alignment of teaching and learning content with the reality of the learners (see case study chapter 6.5).

Recommendations for Universities	<ul style="list-style-type: none">• Universities must reflect on and (re)define their role in lifelong learning. In order for (extra-occupational) adult education to also be anchored at universities, lecturers at universities in particular should see themselves more strongly as important players in this regard and be supported in this role.• In line with the new role of universities in lifelong learning, teaching content must be geared towards the individual career paths of learners (personalised curricula) and enable project-based approaches (see above) in order to teach career-relevant skills in a practical way.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy should continue to initiate an exchange on the role of universities in lifelong learning and as actors in (extra-occupational) adult education - building on completed programmes such as the BMBF's "Aufstieg durch Bildung" (Advancing through Education) programme.• In order to expand continuing education programmes at universities, it is necessary to enable credit to be awarded to lecturers. Implementation also requires further training programmes for teachers to prepare them for the specific needs of adult learners.• Higher education policy should encourage and promote the development of partnerships between adult education stakeholders (universities and other educational institutions, companies and non-profit organisations). The identification and exchange of best practices (including internationally where appropriate) should be initiated.

7.2.3 Case study: Minerva University, approach: institution-wide agile competence framework

With its institution-wide standardised competency framework, which emphasises transfer competencies, and the continuous adaptation of curricula by teachers, universities can take Minerva's response to the challenge of universities to educate their students sustainably while keeping teaching content up to date as an example (see case study chapter 6.6).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should develop an institution-wide standardised competence framework based on their profile, which defines the interdisciplinary competence set of all graduates and contributes to sharpening the profile of the universities through regular reflection and adaptation.• Universities should not only structurally anchor teaching innovations, but also the continuous adaptation of the content of existing teaching programmes within the university, for example by defining revision processes and support services for teaching staff.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy should strengthen capacities for the regular adaptation of teaching content by creating incentive systems in teaching and expanding teaching capacities (for example by increasing staff at universities with a teaching focus).• Higher education policy should create a framework for the accreditation of dynamised study programmes. In this way, universities could test dynamised study programmes, for example at Master's level, in order to promote incentives for graduates to continuously acquire skills as part of their professional careers.

7.3 Pain Point 3: Lack of innovation in the design of learning experiences

The following approaches focus on innovative learning experiences and teaching and learning methods, taking into account technological and social progress.

7.3.1 Case study: 42 Heilbronn, approach: peer learning and evaluation

Peer learning and evaluation approaches, such as those implemented at 42 Heilbronn, are new ways of imparting knowledge that enable a personalised and effective learning experience, particularly in the STEM field, and can lead to higher numbers of graduates (see case study chapter 6.4).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should experiment with the design of holistic learning experiences that use peer learning and peer evaluation as guiding principles in courses, modules or entire degree programmes - especially in subjects in which skills acquisition via use cases (in "challenges") can be easily integrated (e.g. STEM, law). Co-operations in university networks and with companies should be initiated for implementation.• Universities should create the necessary framework conditions for effective peer learning by developing and implementing appropriate spatial concepts. The focus here should be on the targeted promotion of exchange and cooperation in physical, digital and hybrid learning environments.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy should support an understanding of teaching that recognises peer learning as a relevant approach. To this end, pilot programmes should be promoted that enable results-oriented evaluations and promote the political debate on new teaching formats.

7.3.2 Case study: European Consortium of Innovative Universities, approach: micro-credentials

Higher education institutions could use the ECIU approach to micro-credentials to enable flexible, personalised professional skills development in direct collaboration with partners from education, business and society. Learners can acquire specific competences that are relevant to their careers and improve their employability (see case study chapter 6.3).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should strategically integrate micro-credentials into the programmes offered by their institutions and provide incentives and support measures as well as resources for the development and implementation of micro-credentials by teaching staff.• Universities should enable the flexible design of curricula so that micro-credentials can be integrated in the form of short, specialised courses. A wide variety of micro-credentials should be promoted to enable the development of different competences and levels of progression.• Universities should define transparent assessment criteria for micro-credentials to make the recognition of learning outcomes efficient and fair.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy should promote the integration of micro-credentials into university curricula: This can be done by creating incentives and by developing cross-university guidelines.• Higher education policy should work together with the relevant stakeholders (universities, ministries, accreditation institutions, etc.) to develop clear quality standards for micro-credentials in order to ensure comparability and transparency.

7.3.3 Case Study: Arizona State University, approach: Learning analytics for student success

The use of learning analytics and adaptive teaching and learning materials for better academic success and individualised support is an approach pursued by Arizona State University. The clear focus on the specific, individual needs of students could also serve as a model for German universities (see case study chapter 6.1).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should understand learning analytics as a strategic tool for personalised learning experiences and an increase in student success and integrate it into their university strategy accordingly.• Universities should sensitise teachers to the advantages and disadvantages of learning analytics through information and qualification measures (e.g. training courses) and prepare them for its use. The integration of learning analytics into the development of curricula should be promoted by creating suitable teaching materials, offering training and incentivising the use of learning analytics. Teachers should be actively encouraged to use learning analytics data to optimise courses (e.g. reviewing the course structure).• Universities should promote collaboration between different disciplines (for example computer science, education, psychology) and support pilot projects to test or evaluate the effectiveness of learning analytics in practice and use it to design personalised, effective learning experiences.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy should promote public awareness and discussion of learning analytics in order to reduce misunderstandings (for example on data protection issues) and strengthen confidence in its potential.• In addition, guidelines and recommendations for the effective, responsible use of learning analytics should be developed to provide guidance. This could include the development of good practices, ethical guidelines and data protection standards.• University policy should create targeted funding programmes and financial support for projects to implement learning analytics. These programmes should offer scope for experimentation and be geared towards practical transfer.

Overall, all stakeholders should work together to utilise the potential of learning analytics to increase student success and improve the quality of higher education. The anonymised data and findings should be used transparently and responsibly in order to continuously optimise the learning conditions for students.

7.3.4 Case study: Minerva University, approach: cohort-based exchanges & local project work

Universities could use innovative elements of study abroad programmes (such as Minerva's cohort-based secondment and local project work during the exchange) to provide students with innovative and better learning experiences and thus strengthen their academic and degree success (see case study chapter 6.6).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should introduce cohort-based (rotating) stays abroad in (international) degree programmes with the aim of improving learning experiences and increasing identification with, and the attractiveness of the degree programme. Such integration requires a comprehensive revision of teaching concepts, the logistical organisation of student accommodation and consideration of mobility costs.• Universities should introduce curriculum-based project work during stays abroad in order to increase cooperation with local partners. This requires the support of local experts.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy should ease the administrative burden of cohort-based study abroad programmes, for example by providing visa support through public partnerships and institutional letters of recommendation for participating exchange students.• Higher education policy should strive to harmonise German semester times with international degree programmes in order to simplify the implementation of cohort-based (rotating) stays abroad and to ensure seamless individual course planning.

7.4 Pain point 4: Insufficient structural and institutional agility

The approaches in this area address the adaptability of university structures to the complex challenges currently facing society. Dynamic, interdisciplinary and transdisciplinary structures are required to meet these challenges. Both approaches within existing institutions and completely new structures are taken into account.

7.4.1 Case study: Erasmus University Rotterdam, approach: Community for Learning and Innovation

For an institution-wide focus on innovation and quality assurance in teaching, universities could take inspiration from the internal "Community for Learning and Innovation" (CLI) at Erasmus University Rotterdam. Such a programme could create community-focused exchange processes and structures, offer further training and support research for teaching innovation (see case study chapter 6.2).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should establish cross-faculty and cross-status group network structures that enable sustainable and agile educational and teaching innovations on a community basis and based on findings from educational research and learning practice.• Universities should actively involve students in the quality development of study programmes and teaching on an equal footing• Universities should invest more in technology, training and personnel in order to finance networks and innovation projects and implement innovative teaching methods. To this end, universities should provide budgets for educational innovation and/or acquire external funding.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy should promote the strengthening of innovation and quality assurance in teaching, for example along the lines of the model of cross-departmental structures (or centres for university teaching) presented here.• Higher education policy should provide greater incentives for the development and use of further education programmes for teaching staff. Only the systematic qualification of teaching staff enables professionalisation in teaching. With this in mind, further training centres for teaching should also be established or expanded.• Higher education policy should promote the exchange between universities on existing, successful structures. It should support universities in testing new possibilities for structural innovations and quality improvements and provide the space for critical reflection on existing structures.

7.4.2 Case study: Arizona State University, approach: institutional anchoring of innovation

A higher degree of flexibility could also be made possible by the institutional anchoring of innovation through firmly defined structures as well as the entrepreneurial mode of organisation as at ASU. Even if the approach in the US university system is subject to different conditions and (funding) opportunities, individual aspects can also serve as inspiration for the German system (see case study chapter 6.1).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should establish specialised, interlinked staff units ("innovation units") that enable interdisciplinary and transdisciplinary innovation in the areas of degree programme development, research and learning infrastructure. They should also promote a corresponding culture of openness to innovation (and entrepreneurial thinking) (at presidential board level). This can be achieved through targeted training, workshops and strategy processes in addition to specially established positions.• Universities should experiment in their structural development. This also requires quick reactions if an approach does not achieve the desired results ("fail fast").• Universities should make innovation a top priority within the university and designate responsibilities for this in the university management.
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7.4.3 Case study: Technical University of Nuremberg, approach: agile department structures

In the example of the newly founded Technical University of Nuremberg (UTN), the university organisation is restructured from the start in the form of agile departmental structures. Even with less radical steps than the complete dissolution of existing structures, universities can potentially strengthen their flexibility and efficiency using the following suggestions for action (see case study chapter 6.7).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should push ahead with the gradual introduction of departmental structures by piloting them in two to three selected faculties, for example in those that are linked via a cluster of excellence.• Universities should also test new approaches to cooperation within existing structures by developing interdisciplinary degree programmes across faculties.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• University policy should support interdisciplinary cooperation not only in research, but also in teaching, for example through relevant funding programmes for interdisciplinary degree programmes or teaching innovations (for example using challenge-based learning).• Higher education policy should encourage the use of departmental structures at existing universities, especially in the case of newly founded or future reorganisations of universities.

A university-wide implementation of departmental structures at German universities traditionally organised according to the chair principle would mean a radical reorganisation that could only be implemented in the medium term (cf. Error! Reference source could not be found.). Accordingly, the approach can be implemented in existing structures either selectively and as part of pilot programmes or applied to newly founded educational institutions.

7.4.4 Case study: Interdisciplinary Transformation University Austria approach: multiple professorship models

Diversity and flexibility in models for the organisation of professorships, such as those planned at IT:U, could enable universities to attract high-performing teaching staff, especially in highly competitive areas such as AI research (see case study chapter 6.7).

Recommendations for Universities	<ul style="list-style-type: none">• Universities should drive forward the establishment of new professorship and appointment models, especially if the corresponding legal framework already exists (as is the case in various federal states). Existing opportunities should be utilised more by universities, especially in subject areas with challenges in recruiting professorial staff.
Recommendations for the Higher education policy level	<ul style="list-style-type: none">• Higher education policy should make the framework conditions for hiring professors more flexible, especially for Universities of Applied Sciences.• Higher education policy should promote higher education exchanges on recruitment models for universities, similar to the promotion of exchanges between UAS, which is already supported by the federal and state "FH-Personal" programme.• Higher education policy should anchor excellence appointments, for example following the Bavarian model, in the state higher education laws of the federal states across the board in order to accelerate the appointment procedures for highly qualified scientists with an urgently needed top profile, for example in the fields of AI, quantum computing or semiconductor technologies.

Appendix A: Sources & interviews of the case studies

Arizona State University

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Ben Nelson, founder of Minerva University and CEO of Minerva Project
Kayla Krupnick Walsh, Vice President of Student Affairs & Dean of Students Minerva University

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College Unbound

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Future Mission for Education

The exploration study is part of the vision track of the Future Mission for Education, which bundles measures with a co-creative and exploratory approach to strengthen the future viability of universities. With the Future Mission for Education, the Stifterverband wants to create an education system for a changing world that quickly trains and further educates more people with the necessary skills. The aim is to find solutions to combat the shortage of teachers, increase educational potential, secure STEM specialists and promote future skills. To this end, the Stifterverband initiates various activities and brings together relevant stakeholders from business, science and civil society in four strong alliances which speak with one voice to policymakers, which jointly shape framework conditions and thus bring about a long-term change in the education system.

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