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Strengthening Research and Education at Swedish Universities of Applied Science

Support for the Knowledge Foundation's Strategy Development

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Summary

In 2024, the Knowledge Foundation (KKS) celebrated its 30th anniversary, and commissioned this external report to complement its own work on a new strategy. The report is based on interviews with stakeholders and observers of the Universities of Applied Science (UAS[1]) sector in Sweden and elsewhere as well as documentation on KKS, literature on the UAS sector, and desk study of UAS-related policy in five countries.

When it was established in 1994, KKS' mission was to support knowledge and capacity exchange between business and the research and higher education sector, funding research and small and medium-sized colleges and new universities, and promoting the use of information technology (IT).

Its Statutes gave KKS freedom to define and refine its own specific tasks over time, namely:

- Funding research at the UAS, which must be co-funded by the business sector
- Supporting UAS teaching at master's level and above, especially teaching that can be done in cooperation with industry
- Helping support capacity development and structural reform in the industrial research institutes
- Promoting the use of IT

Having completed the third and fourth tasks, KKS continues to work on the first two. Since, after 30 years considerable progress has been made on capacity-building in the UAS, it is timely to develop a new strategy to support them.

Many countries have binary higher education systems – with separate rules and expectations for traditional universities and UAS, which have a greater focus on vocational skills and applied research. Sweden formally has a unitary system, with both kinds of university in principle funded from the same pool. However, the UAS are disadvantaged in competition by their shorter history, and lower levels of research personnel and other resources. In practice, therefore, a quasi-binary research funding system has evolved in Sweden with the traditional universities dominating the funding from national agencies and the UAS to some extent inhabiting a separate funding pool in which KKS and various regional authorities play substantial roles. In effect, KKS plugs the hole in the state funding system where specific support to the UAS should be.

The UAS now face several important challenges. One is a widespread expectation that the funding curve will flatten as the long period of expansion in the UAS sector comes to an end. UAS have been able to shape their own strategies by flexibly exploiting growth but will increasingly have to decide what to stop doing as they continue to innovate in response to changing needs. Societal and UAS needs are likely to change fast, through industrial restructuring, the emergence of new materials and technologies, the changing geopolitical context and the need to tackle the societal challenges. Important changes will affect not only technology but also **socio**-technical systems, requiring interdisciplinary approaches and the involvement of wider stakeholder groups.

However, in contrast to the societal need for more directionality to solve specific problems, Swedish higher education policy has been to provide the institutions with ever-greater autonomy. While this has probably served Sweden well in times of incremental change, it

[1] We use this term in the absence of a simple collective noun for the mix of colleges and new universities that KKS funds

means there are few ways generate the coordinated action among the UAS or in the higher education system more broadly that is needed to tackle more radical and systemic changes.

Our country cases are inevitably diverse, but they do show the feasibility of intervening in new ways, some of which offer opportunities in the Swedish UAS system:

- Reinforcing the UAS system to deliver middle-level skills, as an activity distinct from what traditional universities do
- Networking institutions to deliver teaching and research across regions, while maintaining the ability to reconfigure the networks and cope with changing needs
- Coordination among institutions, formally or informally, to counteract a tendency to local optimisation
- Creating a specific mechanism to fund capacity development in the UAS sector
- Coordinating action in life-long learning

This report proposes three scenarios for future KKS strategy.

- Scenario 1 – business as usual, potentially adding greater funding and competitive pressure to drive the quality of research up further
- Scenario 2 – addressing disruptive industrial and technical change at the regional level, becoming more involved in supporting and networking with regional development processes
- Scenario 3 – prioritising and tackling certain societal challenges at the level of the UAS system, supporting socio-technical transitions at trans-regional level

As a private foundation, KKS has much greater freedom to act and to choose its priorities than the public authorities. We suggest that scenario 3 is now the most appropriate direction, for the following reasons.

- It is the most relevant to current societal needs
- It helps the UAS system adjust to changing needs – an adjustment that will be needed whether or not KKS changes its strategy
- It continues KKS' central task of being a change-agent to support development in the UAS system
- It continues to deliver funding support to the UAS sector, rather than moving it elsewhere
- It provides a basis for allying with other funders such as Mistra, the Environmental Protection Agency (*Naturvårdsverket*) and other foundations to increase the amount of resources available
- It is tractable for KKS, given the skills and experience of its personnel, though some learning will be needed

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1 Introduction

After 30 successful years of operation KKS is developing a new strategy to meet the needs of a new and different time. It has been consulting stakeholders and beneficiaries as well as conducting internal workshops to prepare the new strategy. Such a consultative process tends to produce rather conservative results, with beneficiaries understandably wishing to continue receiving support along the lines to which they have become accustomed. Aware of this, KKS commissioned this report, intended, first, to provide an independent perspective from outside KKS' community, and second, to take account of broader changes in the policy context.

To compile this report, we have:

- Searched for literature about the sector KKS currently addresses, namely the vocational and regional colleges and new universities within the overall higher education sector. In the absence of a good collective noun for this sector, we refer to it as the 'UAS' (universities of applied science) sector, in line with developing practice internationally
- Interviewed about a dozen people, who work in or study the UAS sector
- Consulted academic literature on UAS and statistics on the Swedish higher education sector
- Reviewed literature about five countries that have been reforming their UAS sectors – Austria, Finland, Ireland, The Netherlands, and the UK
- Built on experience from a wider set of Technopolis studies touching on how national research and innovation (R&I) funding systems can adapt to the need to tackle the societal challenges, trigger socio-technical transitions (such as decarbonisation of electricity supply), and the retreat of globalisation in trade and R&I policy
- Interacted with KK's reference group and the Board
- Developed a set of strategic directions for the Foundation's consideration, providing alternatives that reflect the new policy concerns

A very striking feature of the higher education literature is that it almost completely ignores the UAS sector. As is the case with the research institutes that formerly were part of KKS' mission, the UAS sector seems to be a 'neglected stepchild of public policy' (Crow & Bozeman, 1998).

2 KKS

This section describes the KKS' origins and tasks, sketches its role in the R&I funding system, lists its beneficiaries, describes the current funding instrument portfolio and summarises evaluation evidence about the performance of KKS and its instruments.

2.1 Origins and role of the KKS

KKS is one of ten foundations created by the conservative Bildt government in 1994. The three most important for R&I funding are the Strategic Research Foundation (SSF), KKS, and the Swedish Foundation for Strategic Environmental Research (MISTRA).

The second Palme government (Social Democrat) introduced a levy on the profits of large, Swedish-owned firms in 1984 to capitalise the so-called Wage-Earner Funds (WEFs), which bought shares in these firms with the intention gradually to move them into employee ownership. The conservative Bildt government of 1991-94 regarded this as nationalisation by the back door, abolished the levy and then put a lot of the funds into research because – unlike most of the alternative ways discussed to use the money – this was uncontroversial (Arnold & Barker, 2022). The government tied the capital up in foundations to keep them outside state control and appointed boards for the Foundations that should in future appoint their own successors.

The Bildt government wanted the foundations to modernise and strengthen Swedish research by providing new money while not creating 'losers'. They were to fund excellent, primarily interdisciplinary, university-based research via large grants and centres (Prop 1993/94:177). Much of the research (especially at SSF and MISTRA) would be 'strategic', in line with growing international interest in enabling technologies and pre-competitive or strategic research. When the Social Democrats returned in 1994, the courts let the government change the foundations' statutes so that from 1997 it appointed the foundations' chairs. In 2010, the statutes were changed again, so that the government appointed two board members while the others were appointed by the academies of science and engineering, the universities, and the state funding agencies.

KKS was tasked to support the development (and especially the research capacity) of the UAS sector, at a time when other countries (including Norway, Finland, and the UK) were doing the same. Its statutes specify that the UAS are to be co-developed with the business sector, which should also co-fund research projects. In practice, the business sector has mostly been seen by KKS as manufacturing industry. Under the current statutes, the public sector – which is a major target of education and research in the UAS – is out of scope.

Its status as an independent foundation means that KKS is not answerable to any ministry and does not formally play a role in government R&I policy, though it does voluntarily contribute to government R&I policy formation, for example by providing inputs to government research bills.

2.2 KKS in the research and innovation system

2.2.1 University external research funding in Sweden

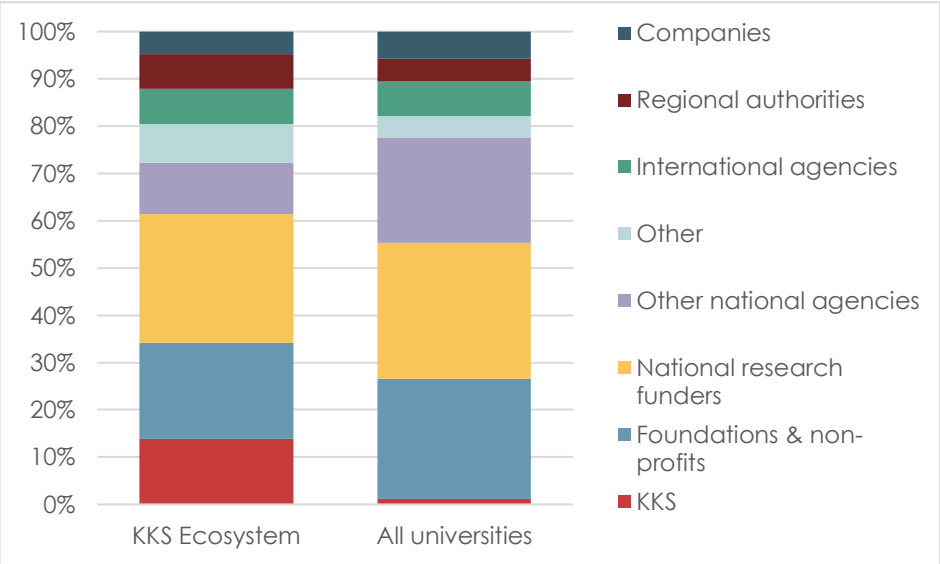
Swedish university research has a large and diverse set of external funders, with many more state funders and non-government research funding foundations than most other countries (OECD, 2016). The Swedish Higher Education Authority (UKÄ) lists 40 universities that received external research funding in 2023, including the broad national universities (such as Stockholm or Göteborg) and the big technical universities (such as KTH, Chalmers and Luleå) as well as the UAS.

KKS provided us with profiles of 22 UAS that it regards as its clientele and with which it maintains a dialogue. Six of these[2] are specialised – one in defence, the second in sports science, and the other four in music and the arts. The Swedish Defence University has about a thousand students, while the remaining 5 have student bodies in the hundreds. The other sixteen UAS are larger (from about 3,000 and up to 17,000 students), have fairly broad curricula and a significant degree of industrial focus. We refer to these 16 here as the 'KKS ecosystem'.

Our interviewees argued that the KKS ecosystem has needs and funding patterns that differ from those of the traditional university system. This section describes that funding environment using UKÄ research funding[3] statistics for 2023.

The total external research income of the KKS ecosystem was some SEK 2,6 billion in 2023, out of SEK 34 billion for the university sector as a whole. Figure 1 shows the overall funding pattern for the two systems, which we produced by aggregating funder categories in the UKÄ's statistics. A major difference is the greater importance of foundations in general, and KKS in particular, in the KKS ecosystem. The KKS ecosystem uses a narrower range of national agencies, while regional authorities and 'Other' funders are a little more important to it than to the university system overall.

Figure 1 Research funding by category, all universities and KKS ecosystem, 2023



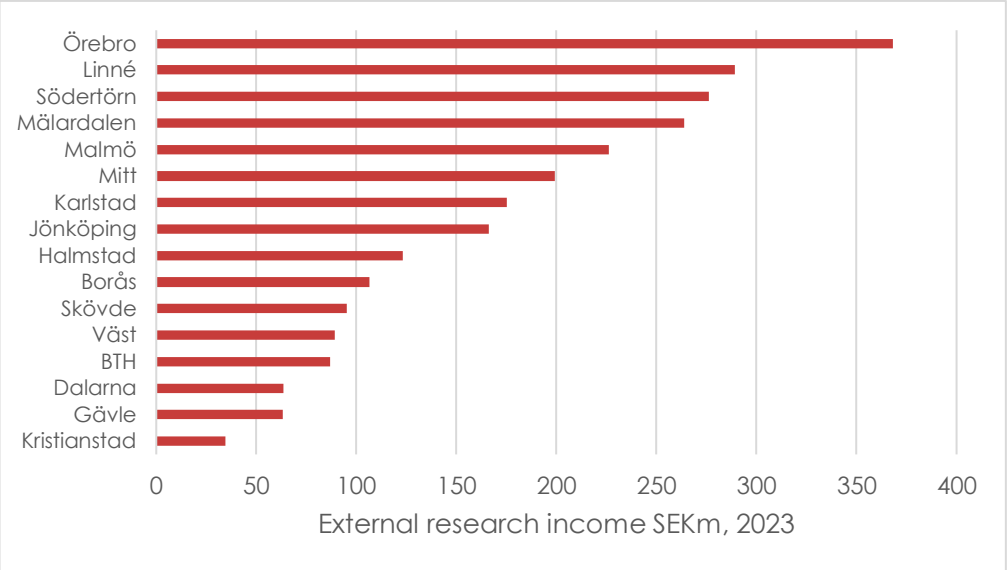
Source: EKÄ data, recategorised Technopolis

Figure 2 breaks down the external research income for individual members of the KKS ecosystem in 2023. To put the numbers in perspective, the KKS ecosystem's entire external research funding in 2023 was only slightly more than that of KTH (SEK 2.4 billion), and substantially less than that of Uppsala (SEK 3.7 billion) or Lund (SEK 4.9 billion) universities.

[2] Försvarshögskolan, Gymn och idrottshögsolan, Konstack, Konsthögskolan, Musikhögskolan and Kungliga Kosnthögskolan in Stockholm

[3] Strictly, these statistics refer to external funding for research and research training in higher education. The statistics are available from uka.se. We downloaded them on 12 July 2024

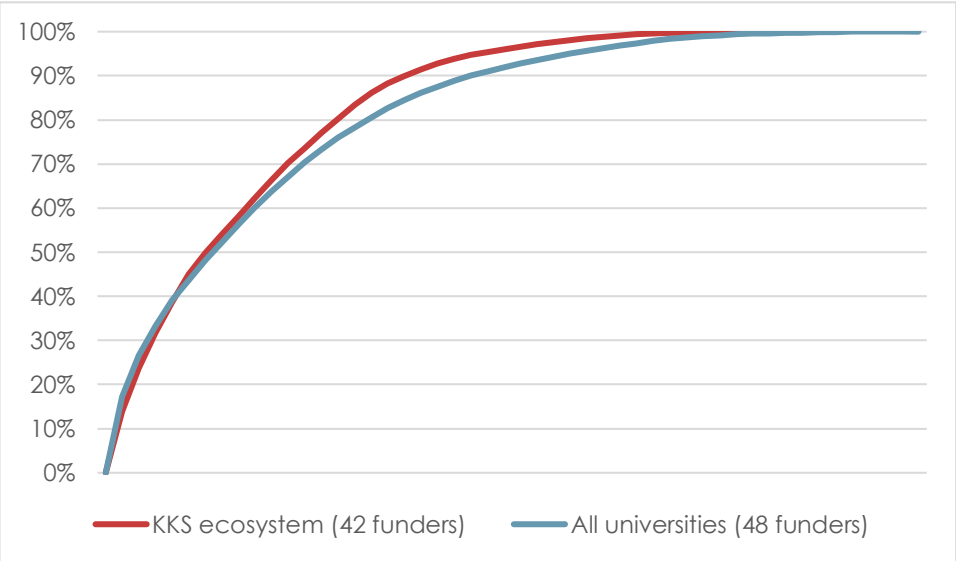
Figure 2 External research income of UAS in the KKS ecosystem, 2023



Source: UKÄ. Note: We refer to the UAS by their location, to avoid cluttering the Figure

Figure 3 shows that the concentration among the funders is only slightly greater in the KKS ecosystem than in the university system as a whole. In the KKS ecosystem, the top 6 funders together account for 50% of the external funding, while the top 15 account for 80%. In the university system as a whole, the top 7 funders account for 50% and the top 16 for 80%.

Figure 3 Pareto curves for external research funding at all Swedish universities and the KKS ecosystem, 2023



Note: These curves are constructed by arranging the percentages of total funding provided by the various funding organisations in descending order, then plotting the cumulated percentages, starting at 0%. The largest funders are listed in Table 1 below

Source: UKÄ; calculations Technopolis

There are both important similarities and differences between the two distributions (Table 1).

- KKS provides 14% of the external funding in the KKS ecosystem, but only 1.1% of overall university funding (making it too small to include in Table 1)
- The Swedish Research Council is the biggest state funder in both systems – though twice as important in the overall university system as in the KKS ecosystem
- Swedish non-profit organisations are equally important in both cases[4]
- The Foundation for Baltic and East European Studies (Östersjöstiftelsen) is a Wage-earner fund foundation with the primary objective of funding the development of Södertörn University in Stockholm, funding limited research outside that institution
- The Wallenberg foundations are big research funders at the national level, but provided only 1% of the KKS ecosystem's research income in 2023
- Regions and counties, companies in Sweden, Formas and the EU Framework programme (excluding the ERC) are all about equally important in the two systems
- In contrast, Vinnova and Forte are more important in the KKS ecosystem than overall, reflecting their respective foci on innovation and on professions of importance in the state

Table 1 Funders accounting for 80% of research funding in the KKS ecosystem and all universities, 2023

KKS ecosystem			All universities		
Funder	**Percent**	**Cum. %**	**Funder**	**Percent**	**Cum. %**
KKS	13.9%	14%	Swedish Research Council	17%	17%
Swedish Research Council	9.8%	24%	Swedish non-profits	9%	27%
Swedish non-profits	8.0%	32%	Wallenberg Foundations	7%	33%
Foundation for Baltic and East European Studies	6.9%	39%	Payments for clinical research	6%	39%
Vinnova	6.4%	45%	State universities & UAS	5%	44%
Forte	4.9%	50%	EU Framework programme, excl. ERC	4%	48%
Companies in Sweden	4.2%	54%	Companies in Sweden	4%	53%
EU Framework programme, excl. ERC	4.1%	58%	Regions, Counties	4%	57%
Financial income	4.0%	62%	SLU	4%	60%
Regions, Counties	4.0%	66%	Formas	4%	64%
Formas	4.0%	70%	Financial income	3%	67%
Other state agencies	3.4%	74%	Vinnova	3%	71%
EU, excl. Framework programme	3.4%	77%	Foreign non-profits	3%	74%
State universities & UAS	3.2%	80%	State authorities excluding universities and UAS	3%	76%
			Swedish Energy Agency	2%	79%
			Swedish Cancer Society	2%	81%

Source: UKÄ; calculations Technopolis

Overall, the funding pattern confirms that KKS plays an important role in funding its ecosystem – arguably large enough to act as a change agent, but not sufficiently dominant to sustain or determine the behaviour of the UAS sector. The KKS ecosystem's funding portfolio is almost as broad as that of the university system as a whole, which should make it rather resilient. In line with KKS' objectives, the ecosystem's funding is somewhat more industrially orientated than

[4] Note, however, that UKÄ's statistics identify large funders individually and uses this kind of collective category for smaller ones

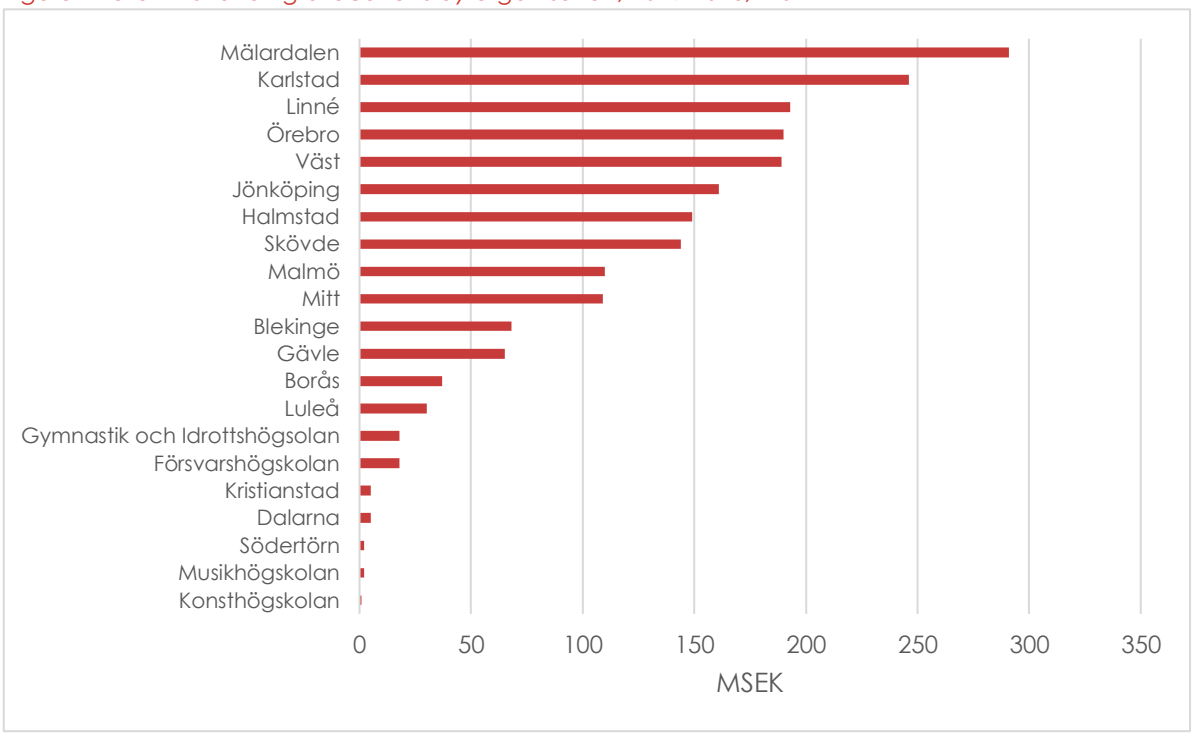
that of the overall university system. The KKS ecosystem's income is only slightly more dependent on the regional authorities (7%) than the university system as a whole (5%), despite a general expectation that the ecosystem should be much more strongly orientated to regional needs.

2.2.2 *KKS funding of UAS and university research*

In line with its statutes, the KKS funds the UAS sector, primarily focusing on research. Both KKS-funded research and evidence from elsewhere, such as strongly confirms that the presence of research as well as teaching in regional higher education systems is associated with economic development, increased productivity and higher incomes per head, providing a solid justification for doing so (Eklund & Pettersson, 2019; Charles, et al., 2021; Klaesson & Pettersson, 2023; Adams, et al., 2024).

KKS funding is concentrated on a limited number of organisations, but their relative fortunes vary from year to year. Figure 4 shows the total allocation of grant funding in 2019-2023. UAS with university status cluster towards the top of the Figure.

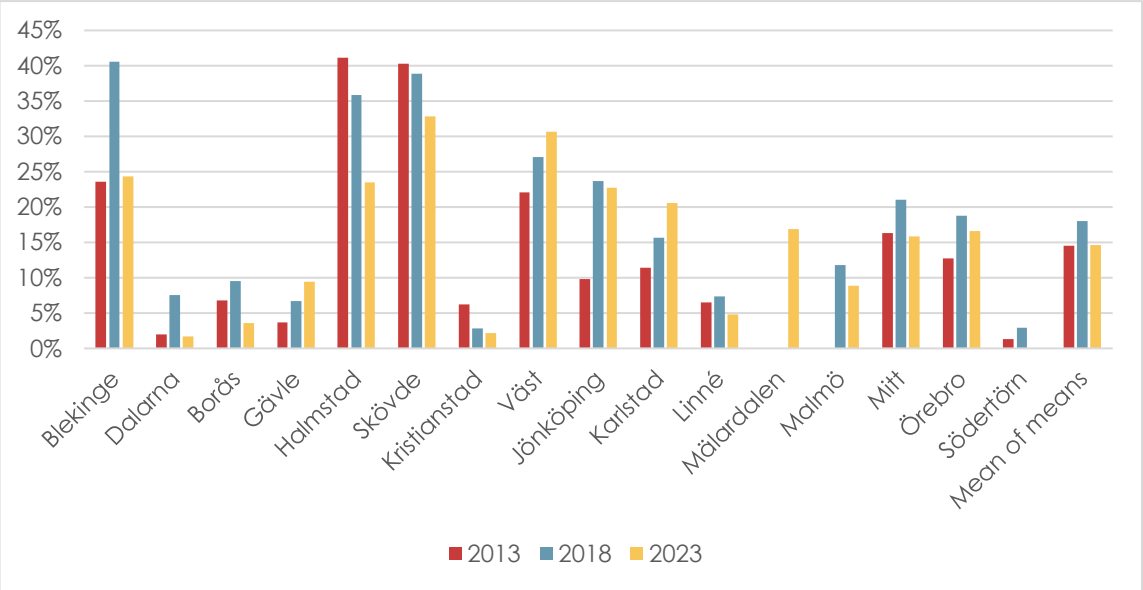
Figure 4 Total KKS funding allocations by organisation, 2019-2023, MSEK



Source: Data from KKS Annual Reports, 2019-2023
Note: Except for the specialised vocational ones, we refer to the UAS by their location, to avoid cluttering the Figure

Figure 5 illustrates how the importance of KKS funding varies among UAS in the KKS ecosystem and over time. There are no clear patterns that would, for example, suggest that KKS funding increases UAS' ability to win money elsewhere and therefore declines over time as a percentage of their research income. The programme evaluations suggest that KKS funding does support career and organisational development, so the uses to which funding is put may be changing within individual UAS. Equally, the bottom-up character of KKS funding within a fragmented funder landscape may simply mean that PIs' funds-seeking behaviour is opportunistic.

Figure 5 Share of KKS in total external research funding, KKS ecosystem, 2013-2023



Source: UKÄ; calculations Technopolis. Gaps indicate data missing from the UKÄ database.
Note: The 'mean of means' is literally that, indicating the average proportion of KKS funding in total external funding across the UAS included. The total KKS funding divided by the total external funding for the whole ecosystem produces the following percentages: 12% in 2013; 17% in 2018; and 14% in 2023. We refer to the UAS by their location, to avoid cluttering the Figure

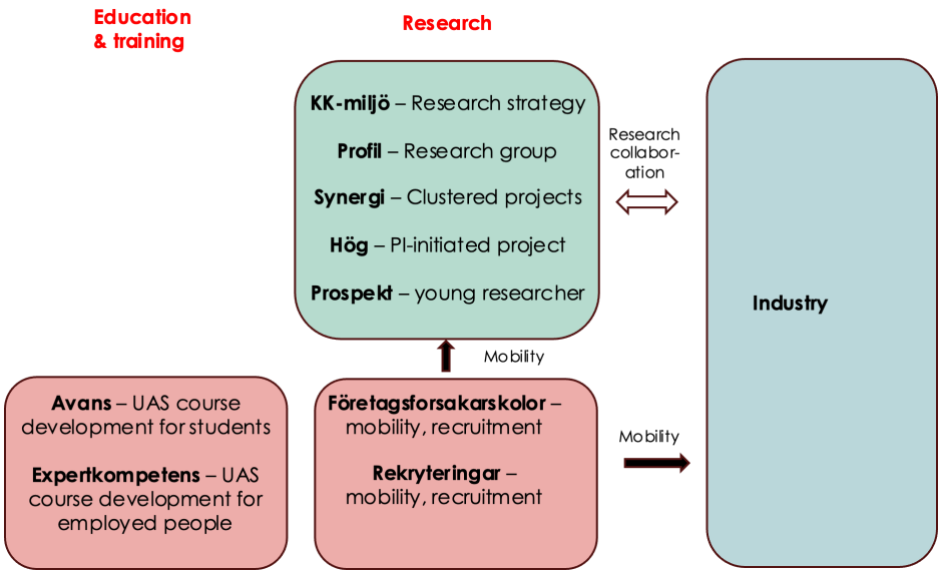
2.2.3 *The KKS programme portfolio*

KKS works closely with industry. The research programmes involve industry co-funding. Unlike state research funding organisations, KKS also funds education, through graduate schools and schemes for providing research training to industry personnel. In principle, the KKS does not set thematic priorities, leaving principal investigators (PIs) to choose their own research topics. (A possible exception would be the special call for proposals in support of industrial decarbonisation during 2022.) KKS also maintains some internal staff capacity for collecting strategic intelligence and buying external evaluation services.

KKS currently operates nine support programmes for the UAS. Five of these form a hierarchy for developing UAS' research capacity; two develop industry-orientated training courses within UAS; the other two form a bridge for human resources between UAS and industry (**Error! Reference source not found.**, Table 2).

With the important difference that the entire effort is devoted to building cooperation between the UAS and industry, this instrument portfolio is not very dissimilar to what would be normal at a traditional research council. The research funding programmes cover research career stages and the development and renewal of the academic community. Establishing graduate schools is also part of normal research funding practice and is probably especially useful in smaller organisations with limited institutional funding. Mobility schemes aimed at recruitment are more normally found in innovation or company support agencies. The need for course development programmes is a more specific feature of developing UAS systems.

Figure 6 The current KKS programme portfolio



Source: Based on information from www.kks.se

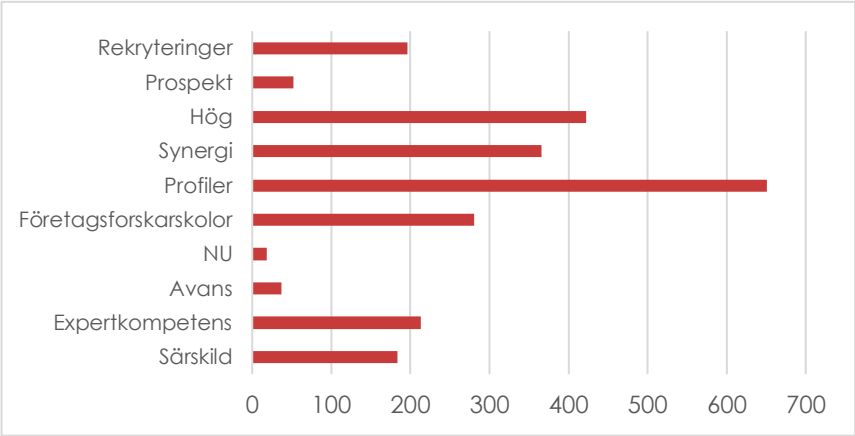
Table 2 Brief programme descriptions

Programme	Description	Max funding (MSEK)	Max time (Years)
Prospekt	Young researcher grant	2	2
Hög	Main bottom-up programme for PI-initiated projects	4	4
Synergi	Clustered projects within a single UAS	10	4
Profil	Research group capacity-building funding	40	8
KK-Miljö	Dialogue-based research strategy development and implementation, in 3 to 4-year stages	Not specified	10
Expertkompetens	UAS course development for industry employee courses	4/12	3/5
Avans	UAS course development for student courses	0.5/2	1/3
Rekryteringar	50-90% wage support for mobility or fixed-term employment from UAS to industry and vice versa		
Företagsforskarskolor	Graduate school for 6-15 industry-employed doctorands (renewable once)	27	6
NU (to 2022)	International profiling	1.5	2

Source: www.kks.se

Figure 7 shows the funding allocated to each of the programmes over the last five years. The first six programmes roughly follow the researcher career, starting with *Rekryteringar* or *Prospekt* and working up to *Företagsforskarskolor*. These career-stage and developmental research programmes are the core of what KKS does. Funding course development is the second-largest activity, while '*Särskild*' refers to thematic calls, the biggest relating to climate change.

Figure 7 KKS funding decisions by programme, 2019-2023, MSEK



Source: KKS Annual Reports, 2019-2023
Note: We refer to the UAS by their location, to avoid cluttering the Figure

2.3 What do the evaluations of KKS programmes say?

KKS has been thorough in its approach to evaluation, commissioning studies of all its funding instruments during recent years. These suggest that the funding instruments are well received, help develop UAS' capacity and have useful impacts on industry while strengthening the relationships between the UAS and industry.

DAMVAD's (2014) evaluation of the overall impact of KKS' activities found that the firms involved grew faster than equivalents and increased their employment of masters-level people, while raising the production of scientific publications by the UAS. Co-authorship with industry was more common than in other Swedish scientific production, while the citation of articles produced with *Hög* funding was at or above the Nordic average. Evaluations of the individual programmes are broadly positive, though the research programmes tend to receive more positive evaluations than the course development programmes.

Prospekt was successful in helping launch the academic careers of beneficiaries, resulting in many well-cited publications. The programme's ambitions for researcher mobility were not sufficiently clear to generate much effect on this dimension. More broadly, the programme's theory of change was criticised as being insufficiently clear. Beneficiaries often needed more support and flexibility from the programme, to compensate for their lack of experience as principal investigators, and perhaps also the variable ability of their UAS to support them internally (Ramböll, 2024).

Hög is widely appreciated in the research community, which says that *Hög* projects are highly additional, in the sense that without the *Hög* funding they would not have been done. The bottom-up nature of the programme means the projects can be used as complements to other funding instruments. While their PI-initiated nature means the choice of research theme is open, in practice their thematic focus tends to reflect those of the UAS. Unlike some other KKS programmes, which imply making strategic choices or innovations, *Hög* proposals need little internal discussion about the themes chose, though they are often internally quality-controlled by the UAS to maximise the probability of success.

The need to collaborate with industry tended to orientate project goals towards the shorter term, higher TRLs and projects that are rather close to market, but they expanded the academic as well as the industrial networks of the PIs and helped build academic careers.

Both academic and industrial results were produced. Usually, continuing the research required a new *Hög* grant, as there were few other sources of funding available (Ramböll, 2023).

Synergi is broadly understood as providing an intermediary step between *Hög* and *Profil*, building from individual PI-initiated projects to forming a wider research group. Industrial partners are mainly large firms. Projects produced a large volume of scientific publications, notably in medicine. The evaluators concluded that the programme played a systemic role in UAS development, research careers and the building and underpinning of academic-industry links. It should therefore be retained in its current form (Ramböll, 2023).

Profil – individual profiles have been evaluated via bibliometric indicators. An evaluation of four profiles in 2011 concluded that they were succeeding in establishing new research milieux, in addition to contributing to the development of teaching and research in the respective UAS and also enhancing the technological capabilities of the firms involved (Melin, et al., 2011). The evaluators noted that capacity-building takes time, and that even the six years which the profiles had thus far enjoyed were not enough. They judged that the profile centres could be seen as nationally competitive, but that they needed considerable further development before they could reach an international level. They mentioned two features of the profiles as being unusual. First, at least some of the doctorands were strongly motivated to join by the specific nature of the applied research being done, Second, people working in the profiler were unusually highly motivated, compared with what the evaluators had experience in centres elsewhere,

Some of the profile projects have benefited from 'profile plus' follow-on funding, intended further to strengthen and focus the profiles, building deeper relationships with industry and reaching higher quality levels. An evaluation recommended the programme be terminated, as projects had not become financially self-sustaining, bibliometric citation indicators were still not all that strong and had improved little since the previous bibliometric analysis in 2020 (Damvad Analytics, 2023). We are obviously not in a position to rerun the analysis. On the one hand, the evaluators' performance expectations appear somewhat ambitious given how long it takes to build a research centre based on limited resources. On the other hand, reaching international performance levels is genuinely difficult, and it would be reasonable to consider what levels of performance can be attained given the resources, timescale and contexts involved.

KK-miljö – where an evaluation of projects at Mid-Sweden University, Skövde and Halmstad concluded that "the programme has performed well with respect to strengthening centres and their host universities on the central parameters, including strengthening their strategic and organisational ability, quality assurance, academic profiling, balancing research and education, and collaboration with external partners. The biggest impact from the programme has been on the strategic and organisational abilities, which has clearly been strengthened at the three universities." (Damvad Analytics, 2021) The evaluators went on to propose a number of process improvements to the programme.

Expertkompetens is intended to help UAS build on their existing industrial relationships by developing training courses for company employees. While the projects considered in the evaluation were additional and reached their goals in terms of course attendance, the evaluation found that the UAS tended to need further to develop their course-writing skills and capacity. The UAS needed to do more and better market research before developing courses and to do more marketing to attract more employee-students. The programme increased the UAS' range of offers to industry, improved their networks, and enabled them better to understand industrial requirements (Holmberg, et al., 2022).

Avans aims to increase the number and level of industry-orientated courses the UAS can provide for students, by coproducing courses with industry. The evaluation looked in detail at

six of the 37 *Avans* projects funded in 2013-2021, five of which produced courses that were implemented. However, it turned out to be difficult to recruit students to many Avans-funded courses (part of a wider problem of recruiting in STEM subjects). The evaluation suggests that many participants were free-riding, in the sense that they would have developed the courses even in the absence of the KKS funding, while there were also many cases where additional courses were produced and where UAS' course-writing capacities improved. The evaluators argued that the scope of the problem was too broad, ranging from formal master's courses to mid-career course of various types, and that KKS should make the programme goals clearer and more specific (Ramböll, 2022).

Rekryteringar funds the recruitment of guest and adjunct professors and fixed-term contracts for less senior positions in the UAS or industry. In practice, the UAS have been the driving force in most projects, building capacity and networks and producing good research (especially when international guest professors were involved), while the companies' influence has been more limited. There was a need for clearer research goals, to improve the integration of recruits into the UAS and increase the degree of collaboration between them and existing faculty. The benefits for industry were variable and not always clear. In our reading of the evaluation, this seems likely to be because, while the UAS have well-structured systems for employing and developing researchers, companies were not necessarily structured to make best use of recruiting a researcher in the absence of a specific project need (Ramböll, 2024).

DAMVAD (undated) have analysed publications from the ***Företagsforskarskolor*** and their impact, expressed as a proportion of them appearing in the Top-10%, -5%, and -1% of most highly cited publications in their respective fields (based on SCOPUS). These indicators need to be treated with caution because the absolute volume of papers and the numbers making it into even the Top-10% are very small. Publications concentrate in Engineering, Computer Science and Materials Science. While the graduate schools' collective citations still lie below the mean Swedish, Nordic and OECD levels, they are noticeably better cited than those of the earlier generation for *företagsforskarskolor*, overall making up 7% of the top-10% of overall publications (compared with the 10% that would be achieved if 10% of the UAS' publications reached that level). This citation indicator has the advantage of focusing on the most highly cited sub-set of the UAS' publications and shows that – measured by citations – a respectable 7% can be thought of as 'excellent'. The analysis also shows intense co-publication with company personnel, but a low degree of international collaboration.

An earlier evaluation of six projects found satisfactory levels of publication and that they had added value to both the UAS and the companies involved (Damvad Analytics, 2018).

Nu (up to 2022) funded small projects, done in collaboration between a UAS and one or more firms, to develop advanced Web-based training courses (including MOOCs) to increase their international visibility. While many of the resulting courses proves sustainable and have influenced other UAS education and training, their overall impact was marginal. The evaluation recommended integrating *Nu* into *Expertkompetens* to increase the range of options for delivering courses (Damvad Analytics, 2022). KKS has since discontinued the Nu programme.

3 Needs and challenges in the UAS sector

This section is largely based on testimony from our interviews (see Appendix) with faculty at various UAS and with observers and researchers who work with the sector.

3.1 Achievements

Unsurprisingly, since our interviewees were mostly beneficiaries of KKS funding, they were positive about KKS' achievements in the UAS sector and appreciated the current set of funding instruments. Overall, they thought the Foundation has made a very substantial contribution to building research capacity in the UAS and that the profiles and graduate schools had been especially important in doing this, creating opportunities both to hire and to train researchers. This in turn means that education is more research-based than before. KKS' focus on funding groups rather than individual researchers has been an important contribution to building sustainable research capacity.

Some of the research groups created are said to have become highly cited, and certain UAS have reached a level where they now cooperate with the university sector. While there were a few such cooperations 10-20 years ago (such as Mitthögskolan-KTH in pulp and paper or Blekinge-Lund in digital signal processing) they are more common now, indicating that there is a qualitative increase in UAS research capacity.

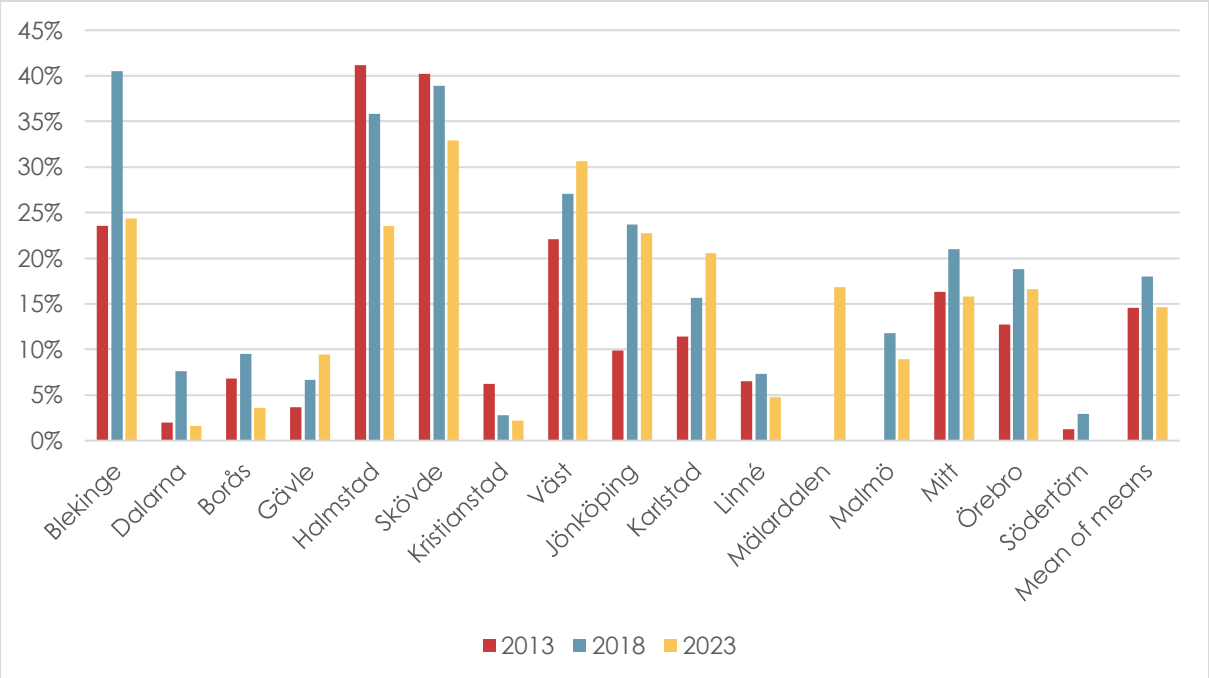
Because its statutes require that it should fund cooperation with industry, KKS has chosen to focus its funding on the sub-set of UAS represented by our interview partners, which tend to have strong regional links with manufacturing industry. These UAS have grown substantially, especially over the last decade or so, as the higher education system has continued to expand. Increased research funding together with close industrial relationships has allowed these UAS to act strategically and flexibly, arguably to a greater extent than the traditional universities. Some – for example, Malmö and MDU – have been able to attract researchers away from universities such as Lund, but there are also other examples of universities whose traditional governance and slow decision-making processes make it hard to be strategic or to change quickly. Now, the expectation is that growth in the higher education sector will stop, causing an internal "challenge of stability" for the UAS, even as the wider context becomes increasingly unstable.

In law, Sweden has a unitary higher education system, in which traditional universities and UAS have common goals for excellence in education and research. Institutional funding – especially that for research – is nonetheless substantially lower in the UAS, creating a lock-in, where the UAS' low research capacity has largely meant they could not win research funding from the national research and innovation (R&I) funding agencies. This allowed the traditional universities largely to monopolise national research funding, because the combination of the UAS' low institutional funding and very low success rates in applying for competitive national research funding meant they could not build the research capacity needed to succeed.

Research funding from KKS has provided help for those UAS relevant to industry to bootstrap themselves into starting to become credible competitors in national research markets. Our interviewees nonetheless describe a research funding system that is *de jure* unitary but *de facto* binary. To simplify a little, our interviewees indicated that the traditional universities inhabit a national funding system, while the UAS inhabit a series of small, regionally defined funding systems. The successful UAS fund their research growth substantially via regional money, grants from KKS and in some cases the Strategic Foundation (which historically has worked with the enabling technologies that are crucial to Swedish industry), and with funding and co-funding from industry. This has the important strength that the industrially orientated UAS focus both research and skill production in the regional economy (while also looking for ways to exploit their specialisations at the national level). The downside is that if industry sneezes, the whole region catches a cold. Equally, even major positive restructuring in the region such as the opening of a new industry (batteries, strategic materials, digital economy, etc) provides a major challenge. Such industries are often footloose, which means that regional innovation systems need to provide competing offers in the form of education, skills, research, facilities and infrastructure.

The UKÄ funding data, however, offer a more nuanced picture. Figure 8 shows the proportions of the KKS ecosystems' external research funding coming respectively from KKS, the various regional authorities and companies (both inside and outside Sweden). On average, KKS and the regions together provide 21% of the external research but there are wide variations, with KKS funding being very important in several cases and regional money being the dominant force in a smaller number. Industry money has been important in some UAS that tend to have a focus on manufacturing industry.

Figure 8 Share of UAS' external research funding from KKS, regional authorities and industry, 2023



Source: UKÄ statistics, Technopolis calculations
Note: We refer to the UAS by their location, to avoid cluttering the Figure

While the European Commission has increasingly promoted Smart Specialisation (RIS3) in regional development, this has been most influential among lower-income Member States, which are especially dependent on Structural Funds. Our interviewees suggest that the idea of Smart Specialisation (which is currently being extended to tackle restructuring and socio-

technical transitions) has not been very influential in Sweden. As a result, they believe that regional policy is less systemic and that the UAS are less well connected to regional development than might be expected. If true, this would imply that Sweden lags the state of the art in regional development and restructuring and may be disadvantaged in competition for investment from new industries.

The most recent study of smart specialisation in Sweden we can identify is from 2019. The author points out that Sweden has been a late adopter of smart specialisation (Paulssson, 2019)[5], which was discussed in the middle of the first decade of this century and was heavily promoted by DG-REGIO from about 2010. He argues that the 'hourglass shape' of regional policymaking in Sweden has been an obstacle, with the level of the län (the historical regional policy apparatus of the central state) acting as a bottleneck between the national and the regional levels. The län have small populations compared with regions in large EU countries. In practice, many industrial ecosystem boundaries do not coincide the those of the län, so Swedish regional development policy has been fragmented and often under-critical. Paulsson further points out that there is no governance link between university funding and regional structure in Sweden, further complicating the kind of integration of higher education and research into regional development envisaged in smart specialisation. There was no central force in Sweden supporting smart specialisation policy until Tillväxtverket was given the responsibility in 2016, and started to run pilots from 2018. Both our interviewees and Paulsson's account imply that these systems failures persist in Swedish regional development policy, and therefore there is potential for KKS to add value by supporting greater integration between individual UAS an regional development strategies.

While its statutes dictate that the KKS focus on the needs of business and linkages between higher education and business sectors, the UAS sector has another important role in supplying skills and doing research for service sectors and the state, for example training teachers, healthcare workers as well as more generic skills (software and AI, logistics, technicians). Formally, non-business needs are outside the scope of the KKS. Our interviewees nonetheless repeatedly stressed that there are opportunities for KKS to take a broader role in developing the UAS.

3.2 Challenges for the UAS sector

Interviewees identified several clusters of challenges for the UAS sector.

The **unitary model was seen as counter-productive** – largely serving the interests of the traditional university sector and impeding the development of the UAS. There is therefore a need to legitimise in policy the *de facto* binary approach and be explicit about the differences in roles and rules that apply in the two parts. This also implies addressing the tension between the low level of institutional funding for research among the UAS and the government's ambitions for the quantity and quality of research they can produce.

Interviewees saw the **UAS system** as fragmented and probably containing too many organisations for a population the size of Sweden's. While individual UAS profiles or specialisations have tended to become clearer, there was room for further improvement. Individual UAS 'optimise locally' because (especially since the reforms increasing the autonomy of higher education institutions) there is no coordination mechanism or collective arena that could optimise at the level of the system by negotiating about the division of labour among organisations or coordinating their activities. Optimisation or systemic innovation needs

[5] The report has no publication details beyond the name of the author and the date. Tiilväxtverket among others refer to it, and can be downloaded from https://www.centralsweden.se/wp-content/uploads/Report-on-smart-specialisation-final .pdf

to be a continuous process. A static optimisation is not useful because the UAS are parts of bigger systems that are themselves in constant change.

Experience suggests that societal organisations and systems respond best to a combination of bottom-up and top-down pressures. On balance, it seems that the bottom-up forces on the UAS system have become too powerful – not only because they fragment and limit the system's ability to react to change needs but also because they limit **directionality**. Tackling big challenges such as decarbonisation requires a much more disruptive reorientation of activities to a new purpose than the UAS system has been able to manage in the past.

Several of our interviewees pointed to the Skellefteå University Alliance as a potential model for dealing with change. So far, five universities have agreed to cooperate in Skellefteå, increasing the range and capacity of teaching available to meet the challenge of rapid industrial expansion and resulting skill shortages. The Alliance builds in part on pre-existing external campuses of universities from other cities. So far, there appears to have been little focus on research, though press statements from participants imply that this will follow.

During its growth phase, the UAS sector has been able to adapt flexibly via organic growth to needs and opportunities. The "**steady-state challenge**" it now faces means that to start doing new things it has to stop doing older things. This is altogether more demanding for UAS leadership, management and funding, and the costs and difficulty of change are expected to increase.

While UAS budgets are expected by many to flatten, industrial restructuring and therefore costs of change seem more likely to increase, because of the global and societal challenges discussed earlier in this report. These disruptive changes are likely to be more systemic in character than the simpler changes in technologies and skills that the UAS have traditionally faced. The UAS will need to respond to restructuring with more 'joined-up' changes, orientated towards systems innovation rather than only tackling individual technical changes. This will involve additional stakeholders, policy and political processes, and will demand greater interdisciplinarity from the UAS.

Life-long learning is internationally associated with the further and higher education systems. While in Sweden the government has given the higher education sector this responsibility, our interviewees said that the responsibility has not been accompanied by any funding, and that the UAS were therefore not actively addressing life-long learning.

The interviews produced a mixed picture in terms of **human resources**. Some said that UAS faculty positions could be attractive in their own right (sometimes because they are located in the regions) while others argued that there was a systemic problem of UAS researchers pursuing their careers by seeking a job in a 'proper' university. Student recruitment and retention was widely described as problematic. Fewer students than before appeared to be interested in technical degrees. Many of those who did were primarily interested in learning and less interested in obtaining a certificate. Hence, we were told that many simply disappear before the final exams, having reached their own goal but without graduating, so that the UAS does not receive the completion fee that the government provides.

3.3 Issues for KKS

Our interviewees frequently said that, while KKS is formally a foundation, it is largely staffed by people with a civil service background and behaves rather like a government agency. This has supported its role as a R&I funder specialising in the UAS sector, providing a largely predictable flow of bottom-up funding. Several interviewees said that if KKS abandons this role, it will undermine the viability of the sector.

A smaller number of interviewees held the opposite view: namely, that the KKS was established to act as a change agent, and that the large changes in the context and the urgency of tackling sustainability problems require the UAS to make large adaptations to their behaviour and capacities. This should therefore become – at least for a period – the core of KKS' mission. Some additionally argued that these changes are so big that they could best be addressed by an alliance between KKS, the Strategic Foundation and MISTRA, and that a window of opportunity is opening for the Wage-earner fund foundations to make use of their freedom to act in ways that are difficult to accommodate within the state.

3.4 Contributions from the policy research literature

As indicated above, the policy research literature about UAS appears to be thin and contains few surprises. UAS are often ignored in the wider higher education literature and policy documents. For example, the European Strategy for Universities (European Commission, 2022) mentions the need for universities to tackle the twin green and digital transitions, while not mentioning the UAS at all.

One strand in the literature focuses on the role of UAS and other higher education institutions in regional development, and higher education institutions' importance is well recognised in the literature associated with smart specialisation (RIS3), A recent literature review (Fonseca & Nieth, 2021)of the role of universities in regional development found that key roles were:

- Brokering, networking, triggering learning processes, and shaping institutional capacity
- Assisting in regional planning, new path development, strategy design, implementation, and management
- Having multi-level participation in governing and advisory boards, and contributing with expertise for regional development
- Providing leadership in regional development processes
- Creating links between local and global academic and business networks

In the four cases studied, these functions were also considered important, but there was a tendency for the universities not to get deeply involved in regional policy or governance.

A related literature focuses on 'entrepreneurial universities' in the regional context. A recent book of case studies of regional universities' role in regional development in Norway (Charles, et al., 2021) brings roughly the same message, namely that effective contribution to regional development requires universities to become socially and organisationally engaged with regional development strategy and policy. It concludes that common traits are:

- Certain systemic challenges constrain universities' efforts in delivering their role as significant contributors to regional innovation
- Though challenged in scale and scope, universities in peripheral, rural or less developed regions are significant players in facilitating regional development
- The contributions of universities usually need to be tailored to meet the specific requirements of their respective regions
- Broad stakeholder involvement is required to address the challenges and tensions inherent in regional development

In effect, these studies confirm a central tenet of the smart specialisation literature – namely that higher education organisations can be effective if they become actively engaged in generating and implementing the smart specialisation strategy, but also point to the fact they may have difficulty engaging in this way.

The trend towards mergers between higher education institutions over the past 50 years or so, led in the USA, has produced large numbers of such mergers. (Pinheiro, et al., 2016) point to a review of the literature covering the 1970s-1990s, which identified the most important reasons for merging as being related to improving organisational effectiveness and competitiveness and therefore the need for:

- Boosting efficiency and effectiveness
- Dealing with organisational fragmentation
- Broadening student access and implement equity strategies
- Increasing government control over higher education systems
- Greater decentralisation
- Establishing larger organisations (Ahmadvand, et al., 2012)

More recent merger trends in the Nordic countries seem to be more associated with reorganisations and redivision of labour in higher education systems, consolidations among colleges and UAS to build larger entities, or sometimes integration between UAS and universities. These are often influenced by government policy, but individual cases seem to be driven bottom up because current governance systems make it hard for governments to impose specific strategies or mergers on individual organisations. Both the literature on higher education mergers and wider management experience suggest that mergers fail unless the organisations merging are committed to them.

A slightly earlier analysis of mergers and alliances in higher education across a wider range of countries provides similar case-study evidence (Curaj, et al., 2015) – mostly focused on the process of merger and integration rather than the policy drivers involved. Such as it is, therefore, the academic literature supports the idea that UAS have significant potential to contribute t regional development but that to do so they need to be more active than has traditionally been the case.

4 The policy context

It is important in discussing policy to recall that Sweden has a strong research and higher education system overall, with strong leading universities and an industry with a very high propensity to invest in R&D. Most governments would be delighted to have such powerful assets.

Nonetheless, developments in national and international higher education and R&I policies in recent decades seem to have brought Sweden to a turning point, where the way ahead is unclear. Policies that have increased autonomy in higher education have, at least in the traditional universities, not been accompanied by sufficient modernisation of internal governance to unleash their full potential as change agents. Rather, their ability to develop and implement strategy is hampered by governance that is ill-equipped to handle change. R&I policy in Sweden, as elsewhere, is at a turning-point where the need to reorientate from industrial growth towards societal sustainability is widely recognised, but the needed new governance mechanisms, policies and funding instruments are in the early stages of development. The need not only to understand but also to implement solutions to major problems such as climate change, loss of biodiversity and the failure to circularise the economy is frustrated by inability at the government level to break the ministry silos, engage properly with stakeholders and societal actors outside the R&I policy space, and set clearer directionality for needed socio-technical changes.

Rapid and radical changes in the global context make it more difficult to adjust to these policy needs in higher education and R&I.

4.1 Higher education policy

Especially since Sweden formally has a unitary HEI system, it is important to understand how the UAS fit into the longer pattern of evolution in HEI policy, and therefore useful to devote some space to Benner and Schwaag-Serger's recent (2023) claim that Swedish higher education policy can be divided into four successive stages in the post-War period, culminating in stagnation.

- 1945-1969 – modernisation, while educating a small elite of students. Research was more strongly affected than education and modernised by establishing external funding through research councils and fostering small research institutes, often coupled to the universities of technology. Social mobilisation spanning government, unions, and companies, around the idea of research was a driver of increased social welfare. Broader societal involvement in higher education policy relaced the narrower and more elitist steering of the past. An important footnote was the creation of a college of medicine and dentistry in Umeå, primarily to support regional development in Northern Sweden[6]
- 1970-1990 – the state becoming the main driver and organiser of increased massification of higher education, seeking better alignment between higher education and economic needs, with the regions increasing agitating for better access to higher education to support economic development. 'Sector agencies' increased the volume of external research funding, offering incentives to universities to address the socio-economic needs of the societal sectors they represented, but also triggered opposition from the traditional university establishment that understood this as a reduction in their power. New regional

[6] A development mirrored on the other side of the Norwegian border by the creation of the medically orientated University in Tromsø in 1972

colleges were established, focusing on professional and vocational training needs more than the wider array of more traditional university subjects

- 1990-2010 – this period marks a reduction in state control from the higher education sector, with reforms to increase organisational autonomy and reduce central quality control over higher education. This increased the freedom of higher education institutions (HEIs) to compete to respond both to the research and educational needs of their local 'markets' and to grow in line with application pressure from new students. Both higher education courses and research at HEIs were increasingly rewarded for 'excellence', while (as in other countries) in the same period, the University Law was changed to encompass the 'third mission' of knowledge transfer[7]. Despite considerable deregulation, however, overall growth in the HEI system allowed the universities' behaviour to change little from the previous period, while the UAS entered a more dynamic time of growth and capacity building
- 2010 to the present – Benner and Schwaag-Serger argue that in this period Swedish higher education policy has been in a state of 'expansive stagnation', lacking overall direction and any clear connection to society's transition towards social, economic, and ecological sustainability. HEI policy has, with minor refinements, focused on making Sweden a leading knowledge- and research-based nation. While HEIs individually have a great deal of autonomy and freedom to strategise, in practice they make limited use of this. Collectively, there is no effective arena in which to negotiate, or policy pressure to impose, directionality

Benner and Schwaag-Serger suggest four avenues to increasing the relevance of the HEI system for addressing current societal issues, namely:

- Multidisciplinary centres, institutes or think tanks
- State of the art reviews of knowledge about complex societal problems for decision-makers
- More support for disruptive research
- A higher rate of renewal in higher education

These seem likely to help and should be considered in developing higher education policy. However, in our view, implicit in Benner and Schwaag-Serger's analysis is a more fundamental and troubling narrative about governance failure.

The third (1990-2010) period described marked the beginning of the end of a long period of Social Democrat dominance in government and the start of experimentation with liberal ideas about government and governance – notably through the influence of the New Public Management movement. This aimed to improve the efficiency and 'customer orientation' of the state through de-regulation and the use of markets as well as performance contracts and management by objectives within the state itself.

Governments' increasing desire to set objectives and to stay out of the details of implementation coincided in the higher education sector with the interests of the research and higher education establishment, which consistently objected to sector funding on the grounds that it was 'top-down' and broke the principle of academic freedom in the universities. The higher education reforms of the 1990s modernised the high-level governance of the universities, formally reducing the extent of collegial control, while freeing the universities from micro-management by the Education Ministry. (The creation of KKS and the other wage-earner fund foundations by the Bildt government was in line with this trend towards reducing the role

[7] In Sweden as elsewhere, the third mission was initially seen as creating a focus on knowledge transfer to industry. Since then, the concept has generally been broadened to encompass knowledge transfer (in both directions) between HEIs and society

of the state in micro-managing higher education and research.) But in practice little changed in universities' behaviour. In particular, the inability effectively to make and implement strategy (and especially to shut down old activities in order to take on new ones) that characterised the traditional 'continental' model of university governance that has been normal in Sweden, persisted (Arnold & Barker, 2022) and persists to this day in the traditional universities. In contrast, the growth of the UAS system during the period seems to have created the organisational slack needed flexibly to develop and implement thematic strategies. Whether that remains so now that the period of growth may have finished is an open question.

On this analysis, reactivating the HEI sector as a driver of a developing knowledge society would require more fundamental changes in governance, and in the relationship between the HEIs and society. As the following indicates, the same issue appears when the HEIs are viewed through the lens of research, as opposed to higher education, policy.

4.2 Research and innovation policy

Over the same period, research policy internationally has experienced successive shifts, culminating in the current focus on societal challenges and sustainability – a broad thrust that is still being worked out in practice. Before the Second World War (WWII), most research was in practice "science for use" (Martin, 2003) – often for the monarch and with military aims. But there was also patronage, with other rich people supporting researchers and scholars to research what they wanted. By WWII, governments were devoting significant resources to research to meet their own needs (defence, health, metrology, and so on) as well as via universities and research institutes.

Schot and Steinmuller (2018) and Breitinger et al. (2021) respectively propose three 'framings' and three 'paradigms' in the relationship between science and society after WWII. We prefer to think of three 'generations' of post-War R&I governance, because these link directly to the structure of government and hence to policymaking. Later funding generations co-exist with earlier ones like sedimentary layers, and indeed with the pre-WWII situation, which we can think of as 'generation zero'. Governments need to take account of them all, to produce holistic policy.

- The first generation focusing on basic research, "blind delegation" (Braun, 2003) of the governance of science to the scientists, and relying on a 'linear model' of innovation, namely the idea of 'science push' eventually generating innovations and other benefits in wider society – with Vannevar Bush's (1945) report to the US president, *Science, the Endless Frontier* as the manifesto.
- The second generation taking greater social control of science and demanding a social return in the form of innovation and economic growth, matching scientific and technological opportunities to 'demand pull', then evolving into 'national innovation systems' thinking, seeing innovation as co-produced and dependent on industrial involvement
- The third generation tackling societal challenges, such as climate change, disease, and loss of biodiversity and involving not only the R&I system but also wider society, which helps decide what societal challenges to address as well as implementing the solutions, resulting in systemic changes

In Sweden, the first generation corresponds to the establishment of the research councils in the post-War period. The second is marked by the creation of STU (now Vinnova) in 1968 and the build-up of other sector funders in areas like construction (BFR), transport and communications (KFB), and so on. The transition to the second generation involved learning across more than a decade how to do innovation policy (Weinberger, 1997; Arnold & Barker, 2022). In Sweden, a key event was the publication of the 'Research 2000' report (SOU 1998:128, 1998) – that Benner

(2001) rightly characterises as a counterattack on the growth of innovation policy by the parts of the research community that had felt marginalised by it, and most recently by education minister Tham and his government's research policies. This was the culmination of perhaps three decades of argument about who controlled research policy in a long series of reports from government commissions. In 2000, the government responded to Research 2000 by separating the warring factions into three committees that carved the Swedish state research funding systems into three parts: the Swedish Research Council for the basic research traditionalists; Vinnova for STU's successor Nutek Teknik, KFB, and parts of working life research for the innovation faction; and two smaller research councils with a more applied focus on the built and natural environment (Formas) and health, working life and welfare (FAS, now renamed Forte), handling a mix of fundamental and applied work.

Organising to meet the needs of the third generation is still a work in progress. Notably, since about 2000, governments have told the research and innovation funders to work together in support of a more holistic approach to R&I policy, while retaining the traditional government ministry silos. In Sweden, as in other countries, R&I policymakers are struggling with the 'STI trap': namely, that third-generation policies must embrace implementation and not just knowledge production. (There is no point in knowing how to stop climate change if we do nothing about it.) To be effective, third-generation policy must break out of the R&I world and engage not only with other parts of government but also with many other stakeholders and parts of society.

4.3 An unstable global context

The current period also presents us with very worrying discontinuities at the global level. In brief, these are:

- Most visibly, wars in Ukraine and Israel, cybersecurity threats, rapid technical changes in the way wars are fought, leading to re-armament, concern with dual-use technologies and potentially large reallocations of state budgets from current priorities such as research to other matters
- Changes in geopolitics and the realignment of countries into different blocs than those we have been used to in the post-Cold War period, with some degree of de-globalisation, rearrangement of supply chains, increased focus on keeping some advanced technologies secret, and building technological sovereignty
- Disruptive changes in technology, ranging from digitalisation and AI through the emergence of access to critical materials like Cobalt and Lithium as major policy concerns, and a need for industrial restructuring in areas like car production, energy production and transmission, agriculture, and land use.

These changes are happening under increasing time pressure, making flexibility in research and higher education as well as in wider economy and society increasingly important.

These global issues are beyond the immediate reach of a small organisation such as KKS. One more tractable element is that they imply big changes in skills and knowledge needs.

The current debate about AI is refocusing attention on growing skill needs in industry. A recent EU skills foresight on the future of green jobs (Knudsen, et al., 2024) provides four scenarios, all of which involve substantial disruption, but without offering much sense of what the specific needs are.

The report *Kompetensförsörjningen för klimatomställningen* (Wallén, 2021) published by the Confederation of Swedish Enterprise (Svenskt näringsliv) indicates that there have been important skill shortages in industry since about 20 years ago and argues that the decarbonisation transition will significantly increase this deficit. More than half Svenskt näringsliv's questionnaire respondents said that skill shortages would either completely or 'to a

high degree' prevent Sweden from reaching its 2045 climate goal. As a result, Svenskt näringsliv estimates that about 225,000 people need further education or retraining in the industries it represents. There are further training needs in addition deriving from the digital transition. Svenskt näringsliv argues that new initiatives are needed – this cannot be done within existing systems.

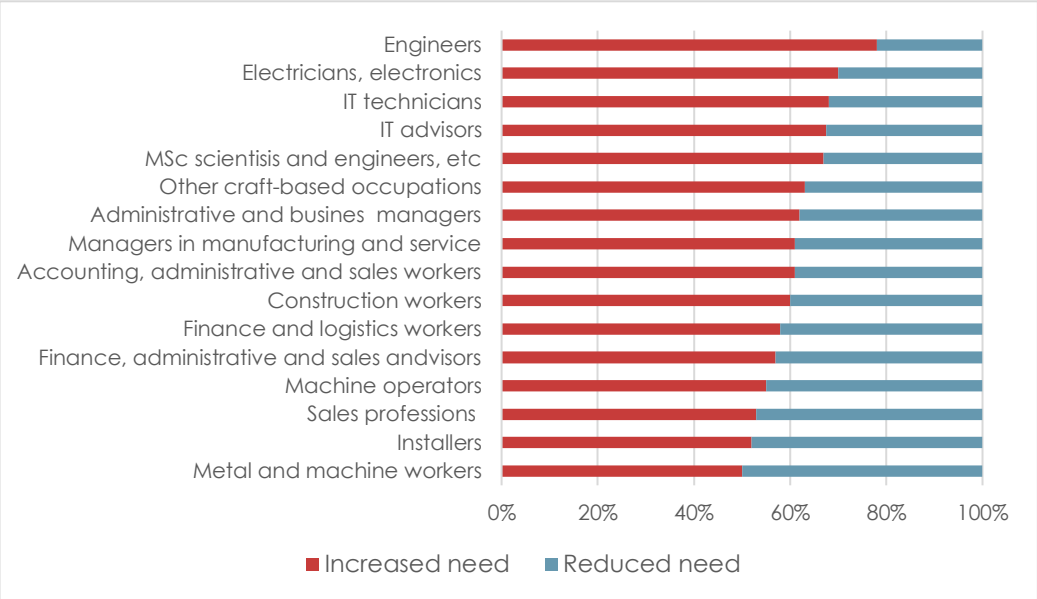
NIFU and SINTEF have recently surveyed over a thousand firms in Norway to explore their perceptions of future skill needs. Table 3 illustrates anticipated changes in different sectors of Norwegian industry driven by the green transition. Figure 9 shows how these vary by categories of worker. The authors point out that the oil and gas industries will have even bigger needs for new skills and skilled people than other parts of Norwegian industry

Table 3 Overview of changes in Norwegian skill needs as a result of the green transition

Sector	Skill needs
Retail	Sustainability, interdisciplinary problem solving, product design, reuse, repair, new business models (circular economy), climate accounting, EU taxonomy and finance, IT and digitalisation
Construction	Circular economy, digitalisation, materials competence, climate accounting, documentation of buildings (engineering and vocational school), sustainability
Manufacturing	Automation and electrical engineering, generalists in energy, design, life-cycle analysis, electrochemistry, chemical processes, mechanical engineering, digitalisation
Agriculture and forestry	Reduced need for basic technical competence, increased needs for digital and biological competence, sustainability, calculating impact on climate and environment, competence about regulatory requirements
Finance and insurance	Climate risk and risk profiles, knowledge of technologies, sustainability expertise and how different industries (e.g. seafood) are affected by the green transition
Transport	Technical competence (electricity, battery and hydrogen, infrastructure, new technology), digital competence and IT, sustainability competence, logistics, monitoring and management systems

Source: Our translation from Endresen et. Al (2023)

Figure 9 Norwegian industry's expectations of changes in needs for different types of workers

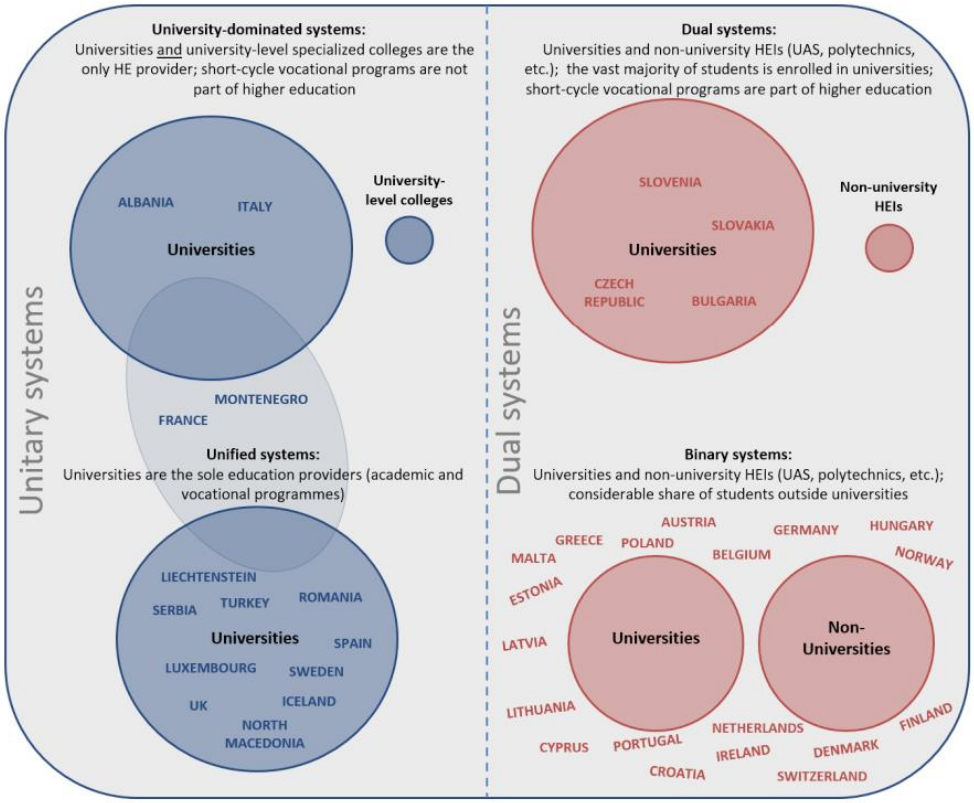


Source: Endresen et. Al (2023)

5 International Experience

The purpose of this section is to understand whether there are policies or policy instruments available that could be of use in implementing KKS' updated strategy. The Appendix to this report contains descriptions of relevant elements of the UAS system in the five countries considered – Ireland, UK, Finland, Switzerland and The Netherlands – and also some notes on life-long learning in Switzerland, which has a well-established system. While the UK is a long-standing example of a unitary system, Ireland, Finland, Austria and The Netherlands are examples of binary systems. We are particularly interested in the modern binary systems, as Sweden appears to be evolving in this direction and, in terms of research at least, can arguably be described as having a binary funding system.

Figure 10 Classification of national higher education systems



Source: ETER (European Tertiary Education Register), Dual vs Unitary systems in Higher Education, ETER: 2019, based on a classification developed by Kyvik (2004)

As the European Tertiary Education Register[8] indicates, UAS are more common in Western European (32% of HEIs) and Northern European (25%) than in Eastern European countries (3%). UAS are more likely than universities to be specialised, especially towards professional and vocation training areas, but patterns vary dramatically among countries. Traditional higher education systems tended to be university-dominated (Figure 10), with vocational education largely handled outside the university system. Systems have tended to evolve either to become unified, where the university sector has in effect absorbed vocational education, or binary, where vocational education has evolved to become degree-granting and evolved into a

[8] https://eter-project.com

parallel but more vocationally orientated system alongside the universities. A few countries have dual systems, where most degrees are awarded by universities but a small vocational sector lives alongside them.

5.1 Evolution of the Universities of Applied Sciences

Table 4 below shows the predecessors of the UAS, their current names, and the year of their establishment in the countries considered. Strategies for the UAS sector tend to be part of broader educational strategy. Strategies solely related to UAS instead tend to be on university-level.

Ireland stands out from the other countries as a late-industrialising economy. After joining the EEC in 1973, Ireland was the poorest country in the community, in terms pf GDP per head, and has gone on to become one of the most affluent. It built on traditional universities from the 1970s, introducing first masters education and then starting to build up doctoral studies from the 1990s. Starting with the Dublin Institute of Technology, it then increasingly upgraded regional technical colleges to Institutes of Technology (IoTs) provide higher levels of education and starting to do research. In recent years, a focus has been on consolidating the Irish IoTs into a smaller number of stronger amalgamed institutes. A second step in the emphasis on consolidation occurred more recently by consolidating two IoTs into so called Technological Universities. This has created pressure on the remaining IoTs to merge into such institutions, in line with the National Strategy for Higher Education from 2011. In Ireland there is a single strategy concerning higher education, the *National Strategy for Higher Education to 2030* from 2011. It puts strong emphasis on consolidation of IoTs.

Table 4 Predecessors of the current UAS and the origin of the current UAS

	Ireland	**United Kingdom**	**Finland**	**The Netherlands**	**Austria**
Predecessor system	Regional Technical Colleges	Polytechnics	Vocational Colleges and Vocational Schools	Colleges for Higher Professional Education	Upper-Secondary School (BHS)
Current system	IoTs and Technological Universities Technological Universities – 2018 IoTs – all institutions upgraded in late 1990s	Post-1992 Universities Established in 1992	UAS and Consortia of UAS, Universities and other institutions UAS established in 1991	UAS Colleges for Higher Professional Education upgraded in the 1960s Legally acknowledged as a higher education subsector in 1986	UAS Established in 1993

The UK built up a system of polytechnics from various technical and vocational colleges, creating a binary system. The Higher and Further Education Act of 1992 consolidated the polytechnics and the traditional universities into a (formally) unitary system, with the polytechnics gaining university-status. Recently, government has recognised that this has led to a neglect of middle-level skills, and it is currently building a system of Institutes of Technology (IoTs) to provide sub-degree vocational qualifications by networking together existing colleges and parts of industry. The UK lacks a comprehensive strategy regarding the higher education sector. Each has a charter granted by the monarch, so formally the state can provide incentives to the universities but not literally tell them what to do. Creating the new organisations may sometimes in practice be the way to ensure change, as appears to be the case with the UK IoTs.

In Finland, the polytechnic reform between 1990-2000 made significant changes to the higher education system and the reform included the establishment of UAS as separate entities from traditional universities. It aimed to provide more practical, professionally oriented education and to increase cooperation between higher education institutions and the labour market. The reform started in 1991 via a merger of several vocational colleges and vocational schools. The first 22 polytechnics schools were established under temporary licenses in 1991 and have since 1996 gradually become permanent.[9] In Finland, higher education policy defines the main aspects of UAS in Finland. Among other things, it states that the activities of universities and universities of applied sciences promote Finnish competitiveness, well-being, education and learning as well as sustainable development and that the higher education system consists of universities and universities of applied sciences of high standards, each profiled in their core areas. Profiled higher education institutions create clearer and deeper cooperation and division of responsibilities among themselves and with research institutes in the areas of education, research, support services, structures, and infrastructures.[10]

The background of the Dutch UAS goes back many decades. However, as part of tertiary education their history dates to the 1960s, when colleges for higher professional education were upgraded. In 1986, they were legally acknowledged as a higher education subsector, and as of now there exist 41 UAS. In 2019 the Dutch Strategic Agenda for Higher Education and Research was published. Regarding UAS, the agenda, among other things, states that the Netherlands are working to expand the practice-oriented research with use of lecturers and a higher professional education postdoc program.

The Austrian UAS (Fachhochschulen) are formally governed at the regional level but have in recent years had strong support from the federal level. They have their origin from the Universities of Applied Sciences Act of 1993. The Act was a response to the university trend of low completion rates, increased number of students and lengthy periods of study.[11] One of the main national strategies in Austria is the National strategy on the social dimension of higher education. Towards more inclusive access and wider participation from 2017. Some of the actions relating to UAS presented in the strategy include to review higher education funding and its effect on the social dimension and integrate social dimension criteria into funding (e.g. incentives, budget allocation) and performance agreements for higher education institutions, and into the next development and funding plan for universities of applied sciences, to increase the number of "educationally disadvantaged" students in higher education by decreasing the discrepancy in the probability factors between public universities and universities of applied sciences and to increase the number of vocational places at universities of applied science to 50 percent.[12]

Table 5 summarises trends in the case-study countries.

[9] https://www.jstor.org/stable/25195373 s.759

[10] https://okm.fi/en/policy-and-development-in-higher-education-and-science

[11] https://op.europa.eu/en/publication-detail/-/publication/f924dc2a-3f4e-11e6-af30-01aa75ed71a1 s.6

[12] file:///C:/Users/nils.karlsson/Downloads/National_Strategy_BF_english.pdf

Table 5 General focus and trends of UAS system reforms in case-study countries

Country	Development/main focus today	Consequences
Ireland	• Binary system (however, more similarities today) • Emphasis on consolidation (increased consolidation)	• Creation of Technological Universities • Increased similarities between the universities and the TU (less of a binary system) • Might lead to a loss in vocational education in the TUs and IoTs
UK	• Unitary system (but still a divide in practice (old/new universities) • Ended binary system in 1992, but exist to some degree through for example the "university alliance" • Focus on increasing access to top universities • Focus on STEM through the new IoTs	• Increased similarities • Increased transparency and access for marginalised groups
Finland	• Binary system through reform starting in 1991 • Centralisation of funding (from local to government) • Harmonisation of admission models • Less of a binary system after the university act in 2009 (university consortium)	• Increased status of polytechnic graduates • Increased eligibility • Increased cooperation among universities, UAS etc, and, through this, an increased focus on third mission
The Netherlands	• Binary system • Since 2001, transferring and developing knowledge has been a second important task. Their primary focus has traditionally been on regional and local needs. • Harmonisation of criteria (1992) • Introduction of performance agreements (2012)	• Increased collaboration between UAS and universities • Professionalisation remains an issue as of 2016 • Increased monitoring and linking of university-budgets to performance
Austria	• Binary system • Expansion of the UAS sector and in particular STEM • Making the UAS resemble the rest of the higher education system, through double diplomas, eligible to PhD • Creating a consistent framework, reducing the number of titles.	• Increased similarities between universities and UAS • Considerably increased the proportion studying at UAS • Increased STEM graduates

5.2 Reforms and instruments of interest

Our quick review of UAS policies shows that there are variations, largely based on national context, but that there are structural forces pushing countries' higher education systems in similar directions. The UAS and universities together have grown in size as higher education has become increasingly massified, and as countries strive to put at least half the cadre emerging from school through higher education. The result is a tendency for most of the higher education institutions to aspire to elite university status and funding[13]. However, the underlying need for

[13] Fortunately, there are exceptions. John Ashworth, the first Vice Chancellor of the University of Salford achieved some notoriety by announcing to the world that Salford was not an elite university: "Our job is to educate the foot-soldiers of the industrial army."

vocational education and training (VET) to supply the middle-level skills needed in much of the economy provides a countervailing force, pushing the higher education system as a whole towards binary structures, whether *de jure* or *de facto*. Even the notoriously elitist UK system has been forced to (re)introduce a middle level, in the form of the new Institutes of Technology, while countries such as Austria, Switzerland and to some degree The Netherlands with long traditions of manufacturing have retained and built on more established systems. The recent industrialisers – Ireland and Finland – have shorter traditions but nonetheless recognise the importance of the UAS and similar organisations.

A second trend is the tendency not only to consolidation within the UAS sector, but to establish network organisations to overcome organisational and spatial boundaries. The UK IoTs are 'front ends' to networks of colleges. Finland's 2009 universities act set up a programme for networking between universities and UAS, and its alliance among Haaga-Helia, Laurea and Metropolis UAS to deliver life-long learning is another example. And in Sweden, the Skellefteå University Alliance provides a novel example of networking existing capabilities flexibly to deliver new teaching for regional needs.

Some of the countries considered have made a systemic response to the need to develop UAS capabilities. UAS are generally eligible for research council funding, but in The Netherlands, Austria and Switzerland there have been special government funding schemes aimed at building UAS capacity – the role that KKS has taken up outside the state.

Approaches to life-long learning vary. The UK remains un-strategic and poorly organised. In contrast, Ireland. Finland, The Netherlands and Switzerland have taken a stronger national approach. Ireland's South-East Technological University provides a coordination network for life-long learning in its part of Ireland. Finland's Service Centre for Continuous Learning and Employment (SCELE) is an unusual attempt to coordinate activities in an area that normally is very fragmented.

In Austria, the UAS Council provides a rare way to coordinate within the UAS sector, as well as handling aspects of the complex relationship between the federal and regional levels for the UAS. The Finnish Profi programme, while addressed to old and new universities rather than the Finnish UAS, has also driven strategic thinking and some de facto coordination among the new universities

These examples are detailed in the Appendix, but suggest at least five options to consider when developing future interventions:

- Reinforcing the UAS system to deliver middle-level skills, as an activity distinct from what traditional universities do
- Networking institutions to deliver teaching and research across geographies, while maintaining the ability to reconfigure the networks and cope with changing needs
- Coordination among institutions, formally or informally, to counteract the tendency to local optimisation
- Creating a systemic mechanism to fund capacity development in the UAS sector
- Coordinated action in life-long learning

6 Challenges and strategic directions for KKS

The picture that emerges is that KKS has delivered all four of its tasks. The Board has rightly decided that the missions to diffuse IT across society and to help reform the research institute sector have been accomplished. Holmberg and Sörlin's (2019) study of KKS after 25 years celebrated the Foundation's achievements in the UAS sector and identified a strategic uncertainty about the degree of funding concentration needed in the future.

Our impression is similarly that KKS has enabled radical increases in research capacity in the UAS sector. However, unlike the institute and IT tasks, the UAS support one has no 'stopping rule', and without a definition of what success looks like it could go on forever. This problem is exacerbated by the fact that KKS has to some extent helped the unitary Swedish UAS system acquire binary foundations, at least in research funding. *De facto*, the traditional universities and the KKS ecosystem inhabit different, albeit strongly overlapping, funding systems, and KKS is an important building block of the UAS research funding system. To put it another way: KKS was set up to be a change agent, but increasingly supports 'business as usual' in what amounts to a gap in the state funding system.

KKS faces a series of further challenges internal to the UAS system.

- A need for further consolidation, de-fragmenting but also coordination in the UAS sector, reducing the tendency of the individual UAS to optimise locally and coordinating more at the system level
- A 'challenge of stability', helping the UAS deal with the strategic and management challenges of moving from a period of growth to one where new things can only be started by stopping old ones
- The need further to increase the UAS' ability to compete for external research funding from the national funding system
- Maintaining and strengthening the role of the UAS in regional development
- The lack of a properly thought through and funded life-long learning policy on the part of government, in a time when there are expected to be disruptive changes in skill needs

Externally, KKS faces further, big challenges

- The global challenges identified above, which have major implications for industry, knowledge, and skills
- Industrial restructuring, which is expected to have a strong regional element – so the UAS will have to act partly to support their regional ecosystems while at the same time handling the economy-wide implications of disruptive changes such as AI
- Last, but absolutely not least, how most constructively to help the UAS tackle the societal challenges, especially climate change

An important cross-cutting choice is the extent to which KKS focuses on the internal or the external challenges.

Table 6 summarises these challenges, presenting them as the bases for alternative strategies. These cannot realistically be compared in cost/benefit terms; KKS needs to consider them more in terms of which challenges it sees as most urgent and addressable, and the extent to which its greater freedom of action than many other funders means it is better placed to act as a change agent than others. However, they are not completely mutually exclusive.

Variant 1 is the 'no change' scenario, in effect accepting that KKS is locked in to a more or less stable system for funding the UAS and should therefore restrict itself to making incremental improvements to it. Variant 1A is similar but would tilt the support further towards funding

excellence. Variant 2 would focus KKS' efforts more on regional development, tackling the relative failure of Swedish UAS to be as involved in regional development as those in other countries by strengthening the role of the UAS in regional strategies and ecosystems to support development and restructuring. Variant 3 would refocus on external challenges – primarily on system-wide aspects of the societal challenges such as reskilling for the green and digital/AI transitions as well as tackling the needs of new strategic technologies. It could be useful to explore whether the Strategic Foundation and MISTRA would be willing to join forces with KKS to tackle aspects of Variant 3 and bring more resources to bear than KKS could alone provide. A synthesis of Variants 1, 2 and 3 could be considered – but would risk being sub-critical.

Table 6 Potential strategic directions for KKS

	Challenges	**Responses**	**Expected outcomes**	**Expected impacts**
1	Continuing need to build and support UAS research capacity in the context of the end of the growth period for HEIs	KKS as a development-orientated 'aggregation machine'	Continued gradual improvement, hampered by increased costs of change. Local optimisation in the UAS system	Continued modest improvements but no radical changes
1A	Continued inability of UAS to compete head-on with the universities, especially in scientific quality	Dash for excellence – refocus a big part of the budget on the highest-achieving players	Perhaps a few UAS can compete more with the universities	The rest are left behind, with a risk of being hollowed out
2	Disruptive regional restructuring (Northvolt, new materials, increased defence production …)	Support UAS to engage in a systemic regional response – wider stakeholder engagement, more teaching and implementation activity	Regional innovation systems adapt faster and better to supporting changed industrial needs	Regional innovation systems more attractive for investment, capturing beneficial impacts. Potentially also tackling grimpacts …
3	Global and society-wide challenges (climate, circular economy, advanced digitalisation and AI …)	New modus operandi, from reactive to proactive. Wider consultation and analysis (needs and demand analyses, enabling technologies, foresights, road maps, alternative futures, guiding visions …) Work with leading players (especially in industry, possibly also HEIs) to define systemic needs	New and changed capacities are overlaid on UAS system, allowing coordinated national or cross-regional action to break skills and knowledge bottlenecks to fixing challenges. Overcome conservative tendencies in regional industries and UAS and tackle the leading edge of new needs	UAS system equipped with new capabilities that can be deployed across regions, supporting the leading edge of change rather than reacting to it. Addresses societal challenges (though only some of them ….)

Instrument choice and design should be tackled once KKS decides its overall strategic direction. Since activating and engaging the enthusiasm of individual UAS and their regions will be important, instruments will need to be competitive and based on bottom-up proposals within broad parameters. Broadly, however, the implications of the three scenarios for implementation are as follows.

- Scenario 1/1A – business more or less as usual

- Continued use of a broad range of instruments similar to the current one, tracking the research career and organisational development
  - Bottom-up approach – no thematic prioritisation
  - Scenario 1A would imply making fewer, bigger and therefore more competitive grants, both to individual UAS and to UAS consortia, while reducing the availability of smaller research grants
  - Since generally grant-making costs are more strongly driven by numbers of grants than by their value, this scenario could produce some small administrative savings
- Scenario 2 – focus on regional restructuring
  - Grants will need to support more planning and networking costs than today (which are unlikely to be attractive for industry to co-fund)
  - More grants will need to go to consortia, to build and support regional networks and ecosystems
  - Participation rules will need to change to ensure engagement with the regional social and policy levels
  - Bottom-up approach, based on competition among regional ecosystems, in which one or more UAS will be embedded
- Scenario 3 – focus on global and societal challenges
  - Implies thematic prioritisation. It is dangerous to do this top-down at large scale, so an initial activation phase will be needed, in which coalitions of the willing and able are defined[14]
  - Competition for large consortium grants, in line with thematic priorities emerging from the activation exercise
  - Slow transition from current instrument portfolio, to avoid all the large new initiatives being launched at once, thus locking up the KKS funding system for several years
  - Additional skills will be needed at KKS, to understand and work with socio-technical transitions and mission-like programmes. This could push administrative costs upwards slightly, but could be compensated by funding a smaller number of bigger projects than is done today

As a private foundation, KKS has much greater freedom to act and to choose its priorities than the public authorities. In the context of the changing societal needs underlying the societal challenges and the UN Sustainable Development Goals, we would argue the time is ripe for a bigger change in direction than has been needed in the past. While five years ago Holmberg and Sörlin's dilemma about whether to focus funding among the set of beneficiaries (Holmberg & Sörlin, 2019) was appropriate, we suggest that scenario 3 is now the most appropriate direction, for the following reasons.

- It is the most relevant to current societal needs
- It helps the UAS system adjust to changing needs – an adjustment that will be needed whether or not KKS changes its strategy
- It continues KKS' central mission of supporting development in the UAS system
- It continues to deliver funding support to the UAS sector, rather than moving it elsewhere

[14] A possible source of inspiration for this could be the strategic innovation agendas used by Vinnova as precursors to the Vinnova/Formas/Energy Agency Strategic Innovation Programmes

- It provides a basis for allying with other funders such as Mistra, the Environmental Protection Agency (*Naturvårdsverket*) and other foundations to increase the amount of resources available
- It is tractable for KKS, given the skills and experience of its personnel, though some learning will be needed

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Appendix A Country cases

A.1 Ireland

A.1.1 Short introduction

The Irish higher education system mainly consist of seven universities and 14 **institutes of technology (IoT)** and is in principle a binary system. There are several differences between these institutions, where for example the boards of the latter are approved by the Minister with the Chairs and appointed by the Minister for Education and Skills. The proportion of postgraduate are also higher at universities. The role of the universities is mainly regulated by the Universities act while the IoTs are regulated by the Institutes of Technology Act.

Above this, there are several colleges, so called colleges of education. These are privately owned and predominately devoted to teacher education. All the colleges of education are closely linked to universities, either as recognised colleges or as associated colleges. Accordingly, their academic and quality assurance procedures come within the university framework and follow its patterns. These colleges benefit from state support and free student undergraduate fees. Their academic awards are made by the relevant university, and the governance, management and staffing procedures are also university approved.

It is the IoTs which represents the universities of applied sciences (UAS) in Ireland, although the comparison is not fully accurate between countries. A technological university can be created through the consolidation of at least two IoTs.

A.1.2 Reforms

The IoTs have since their creation in the 1960s, then known as Regional Technical Colleges, undergone several reforms.

The National Strategy for Higher Education to 2030 from 2011 is one of the main strategy documents concerning education in Ireland. Regarding IoTs, a strong emphasis is put on the need for consolidating IoTs into a smaller number of stronger amalgamated institutes. Except the discussions on needed future reforms the strategy document mention reforms that have been carried out. For example, the **Institutes of Technology Act of 2006** enshrined the principle of legal autonomy of IoTs, and resulted in greater institutional autonomy, improved governance and a statutory guarantee of academic freedom for the IoTs. The act resulted in a similar relationship between them and the Higher Education Authority that the universities got through **the Universities Act of 1997**. For the universities the Act set out the objects and functions of a university, the structure and role of governing bodies, staffing arrangements, composition and role of academic councils and sections relating to property, finance and reporting. The governing authorities are required to see that strategic development plans are in place, and that procedures for evaluating teaching and research are in place. Moreover, the Higher Education Athourity has an overseeing role on such plans and quality assurance procedures. The legislative framework preserves the academic freedom of the universities and respects the diverse traditions and institutional autonomy of each university. The Institutes of Technology Act of 2006 thus resulted in similar aspects for IoTs.[15]

As a next step, the **Technological Universities Bill** was published in 2015 and had as its main purpose to give effect to the recommendations set out in the National Strategy regarding the IoT sector, including the development of a new technological university model. Above this, the

[15] https://eurydice.eacea.ec.europa.eu/national-education-systems/ireland/types-higher-education-institutions-0

Bill provided for a number of important reforms to the governance and operation of the existing IoTs. The Bill was subject to amendments in 2016 and 2017.

After the above-mentioned Bill the **Technological Universities Act** was published in 2018. The act follows the earlier emphasis on consolidation as it sets out a process whereby consortia may apply for technological university designation. The first technological university was formed in 2019 and as of now five of them exist. As mentioned, the creation of a technological university requires the consolidation of at least two IoTs. One purpose of technological universities is to address the social and economic needs of their region and to engage in industry-focused research (emphasis on level 6-8).[16] The possibility of consolidating IoTs into technological universities has challenged the two-tier status quo where the top tier is comprised of the university sector. Moreover, due to the strength of the new technological universities, the remaining IoTs has been forced to explore future options. Additionally, this change, has according to an earlier study led to the university sector adapting many of the attributes traditionally associated with the IoT sector such as widening access to non-traditional students, increasing the vocational relevance of their courses, engaging in more applied research, and focussing in more depth on their locality and region. The same study mention that the experience from the UK indicates a risk that the technological universities and IoTs will lose much of their vocational orientation. The report also mentions that consolidation of IoTs could lead to a loss in the regional development perspective. In sum, while the consolidation of IoTs into technical universities might have led to positive aspects such as diversified academic profiles and elimination of duplicative programmes, it also has negative effects on the Irish UAS system.[17]

Above the above-mentioned reforms, the IoTs, since 2013 also has a performance-based component of their funding model. This component allows for the withholding of up to 10 percent of the allocated block grant based on verified performance against agreed targets for the preceding year. The performance-based component centres around a system of agreed three-year mission-based compacts where HEIs propose their own targets relevant to their agreed mission and profile in line with objectives set by the Minister for Education and Skills as part of an overall system performance framework.[18]

Table 7 UAS related reforms in Ireland

Main reforms and regulations
National strategy for Higher education to 2030
The Institutes of Technology Act, 2006
Technological Universities Act, 2018
Technological Universities Bill, 2015

A.1.3 Ireland IoTs

Ireland had a **Science Foundation Ireland investment programme** in research infrastructure between 2015-2021 **to develop capacity in the R&D system**. In the context of the programme research infrastructure encompasses the equipment, facilities, infrastructure, and personnel

[16] https://hea.ie/policy/he-reform/technological-universities/

[17] https://arrow.tudublin.ie/cgi/viewcontent.cgi?article=1086&context=ijap

[18] https://hea.ie/funding-governance-performance/funding/how-we-fund/

used for research. This includes physical equipment, laboratories, office spaces, IT infrastructure, database access, and technology to facilitate research. It also involves administrative support and professional networks for researchers. The programme involved investments in Institutes of Technology (IoTs). In an **evaluation of the programme**, there were divided opinions within the involved IoTs as to whether the programme was successful or not. Although the majority of IoTs thought it was effective (55 percent), there were still some doubts about it. Of the involved IoTs, 11 percent thought it was neither effective nor ineffective, while 22 percent thought it was ineffective. The remaining 12 percent did not respond.[19]

In 2011, the National Strategy for Higher Education recommended that a network of Technological Universities (TU) should be established in the higher education system, evolving from the existing IoTs towards more university-like structures with greater critical mass, capacity, capability and reach than the former IoTs. As a consequence, the **TU Research Network (TURN**) was established **to examine how** TUs could achieve their national and sectoral objectives. The creation of **TUs strengthened the ambitions of the Government for technological education**. As described in the report, the establishment of **TUs was fundamental in meeting a range of strategic national priorities and key sectoral objectives.** As an example, TUs mission and purpose align closely to meeting key National Strategic Outcomes (NSO) and Public Investment Priorities in Project Ireland 2040 and the National Development Plan 2018 – 2027. **TUs also leads to a deepened talent pool** for regional sectoral clusters and drives applied research and innovation in line with the NSO.[20]

The **transformation between IoTs and TUs** also meant substantially **increasing R&D activity** compared to their predecessor institutions (IoT). This includes:

- An increase in research student enrolment from four to seven percent within five years
- A minimum of five fields of PhD programmes, from the previous three.
- That 65 percent of academic staff should have a level 10 qualification (often PhD), an increase of 20 percent from the previous 45 percent within 10 years.[21]

The development of TUs furthermore significantly enhanced the capacity and potential of the Irish higher education system. This shift allows for re-evaluation of the importance of higher vocational, technical, technological, and professional skills and qualifications, addressing future work demands and opportunities.[22] The government priority on this and a result of the recommendations can be illustrated by the **Technological University Transformation fund** with a **three-year fund totalling €90 million** to assist and support the development and progression of TUs. In turn, this fund was replaced by a €**50 million Technological Sector Advancement Fund**. The objectives of these funds included that the established TUs will be enabled in terms of sustainability and self-sufficiency, with a focus on quality and excellence and capacity building including evidence of durable collaborations with industry, employers and other partners and the highest quality of teaching and research.[23][24] In sum, the consolidation of IoTs into TUs contributed to the above.

[19] https://www.sfi.ie/research-news/publications/SFI-Research-Infrastructure-Indecon-Report-Final-Version-22.pdf

[20] https://hea.ie/assets/uploads/2019/12/Report-of-the-TU-Research-Network-2019.pdf

[21] https://www.sfi.ie/research-news/publications/SFI-Research-Infrastructure-Indecon-Report-Final-Version-22.pdf

[22] https://hea.ie/assets/uploads/2019/12/Report-of-the-TU-Research-Network-2019.pdf

[23] https://hea.ie/policy/he-reform/technological-university-transformation-fund/

[24] https://www.gov.ie/en/press-release/d52f4-minister-harris-announces-50-million-technological-sector-advancement-fund/

A.1.4 Ireland – Lifelong Learning

Lifelong learning poses a significant challenge within the Irish higher education system, as evidenced by several reports pointing out its poor performance in this regard. As the need for skill upgrades grows, changes in funding and operations are required in the higher education system. Institutions must increase the variety and diversity of their offerings and improve the interface between higher education and further education to support better progression opportunities.[25]

The Government White Paper on adult education**, "Learning for Life" (2000),** established lifelong learning as a key principle in Ireland's education and training policy. The **Lifelong Learning strategy** includes **six key approaches**:

1. **High-quality initial education**: providing comprehensive early childhood, primary, and post-primary education, developing key competencies, broadening circular choices, offering diverse options to cater to different abilities and interest, and strengthening language, technical, and vocational curricula.
2. **State investment and addressing disadvantage**: prioritising investment for at-risk groups, focusing on literacy and numeracy, preventing early school leaving, addressing unemployment, and offering second-chance education and training for low-skilled individuals.
3. **Skill development**: ensuring a high-quality workforce by promoting and funding training for job seekers and employees and widening access to lifelong learning through an integrated education and training approach.
4. **Removing Access Barriers**: Strengthening financial supports, guidance, counselling, childcare services, and increasing flexibility in educational provision.
5. **Enhancing Quality of Provision**: Investing in the professional development of teachers and trainers.
6. **National Framework of Qualifications**: Embedding education and training within a national qualification's framework, ensuring quality standards, streamlined progression pathways, credit accumulation, and accreditation of prior and work-based learning, including learning in formal, non-formal, community, and workplace settings.[26]

The 2007 National Skills Strategy is another part of the **lifelong learning strategy** and sets targets for a highly educated and skilled population by 2020, integrating literacy and basic skills into all public-funded education and training programmes. Despite progress, **challenges remain in upskilling individuals at lower qualification** levels (1-3 to 4-5). The government's priority is investing in learning opportunities for the unemployed or underemployed, with initiatives like the Jobs Initiative providing nearly 16,000 education and training places across various programmes.[27]

Ireland's creation of Technological Universities (TUs) is a key component of the government's plan under Project Ireland 2040, aimed at driving regional economic growth and development. By 2026, this initiative seeks to position Ireland as a leading provider of education

[25] https://hea.ie/assets/uploads/2017/06/National-Strategy-for-Higher-Education-2030.pdf

[26] https://eurydice.eacea.ec.europa.eu/national-education-systems/ireland/lifelong-learning-strategy

[27] https://eurydice.eacea.ec.europa.eu/national-education-systems/ireland/lifelong-learning-strategy

and training services in Europe. **TUs are designed to** promote balanced population and employment growth across the country.[28]

Creating a technological university in Ireland requires the merger of at least two institutes of technology. Each consortium must meet **specific criteria**, such as staff qualifications, research output quality, and the proportion of students involved in lifelong learning, before being designated as a technological university.[29] When applying for designation as a technological university, the applicant institution **must have a combined minimum of 30 percent of all students enrolled in lifelong learning programmes**. These programmes include professional-focused, industry upskilling, part-time, work-related, work-study programmes, and/or mature learner initiatives.[30] Such requirements thus create a built-in mechanism which automatically results in a higher emphasis on lifelong learning

An example of a TU dedicated to **lifelong learning is Southeast Technological University (SETU)**. Specifically, SETU forged a **partnership with An Cosán**, Ireland's largest community education organisation, providing adult education and services to women from disadvantaged backgrounds. This collaboration aimed to deliver a tertiary-level programme tailored to mature students and women facing significant barriers, with An Cosán offering comprehensive support services such as hospitality, childcare, flexible scheduling, and tutor assistance to foster inclusion and participation.[31]

The initiative responds to a **critical social challenge in Ireland**: the exclusion of marginalised communities from tertiary education, with **only 10 percent of higher education originating from disadvantaged areas**. An Cosán's learner-centred, holistic, and transformative educational model initially targeted priority groups in Tallaght's local community. Through the partnership between SETU Lifelong Learning and An Cosán, a national Linked Provision programme was established, showcasing leadership in equitable access, participation, and success. The programme offers courses spanning various disciplines and award levels, including Level six Certificates, Level seven and Level eight Degrees, and Special Purpose or Minor Awards. Online provision ensures nationwide accessibility for all learners.[32]

This collaboration has yielded significant achievements, opportunities, and benefits:[33]

Achievements

- 272 learners graduated with a BA Degree level award (2011-2022).
- 1,017 learners have achieved an accredited award (2011-2022).
- The Linked Provision Programme has an 88 percent competition rate (2018-2022).

Opportunities:

- 44 percent of graduates reported entering full or part-time employment (recent graduate survey).
- 38 percent of graduates reported progressing to Honors Degree or Masters level (recent graduate survey).

Benefits:

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[28] https://www.gov.ie/en/press-release/5a1ec4-government-gives-green-light-to-irelands-first-technological-univers/

[29] https://hea.ie/policy/he-reform/technological-universities/

[30] https://hea.ie/assets/uploads/2017/04/Towards-a-Higher-Education-Landscape.pdf

[31] https://hea.ie/funding-governance-performance/south-east-technological-university/

[32] https://hea.ie/funding-governance-performance/south-east-technological-university/

[33] https://hea.ie/funding-governance-performance/south-east-technological-university/

- 97 percent of survey respondents agreed or strongly agreed that the programme contributed to their personal development (2020).
- 83 percent agreed or strongly agreed that it aided in their professional development (2020).

The evidence-based model developed by SETU and An Cosán demonstrates how adult learners facing diverse inequalities can be supported and motivated to access, participate, and succeed in tertiary education. **Key insights from this collaboration include:**[34]

- **Collaboration and partnership** between academia and community-based organisations bring higher education directly to communities, responding to their specific needs.
- **Accessibility, flexibility, and comprehensive support** are crucial for fostering inclusion and participation, including part-time delivery options, minor awards for low-risk entry, and provision of support services such as counselling and mentoring.
- **Transformative education** empowers learners by valuing their motivations, life experiences, and diversity, enabling them to transition to quality employment.
- **Robust administrative data systems** are essential for high-quality programmeme delivery, documenting success, and facilitating organisational learning.
- **Sustainable and predictable funding** is vital for long-term success.
- **Review** processes support programme enchantment and adaption, including transition to online delivery during crises such as the COVID-19 pandemic.
- **Dissemination and engagement initiatives** extend the programme's reach nationally and internationally, fostering knowledge exchange and collaboration.

[34] https://hea.ie/funding-governance-performance/south-east-technological-university/

A.2 United Kingdom

A.2.1 Short introduction

Unlike many of the other countries the UK in practice has a unitary system, with little difference between UAS and universities. Which actors that are UAS are thus difficult to identify. However, a relatively good comparison can be done with what in the UK is called the "old universities", more specifically a pre- och post-1992 university. The post-1992 universities were earlier called polytechnics and had a similar mission as the UAS in other countries. Most of these were previously vocationally and professional focus 'polytechnics' that were granted university status by the **Further and Higher Education Act 1992**. While there are no significant legal or regulatory differences between – 'pre-1992' and 'post-1992' universities, many post 1992 institutions have maintained their vocational and professional identities – for example the University Alliance, a mission group of 12 post-1992 universities describe itself as 'the voice of professional and technical universities.[35]

Another part of the UK-system is the British IoTs. United Kingdom established its first institutes of technologies (IoT) in 2019 and has since then specialised in delivering higher technical education. IoTs in the UK bridge the gap between education and business by fostering collaboration among colleges, universities, and industry partners.

A.2.2 Reforms

The main reform that lays the foundation of the current UK UAS system is the above-mentioned **Further and Higher Education Act 1992** in which the former polytechnics and central institutions gained university status. A goal of the act itself was to end the binary divide between these institutions and the pre-1992 universities. The Act established a single funding structure and a common quality assurance framework for a unitary sector of higher education. In addition, degree-awarding powers were extended to the polytechnics and some other higher education institutions, the polytechnics and other major higher education establishments were allowed to adopt university titles, and these were included in the dual support system for research funding.[36]

The main characteristics of the former polytechnics according to Lewis 1991 was:

- Teaching rather than research is the main function.
- Access is a prime consideration.
- Aptitude for higher education is a more important criterion for admission than formal entry requirements.
- Underprivileged and underrepresented segments of society are encouraged to benefit from higher education through the polytechnics.
- Strong links are fostered with local and regional communities, with industry, commerce, the professions, and the public services.
- Subjects and programs are closely related to the world of work.
- Part-time students form a significant proportion of enrolments.

[35] https://cris.brighton.ac.uk/ws/portalfiles/portal/31853687/WAUS2.pdf

[36] https://files.eric.ed.gov/fulltext/ED465050.pdf

- A substantial proportion of enrolments are in programs leading to a diploma rather than to a full-fledged degree.

A natural criticism of the Act was that these aspects would be lost. However, *the fact that allowing the polytechnics to call themselves universities conceals the fact that the universities to a higher degree had become polytechnics*.[37]

Due to the unitary system, it is difficult to separate UAS when looking at the development of reforms and strategies 1992 onwards. As a consequence, the reforms below are not solely connected to UAS.

The Higher Education Act of 2004 further changes the governance, but also funding and quality assurance mechanisms in the higher education system. Regarding funding the Act for example introduced variable tuition fees and expanded student grants. One of the goals of the Act was to make access to the "top universities" more accessible. However, an earlier study shows the opposite and in relative the terms access to these universities had became less fair.[38]

The Higher Education and Research Act published in 2017 had four broad policy aims:

- increase choice and competition in HE by providing a single route into the sector and levelling the playing field between what were previously known as publicly funded HE institutions and alternative providers
- introduce a new, single regulator for HE to operate a risk-based approach to regulation, reflecting the changing funding landscape
- bring together the widening participation responsibilities of the Office for Fair Access (OFFA) with the funding responsibilities for the activity held by the Higher Education Funding Council for England (HEFCE), promoting social mobility
- simplify the approach to research and research funding, and support interdisciplinary activity

It also resulted in the creation of a new higher education regulator for England, the Office for Students (OfS). The OfS had the power to require higher education institutions to meet a "transparency condition" as a condition of their official registration as a higher education provider. This transparency condition required providers to share with the OfS and wider public annual statistics on the number of applications received from and several offers of university places made to applicants from different ethnic groups.

In addition to this OFFA had as its aim to increase the proportion of learners from under-represented and disadvantaged groups who enter, succeed in and are well prepared to progress from higher education to employment or postgraduate study. [39] UNESCO suggest that this might be the reason for why many universities introduced training for admission staff on so called unconscious bias on admissions decision-making concerning ethnicity and other protected characteristics. This view is also supported by the fact that the ratio of entrants to higher-tariff universities from black British as compared to white British background has changed from 0,61 to 1 in 2015 to 0,92 to 1 in 2021.[40]

In 2021 the Government White paper ***Skills for Jobs: Lifelong Learning for Opportunity and Growth*** was published. According to the white paper the IoTs are unique collaborations between further education colleges, universities and leading employers. They have access to

[37] https://arrow.tudublin.ie/cgi/viewcontent.cgi?article=1086&context=ijap

[38] https://uwe-repository.worktribe.com/index.php/preview/962342/Publication%20JEP.pdf

[39] https://www.offa.org.uk/about/objectives/

[40] https://unesdoc.unesco.org/ark:/48223/pf0000384293/PDF/384293eng.pdf.multi

state-of-the-art equipment and facilities, and benefit from support from local employers and partners, who contribute resources such as further investment, seconded teaching staff, and equipment. Their focus on collaboration between different types of provider and employers, underpinned by capital investment to expand provision, represents an exciting new model for skills delivery. While the IoTs could be viewed to challenge the unitary system, the focus on collaboration still indicates a largely unitary system.[41]

Moreover, the objective is to deliver higher-level technical education with a clear route to high-skilled employment focusing on STEM skills in areas like advanced manufacturing, infrastructure, digital, and life sciences.[42] While the UK still has a largely unitary system the creation of the IoTs partly challenge this as they differ from universities and colleges in four main ways.

- They foster partnerships between businesses and educational institutions to collectively address the technical skill demands of their local communities. Businesses play an active role in shaping training programs, tailoring the curriculum to meet their specific requirements and ensuring a ready supply of skilled local talent.
- They deliver adaptable and cost-effective qualifications to individuals from diverse backgrounds and age groups, preparing them for fulfilling technical careers. Each Institute of Technology sets goals to enhance representation, such as boosting the participation of women in certain technical fields.
- They leverage cutting-edge applied research to foresee the skill sets needed in the evolving workplace driven by new and emerging technologies. Adopting nimble methodologies, the Institute of Technology Network ensures swift integration of industry advancements into training curricula. Collaboration within the network facilitates the exchange of insights and expertise.
- They grant students access to modern facilities and industry-aligned equipment, promoting the adoption of innovative teaching techniques and technologies. A £300 million capital investment is dedicated to establishing new and upgrading existing facilities, enhancing the sector's capability to offer level 4 and 5 qualifications.

The British IoTs have several general aims which illustrate the focus of this reform. Some of these include to bridge the skills gap, particularly in STEM, to promote collaboration between education and industry, to enhance access to technical education and to drive innovation and applied research. In sum, a clear focus on bringing education and society closer together can be seen in the IoTs.

Whether the UK has performance-based funding for specifically UAS is difficult to assess as they to a large degree are non-existent. However, in general the UK HEI has the system called Research Excellence Framework which is used by the four UK higher education funding bodies: Research England, the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales (HEFCW), and the Department for the Economy, Northern Ireland (DfE). The REF outcomes are used to inform the allocation of around £2 billion per year of public funding for universities' research. The Framework has three objectives:[43]

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41 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957856/Skills_for_jobs_lifelong_learning_for_opportunity_and_growth__web_version_.pdf

42 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957856/Skills_for_jobs_lifelong_learning_for_opportunity_and_growth__web_version_.pdf

43 https://www.ref.ac.uk/about/what-is-the-ref/

- provide accountability for public investment in research and produce evidence of the benefits of this investment
- provide benchmarking information and establish reputational yardsticks, for use in the higher education sector and for public information
- inform the selective allocation of funding for research

The report *Jobs of the future* shows several future scenarios which are relevant for the UK HEI sector, including:

- More than 11 million extra graduates, in addition to the 15.3 million graduates currently in the UK workforce, will be needed to fill jobs in the UK by 2035 in industries such as computing and engineering, teaching and education, and health.
- 88% of new jobs by 2035 will be at graduate level.
- The UK will need over 1.9 million STEM professionals, including in areas such as computing and engineering, by 2035.
- The UK will need over 1.2 million health and social care associate professionals, including opticians, medical technicians, housing officers and youth and community workers, by 2035.
- The UK will need over 1 million health professionals (such as doctors and nurses) by 2035.
- The UK will need 1 million teaching and educational professionals, such as university and higher education teachers, by 2035.
- In the UK, due to AI, there will be a 10% net increase in jobs that require a degree over the next 20 years.

Above this lifelong learning and graduate skills and AI are identified as areas important for the future. Regarding lifelong learning it is for example stated that more than half (54%) expect the future workforce will need to retrain at least once in their career due to the rapid pace of technological change. Regarding graduate skills and AI it is for example stated that more than half (52%) of those questioned say that UK businesses will need to rely more heavily on UK university graduates to respond to skills gaps and workforce challenges of the future.[44]

Table 8 UAS related reforms in the United Kingdom

Main reforms and regulations
Further and Higher Education Act 1992
Higher Education Act of 2004
Higher Education and Research Act
Skills for Jobs: Lifelong Learning for Opportunity and Growth 2021

A.2.3 UK IoTs

The UK IoTs are a developing national network of technical colleges working closely with leading industry employers to deliver technical education and training. They are being created by networking together existing further and higher education providers and are part of an

[44] https://www.universitiesuk.ac.uk/what-we-do/policy-and-research/publications/jobs-future

increasing government focus on the need for middle-level skills, de-emphasising the universities. They offer sub-degree qualifications – in effect trying to fill the gap left by the evolution of the old polytechnics into universities. There appear not to have been any clear policy statements about the implications for the university sector, though these can easily be guessed from the growing funding crisis among the universities and the expectation that several universities will be bankrupt within a short time.

The government's goal is to establish 21 IoTs (, with the last two opening in September 2024) and is investing up to **£300 million** to achieve this. The **primary objectives for introducing IoTs in the UK are**:

- **To increase Higher technical Qualifications (HTQs):** significantly boost the number of learners obtaining higher technical qualifications, such as HTQs or higher or degree apprenticeships.
- **To have flexible Access to Education:** Support learners seeking flexible access to higher-level education, catering to school leavers and individuals in the current workforce aiming to upskill or reskill.
- **To promote Diversity:** Attract a diverse range of learners to tackle the lack of diversity in certain sectors of technical workforce.
- **To meet Business Needs:** Provide the skills that business requires both now and in the future which are essential for local, regional, and national productivity and growth.

One notable government initiative involving IoTs is the Emerging Skills Project, part of the Skills for Jobs plan. Launched in 2021, this project leverages the technological and industrial expertise of the **High-Value Manufacturing (HVM) Catapult**, a Centre of Innovation, **to identify future skills needed in UK manufacturing**. It collaborates with IoTs and other stakeholders to develop training systems and products that meet these emerging needs, enabling UK businesses to **better harness new technologies and maintain competitiveness.**[45]

A.2.4 United Kingdom – Lifelong Learning

As of 2021, the **UK lacked a formal legal and regulatory framework concerning Lifelong Learning (LLL)**, with government policies in this realm being encouraging but lacking clear, definitive directives. However, certain conditions related to LLL and Adult Education (AE) have been outlined within the Skills Strategy in England. **This strategy emphasises** the importance of individuals and employers contributing to educational costs, particularly as funds are limited. The goals of AE in England have predominantly embraced a market-oriented approach, as evidenced by their inclusion in the "Skills for Sustainable Growth: Strategy Document".[46]

The "Rigour and Responsiveness in Skills" strategy, updated in 2013, further underscores this market-driven approach, focusing on enhancing the qualifications of the workforce. The overarching aim is to establish a flexible system capable of meeting the demands of employers by providing relevant training opportunities. Notably, **LLL in the UK is frequently associated with** competitiveness, market orientation, and aligning with the needs of industry and the business world, as highlighted across various policy documents.[47]

A policy which aims to support lifelong learning in the higher education system is the **Lifelong Loan Entitlement (LLE).** The LLE provide adults with the financial flexibility to access education and training throughout their lives. **This entitlement offers** up to four years' worth of student loan

[45] https://emergingskillsproject.com/about/

[46] P.318 https://dergipark.org.tr/tr/download/article-file/963846

[47] P.318 https://dergipark.org.tr/tr/download/article-file/963846

funding **(£37,000)** which can be used for both full-time and part-time study, allowing learners to pace their education according to their needs. This loan is also accessible to IoT students.[48] Furthermore, the **LLE entails that starting from 2025**, universities and colleges will be mandated to adopt a new method for determining the maximum level of tuition fees applicable to various courses. **This approach aims to ensure** that the pricing of modules and short courses aligns with the principle of proportionality, thereby enabling all students to access these courses at equitable rates and fostering increased participation in flexible learning methods tailored to individual needs. The **Bill will**:

- **Introduce a novel method** to restrict the fees that colleges or universities can levy for a course or module based on credits. This ensures that the fee structure remains proportional regardless of whether students opt for short courses, individual modules, or traditional full courses.
- **Empower the Secretary of State for Education** to establish maximum chargeable credits per course year, thereby preventing students from being subject to unfair charges for their courses.
- **Introduce the concept of a 'course year'** in place of an 'academic year' to enable more precise application of fee based on the actual commencement date of the course. This adjustment supports the adoption of more flexible study patterns.[49]

[48] https://www.gov.uk/government/publications/lifelong-learning-entitlement-lle-overview/lifelong-learning-entitlement-overview

[49] https://educationhub.blog.gov.uk/2023/02/02/everything-you-need-to-know-about-the-lifelong-learning-bill/

A.3 Finland

A.3.1 Short introduction

The Finnish UAS were established in the early 1990s as an experiment by The Ministry of Education. This experiment, which commenced in 1991 and extended until 1999, aimed primarily to enhance vocational and university education by elevating the theoretical framework of applied sciences degrees. Initially regulated by the Act on Experiment in Youth Education and Polytechnics in 1991, the status of UAS was later fortified through the **Act on University of Applied Science Studies** in 1995. The overarching intention was to establish educational institutions that provide vocational higher education alongside traditional universities of science.[50]

The first institution to receive a license was Haaga Instituutti, founded in 1991. Subsequently, Helia University of Business and Applied Sciences was granted a license to operate as a UAS. These institutions later merged to form Haaga-Helia University of Applied Sciences.[51] During this period, other universities such as PIRAMK and TAMK were also granted licences to operate as UAS, later amalgamating into a single UAS entity.[52] Initially, these licenses were only temporary, and it wasn't until August 1996 that the first UAS received permanent licenses to operate.[53]

In Finland, UAS has as a primary objective to offer education that responds to market demand. They engage in collaboration with businesses, industries, and service sectors at a regional level. Apart from education, UAS also prioritise research and development (R&D) activities that foster regional growth and support instructional objectives. In Finland, UAS offer bachelor's degrees, master's degrees, open UAS education, professional specialisation programs, adult education, and professional teacher education.[54] In Finland, institutions commonly known as polytechnics schools are also recognised as UAS.[55]

A.3.2 Reforms

The polytechnic reform between 1990-2000 made significant changes to the Finnish higher education system. This reform included the establishment of UAS as separate entities from traditional universities. It aimed to provide more practical, professionally oriented education and to increase cooperation between higher education institutions and the labour market. The reform started in 1991 by a merger of several vocational colleges and vocational schools. The first 22 polytechnics schools were established under temporary licenses in 1991 and have since 1996 gradually become permanent.[56]

A previous study indicates that the polytechnic reform yielded positive outcomes in terms of earnings for polytechnic graduates compared to students from the same institutions prior to the reform. However, it also resulted in a decline in relative earnings for graduates of vocational colleges as the new polytechnic graduates entered the labor market.[57] Furthermore, another study revealed that the earnings of post-reform graduates increased notably only in the fields of business and administration, with insignificant changes observed in other fields. Additionally,

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[50] https://www.theseus.fi/bitstream/handle/10024/66938/A1.pdf?sequence=1 s.7

[51] https://www.haaga-helia.fi/en/haaga-helias-story

[52] https://sites.tuni.fi/tamkannualreview2019/tamk-history/

[53] https://www.theseus.fi/bitstream/handle/10024/66938/A1.pdf?sequence=1 s.7

[54] https://opintopolku.fi/konfo/en/sivu/higher-education#finnish-universities-of-applied-sciences-uas

[55] https://www.niad.ac.jp/media/001/201802/pdf/nk002005.pdf s.79

[56] https://www.jstor.org/stable/25195373 s.759

[57] https://www.jstor.org/stable/25195373?seq=1 s. 755

employment levels rose for business and administration graduates following the reform, while remaining unchanged for graduates in other fields.[58] Moreover, the polytechnic reform is associated with an increase in the total number of high school graduates migrating to Finland.[59]

An important policy document for the period around 2010 is the **2007-2012 Finnish National Development Plan for Education and Research.** The development plan directs the implementation of research and education policy goals stated in the Government Program and in the 2007-2012 development plan UAS was a large focus. Among other things, the development plan states:

- Closer administrative cooperation between universities and polytechnics and joint strategic decision-making are desirable, especially in areas with weaker population development.
- The joint work agreements of university center operators will be renewed so that UAS can also join them.
- The funding of UAS will be developed to be more encouraging than at present, so that the funding is determined more on the basis of degree goals and completed degrees and the quality of the education than at present.

Additionally, The Ministry of Education intends to reform the guidance for university and polytechnic planning, with a focus on enhancing the effectiveness and quality of research and teaching. Monitoring mechanisms will gauge the efficacy of higher education institutions, with funding allocations based on developed indicators. The guidance framework for UAS allows flexible resource allocation to degrees, catering to both younger and adult learners within the prescribed degree goals.[60] Regarding R&D, increased funding is earmarked for UAS to bolster R&D activities that contribute to regional development and address real-world challenges.[61] Moreover, stronger alignment between UAS studies and R&D endeavours is envisaged to lead to a twofold increase in completed R&D projects.[62] Notably, preparatory education for UAS is set to receive additional funding as part of the basic allocation for UAS.[63]

The plan was subject to several reforms. In a discussion paper from the Finnish Ministry of Education and Culture (MEC) there were some guidelines about reforms of the innovation system. The reforms during this period included several **mergers of higher education institutions** to reduce the total number of institutions.[64] The mergers set to strengthen the institutional profiles, the research capacity and lead to a more efficient allocation of resources.[65] The institutional mergers were increasingly possible through the **University Act of 2009**, in which universities, UAS and other institutions got the possibility of entering a consortium. The new possibility of establishing university consortium made an exception to the otherwise dualistic higher education landscape in Finland, divided into research universities and UAS. The consortia provide education and research activities in areas otherwise lacking a local university through collaborative efforts of the 'parent' universities. Their position was legitimised in the above-mentioned University Act, and in 2012, the additional regulations on how to secure their state funding were approved. The establishment of these consortia were justified by the

[58] https://www.sciencedirect.com/science/article/abs/pii/S0272775709000417 s. 672

[59] https://mpra.ub.uni-muenchen.de/34619/1/MPRA_paper_34619.pdf s. 16

[60] https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/79100/opm09.pdf?sequence=1&isAllowed=ys.37-38

[61] https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/79100/opm09.pdf?sequence=1&isAllowed=y s.39

[62] https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/79100/opm09.pdf?sequence=1&isAllowed=y s.50

[63] https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/79100/opm09.pdf?sequence=1&isAllowed=y s.47

[64] https://nrl.northumbria.ac.uk/id/eprint/45369/8/scab003.pdf

[65] https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1468-2273.2009.00425.x?saml_referrer s.230

enhanced societal role of higher education to respond to local needs. Besides providing access to higher education and being a source of skilled workforce, the consortia are expected to play an enhanced role in regional development. The consortia have been especially active in EU Structural Funds projects.[66]

Examples of consortia in which UAS can collaborate include:

- Tampere3 - Tampere University of Applied Sciences, Tampere University and Tampere University of Technology
- 3AMK - Haaga-Helia, Laurea and Metropolia .
- Lapland's higher education group - Lapland University of Applied Sciences and the University of Lapland.
- The Vaasa University Consortium - University of Vaasa, Åbo Akademi (Vasa), Svenska Handelshögskolan, Vaasa University of Applied Sciences, Vocational College Novia and Helsinki Faculty of Law Education in Vaasa.
- LUT University and LAB University of Applied Sciences form a "group of two autonomous higher education institutions".
- A partnership of the University of Turku, Åbo Akademi, Turku University of Applied Sciences, Vocational University of Applied Sciences Novia, Diakonia University of Applied Sciences and Humanist University of Applied Sciences.

In autumn 2011, a reform of polytechnics was initiated with the purpose of transferring financing from local authorities to the government with the goal of improving the quality and impact of polytechnics operations.[67] The polytechnics reform that started in 2011 lead to **the University of Applied Science Act in 2014.** The Act was published with the purpose of regulating the operations, governance, funding, and supervision of UAS. The Act sets out the mission and objectives of UAS, defines their role in the Finnish higher education system, and outlines the criteria for the allocation of government funding. Additionally, the Act addresses the student body, supervision, reporting and the handling of personal data within UAS. The Act aims to ensure the quality, effectiveness, and accountability of UAS in fulfilling their educational, research, and societal responsibilities.[68]

In 2018 the student education selection went under reform with the objective was to expedite the shift from secondary higher education and to bolster the significance of the matriculation exam compared to the entrance examination. The reform has received criticism for some subjects have been given to much weight compared to other subjects in the student selection process.[69]

The student choice reform started in 2020 and meant that UAS in Finland changed their selection criteria for admitting students. Previously, only high school diplomas were considered for selection. However, since spring 2020, applicants with both a matriculation degree and a vocational basic qualification completed after August 1, 2015, became eligible for selection. Common scoring models were introduced for various qualifications, including the matriculation examination, vocational basic examination, and international degrees. UAS now set minimum score limits and threshold conditions for each program. Additionally, applicants with both a high school diploma and a vocational basic qualification have separate quotas for admission,

[66] https://nrl.northumbria.ac.uk/id/eprint/45369/8/scab003.pdf

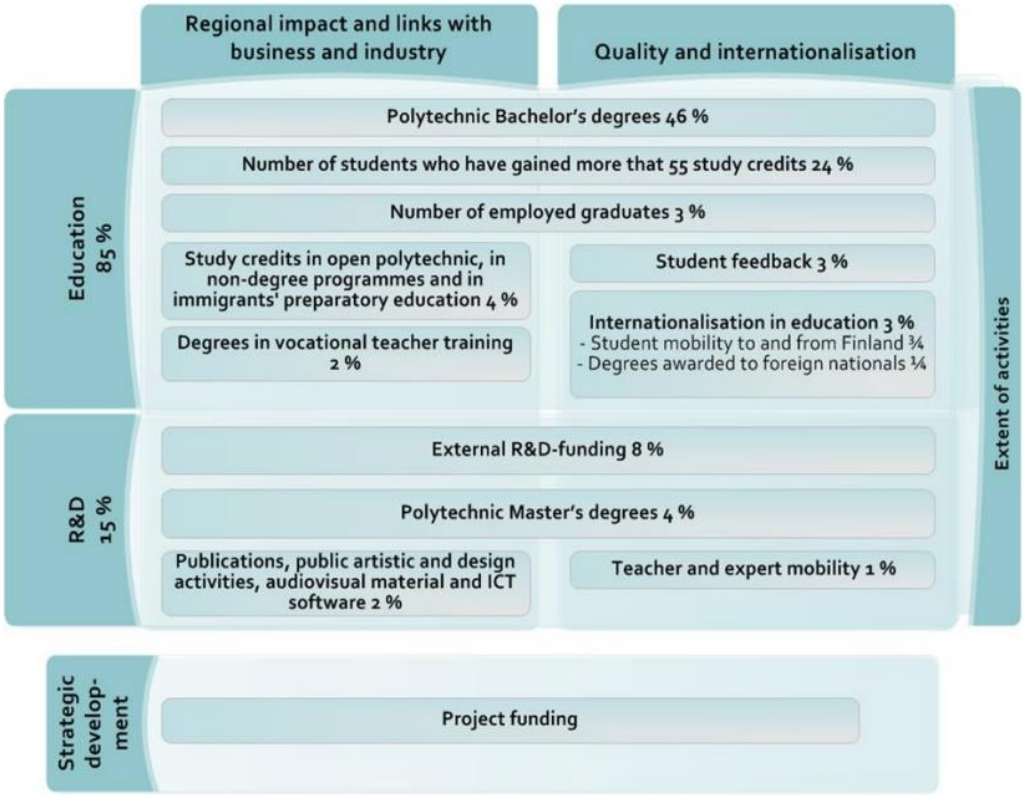
[67] https://www.oecd-ilibrary.org/sites/287ea6a3-en/index.html?itemId=/content/component/287ea6a3-en

[68] https://elab.lab.fi/sites/default/files/category-page/2020-12/Universities%20of%20Applied%20Sciences%20Act.pdf

[69] https://eurydice.eacea.ec.europa.eu/national-education-systems/finland/national-reforms-higher-education

which vary depending on the program. These changes apply to all UAS and fields of study, except for culture and interpreter training at Diakonia University of Applied Sciences. The reform also introduced AMK, a new type of selection exam. The introduction of the AMK selection exam marked a departure from the previous practice of conducting nationwide selection exams by field of education. This change came into effect during the autumn 2019 joint application period.[70] Finland also has a performance-based funding model for UAS. The figure below illustrates this during the year 2014.

Figure 11 Finland UAS performance- based funding model



Moreover, the figure below illustrates the future needs and trends of UAS in Finland according to the Finnish UAS.[71] In general, according to a report by the Finnish National Agency for Education estimate that in the future workforce, 47 percent should have vocational education, 30 percent university of applied science education, and 22 percent university education. The increase in the need for higher education is due to the workforce becoming more expert-driven.[72]

[70] https://www.ammattikorkeakouluun.fi/opiskelijavalintauudistus/

[71] https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/75119/okm11.pdf

[72] https://www.oph.fi/en/news/2024/demand-higher-education-has-increased-especially-more-experts-engineering-and-service

Figure 12 Future needs of UAS in Finland

Figure 40. Average agreement to statements about Higher Education, ranked on average importance (also ranked within categories of importance)

Average importance	Statement	Average agreement
Very Important	Studentcentred (i.e. blended learning, flipped classroom) learning methods should be fully implemented	Fully agree
Important	Interdisciplinarity will become more important in both research and education	Fully agree
	Research quality at Finnish HEIs is generally high	Somewhat agree
	There are sufficient structures in Finland for utilisation of research findings	Somewhat agree
	Recruitment of the staff will become the most important future investment for HEIs	Agree
	Collaboration with industry raises the quality of research at HEIs	Agree
	Collaboration with industry will become more important than basic research	Agree
	The grand challenges and societal needs must have a greater influence on which research is being supported	Agree
	Distinct profiling and branding of HEIs become more important	Agree
	Student selection will become the most important future investment for HEIs	Somewhat agree
	There will be more online courses and less students on campus	Agree
	A HEI should be able to grant both academic and professionally oriented HE degrees	Somewhat agree
	Universities of applied sciences should have a regional focus rather than national or international	Somewhat agree
	Foreign students from outside EU need to pay tuition fees	Agree
	Better regional embedding is essential for all HEIs	Somewhat agree
	Finland needs more than one internationally topranked university, even if means to reallocate national resources from weaker to stronger HEIs	Somewhat disagree
	All the students need to pay tuition fees	Disagree
	Export of services of HEIs becomes more important	Agree
	The grand challenges and societal needs must have a greater influence on the educational content	Agree

Source: Technopolis 2015

Table 9 UAS related reforms in Finland

Main reforms and regulations
Polytechnic reform between 1990-2000
University of Applied Science Studies Act of 1995
National Development Plans for Education and Research
University Act 2009
2011 reform of polytechnics
University of Applied Science Act 2014
Student education selection 2018
Student choice reform 2020

A.3.3 Finland Profi (Research Council of Finland)

The **Finnish University Profiling (PROFI)** funding scheme applies **exclusively to Finnish universities, excluding UAS but including new universities**. Documentation of the granted funding through

the PROFI scheme from 2015-2023 indicates that 15 universities have received financing, with none of the recipients being UAS.[73] An evaluation of the PROFI funding found that it has **not led to strong cooperation between universities** but **has increased the exchange of information between the universities** and **strengthened the discussion on the division of labour**. The PROFI funding **has been an effective tool** for strategy implementation, management, and monitoring, enabling quicker decision-making and adaptation. PROFI funding has largely achieved its mission, with universities developing clear plans for further growth in their profiling areas. However, the landscape of **competitive research funding in Finland has become fragmented**, with high application costs. The evaluation recommends maintaining strategic planning elements in state funding while streamlining funding processes to reduce complexity.[74]

In 2020, the Academy of Finland awarded **EUR 10 million** to higher education institutions for Research, Development, and Innovation (RDI) networks. This funding **aimed to foster research-based partnerships** with businesses and industries, **enhancing the societal impact of high-quality research**. The **initiative was designed to** strengthen and deepen existing collaborative networks and to establish new ones.[75] However, there is no evaluation of the programme yet.

A.3.4 Finland – Lifelong Learning

The Finnish education system **fosters lifelong learning through several avenues**. Firstly, there are **no dead-ends in the system**, allowing learners to progress to higher levels of education regardless of their previous choices. Recognition of prior learning minimises unnecessary redundancy in studies. Moreover, legislation mandates educational providers actively to **promote lifelong learning**, ensuring its continuous support throughout the system.[76]

In 2020, **policy guidelines** were established for the **continuous learning reform**, outlining a vision and 27 measures aimed at achieving targets by 2030. This reform primarily **addresses competency needs** arising from shifts in the workforce, emphasising the holistic development of education and employment services. Its key objectives include facilitating working-age individuals' competency development and enhancing the availability of skilled labour. The reform's implementation spans beyond the government term, highlighting the importance of completing ongoing initiatives in the coming years.[77]

As part of this reform, the **Service Centre for Continuous Learning and Employment (SCELE)** was established to enhance the skills of working-age individuals and bolster the supply of skilled labour. SCELE finances targeting training programmes based on foresight information to address sudden skills needs or complement existing education and training provisions. These programmes target sectors such as healthcare, social welfare, early childhood education, care, hospitality, tourism, culture, and events industries impacted by the COVID-19 pandemic. Additionally, SCELE fund training related to green transition and digitalisation, focusing on areas like the hydrogen economy and battery industry.[78]

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[73] https://www.aka.fi/globalassets/1-tutkimusrahoitus/4-ohjelmat-ja-muut-rahoitusmuodot/5-yliopistojen-profiloituminen/ulkoiset-sivut_myonnot_profi_1234567_euroa_saavutettava_en.pdf

[74] https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160948/OKM_27_2018.pdf

[75] https://www.aka.fi/en/about-us/whats-new/press-releases/20202/academy-of-finland-grants-10m-for-partnership-networks-in-research-development-and-innovation/

[76] https://eurydice.eacea.ec.europa.eu/national-education-systems/finland/lifelong-learning-strategy

[77] https://www.oecd-ilibrary.org/sites/2ffcffe6-en/1/2/4/index.html?itemId=/content/publication/2ffcffe6-en&_csp_=46e1e4785a276963426792140c5707f5&itemIGO=oecd&itemContentType=book

[78] https://www.oecd-ilibrary.org/sites/2ffcffe6-en/1/2/4/index.html?itemId=/content/publication/2ffcffe6-en&_csp_=46e1e4785a276963426792140c5707f5&itemIGO=oecd&itemContentType=book

SCELE also pioneers new approaches to reach employed individuals who typically participate less in training and education. These outreach initiatives, implemented in 1,200 companies, serve to gather research data on the effectiveness of measures. Furthermore, **SCELE analyses foresight information** on skills and labour force requirements, develops information services, provides guidance, and enhances regional collaboration networks.[79]

An **exemplary Finnish consortium engaged in lifelong learning** is the alliance comprising the three UAS: Haaga-Helia, Laurea and Metropolia. These institutions leverage data to:

- Understand current and future skill demands,
- Provide students with guidance on course selection and individual learning paths,
- Inform curriculum development,
- Enhance the competitiveness of educational offerings, and
- Develop the competencies of university staff.[80]

[79] https://www.oecd-ilibrary.org/sites/2ffcffe6-en/1/2/4/index.html?itemId=/content/publication/2ffcffe6-en&_csp_=46e1e4785a276963426792140c5707f5&itemIGO=oecd&itemContentType=book

[80] https://www.oecd-ilibrary.org/sites/2ffcffe6-en/1/2/4/index.html?itemId=/content/publication/2ffcffe6-en&_csp_=46e1e4785a276963426792140c5707f5&itemIGO=oecd&itemContentType=book

A.4 The Netherlands

A.4.1 *Short introduction*

The background of the Dutch UAS (Dutch: hogescholen) goes back many decades. However, as part of tertiary education their history dates to the 1960s, when colleges for higher professional education were upgraded. In 1986, they were legally acknowledged as a higher education subsector, and as of now there exist 41 UAS. The Dutch UAS has undergone a significant merger process since their creation. The number of institutions which were 400 were reduced by 90 percent, in which the process was based on an increase in the number of students in this sector, instead of an expansion of the research universities, as to maintain the quality of academic education and to reduce its costs. The result has been that big conglomerates have emerged, several of them comprising over 30,000 students.[81]

The Dutch system is moreover binary with universities (WO) on the one hand and UAS (HBO) on the other. Their main task is to offer theoretical and practical training with an explicit professional orientation. Since 2001, transferring and developing knowledge has been a second important task. Their primary focus has traditionally been on regional and local needs, although several UAS also operate nationally and internationally. As a subsector, it hosts institutions that vary in size and orientation, from small mono-disciplinary institutions to large multi-disciplinary ones.

A.4.2 *Reforms*

The Dutch UAS has undergone several reforms since their foundation in the 1960s. The foundation for the transformation of and expansion of vocation education institutions into more comprehensive UAS was laid by the **Higher Professional Education Act of 1986 (WHBO)**. It provided separate legislation for higher VET and thus freed it from the constraints of secondary education regulation. The WHBO was superseded by the **Higher Education and Research Act of 1992 (WHW**), which could be considered as the primary legislation governing higher education in the Netherlands. The Act introduced reforms to streamline and consolidate the higher education system, enhance quality assurance mechanisms, accreditation processes, and program validation, and promote collaboration between Hogescholen, Research Universities, industry, and the public sector. For example, regarding accreditation the WHW states that all degree programmes offered by both universities and UAS must be assessed according to a set of criteria. It is the NVAO which has the main responsibility for this, however Ph.D. programmes are the responsibility of the individual university and therefore fall outside the scope of the accreditation process.[82] [83] [84]

According to the WHW the formal tasks of UAS are:

- To offer professional training
- To carry out research relating to the education-programs. The Open University is mentioned separately in the WHW. This institution provides vocational- and university-training in the form of distance learning.[85]

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[81] file:///C:/Users/nils.karlsson/Downloads/nadams,+p27_28_de_Wit.pdf

[82] https://www.government.nl/topics/secondary-vocational-education-mbo-and-tertiary-higher-education/tertiary-higher-education

[83] https://www.cedefop.europa.eu/files/4142_en.pdf

[84] https://wetten.overheid.nl/BWBR0005682/2014-01-01/1#Hoofdstuk10

[85] https://ris.utwente.nl/ws/portalfiles/portal/5580622/Canton01dutch.pdf

Forward to 2001 another reform was introduced. In 2001, the Ministry of Education and the representative organisation of the UAS reached an agreement, known as a 'covenant', to introduce new staff positions within the UAS. These newly established roles were termed 'lectorates'. Each lectorate is overseen by a 'lector', a position sometimes likened to a 'UAS professor', albeit without the authority to supervise doctoral degrees. One primary responsibility of a lector is to initiate 'knowledge circles' within the UAS. These circles comprise individuals who collaboratively develop, exchange, and disseminate practice-oriented research knowledge alongside their teaching duties. The implementation of lectorates at the UAS was driven by four key objectives: a) advancing knowledge development, b) enhancing staff professionalisation, c) innovating educational programs, and d) facilitating the exchange of knowledge between the university and the broader economy and society.[86]

In 2005, a new policy tool was implemented to enhance the research capabilities of UAS called 'knowledge circulation' grants. Initially aimed at fostering knowledge development and collaboration between UAS and industry, these grants expanded their focus in 2006 to include partnerships between UAS and public sector organisations. Additionally, a related funding program emphasising practice-oriented research was introduced in 2008.[87]

In 2010, another initiative was introduced with the establishment of the first Centres of Expertise. The Centers represent public-private collaborations, partially funded by the government, where UAS collaborate with industrial partners to foster knowledge development and exchange.[88]

In 2012 the so called prestatieafspraken (performance-based funding) was introduced. These were introduced as part of a new performance-based funding model for higher education institutions. The table below gives an overview of what the initiative is.

[86] https://op.europa.eu/en/publication-detail/-/publication/81f05984-3f4e-11e6-af30-01aa75ed71a1/language-en/format-PDF/source-313295921

[87] https://op.europa.eu/en/publication-detail/-/publication/81f05984-3f4e-11e6-af30-01aa75ed71a1/language-en/format-PDF/source-313295921

[88] https://op.europa.eu/en/publication-detail/-/publication/81f05984-3f4e-11e6-af30-01aa75ed71a1/language-en/format-PDF/source-313295921

Table 10 Prestatieafspraken (performance-based funding)

Aspect	Description
Rationale	Strengthen institutional profiling; improve student success and teaching quality; Alignment of institutional goals with national higher education agenda
Duration of the agreement	Four years
Number of goals	Three broad goals: (1) improve education quality & student success; (2) institutional profiling & programme differentiation; (3) strengthening knowledge transfer & societal engagement
Goal setting/process of concluding the agreement	Institutions set their own ambitions and goals (including quantitative ambitions). An independent Review Committee discusses ambitions with the executive board of the institutions and advises the ministry about the consequences for the institution's performance funding.
Indicators in agreement	Seven mandatory indicators focusing on education (student success; quality). Institutions can choose to incorporate additional (non-mandatory) indicators to express further ambitions
Monitoring of progress on agreements	Each institution reports on progress in its customary annual report. This acts as input for the Review Committee's System Performance Reports (published annually). In a mid-term evaluation meeting between the Review Committee and each institution the institution's progress is discussed. Data are reported by the institution itself but are checked for accuracy by an accountant.
Final evaluation of agreements	Minister about each institution's goal achievement. The minister then takes final decisions about performance budget. After contract period: Review Committee published its final system performance report and its advice on the future of the performance agreements.
Link to budget	Seven percent of the basic occupational education grant for the period 2013- 2016 is ted to goal achievement. This consists of two parts: - five percent is tied to the seven mandatory indicators; - two percent is tied to the instituion's plans for profiling and differentiation. Based on the advice of the Review committee, the minister decides on consequences for funding.
Consequences for non-compliance	A reduction in the institution's future budget (i.e. after the contract period) to be potentially applied (by Minister) in case of underperformance. Final financial consequence depends on outcomes for the mandatory performance indicators and the advice of the Review Committee.

Source: Table 1 in the link below
https://ris.utwente.nl/ws/portalfiles/portal/234127152/NIFU_innsikt2020_5_Performance_Agreements.pdf

In 2019 the Strategic Agenda for Higher Education and Research was published. Regarding UAS, the agenda, among other things, states that the Netherlands are working to expand the practice-oriented research with use of lecturers and a higher professional education postdoc program.

In sum, in the fifteen years since the first steps were taken the research function of UAS has obtained a structural and indispensable position in Dutch higher education. In this respect, the structural reforms has been successful as it has changed the Dutch higher education landscape.

The migration of graduate courses to UAS and the restricting of teacher training programs have led to enrolments increase in HE by eight percent from 2018-2019 to 2019-2020. The introduction of higher vocational education at UAS in 2019-2020 resulted in a three-percentage point rise in

their share from 2018-2019 to 2020-2021. Since then, the distribution of enrolments between colleges and universities has largely stabilised.[89]

Moreover, the Netherlands reform of strengthening the UAS-research function has been successful in the sense that UAS has obtained a structural and indispensable position in the higher education system. Contemporary, UAS are increasingly reliant on practice-oriented research, evident in the rising collaborations between UAS lecturers and their counterparts in traditional universities. Additionally, there is a noticeable trend of young PhD-holders beginning their careers within UAS settings.[90]

The professionalisation of staff within UAS has resulted in a notable rise in the number of employees holding master's and PhD degrees. Nevertheless, as of 2016, the matter of professionalisation remains a pertinent issue, possibly indicating either insufficient progress or ongoing concerns regarding this aspect. The exact attribution of this increase, whether it stems from the establishment of lectorates or alterations in HR policies resulting in the recruitment of staff with varied qualifications, remains uncertain. However, the structural reforms implemented have brought about significant changes in the higher education landscape, likely enhancing the innovation capacity within the Netherlands.[91]

Regarding the future needs and trends of the Dutch UAS sector an OECD report raise important questions about how demand could develop into the future, taking into account the binary divide. The report presents four scenarios on the future demand of UAS and university sector. In the base case where the current trend is followed the number of students will decrease from 450,690 in 2017 to 436,125 in 2030. In universities the base scenario is on the other hand an increase from 280,114 to 329,744. In the opposite scenario the number of students at UAS could instead increase to 489,330 by 2030.[92]

Table 11 UAS related reforms in the Netherlands

Main reforms and regulations
Higher Professional Education Act of 1986 (WHBO).
Higher Education and Research Act of 1992 (WHW)
Covenant agreement, 2001
Knowledge circulation grants, 2005
Centers of Expertise, 2010
Prestatieafspraken (performance-based funding), 2012
Strategic Agenda for Higher Education and Research of 2019

A.4.3 *Netherland UAS*

One notable Dutch funding initiative related to UAS is the **Taskforce for Applied Research SIA**. SIA invests in practice-oriented research, facilitating connections among researchers, knowledge institutions, and companies. As part of the **Netherlands Organisation for Scientific**

[89] https://www.vlaanderen.be/statistiek-vlaanderen/onderwijs-en-vorming/schoolbevolking-hoger-onderwijs

[90] https://ris.utwente.nl/ws/portalfiles/portal/5135166/Netherlands+NC0116163ENN_002.pdf

[91] https://ris.utwente.nl/ws/portalfiles/portal/5135166/Netherlands+NC0116163ENN_002.pdf

[92] https://gpseducation.oecd.org/Content/ProjectsMaterial/BenchmarkingHESystemPerformance_NLD.pdf

Research (NWO), SIA was established to address the need for practical research, particularly in contributing to social issues and fostering collaboration between educational institutions, businesses, and social partners. **Robbert Dijkgraaf**, the current Minister of Education, Culture, and Science **states**:

> *The relevant results and great partnerships that **SIA** makes possible show that practice-oriented research plays a future-oriented and current role in the scientific landscape. This form of research makes important initiatives possible that **benefit society**. It is therefore no longer It makes sense to continue and strengthen the successful collaboration between universities of applied sciences, knowledge institutions, companies and the government with this new agreement.*

Specifically, SIA funding is available to researchers employed by Dutch government-funded universities of applied sciences, with subsidies offered exclusively in Dutch. One Example of SIA's funding opportunities is the **Financing Professional Doctorate Candidates call**. The **Professional Doctorate (PD)** is a new vocational training programme focused on practice-oriented research, training candidates to become highly qualified research professionals capable of addressing complex practices at EQF-8 level (doctorate level). UAS can apply for a maximum of **€249,400** per PD candidate, with **€236,000** allocated for wage costs and **€13,400** for travel and study expenses.

The **SIA** programme has undergone **several evaluations** in 2017, 2020, and 2022, conducted by an independent external committee. The 2022 evaluation assessed the entire programme period, offering several conclusions and recommendations to further stimulate practice-oriented research at UAS and promote the application of knowledge in businesses, institutions, and UAS education. Key conclusions and recommendations include:

- **Clarifying the Assessment Process**: Further investment is needed to make the assessment process more transparent.
- **Strengthening the Knowledge Chain**: While SIA has bolstered the knowledge chain and encouraged practice-oriented research, many UAS still lack adequate knowledge infrastructure and sufficient teacher-researchers. The development of practitioners in secondary vocational education is nascent, and establishing equal cooperation across the knowledge chain requires more detailed stimulating preconditions.
- **Bridging the Gap Between Colleges and Universities**: Despite positive developments, a significant gap remains between colleges and universities regarding research positioning and available resources. The evaluation suggests that NWO should recognise UAS as a primary target group alongside universities. Currently, SIA is still essential for promoting the importance and improving the status of practice-oriented research and its associated culture. However, the goal is to eventually have unified research infrastructure for the entire chain, eliminating parallel structures and investments. This would require NWO to adapt to operate effectively at MBO, HBO and WO levels.[93] [94]

A.4.4 Life-Long Learning

The Netherlands has implemented **several policies and programmes to promote lifelong learning**. One notable initiative is the **Centres of Expertise**, established in 2011 by the Dutch

[93] https://www.nwo.nl/evaluatie-regieorgaan-sia

[94] https://www.nwo.nl/sites/nwo/files/media-files/evaluatie_regieorgaan_sia2022_-_naar_een_volgende_fase_2022.pdf

national STEM platform. These centres are public-private partnerships where educational institutions and companies in specific sectors collaborate to innovate the curriculum and its delivery. The primary objectives of the **Centres of Expertise include**:

- Creating a strong connection between education and the labour market
- Educating innovative and skilled professionals
- Promoting lifelong learning and timely retraining
- Enhancing the innovation capacity of companies

Funding for these Centres is shared between the government and industry, with businesses and organisations contributing with over 65 percent of the costs. In 2016, the total programme budget was **EUR 125 million**, with the government investing **EUR 45.5 million**. The programmes' impact has been significant, involving over 4,500 companies, 83 UAS, and numerous vocational education institutes, reaching more than 50,000 students and 4,000 teachers. An independent expert committee evaluated the Centres and confirmed their effectiveness and positive impact on companies, schools, and the innovation system.[95]

Another key programme **is MKB!dee**, launched in 2018 by the Dutch Ministry of Economic Affairs to encourage experimental lifelong learning approaches in SMEs. Implemented by **Dutch national STEM platform (PTvT)** in collaboration with the **Dutch Enterprise Agency (RVO**), MKB!dee offers support and funding up to **EUR 200,000** per project. The programme addresses practical barriers that SMEs face in investing in continuous employee development, such as difficulty in freeing up personnel and identifying suitable learning opportunities. The **objective of MKB!dee include**:

- Providing practical and financial support to SMEs for developing lifelong learning activities tailored to their needs.
- Identifying and scaling up successful lifelong learning approaches.[96]

During the initial phase (2018-2019), **MKB!dee funded 61 projects**, with an additional **EUR 10 million** reserved for 50-70 more project in 2021. The programme aims to stimulate demand and supply of lifelong learning approaches by upscaling successful projects post-funding. Small SMEs (with fewer than 50 employees) were allocated 27 percent of the total budget, with individual SMEs eligible for grants up to **EUR 125,00** and multi-SME project up to **EUR 200,000**. No co-funding was required, and successful applicants received 90 percent of the budget upfront and the remaining 10 percent upon project completion. In 2019, the research firm SEO conducted an independent evaluation to establish a baseline for future reference.[97]

A third initiative is the **Health Pact (Zorgpact),** launched in 2015 by the Dutch government to foster bottom-up cooperation in the healthcare sector through regional pacts. **Since its inception, 67 best practices have been identified** and unified in a leaders' group. Zorgpact has also addressed and removed 40 barriers to cooperation and supported seven successful project proposals in the Regional Investment Fund for Vocation Education and Training.[98]

[95] https://www.stemcoalition.eu/programmes/techniekpact-technology-pact

[96] https://www.stemcoalition.eu/programmes/techniekpact-technology-pact

[97] https://www.stemcoalition.eu/programmes/techniekpact-technology-pact

[98] https://www.stemcoalition.eu/programmes/techniekpact-technology-pact

A.5 Austria

A.5.1 Short introduction

The Austrian UAS (Fachhochschulen) have their origin from the **Universities of Applied Sciences Act of 1993.** Since then, the number of students in the UAS have grown significantly, from 700 in 1994/1995 to over 58,700 in today. The Austrian system is moreover binary, with universities on the one hand and UAS on the other. However, from a formal point of view the degrees earned at UAS are equal to university degrees. While this is the case, students at UAS tend to enjoy a higher level of support and supervision, but also more structured study cycles. As of now a total of 21 UAS exists in Austria, with a total of about 58,700 student. The number of students at UAS corresponds 16,2 percent of the higher education system.[99] While Bachelor's and Master's courses are available at Austrian UAS, doctoral studies can only be completed at a traditional university. Four other differences between Austrian UAS and universities are listed below.

- **Practical studies**. A UAS study programme is academically founded and yet practical at the same time. In most Bachelor's study programmes, students must complete a work placement.
- **Limited number of study places**. The number of study places per year and per study programme are limited. For that reason, you always have to apply for a study place at a UAS and complete the entrance procedurel.
- **A set timetable, personal advising, guaranteed places in courses and labs**. Compared to traditional universities, UAS degree programmes are more comprehensively organised. For most classes there is mandatory attendance. Your classes will be held in small groups, and you do not have to worry about getting a seat in a lab.
- **Study fees**. For most UAS, study fees must be paid. A UAS course of studies costs € 363.63 per semester. An additional € 20.70 is to be paid in student union fees. There are scholarships and educational grants for students.

The Austrian UAS sector stands apart from the country's university sector through its market-oriented approach, established from its inception. Unlike universities, UAS operate under a model designed to cater to the demands of the economy, with funding derived from various sources, including their own revenue, grants from Bundesländer and support from the Federation. This funding model underscores a decentralised governance structure, where institutions, governed by private law entities like GmbHs (limited liability companies), associations, or private foundations, manage their affairs.[100]

One of the defining features of the UAS is their focus on providing specialised academic education tailored to the needs of regional economies. This emphasis is reflected in the curriculum, which often emphasises business administration and technology-related disciplines. While UAS have historically played a secondary role compared to universities, they are increasingly embracing research activities, aligning themselves more closely with Austrian innovation agendas.[101]

Despite this shift, differences between UAS and universities persist, notably in their admission processes and governance. UAS typically have stricter admission criteria, evaluating not only

[99] https://eua.eu/downloads/publications/autonomy%20scorecard%20country%20profiles_batch_1.pdf s.7

[100] https://ris.utwente.nl/ws/portalfiles/portal/5148954/Enders06extent3.pdf s.10-11

[101] https://ris.utwente.nl/ws/portalfiles/portal/5148954/Enders06extent3.pdf s.11

technical qualifications but also the fit between prospective students and the institution's profile. Moreover, the state plays a more prominent role in overall planning within the UAS sector, with regular collaboration between the Federation, Bundesländer, and the UAS Council to formulate development and funding strategies.[102]

Regular collaboration between the Austrian Federation, Bundesländer, and the UAS Council ensures the formulation of comprehensive development and funding plans for the entire Austrian UAS sector. Despite being private entities, UAS receive study place funding from the Federation, highlighting a symbiotic relationship between public and private support within the sector.[103]

A.5.2 Reforms

During the 1990s two major reforms were implemented where one was a part of the New Public Management reform of the public sector. This reform aimed at reforming the university management and increase the autonomy within the institutions. The other reform was, as earlier mentioned, the **Universities of Applied Sciences Act of 1993**. The Act was a response to the ongoing university trend of low competition rates, increased number of students and lengthy periods of study. Another aim of such structural reforms that set up the UAS system in Austria was to achieve recognition of upper-secondary school diplomas within the European Economic Community and to carry out the government agreement of 1990 regarding higher education management and university autonomy.[104]

The UAS Act had five implicit goals:[105]

1. To increase education capacity and to relieve the universities.
2. To diversify in order to improve education.
3. To reduce regional disparity through the establishment of UAS
4. To decentralise and deregulate the education system.
5. To establish an efficient higher education system

Over the last 31 years, the Universities of Applied Sciences Act have undergone amendment 20 times. One of the more interesting amendments to the Act were in 2001 when Austria implemented tuition fees, setting a standard amount of **363 euros per student**. Foreign students paid double this amount compared to Austrian students. Concurrently, the government established a system of student funding, wherein students receiving state grants for tuition fees could seek partial or full compensation for their fees.[106] Another crucial amendment to the Act was in 2002. In both bachelor and diploma courses at UAS, students must undertake a **professional internship** as a crucial component of their studies. This internship is integral to their training but does not lengthen the overall period of study.[107] Prior to this change, as of 1998, the internship was not a requirement within the curriculum. If a student opted to pursue an

[102] https://ris.utwente.nl/ws/portalfiles/portal/5148954/Enders06extent3.pdf s.11

[103] https://ris.utwente.nl/ws/portalfiles/portal/5148954/Enders06extent3.pdf s.11

[104] https://op.europa.eu/en/publication-detail/-/publication/f924dc2a-3f4e-11e6-af30-01aa75ed71a1 s.6

[105] https://op.europa.eu/en/publication-detail/-/publication/f924dc2a-3f4e-11e6-af30-01aa75ed71a1 s.7

[106] https://ris.utwente.nl/ws/portalfiles/portal/5148954/Enders06extent3.pdf s.8

[107] BGBl. I Nr. 58/2002. S.295 https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10009895

internship, their academic program would be prolonged to encompass the duration of the internship, regardless of whether it was part of the formal curriculum.[108]

In 2003, a significant change was implemented, allowing **UAS courses to be conducted as double diploma programs**. These programs entail collaborative studies facilitated by agreements between Austrian UAS degree providers an internationally recognised post-secondary educational institution. These agreements meticulously delineate the academic accomplishments students will attain from each participating institution.[109]

Austria established a new **University Act in 2002** which mentions some university entrance criteria's that also apply to UAS. Eligibility for doctoral studies is based on successful completion of a relevant diploma or master's program from a recognised domestic or foreign post-secondary institution, including a Fachhochschule degree. Equivalency may be determined through additional qualifications, whit the rectorate having authority to require examinations during the doctoral program. Similarly, admission to a master's program requires completion of relevant bachelor's program from a recognised institution (including UAS), with eligibility established by providing proof of meeting this requirement.[110]

Since the amendment of the **Federal Act on Student Representative Organisations (HSG) in 2014**, all students, both domestic and foreign, pursuing degree or non-degree programs at Austrian universities, UAS, university colleges of teacher education, and private universities, are considered members of The Austrian National Union of Students. Their "general and study-related interests" are represented by this organisation. Its primary objective is to promote the welfare of its members and advocate for their interests. This includes addressing cultural, sporting, social, and academic concerns. The Austrian National Union of students is responsible for representing its members' interests, particularly in interactions with governmental bodies, institutions, and other university entities.[111]

In 2006 the UAS in Austria opened **44 additional degree programs** for students to apply. This led to an increase in the total amount of students in UAS by 10 percent, with as much as 85 percent of the enrolled studying either business or technical degrees. The intention with adding new programs in 2006 was to expand the UAS, allowing it to accommodate a total of 33 000 student in 2010.[112]

The **National Reform Programme (NRP)** serves as a strategic tool for driving socio-economic development, promoting structural reforms, and advancing Austrias's integration within the European Union, while also addressing the specific needs and priorities of the country. For the last twelve years, the NRP has devoted a great emphasis to expanding the UAS sector. Mentioned in the 2012 plan, the implementation of the University Quality Assurance ACT and its amendment to the University of Applied Sciences Study Act have broadened the quality standards for the UAS sector in Austria. Additionally, the utilisation of offensive funds is expected to result in the creation of approximately 5000 more study places in UAS sector by the 2016-

[108] BGBl. I Nr. 72/1998. S. 699
https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10009895

[109] BGBl. I Nr. 110/2003. S. 1547
https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10009895

[110] S.35 https://www.uibk.ac.at/index/finanzabteilung/ug2002_englisch.pdf

[111] https://www.bmbwf.gv.at/en/Topics/Higher-education---universities/University-committees/Austrian-National-Union-of-Students.html#:~:text=Since%20the%20Federal%20Act%20on,deemed%20to%20be%20members%2C%20whose%20%E2%80%9C

[112] S.39 https://ec.europa.eu/social/BlobServlet?docId=6074&langId=en

2017 academic year.[113] Looking ahead to the 2019 plan, the funding plan aims to add over 3,000 student places by 2024/25, broadening and deepening the study course offerings. Expanding capacity in UAS not only increases student enrolment but also improves the range of study program to meet labour market needs. The focus is on expanding STEM programs, particularly in areas like IT, digitalisation, automation, AI, cyber security, and e-government. Furthermore, the plan mentions that there will be a focus on facilitating university studies alongside employment through dual courses. Along with initiatives to encourage women's engagement in STEM fields.[114] These initiatives align university studies more closely with labour market demands, resembling the role of UAS in education based on market needs.

During the initial active phase of UAS, Austria also augmented its total higher education budget from 3.4 to 3.94 percentage between 1990 and 2004.[115] As of 2004, approximately 80 percent of the budget applies to only universities.[116] The expansion of UAS and the increase in student enrolment led to a rise in federal funding. In 2016, federal funding rates were raised by 7 percent to 11.5 percent, varying by the field of study. These measures collectively contributed to the growth of the federal budget for UAS from 281.8 million EUR in 2016 to 310.1 million EUR in 2017.[117]

In 2012, the introduction of new legislation, namely the **Act on Quality Assurance in Higher Education**, had a significant impact on the entire higher education system, including UAS. This Act oversees external quality assurance processes at higher education institutions, mandating that newly established UAS degree programs undergo accreditation. According to the act, accreditation follows the requirements outlined in the UAS Act. Providers seeking accreditation as a UAS must undergo both institutional and program accreditation processes.[118]

Austria creates **National Development and Financing Plans** for the higher education system. The key objectives of the plan might include strategic planning, resource allocation, quality assurance, promotion of innovation and enhancement of access and equity. The plan has over time focused on an expansion of the higher education sector. For example, the most recent National development and financing plan for the UAS sector, is for the period 2023/24 to 2025/26. In terms of financing, the BMBWF will provide EUR 284 million for UAS during the period. In total, with other financial sources included, there will be an investment of EUR 1.8 billion in the UAS sector, which corresponds to a budget increase of 18.4% compared to the previous plan. During the period there will also be 1,050 new federally funded beginner places added to UAS. **The focus of the expansion is on the STEM sector.**[119]

In October 2021, **Austria's University legislation package** commenced, heralding a comprehensive reform aimed at establishing consistent framework conditions for continuing education across all sectors of higher education. This ambitious initiative strived to fundamentally transform higher education institutions continuing education, irrespective of whether it is provided by universities, colleges of education, UAS, or private universities. This was the largest reform since 1995, when Danube University Krems was founded. The legislation

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[113] S. 62 https://repository.fteval.at/id/eprint/141/1/Nationales%20Reformprogramm%20%C3%96sterreich%202012.pdf

[114] S. 42 https://commission.europa.eu/system/files/2019-04/2019-european-semester-national-reform-programme-austria_en.pdf

[115] https://ris.utwente.nl/ws/portalfiles/portal/5148954/Enders06extent3.pdf s.6

[116] Bundesministerium für Bildung, Wissenschaft und Kultur (2005a): Statistisches Taschenbuch 2005. Wien s.19

[117] S.26 https://commission.europa.eu/document/download/c01a8333-6190-46d1-b084-27124f9f5ed0_en?filename=2017-european-semester-national-reform-programme-austria-en.pdf&prefLang=sl

[118] https://planipolis.iiep.unesco.org/sites/default/files/ressources/austria_act-on-quality_assurance_he.pdf s.14-15

[119] https://www.bmbwf.gv.at/Themen/HS-Uni/Hochschulgovernance/Steuerungsinstrumente/FH-Entwicklungsplan.html

package consisted of three parts out of which part 1 - a reform of higher education continuing education – is the relevant one for UAS.[120]

Part 1: The key changes introduced by the legislation included (only the ones that apply to UAS are listed):[121]

- Standardisation of regulations for continuing education courses across all higher education sectors, ensuring uniformity and clarity in program offering.
- Introduction of extraordinary bachelor's program, aligning continuing education studies with the Bologna structure (Bachelor-Master-Doctoral program), thereby facilitating pathways to further academic pursuits, including doctoral or PhD studies.
- Legal clarification regarding provision governing ordinary and extraordinary bachelor's and master's degree programs, while maintaining the distinction between regular and extraordinary studies or students. This distinction remains crucial for the financing of universities and UAS.
- Streamlining the variety of academic titles awarded in higher education continuing education, reducing confusion and ambiguity associated with the multitude of titles currently in use. This reform aims to provide greater clarity regarding qualifications associated with different academic titles. As of 2021, when the reform was implemented, there were over 60 different titles in Austrias higher education system. The reform introduced standardised titles like BA and MA, BSc and MSc, BPr and MPr.

There is some compelling evidence showcasing the initial success of Austria's Universities of Applied Sciences (UAS) in attracting students. From 1998 to today the number of students enrolled at Austrian UAS programs increased significantly, from 7,869 to 58,726 students, an increase of 646,3 percent. The number of students enrolled at Austrian universities have on the other hand, during the same time increased from 221,067 to 263,375, indicating a smaller increase and suggesting that the expansion of UAS have been successful. [122] [123]

In the Fachhochschulen sector in Austria, students with parents holding a university degree are less represented compared to the university sector. The establishment of the Fachhochschulen sector has significantly enhanced the permeability of the education system. It has facilitated increased participation in higher education, particularly among socioeconomically disadvantaged populations, leading to greater accessibility and opportunity for education.[124]

Austrias attempt to increase the overall number of STEM degrees completed has had a positive effect. As of 2014, the overall STEM graduates in Austrian UAS rose to 35.6 percent from 28 percent the previous year.[125]

The main challenge for Austrian UAS will be to manage the ongoing convergence towards universities while maintaining a distinctive profile. This includes addressing preferences for changes in teaching and research to align with a more university-like profile, while still emphasising practical problem-solving and professional orientation.[126]

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[120] https://www.bmbwf.gv.at/Themen/HS-Uni/Studium/Lehrg%C3%A4nge/Reformpaket_Weiterbildung.html

[121] https://www.bmbwf.gv.at/Themen/HS-Uni/Studium/Lehrg%C3%A4nge/Reformpaket_Weiterbildung.html

[122] https://ris.utwente.nl/ws/portalfiles/portal/5148954/Enders06extent3.pdf

[123] https://www.statistik.at/en/statistics/population-and-society/education/university-students-studies

[124] S.14 https://ris.utwente.nl/ws/portalfiles/portal/5148954/Enders06extent3.pdf

[125] https://commission.europa.eu/document/download/367a4c6b-0dc4-46e6-8d7d-715bd44011ce_en?filename=european-semester-national-plan_austria_2016_en.pdf s.25

[126] https://www.sciencedirect.com/science/article/pii/S0016328717304834?ref=pdf_download&fr=RR-2&rr=8785b0222d432e0c s.144-145

A.5.3 Austria UAS

Austria is a part of the **apprenticeship toolbox** running in countries with **dual VET system**. The VET system means that the training takes place at two learning venues, in a company and at a vocational school.[127] The apprentice system has traditionally been the primary method for ensuring a skilled labour supply, supported by the involvement of social partners in its governance. Due to demographic changes, skilled labour shortages, and rising youth unemployment, VET and the apprenticeship system have become political priorities. In response, the government implemented and "**Education and Training Guarantee" until age 18 in 2013**, followed by **mandatory education and training requirement for all under 18s in 2018**. The VET system, with its diverse offerings, is seen as a key solution to these challenges, leading to increased public funding for additional training opportunities and active labour market policies.[128] However, the number of **apprenticeship graduates has had an overall negative trend** over the years in Austria, decreasing with approximately 10 000 between 2011-2020, while the **drop-out amount remains relatively constant** during the same period. For the apprenticeship graduates, 84 percent have been employed since graduation, compared to 44 percent of the dropouts, indicating somewhat of **a success of the programme**.[129]

The Austrian VET system has led to several positive things. The system has **contributed to low youth unemployment and smooth transitions from education to employment**. It also caters to diverse needs, offering support for disadvantaged students and high-level technical training through five-year VET college programmes. The competition rates in upper secondary education are high internationally. At the same time, the **system also has some challenges**. Some VET qualifications may be too narrow to provide an adequate foundation for a career as well as a first job. The workshop-based dual programmes are expensive and may decrease employers' incentive to offer apprenticeships.[130]

A.5.4 Austria – Lifelong Learning

Austria decided to **expand the UAS** sector primarily to address several strategic goals in education and workforce development, like strengthen labour market needs and orientation and to foster cooperation, and innovation.[131] The focus on practical skills is especially relevant in fields like engineering, IT, business, and health sciences. The **three main objectives** during the establishment were to:

1. Ensure a practice-oriented education at university level.
2. Imparting the ability to solve professional problems using the latest techniques and meeting both current and future practical requirements.
3. Promote permeability of the educational system and professional flexibility of the graduates.[132]

Austria has implemented a comprehensive lifelong learning strategy called **LLL:2020,** designed to **address educational needs across various life stages**, from early childhood education and

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[127] Federal institute for Vocational Education and Training, 'Welcome to the Apprenticeship Toolbox!'. Available via: https://www.bibb.de/en/apprenticeshiptoolbox.php [Assessed 2024-05-21]

[128] Federal institute for Vocational Education and Training, 'Apprenticeship System'. Available via: https://www.bibb.de/en/147575.php [Assessed 2024-05-21]

[129] Ausbildungs – und Arbeitsmarkterfolg von LehrabgängerInnen: LehrabsolventInnenmonitoring 2011-2020, Available via: https://ibw.at/en/research/dual-vocational-education-and-training-apprenticeship/

[130] https://www.oecd.org/berlin/45404397.pdf

[131] https://eurydice.eacea.ec.europa.eu/national-education-systems/austria/national-reforms-higher-education

[132] https://www.ris.bka.gv.at/Dokumente/Erv/ERV_1993_340/ERV_1993_340.pdf

care to higher education, continuing adult education, and post-professional education. This strategy adopts a holistic approach, integrating policy areas such as education, labour market, economy, social issues, finance, and regional development to promote coordinated action.[133]

One of the key measures of **LLL:2020 is to increase the availability of part-time study places at UAS** to 50 percent, as well as to introduce part-time master's programmes at all public universities. The initiative aims to ease the burden of balancing high-quality education with employment, especially for individuals with caregiving responsibilities.[134] However, as of 2020, only 36 percent of study places were part-time, **indicating significant progress is still needed**[135] although 50 percent of the available courses are offered on a part-time basis.

The **2021 continuing education amendment** introduced opportunities for recognising skills acquired outside traditional university settings, creating **new framework conditions for the development of higher education and lifelong learning**. These frameworks support the implementation of new study formats, such as university courses tailored for professionals and innovative collaborations with non-university educational institutions. They also promote the development and application of recognition and credit transfer procedures at UAS.[136]

The University of Applied Sciences Development and Financing Plan for 2023/24-2025/26 outlines several initiatives, including the establishment of the Christian Doppler Research Association's Josef Ressel Centers (JRC). These centers target high-performing research groups, facilitating partnerships with industry to conduct applied research.[137] Since 2012, 13 JRCs have been established, **enhancing the integration of regional business partners** in UAS research activities through long-term cooperation. Funded by the Christian Doppler Research Association (CDG), JRCs operate for up to five years with an annual budget of up to **EUR 400,000.** They focus on areas such as mathematics, informatics, electronics, and non-metallic materials.[138]

The CDG's management of the JRCs has been highly successful, promoting science-industry knowledge transfer in Austria. Key strengths of the **CDG model** include:

- **Flexibility and Adaptability:** The CDG funding model is flexible and adaptable to market demands and the practical needs of participating partners.
- **Long-term Funding and Cooperation**: Sustained funding and intense cooperation in applied-oriented basic research have built strong research units and developed highly qualified researchers.
- **Thematic Expansion**: The CDG's success story includes broadening its thematic focus from material sciences to a wide range of research fields, primarily related to natural sciences and engineering.[139]

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[133] https://www.uil.unesco.org/sites/default/files/medias/fichiers/2023/05/austria-strategie-zum-lebensbegleitenden-lernen-in-oesterreich-2020.pdf

[134] https://www.uil.unesco.org/sites/default/files/medias/fichiers/2023/05/austria-strategie-zum-lebensbegleitenden-lernen-in-oesterreich-2020.pdf

[135] file:///C:/Users/nils.karlsson/Downloads/Wissenschaft%20in%20%C3%96sterreich_2022_gesamt_bf.pdf

[136] https://www.bmbwf.gv.at/dam/jcr:21a04113-7bae-4573-a393-e2a2bcc22920/230321_Brosch%C3%BCre_FH_Entwicklungsplan_BF.pdf

[137] https://www.bmbwf.gv.at/dam/jcr:21a04113-7bae-4573-a393-e2a2bcc22920/230321_Brosch%C3%BCre_FH_Entwicklungsplan_BF.pdf

[138] https://era.gv.at/public/documents/3734/OECD_Reviews_of_Innovation_Policy_Austria_2018.pdf

[139] https://stip.oecd.org/assets/TKKT/CaseStudies/1.pdf

The successor programme to the JRCs, **COIN "Aufbau"** (capacity building), aims to strengthen providers of applied research and enhance cooperation between applied sciences and companies, particularly SMEs. Since 2008, **UAS have been successful in this programme**, obtaining significant revenues from R&D cooperation and increasing the business sector's contribution to R&D funding at UAS. In 2015, UAS secured **EUR 40 million** from R&D cooperation, with **EUR 13 million** coming from the business sector, highlighting the vital role of UAS in applied research and industry collaboration.[140]

[140] https://era.gv.at/public/documents/3734/OECD_Reviews_of_Innovation_Policy_Austria_2018.pdf

A.6 Switzerland – Life-long Learning

Under the **"Vocational and Professional Education and Training 2030"** initiative, the Confederation, cantons, professional organisations have launched various project to align vocational and professional education and training with lifelong learning principles. **The State Secretariat for Education, Research, and Innovation (SERI)** collaborates with partners to enhance the appeal of vocational and professional education and training. It also ensures optimal framework conditions for teaching **and continuing education and training (CET)** in the higher education sector.[141] The basis of the lifelong learning strategy lies on the **VET sector**, which provides and opens a wide range of job prospects. Approximately two-thirds of young people in Switzerland enrol in upper-secondary VET programmes after completing compulsory education. These programmes last either two or three years, with this proportion remaining steady over the years. Dual-track VET programmes are the most common form of vocational education in Switzerland.[142]

CET is crucial for individuals, society, and the economy, especially given the rapidly changing labour market and technological advancements. **SERI promotes CET** by encouraging personal and professional development and creating supportive conditions for all individuals. SERI collaborates with cantons to ensure adults can acquire and maintain basic skills, which are essential for lifelong learning and active participation in society and the workforce.[143]

The reform of the UAS sector stands out as a significant and highly successful education overhaul in recent times. The country achieved several milestones, including the creation of a novel form of higher education institutions, the streamlining of UAS campuses, setting clear priorities, and effectively accommodating a growing influx of students.[144]

As one of the leading countries in Europe when it comes to innovation and competition, Switzerland relies heavily on UAS graduates and knowledge and technology transfer from the UAS sector to maintain their innovative capacity. UAS teaching and research staff are professionals with practical experience in their respective fields. This ensures that their knowledge and skills remain relevant and up to date. Additionally, this creates a continuous feedback loop between academic research and economic activities, fostering an environment where practical and theoretical insights are regularly exchanged and integrated.[145]

The **UAS also works as a competent research facilitator** between the private and public sector. The Swiss companies can compete on an international market due to specialised high-quality products and services. Therefore, a large amount of funding is devoted to R&D, where the UAS applied research plays a significant role in benefiting SMEs development and competitiveness. UAS have rapidly expanded their applied research activities both in quantity and quality. This growth is largely driven by research collaborations between UAS and businesses, which are primarily encouraged by the **Innovation Promotion Agency (CTI).** Additionally, the Swiss UAS

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141 https://eurydice.eacea.ec.europa.eu/national-education-systems/switzerland/lifelong-learning-strategy

142 https://www.sbfi.admin.ch/sbfi/en/home/services/publications/data-base-publications/vocational-and-professional-education-and-training-in-switzerland.html

143 https://www.sbfi.admin.ch/sbfi/en/home/services/publications/data-base-publications/vocational-and-professional-education-and-training-in-switzerland.html

144 https://www.sbfi.admin.ch/dam/sbfi/en/dokumente/swiss_universitiesofappliedsciencesuas.pdf.download.pdf/swiss_universitiesofappliedsciencesuas.pdf

145 https://www.sbfi.admin.ch/dam/sbfi/en/dokumente/swiss_universitiesofappliedsciencesuas.pdf.download.pdf/swiss_universitiesofappliedsciencesuas.pdf

sector is also attractive in an international setting. Approximately 20 percent of their staff and 16 percent of their students are from abroad.[146]

Moreover, the Swiss **education system is designed to promote lifelong learning** by combining education and training. The system prioritises student mobility by facilitating between different types of higher education institutions. This includes seamless switches from cantonal universities to UAS and vice versa. Furthermore, internationally recognised bachelor's and master's degree enhance student mobility and ensure better comparability of qualification on a global scale.[147]

In an **evaluation of the Swiss UAS system in 2006**, it was found that the development and implementation of research strategies is highly dependent on the governance model of UAS. There is a need of central organs with sufficient decision-making power and autonomy from the state. As of then, the UAS system had an issue with its role and position in the research system, which needed to be addressed. At that time, some of the **problems were**:

- The extent that UAS should push basic research
- How they should find a research niche for UAS in soft science
- If the research would only be in some domains, while only teaching in other domains
- The relationship between research and education[148]

However, the arguments presented above indicate that the UAS have significant role and position within Switzerland's R&D ecosystem. This might suggest that improvements have been made to UAS role and position in the system.

A specific example of how a Swiss UAS supports **lifelong learning is ZHAW (UAS),** which has developed a comprehensive lifelong learning strategy. To implement this strategy, ZHAW is taking various measures at different levels. Institution-wide, they are expanding the Digital Campus and entrepreneurial skills are being taught across all departments. Additionally, specific measures, such as open curricula, are being planned for implementation within individual departments.[149]

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146 https://www.sbfi.admin.ch/dam/sbfi/en/dokumente/swiss_universitiesofappliedsciencesuas.pdf.download.pdf/swiss_universitiesofappliedsciencesuas.pdf

147 https://www.sbfi.admin.ch/dam/sbfi/en/dokumente/swiss_universitiesofappliedsciencesuas.pdf.download.pdf/swiss_universitiesofappliedsciencesuas.pdf

148 https://www.sbfi.admin.ch/dam/sbfi/de/dokumente/bbt/research_strategiesandframeworkconditionsforresearchinswissunive.pdf.download.pdf/research_strategiesandframeworkconditionsforresearchinswissunive.pdf

149 https://www.zhaw.ch/de/fokusthemen/lifelong-learning/

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Appendix C Interviewees

Name	Organisation
Mats Benner	LU
Stefan Bengtsson	Chalmers
Eugenia Perez Vico	HH/KKS
Helena Hellmark Knutsson	Västerbotten/KKS
Lisa Nieth	Technopolis
Hans Hansson	MDU
Mats Jackson	MDU
Lars Geschwind	SULF/KTH
Cecelia Bjursell	MDU
Monika Bellgran	MDU
Kristina Säfsten	JU
Matthias Jarl	KKS
Lars Niklasson	f d BTH

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