Chapter 2. Applying the HEInnovate framework to higher education in Austria

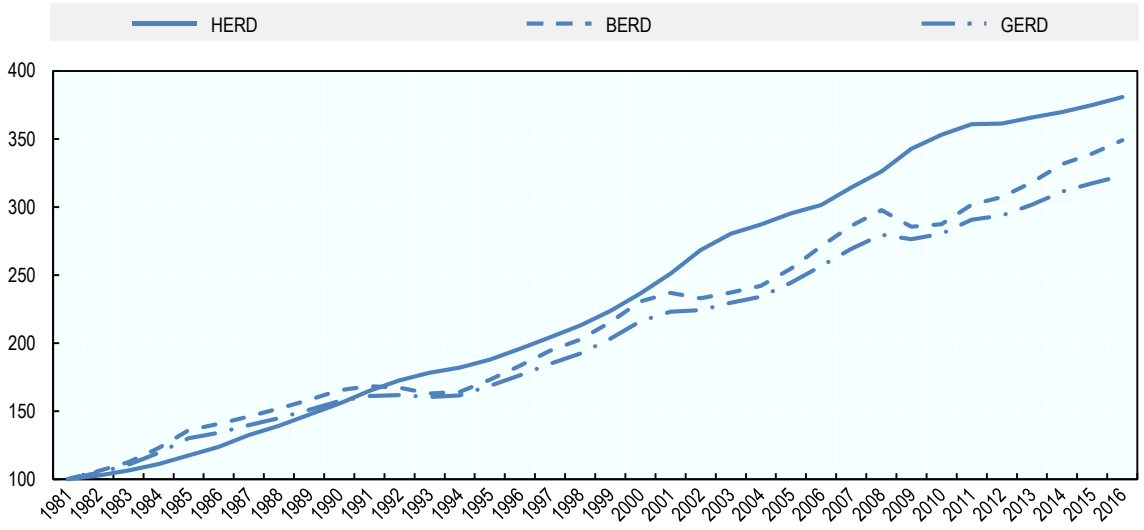
This chapter presents the HEInnovate guiding framework and applies all the dimensions of the HEInnovate framework to Austria's higher education system and to Austrian higher education institutions (HEIs). The aim is to have an all-round discussion of the capacity of HEIs to engage and create value for the economy and society. The chapter illustrates national features and some selected case studies in the eight dimensions of the HEInnovate framework. It displays some relevant results of a leader survey, a questionnaire that was administered to all Austrian HEIs.

The HEInnovate guiding framework

In recent decades, the missions and mandates of higher education institutions have become more complex and their activities have broadened, both in OECD countries and emerging economies. For instance, HEIs have acquired a pivotal role in national innovation systems and have considerably expanded their research and development (R&D) activities since the 1980s, partly at the expense of public research organisations. In the OECD area, as illustrated in Figure 2.1, HEIs' R&D expenditures have increased more rapidly than R&D expenditures in the business and government sectors (OECD 2017).

Figure 2.1. Trend of expenditure on R&D by performing sector in OECD

Base year 1981=100 (Constant USD PPPs)



Note: Higher education expenditure on R&D (HERD); Business enterprise expenditure on R&D (BERD); Gross domestic expenditure on R&D (GERD). The figure shows that HERD has increased more than BERD and GERD, over the past three decades.
Source: OECD Main Science and Technology Indicators Database. https://www.oecd.org/sti/msti.htm.

Moreover, the increasing role of HEIs in national innovation systems and their expected contribution to economic growth, social and cultural development has put an increasing demand on HEIs for knowledge exchange and technology transfer with economic players. This transformation has gone hand in hand with other global trends:

- In many OECD countries and emerging economies, the governance of HEIs has been decentralised. This has often resulted in a greater autonomy of HEIs combined with shifts in funding towards greater emphasis on performance and competition. This has allowed HEIs to autonomously allocate resources, set strategic targets and shape their own profiles in research and education. Research suggests (Aghion et al., 2010) that the shift towards greater autonomy of HEIs has had a positive impact on HEI performance.

  Globalisation has been affecting the way that HEIs interact and compete at the international level. Increasing participation in international science and innovation networks has enabled greater international exchange and mutual learning in research activities and education practices. It is also, however, leading to increased

competition between institutions for attracting and retaining talented students and researchers.

- The changing context for HEIs has put more emphasis on the concepts of the "third mission" and the "entrepreneurial university" (OECD, 2017b; Etzkowitz et al., 2000; Gibb, Coyle and Haskins, 2013). The third mission of HEIs refers to all the activities that go beyond the two core missions of HEIs: teaching and research functions. These activities can be very broad and diversified and take place at different geographical scales (international, national, local). As mentioned above, one of the key third mission activities of HEIs is "knowledge exchange" with business, public organisations and society more broadly (OECD, 2007; Goddard, Kempton and Vallance, 2013; OECD, 2017b). This is also a key feature of what is known as the entrepreneurial university.

To support policymakers and HEI leaders to make the most of these transformations, the OECD and the European Commission have co-developed HEInnovate, a guiding framework for innovative and entrepreneurial HEIs (Box 2.1). The HEInnovate guiding framework is developed around eight dimensions defined, and detailed vis-à-vis Austria, in the next sections of this chapter.

Box 2.1. Components of the HEInnovate guiding framework

The HEInnovate framework includes three main components:

- *The HEInnovate self-assessment tool.* The self-assessment tool was conceived for individual higher education institutions wishing to explore their innovative potential. It guides HEIs through a process of understanding, prioritisation and action planning in eight key dimensions (leadership and governance, organisational capacity: funding people and incentives, entrepreneurial teaching and learning, preparing and supporting entrepreneurs, digital transformation and capability, knowledge exchange and collaboration, the internationalised institution, and measuring impact). HEInnovate also identifies areas of strengths and weaknesses, opens up discussion and debate on the innovative and entrepreneurial nature of individual HEIs and allows for the comparison of trends over time. The self-assessment tool gives instant access to results, learning materials and a pool of experts.
- *The HEInnovate country reviews*. Reviews have been developed to provide a national systemic perspective about innovation in national higher education systems. They complement the HEInnovate tool that targets individual HEIs, by providing a systemic perspective and taking into account the different roles and features of different HEIs in a national system. HEIs do not operate in isolation but collaborate with their community and compete with other HEIs in the same country (and abroad) in a variety of fashions. The country reviews were developed to capture and assess these complex interactions and dynamics. At the time of writing, country reviews had been completed for the following countries: Ireland, Hungary, the Netherlands, Poland and Bulgaria (OECD/EU, 2018; OECD/EU, 2017a; OECD/EU, 2017b; OECD/EU, 2017c; Elliott, 2017).

- *The HEInnovate Policy Learning Network (PLN)*. The PLN was established as a platform of peer learning and policy dialogue among policymakers of the countries participating in HEInnovate country reviews. The participants of the PLN meet regularly and discuss key themes linked to the HEInnovate eight dimensions relevant to their countries. It is a platform to learn from and compare similar experiences across OECD and European Union (EU) countries.

Sources: OECD/EU, 2018; OECD/EU, 2017a; OECD/EU, 2017b; OECD/EU, 2017c; Elliott, 2017.

The HEInnovate eight dimensions in the Austrian context

Austria's science and innovation system ranks very high in the OECD (OECD, 2018). Higher education institutions play an important role in the national innovation system. The OECD HEInnovate Review of Austria, based on the specific request of the Federal Ministry of Education, Science and Research (BMWFW), focuses on three key dimensions, selected among the eight of the HEInnovate framework. These are leadership and governance; entrepreneurship teaching and learning; and preparing and supporting entrepreneurs. The report discusses these three dimensions in detail in Chapters 3, 4 and 5. In addition, the OECD has collected a broader set of information that allows generating some analysis on all the dimensions of the framework. In particular, with the support of the BMWFW, a leader survey was administered to all Austrian HEIs (Box 2.2). The survey's high response rate provides insights to discuss the performance of the higher education system and HEIs in a more holistic way.

Box 2.2. The HEInnovate Leader Survey

The Leader Survey in Austria, 2018

As part of the HEInnovate country reviews, an online survey was administered to Austrian rector's offices, in order to complement the information obtained from the background report and the study visits.

The questionnaire, based on the HEInnovate framework, asked about current and planned practices in: i) the strategic directions of the HEI; ii) management of human and financial resources; iii) the teaching and learning environment; iv) knowledge exchange activities; v) internationalisation; vi) entrepreneurship education; and vii) business start-up support.

The response rate was quite good. A total of 45 Austrian HEIs (approximately. 60% of the total) filled the questionnaire. Respondents were divided into 17 public universities, 4 private universities, 13 universities of applied sciences (UAS) and 11 university colleges of teacher education. Reflecting the selection of case studies (mostly public universities and UAS) the discussion of the data from the Survey focuses especially on these two types of HEIs.

Leadership and governance

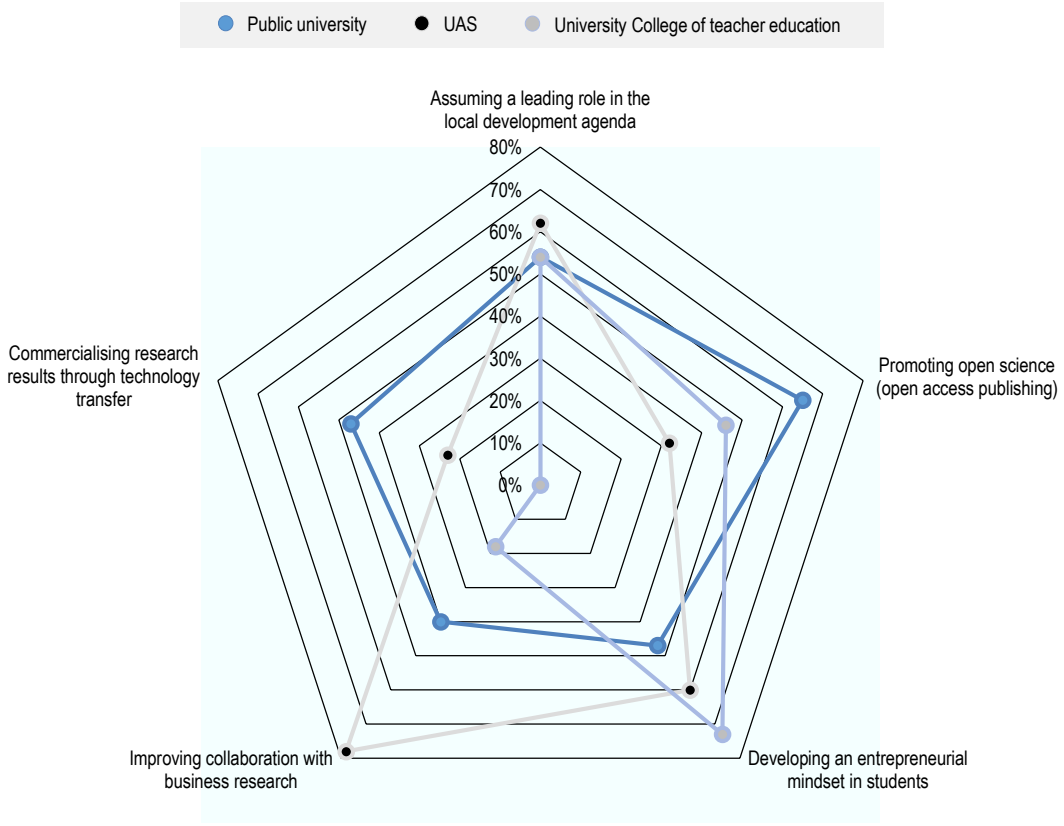
Leadership and governance arrangements are crucial to define the framework of incentives to promote the entrepreneurial and innovation agenda within higher education institutions. Many HEIs across OECD and EU countries include the words "innovation" and "entrepreneurship" in their mission statements but, in an innovative and entrepreneurial institution, this is more than a reference. Entrepreneurship should permeate the strategy of innovative higher education institutions and affect visions, values and missions. For example, an HEI could have a mission statement and written strategy, setting out an entrepreneurial vision for the future of the institution. This strategy could clearly emphasise the importance of entrepreneurship, culturally, socially and economically. In addition to the strategy, it is equally important to articulate a clear implementation plan with clear objectives and define key performance indicators to measure progress.

Austrian HEI leaders can count on an environment conducive to engagement and most HEIs have a strategic approach to engagement activities. Government agencies along with the private sector commit significant resources in support of the entrepreneurial and innovation agenda, in a clear partnership-orientated approach. Within this context, rectorates and senior management are often involved in leading and rolling out their institute's engagement strategy. Entrepreneurship and innovation are embedded in HEI strategies, which, in the case of public universities, become a reference framework for handling eventual tensions between rectorate, senate and university council. For example, if the rectorate of a given public university would like to introduce a new lifelong learning programme in co-operation with the private sector, it will be easier to overcome potential resistance from the senate if such a programme is in line with the university strategy.

The modalities of engagement may change across HEIs. Some Austrian institutions put a particular focus on start-ups and spin-offs. Others have developed a broader engagement agenda, which encompasses social activities. Most common is developing an entrepreneurial mind-set of students. For 60% of the 45 surveyed public universities, universities of applied sciences and university colleges of teacher education this objective ranked among the top three dimensions of the entrepreneurial and innovation agenda, next to assuming a leading role in the local development agenda (56%) and followed by promoting open science through open access publishing (47%), and improving collaboration with business research (45%). Commercialising research results through technology transfer ranked much lower (23%).

A closer look shows that different types of HEIs have developed different foci in their strategies (Figure 2.2). Public universities put emphasis on the development of open science (65%), on commercialising research results through technology transfer (47%), and on mind-set development (47%). Conversely, UAS focus more on improving collaboration with business research (77%) and assuming a leading role in the local development agenda (62%). Commercialising research results through technology transfer is prominent in the strategy of less than 1 in 4 UAS (for 23% of respondent UAS), compared to almost 1 in 2 public universities. 73% of the surveyed university colleges of teacher education point out that they emphasize the development of an entrepreneurial mind-set as a core curriculum and training objective for their students. More than half (55%) stated that they are committed to promoting open science through open access publication and for 43% assuming a leading role in the local development agenda is an important dimension of their "engagement" strategy.

Figure 2.2. Most prominent dimensions in Austrian HEI's strategies for engagement



Note: HEIs responded the following question: "Taking into account the HEInnovate dimensions/components listed below, please indicate the three that are most prominent in your strategy". The total number of responses analysed was 41, of which 17 were from public universities, 13 from universities of applied sciences (UAS), and 11 from university colleges of teacher education. The survey response rates per HEI type are the following: public universities (81%), UAS (62%), university colleges of teacher education (100%). In total, 45 responses were collected. The total number of higher education institutions in Austria is 67.
Source: OECD (2018b) HEInnovate Leader Survey Austria.

The role of the Austrian public authorities, both at the federal and subnational levels, has been prominent to promote HEI engagement. For example, the national innovation strategy (the research, technology and innovation [RTI] strategy of 2011) has put forward the objective of generating stronger linkages between higher education and the economy (OECD, 2017b). In the same vein, the support of national funding agencies (like the FFG and AWS, see Chapter 1) and subnational entities such as regional development agencies, chambers of commerce and industrial associations have spurred entrepreneurship in HEIs' strategies.

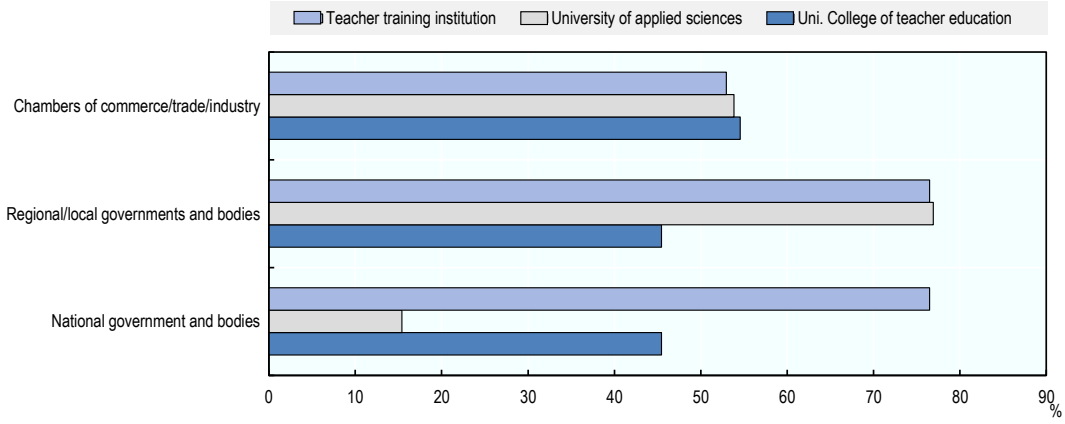
These efforts go in the right direction and could be further improved by developing a common definition of entrepreneurship in the higher education system. The previous performance agreements with public universities (2016-18), for example, suggested the application of the HEI self-assessment tool regarding their entrepreneurial agenda, but it adopted a narrow definition of entrepreneurship closely related to the idea of developing or running a business (see the discussion on "entrepreneurship teaching" in Chapter 4). In recent years, however, Austrian HEIs seem to have developed a broader understanding of

entrepreneurship, which is (informally) defined as an individual's ability to turn ideas into action. This entrepreneurial mindset includes creativity, innovation and risk-taking, as well as the ability to plan and manage projects in order to achieve objectives.

By implementing the entrepreneurial and innovation agenda, Austrian HEIs interact with ecosystems but there are regional differences in terms of firm density and R&D investment from businesses and HEIs. These differences depend on the characteristics of the regional economy, like R&D expenditures performed by the higher education (HE) sector and the business sector or the density of firms. In general, there are several ways in which HEIs can be actively involved in the development and implementation of local, regional and national innovation and entrepreneurship strategies. These include collaborating with the public sector, business partners, direct support of start-ups and established companies, as well as supporting local cultural and artistic activities.

In Austria, HEIs enjoy good collaboration with public authorities and economic chambers, which at the regional level are the private sector's representations in regional ecosystems. More than half of the surveyed HEIs reported collaborating with chambers in supporting entrepreneurship (53%), two-thirds (67%) collaborate with regional and local governments, and 47% with the national government. A closer look by type of surveyed HEI show some differences (Figure 2.3).

Figure 2.3. Main collaboration partners of Austrian HEIs in supporting entrepreneurship



Note: HEI leaders responded to the following question: "With which of the following organisations/ institutions does your HEI collaborate in supporting entrepreneurship?" The total number of responses analysed was 41, of which 17 were from public universities, 13 from universities of applied sciences (UAS), and 11 from teacher training institutions. The survey response rates per HEI type are the following: public universities (81%), UAS (62%), university colleges of teacher education (100%). In total, 45 responses were collected. The total number of higher education institutions in Austria is 67.

Source: OECD (2018b) HEInnovate Leader Survey Austria.

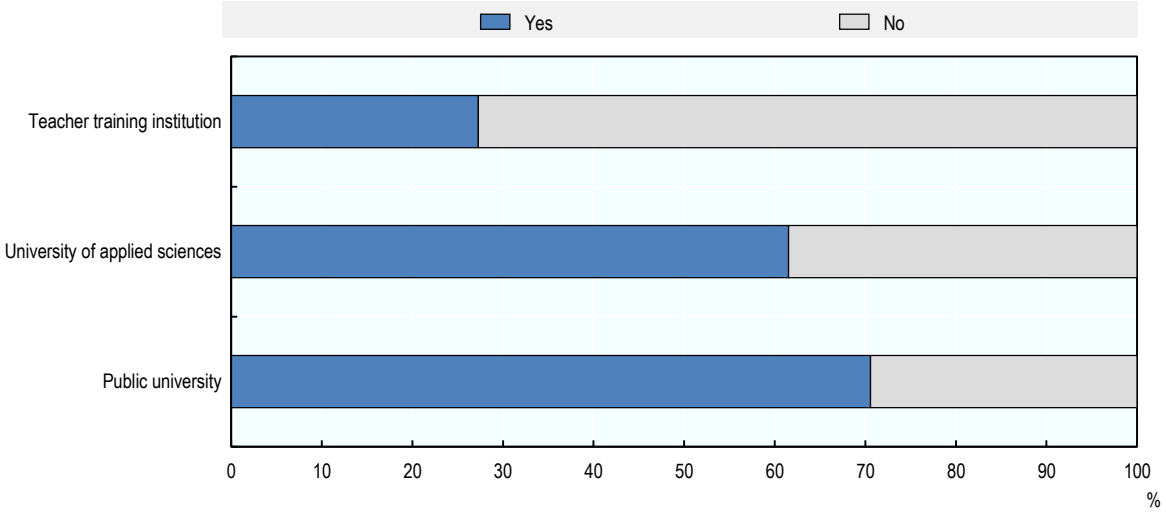
More public universities collaborate with national government and their bodies than universities of applied sciences (76% vs. 15%), and 45% of the surveyed university colleges of teacher education reported to have this kind of collaboration. An important way of collaboration with the national government for public universities are performance agreements (see Chapter 3). Regional and local governments and their bodies collaborate more with public universities and UAS than with teacher training institutions. No differences can be noted for the collaboration with chambers; approximately half of the surveyed HEIs collaborate with them for entrepreneurship support.

Organisational capacity: Funding people and incentives

The organisational capacity of a given HEI affects its ability to implement a strategy. In other words, while important, a strategy alone is not enough to make an institution more capable to engage. An HEI that is committed to carrying out innovative and entrepreneurial activities needs to fund and invest in these areas accordingly and consistently. In this domain success factors include the following: i) a strong alignment between investments in innovative and entrepreneurial activities and the HEI overall financial strategy; ii) a continuous and long-term engagement with funders and investors, also outside the academic world to secure financial resources to deliver strategic objectives; iii) a balanced and diversified range of funding and investment sources, including in-kind contributions; and, finally iv) the possibility to re-invest revenues generated from research, teaching and knowledge exchange activities.

Regarding funding and investment, Austrian HEIs have access to different sources of funding that support their entrepreneurial and innovation agenda. More than half of the surveyed HEIs (53%) responded in the affirmative to the question of whether public authorities – at the national, regional or local level – provide financial support or incentives for the provision of start-up support measures including incubators (Figure 2.4).

Figure 2.4. Funds provided by public authorities to support start-up measures



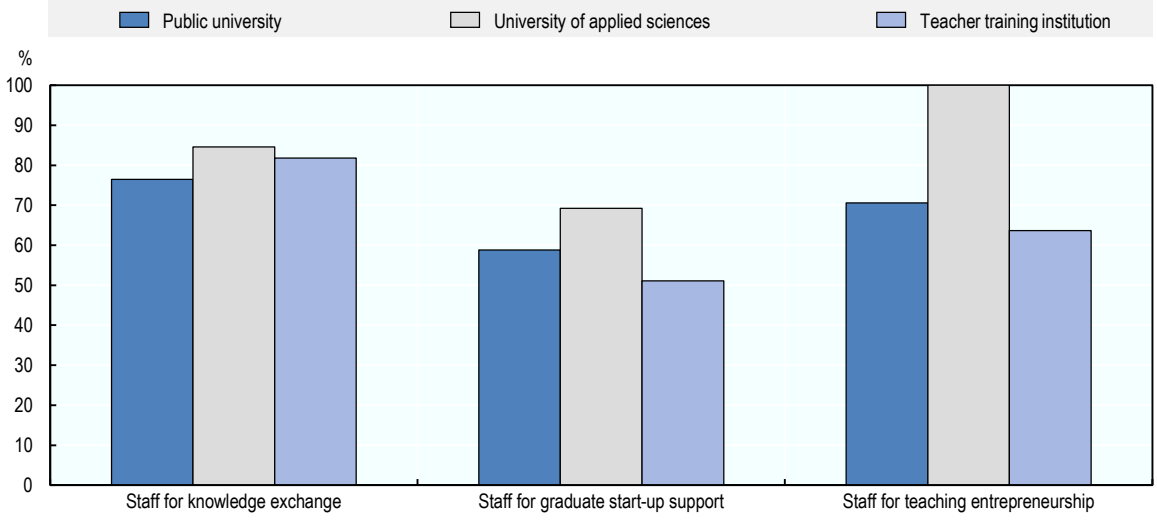
Note: HEI leaders responded to the following question: "Do public authorities – at the national, regional or local level – provide financial support or incentives for the provision of start-up support measures including incubators?" The total number of responses analysed was 45, of which 17 were from public universities, 13 from universities of applied sciences (UAS), and 11 from teacher training institutions. The survey response rates per HEI type are the following: public universities (81%), UAS (62%), university colleges of teacher education (100%). In total, 45 responses were collected. The total number of higher education institutions in Austria is 67.
Source: OECD (2018b) HEInnovate Leader Survey Austria.

Motivated, skilled and committed people are essential to developing the HEI into a more innovative and entrepreneurial organisation. These people need support structures (e.g. centralised office to support engagement activities), training and rewards if their contributions to the entrepreneurial and innovation agenda are going beyond their current tasks.

As discussed in the chapter on leadership and governance, Austrian HEIs can count on different programmes and projects supporting the entrepreneurship agenda. This approach is quite common in OECD countries. There are cases, however, in which the support from the government has been more organic, allowing HEIs to develop a strategic – and long-term – approach to improve their capacity to engage with business and society. For instance, the Netherlands' Valorisation Programme helped HEIs to generate functions and institutions supporting the entrepreneurial agenda. The engagement of HEIs in this direction has been continuing also after the end of the programme (i.e. end of public subsidies to the positions and institutions related to the implementation of the entrepreneurial agenda) (OECD/EU, 2018).

Co-operation with firms can generate funds that can improve the capacity to engage and broaden the range of engagement activities. Supporting academics in their co-operation with firms and other engagement activities is important and widely practised among Austrian HEIs. More than 80% of the surveyed HEIs reported having staff dedicated to knowledge exchange (Figure 2.5). Most (76%) of the surveyed public universities reported that there is an office to co-ordinate knowledge exchange activities; this was less common practice among the surveyed university colleges of teacher education (55%) and universities of applied sciences (46%).

Figure 2.5. Presence of staff dedicated to knowledge exchange



Note: HEI leaders responded to the following question: "Do you have staff dedicated to knowledge exchange?". The total number of responses analysed was 45, of which 17 were from public universities, 13 from universities of applied sciences (UAS), and 11 from teacher training institutions. The survey response rates per HEI type are the following: public universities (81%), UAS (62%), university colleges of teacher education (100%). In total, 45 responses were collected. The total number of higher education institutions in Austria is 67.

Source: OECD (2018b) HEInnovate Leader Survey Austria.

Entrepreneurial teaching and learning

An HEI should explore innovative teaching methods to stimulate entrepreneurial mindsets. Students should learn about entrepreneurship. For instance, starting a new company requires knowledge about tax rules, financial schemes and other private or public policy support, among others. However, entrepreneurship is not only about starting a business. It also means acquiring the skills and competencies associated with the ability to tackle

problems with a variety of methodologies and interdisciplinary approaches. This encompasses soft skills such as communication, management, organisational skills, etc.

As part of the promotion of entrepreneurship education, several Austrian HEIs offer their students the possibility to enrol in interdisciplinary programmes. For example, and as discussed in the chapter 3, assessing leadership and governance, the University of Vienna has put in place "extension curricula" and "alternative extensions" – *Erweiterungscurricula* and *Alternative Erweiterungen* – to give students the possibility to attend classes in different study programmes and faculties. In the same vein, at the University of Innsbruck, some curricula are based on "modules", which can be formed by mixing disciplines/programmes. Data from the Leader Survey illustrate that interdisciplinary programmes are more common among the surveyed public universities (71%) than among the surveyed universities of applied sciences (38%). Within the surveyed public universities, most commonly these interdisciplinary programmes on entrepreneurship are offered in master's programmes (ISCED 7) (41%).

Several HEIs have created tenure for entrepreneurship professors. In UAS, temporary staff with entrepreneurial/technical experiences represents the largest share of faculty. While this potentially gives students access to information about the needs of ecosystems, it also requires quality assurances and co-ordination efforts to combine different courses in terms of their content and teaching styles into a common programme frame.

A better framework of incentives in the higher education system could further develop the numerous practices observed at the HEI level. Encouraging and rewarding innovative and entrepreneurial behaviour in faculty and administrative staff, and students is a key feature of innovative and entrepreneurial HEIs. Well-designed incentive and reward mechanisms should be diverse and differentiated to be able to promote different types of careers and actions depending on the different types of skills of staff. These incentives and rewards mechanisms should be available at an individual level as well as for faculties or departments, extending beyond classic career progression models. Examples of good practices include: adjusting staff teaching and research workloads; providing institutional funds to stimulate innovation and change; allow sabbaticals for staff who seek to enhance their entrepreneurial capacity; develop rewards and incentive mechanisms going beyond traditional research, publications and teaching metrics; making office and laboratory space available for staff and students who pursue entrepreneurial activities; and developing flexible intellectual property (IP) protection models.

In Austria, faculty members that engage with entrepreneurship can benefit from a reduction of their teaching responsibilities. They can even get a sabbatical year to develop their business; for this purpose, the "spin-off fellowship" is offered and is also mentioned in many case-study HEIs as a good practice to raise the interest of young researchers for commercialising the results of their research (Box 2.3). Conversely, students enjoy very limited incentives to approach entrepreneurship while studying.

Box 2.3. Supporting faculty and students creating a company: The Austrian Spin-off Fellowship

The Spin-off Fellowship targets faculty and students interested in founding their own company. The Spin-off Fellowships is a programme of the Federal Ministry of Education, Science and Research (BMBWF) which offers support with the commercialisation of existing and newly developed intellectual property belonging to Austrian universities and research institutions.

By doing that, the programme enables the fellowship project to be followed by a company start-up. The following formal conditions must be fulfilled in order to apply for a fellowship from the FFG:

- The technologies or research results are the property of an organisation which is eligible to apply.
- There is an individual intellectual property commercialisation agreement, based on the spin-off strategy of the relevant university or research institution.
- There is a declaration of support from the host.
- The fellow(s) are in an employment relationship with the university or research institution when the project starts.

Some caveats could be represented by the fact that during the term of the project the fellow(s) (= potential founders) must devote themselves exclusively to the project and may not carry out any teaching or other research assignments during that period.

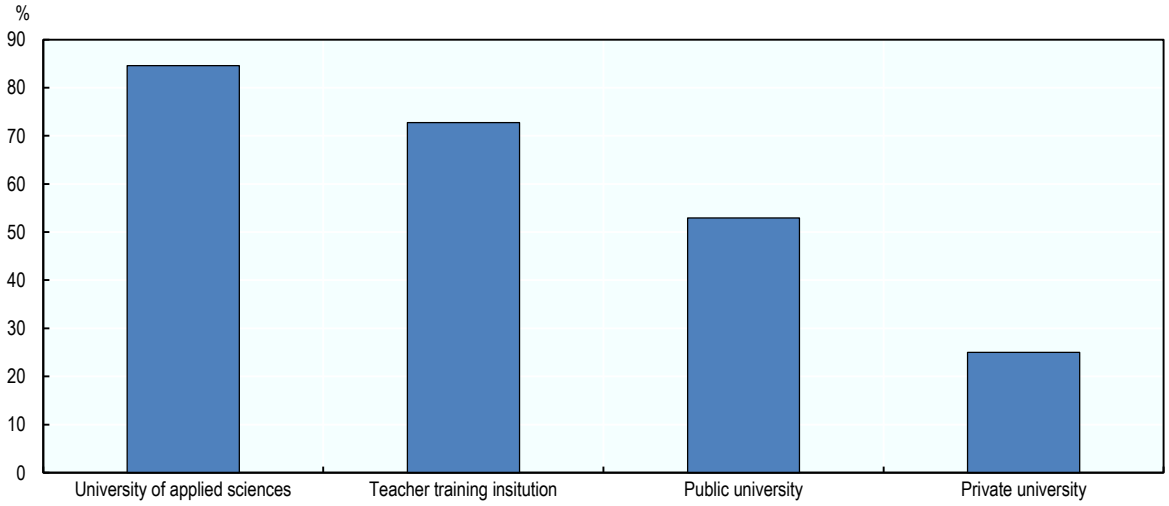
Source: FFG (n.d.), *Spin-off Fellowships*, https://www.ffg.at/en/node/52752 (accessed on 15 April 2019).

Entrepreneurial teaching and learning do not mean necessarily accompanying students starting their own business but rather helping them develop an entrepreneurial mindset and the related skills also necessary to work creatively as an employee. In Austria, many HEIs, including public universities and UAS, have been offering learning opportunities focusing on entrepreneurship.

A large number of Austrian HEIs have developed programmes to provide students with learning opportunities vis-à-vis entrepreneurship. However, these programmes tend to deliver entrepreneurship training to a small number of students. In some cases, classes tend to be centred on financial, legal and regulatory issues. For example, the entrepreneurship programme at the University of Vienna has a relatively narrow focus on financial issues and regulations, which may cause high dropout rates (see Chapter 4).

Similar to the approach of other countries, a wide range of teaching methods is used in entrepreneurship education. Blended learning seems to be more common in UAS and university colleges of teacher education where, of the surveyed institutions, 85% and 73% reported to use blended learning in their entrepreneurship education activities and less practised in public universities (53%) (Figure 2.6).

Figure 2.6. Entrepreneurial teaching and learning: HEIs using "blended learning" teaching methods



Note: HEI leaders responded to the following question: "Which one of these approaches are used by your HEI?" The total number of responses analysed was 45, of which 17 were from public universities, 13 from universities of applied sciences (UAS), and 11 from teacher training institutions. The survey response rates per HEI type are the following: public universities (81%), UAS (62%), university colleges of teacher education (100%). In total, 45 responses were collected. The total number of higher education institutions in Austria is 67.

Source: OECD (2018b) HEInnovate Leader Survey Austria.

Traditionally, UAS have a close collaboration with experts and employers in programme development. UAS were founded with the aim of reflecting the skills needs expressed by the job market, especially by firms operating in their own "ecosystems". For this reason, the participation of representatives from the industry in which the UAS operate is legally binding and supported by specific governance arrangements (see Chapter 3). While academic education should not be affected by short-term skills needs in the labour market, the capacity to take into account the mid- and long-term evolution of skill requirements can improve curricula and offer a better service to stakeholders, including students. Within this context, entrepreneurship education – constantly reviewed and updated – represents, for HEIs, a gateway to the economy and society.

As discussed in Chapters 4 and 5, in Austria, entrepreneurship education is often delivered through extracurricular activities. A greater embedding of entrepreneurship activities into programme curricula can be noted for UAS, reaching approximately 30% of students (Table 2.1). While some extracurricular activities, such as formula student competitions, have formal recognition (the competition awards a prize for innovation for student teams across the world, see Chapter 4), many activities related to entrepreneurship education are informal. This does not represent a negative feature *per se.* Informal (extracurricular) education can be as effective as formal education in developing an entrepreneurial mind-set but it is more difficult to evaluate and also to certificate (i.e. to give the possibility to students to capitalise on their entrepreneurship education when joining the labour market). In general, extracurricular activities are more effective when formally recognised, for examples in exams or other evaluations.

Table 2.1. Students involved in entrepreneurship education in Austrian HEIs

HEI type		What percentage of students are involved?				Total
		Less than 9%	Less than 10%	Between 10% and 30%	More than 30%	
Public university	Count	9	2	3	3	17
	% within HEI type	52.9	11.8	17.6	17.6	100.0
Private university	Count	1	1	1	1	4
	% within HEI type	25.0	25.0	25.0	25.0	100.0
University of applied sciences	Count	1	0	4	8	13
	% within HEI type	7.7	0.0	30.8	61.5	100.0
University college of teacher education	Count	4	4	2	1	11
	% within HEI type	36.4	36.4	18.2	9.1	100.0
Total	Count	15	7	10	13	45
	% within HEI type	33.3	15.6	22.2	28.9	100.0

Note: HEI leaders responded to the following question: "What percentage of students are involved in entrepreneurship education?". The total number of higher education institutions in Austria is 73.

Source: OECD (2018b) HEInnovate Leader Survey Austria.

Some Austrian HEIs have developed "good practices" to review and update entrepreneurship education by integrating the results of research. For example, at the Vienna University of Economics and Business, international research in entrepreneurship affects teaching and connects with the local environment, generating an "intellectual spill-over" in its ecosystem. To achieve this result, the university encourages staff and educators to review the latest research in entrepreneurship education. The Institute for Entrepreneurship and Innovation provides a forum whereby staff and educators can exchange new knowledge and ideas, incorporating the latest research.

Preparing and supporting entrepreneurs

HEIs can help individuals reflect on the commercial, social and environmental or lifestyle objectives related to their entrepreneurial aspirations and intentions. For those who decide to proceed to start a business or any other type of venture, HEIs can offer targeted assistance to generate, evaluate and act upon new ideas, building the skills necessary for successful entrepreneurship and, importantly, find relevant team members and get access to relevant networks (Box 2.4).

In Austria, the support of the government to the entrepreneurial and innovation agenda in HE has positively affected the capacity of HEIs to raise awareness and support entrepreneurship. Over the past decades, Austrian authorities and innovation agencies, as for example the Austrian Research Promotion Agency (FFG), have been implementing policies to promote HEI entrepreneurship. These include the AplusB Centres (2002), the Phönix Prize for innovative academic start-ups (2012) and the Spin-off Fellowship (2017). These initiatives, which are discussed in detail in Chapter 5, have generated development and national good practices; academic entrepreneurship has become popular and helps HEIs engaging with business ventures. However, there are still some conservative environments, especially in public universities, in which faculty members do not see entrepreneurship as a valuable carrier opportunity.

Box 2.4. Supporting entrepreneurs: The I-Corps programme

To transform a scientist into a scientist-entrepreneur, there is a need for appropriate education and training. There are many examples of start-ups producing services or products that fail to meet demand on the market. In some cases, a better definition of the service/product and some market research would have helped transform a failure into a success.

Based on this assumption, the National Science Foundation (NSF) launched the I-Corps programme in 2012. The programme awards principal investigators (PIs) a USD 50 000 NSF grant. PIs, together with an entrepreneurial lead (generally a PhD student and a business mentor), attend a seven-week course in which they are taught to identify business opportunities for their research and ways to exploit these opportunities (Huang-Saad et al., 2017). Academics (students and teachers) who develop a business idea may lack information about the way in which they should successfully implement it.

Through I-Corps, NSF grantees learn to identify valuable product opportunities that can emerge from academic research and gain skills in entrepreneurship through training in customer discovery and guidance from established entrepreneurs.

Sources: NSF (n.d.), *NSF Innovation Corps (I-Corps™)*, https://www.nsf.gov/news/special_reports/i-corps/ (accessed on 15 February 2019); Huang-Saad, A., Fay, J., Sheridan, L. (2017) "Closing the divide: accelerating technology commercialization by catalyzing the university entrepreneurial ecosystem with I-Corps" *The Journal of Technology Transfer* 42 (6), 1466-1486, 2017.

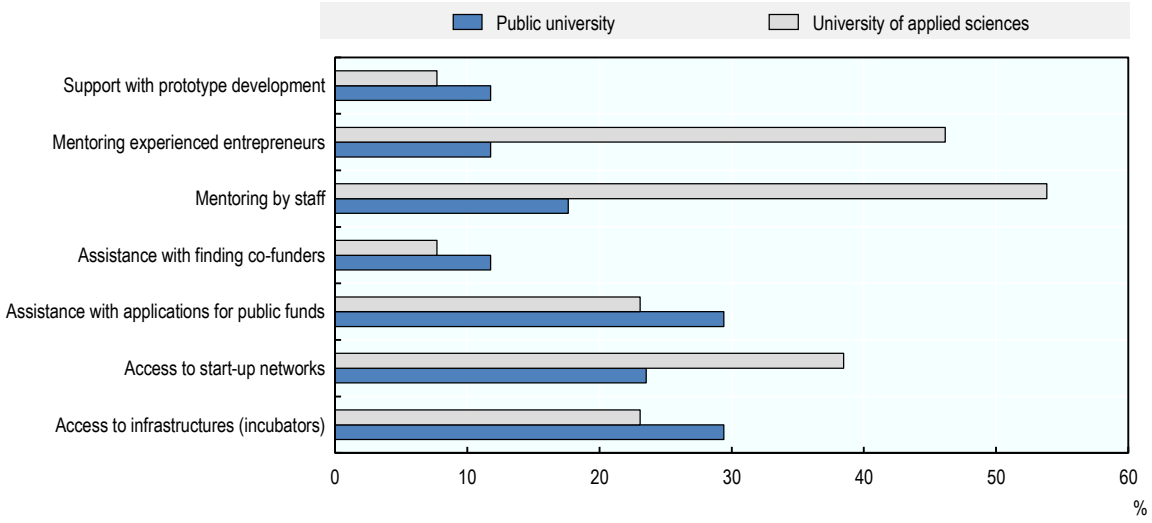
Emotional preparation is as important as the technical aspects (see Chapter 4). Aspects of entrepreneurship, related to soft skills such as dealing with people and building relationships, managing innovation processes, coping with success, stress and risk, and how to restructure or exit, are often not taken into account. The involvement of entrepreneurs and key actors from the entrepreneurship ecosystem is often very useful to offer holistic entrepreneurship training.

Public universities and UAS seem to have different priorities in their start-up support (Figure 2.7). Overall, intramural start-up support appears to be more common for UAS than for public universities. A reason for this could be that public universities rely more on a network approach and refer aspiring entrepreneurs to external organisations that offer specific support. The priority setting in start-up support also points in this direction. Priorities for public universities are offering access to infrastructure, including incubators, assistance with the application to public funding and access to start-up networks, whereas UAS put an emphasis on mentoring by staff and experienced entrepreneurs.

Austria's venture capital sector is relatively small and, despite recent improvements, the country struggles to link excellent research to funding opportunities (OECD, 2017b). External financing can be essential for the success of the initial stages of a new venture. It provides investment for feasibility and market studies, product and prototype development such as proof of concept funding, for initial production or for offering the founders some living income before their first revenues are generated. Public authorities have put in place initiatives, such as the Global Incubator Network (2016), to improve the international linkages of start-ups and SMEs. This network is endowed of EUR 4 million and serves as a platform for international and Austrian start-ups, investors, business angels and start-up agencies. The network's objective is to promote Austria as a start-up hub and improve

international networking for Austrian companies by providing improved access to international incubators and accelerators, international investors and potential international strategic partners. It provides support for entry in international markets, connects to international start-ups and supports firms in handling intellectual property rights (OECD, 2017b).

Figure 2.7. Priorities in the start-up support offer by Austrian public universities and universities of applied sciences



Note: HEI leaders answered the following question: "Please indicate the three most important start-up support measures that are actually in place and used in your HEI". The total number of responses analysed was 30, of which 17 were from public universities, and 13 from universities of applied sciences (UAS). The survey response rates per HEI type are the following: public universities (81%), and UAS (62%). These response rates, however, need to be interpreted with caution as the survey design does not allow for the exclusion of multiple responses per higher education institution. In total, 45 responses were collected. The total number of higher education institutions in Austria is 67.

Source: OECD (2018b) HEInnovate Leader Survey Austria.

There is a large network of HEI incubators and accelerators supporting students, graduates and staff to move from idea generation to business creation. Business incubators provide a range of services such as free or subsidised premises where start-uppers can work on their projects, access laboratories and research facilities, prototyping support, as well as advice on IP matters and financial opportunities. They also offer a visible and accessible location for entrepreneurs to access an integrated package of coaching, mentoring and training. Incubators and accelerators are often developed in co-operation with subnational governments, regional development agencies and chambers of commerce, as in the case of the University of Innsbruck. As in other countries, however, policy support is mostly focusing on technical – hard science – sectors, while social entrepreneurship and other forms of soft science struggle to find their space in incubators.

Digital transformation and capability

Digital transformation and capability were added as the eighth dimension to the HEInnovate guiding framework in June 2018, after the completion of the study visits undertaken as part of this review. The following presents some reflections on the implementation of the multidimensional digital agenda in Austrian HEIs.

The Austrian federal government has elaborated a holistic strategy to promote digitalisation. Policymakers recognise the transformational importance of digitalisation and, through many channels, including higher education, act to accelerate its diffusion. There has been considerable experimentation over decades with varied institutional models to support innovation, and evaluation of innovation policy instruments is a widespread practice. This includes a coherent and shared strategy and action plan allocating resources for digital transformation across the HEI. In particular, a digital roadmap was developed in 2017 to address new opportunities and challenges offered by digitalisation and automation; the newly established Ministry of Digital and Economic Affairs (BMDW) is in charge of developing new Digital Strategy (OECD, 2017b).

As in other European countries, including Austria, HEIs are developing their digital infrastructure to support their vision, mission and strategy. HEIs have been focusing on digital learning activities (online learning platforms). Digital technologies provide opportunities for innovative curriculum design and delivery, new pedagogies, learning processes and assessment methods. For instance, the Institute of Nursing Science and Practice at Paracelsus Medical Private University (Salzburg) has developed a bachelor degree study programme in nursing science on an online basis. The programme is specifically designed to reach out to working students, who can study from home and set their individual time management, limiting the time at university to just one week per study year.

Austria's Open Innovation Strategy provides HEIs with specific support to promote open research, open innovation and accessibility.[1] Open science improves the effectiveness, quality and productivity of a research system, encourages the adoption of new research methodologies and scales up innovation in HEIs (OECD/EU, 2015; Dai, Shin and Smith, 2018). Through open science, the HEI promotes collaborative efforts, faster knowledge exchange and new ways of sharing results (including publications, research data and methodologies) among students, staff and society, with a specific focus – particularly important in the case of Austria – on disadvantaged or non-traditional stakeholders.

Knowledge exchange and collaboration

Innovative and entrepreneurial HEIs do not operate in isolation but are strongly connected to other stakeholders within their ecosystems. Knowledge exchange is an important catalyst for organisational innovation, the advancement of teaching and research and local development. It is a continuous process, which includes the stimulation, direct application and exploitation of knowledge for the benefit of the social, cultural and economic development of society.

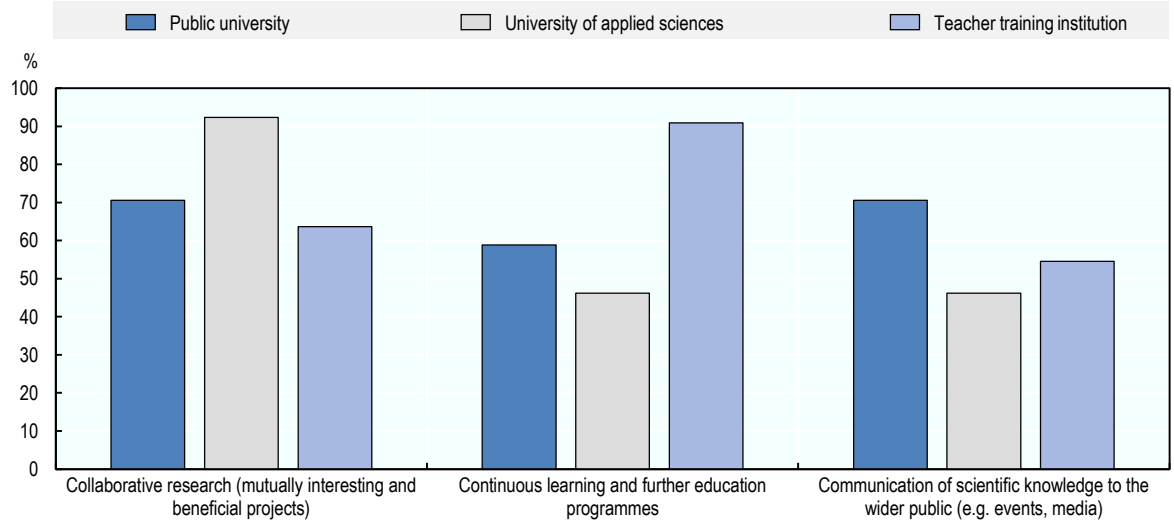
All Austrian HEIs are committed to knowledge exchange and have been developing strategies and modus operandi to engage and collaborate with stakeholders. This situation partly owes to the broad set of instruments to promote science-industry collaboration that has been developed by public authorities with the aim of improving knowledge transfer.[2] There are several examples of collaboration. Among others, the *Angewandte*, the University of Applied Arts in Vienna, has developed a collaboration with a tech company that is developing electronic systems for self-driving cars. The university is helping the company streamline and simplify these systems in order to reduce their vulnerability and increase reliability and resilience.

The capacity of HEIs to engage in knowledge exchange and collaboration activities, however, also depends on the characteristics of the region in which they are located. Although the available data do not allow to affirm this with absolute certainty, it seems that

Austrian HEIs located in areas with a concentration of economic activities tend to be part of denser networks with external stakeholders. This is in line with the idea that HEIs have acquired a "new centrality" in regional innovation ecosystems (EUA, 2019). Also, in Austria, HEIs are experiencing new formats of producing and sharing knowledge, integrated with their traditional roles of educating students and developing research.

The importance of local actors in knowledge exchange and collaboration activities seems to be confirmed by the responses that Austrian HEIs provided to the OECD Leader Survey (2018b). In terms of knowledge exchange, activities very high in the priorities of the surveyed HEIs (public and private universities, UAS and university colleges of teacher education) are: collaborative research, that is, mutually interesting and beneficial projects (71% ranked this as 1 of their 3 most prominently practised); continuous learning and further education programmes (64%); communication of scientific knowledge to the wider public through events and the media (58%) (Figure 2.8).

Figure 2.8. Priorities in the knowledge exchange activities of public universities, universities of applied sciences and university colleges of teacher education in Austrian HEIs



Note: HEI leaders responded to the following question: "Knowledge exchange can take on various forms. The focus can be on teaching, research or any form of strategic collaboration. Which of the following are currently practised at your HEI? Please pick the three most prominent for you". The total number of responses analysed was 41, of which 17 were from public universities, 13 from universities of applied sciences (UAS), and 11 from teacher training institutions. The survey response rates per HEI type are the following: public universities (81%), UAS (62%), university colleges of teacher education (100%). These response rates, however, need to be interpreted with caution as the survey design does not allow for the exclusion of multiple responses per higher education institution. In total, 45 responses were collected. The total number of higher education institutions in Austria is 67.
Source: OECD (2018b) HEInnovate Leader Survey.

A closer look at different HEIs suggests that current priorities for knowledge exchange activities in universities of applied sciences are more directed towards collaborative research (92% said this was 1 of their 3 most prominent practices) than continuous learning and further education programmes (46%) or science communication (46%). The latter was a priority for 71% of the surveyed public universities, together with collaborative research (71%) whereas lifelong learning was a priority for 59%. University colleges of teacher

education have a current focus on lifelong learning (91%), followed by collaborative research (64%) and the communication of scientific knowledge to the wider public (55%).

Good relations with their "ecosystem" have helped Austrian HEIs integrate research, education and knowledge exchange activities. Many Austrian HEIs have established institutions and methodologies to co-operate with ecosystems in a structured fashion. As discussed above, there are several university incubators in the country. These incubators have generated a positive legacy in terms of business creation and support and have become entrepreneurship hubs in their respective ecosystems (see Chapter 5). In addition, Austrian HEIs use internships and collaboration with external stakeholders to help students and staff participating in innovative activities. Both public universities and UAS broadly implement these practices (see Chapters 4 and 5).

An entrepreneurial and innovative HEI engages with the external environment through a variety of activities ranging from informal activities, such as clubs and networking events, to formal initiatives such as internships, collaborative research, industrial PhDs and entrepreneurship projects (Duruflé Hellmann and Wilson, 2018). Austrian public universities have developed specific graduate paths to favour collaboration with external stakeholders. For instance, to pursue a doctoral degree in Austria, students can enrol either in traditional doctoral studies (*Doktoratsstudium*) or structured PhD programmes. The latter apply strict and standardised selection processes, involve a team of supervisors, are based on structured education and course work, and have theses evaluated by external reviewers (BNWF/FWF, 2010). One core objective of structured PhD programmes is to better integrate doctoral students into the scientific community and ensure active monitoring and supervision to guarantee independent and high-quality research (BMWFW and BMVIT, 2016; OECD, 2018).

The internationalised institution

HEIs increasingly compete and operate at the international level. For this reason, they often integrate an international or global dimension into the design and delivery of education, research and knowledge exchange. Internationalisation of HEIs is not an end in itself but a vehicle for change and improvement by learning from peers from other countries. International connections contribute to introduce alternative ways of thinking, questions traditional teaching and research methods, opens up governance and management to external international stakeholder, offer opportunities to exchange knowledge and collaborate with relevant partners (business, academia, public agencies, etc.) abroad. Therefore, it is linked very strongly to innovation and entrepreneurship.

In Austria, all HEIs consider internationalisation as an important dimension in their strategy and a way to improve their capacity to engage with stakeholders. Many participate in the Erasmus+ programme and engage in student mobility programmes to provide students with access to international experiences. There are some examples, such as the FH Upper Austria – a UAS – that is experimenting with a strategy that connects internationalisation and collaboration with businesses. The UAS helps partner firms to connect with HEIs located in countries in which they export their products or have other kinds of business.[3]

International mobility brings in new education and research ideas, develops intercultural connections and long-lasting partnerships (Appelt et al., 2015). In addition to attracting international staff and students, an innovative and entrepreneurial HEI actively encourages and supports the international mobility of its staff and students. It can promote, encourage and reward international mobility through exchange programmes, scholarships, fellowships and internships, for instance through European programmes.

Austrian HEIs are particularly active to support the international mobility of staff and student. Concerning staff, the attractiveness of the higher education system, although improving, could be increased. As highlighted by the OECD Innovation Review of the country (OECD, 2018), compared to countries leading in innovation, Austria's universities lag in major international rankings, undermining their ability to attract talented domestic and foreign researchers.

Austria HEIs contribute to several international research networks. Strategic international research partnerships are an important part of an HEI's entrepreneurial and innovation agenda. In some cases, Austrian institutions represent international research hubs. It is the case of the University of Vienna, the largest in the country and one of the largest universities in Europe. There are however also several smaller – specialised – universities that contribute to international research activities such as the BOKU and the Vienna University of Economics and Business, within the project CASE (Competencies for sustainable socio-economic development), where a variety of national and international co-partners have developed innovative ways of entrepreneurial teaching and learning.

International mobility of students is also a good feature of the national system. The mobility of Austrian students enrolled in tertiary level study programmes is above average among comparator countries (OECD, 2017a). In 2015, Austrian nationals studying abroad constituted 4.6% of all students enrolled in a bachelor's, master's or doctoral programme. Approximately 15% of all tertiary enrolled students in Austria (2015) come from abroad, a share surpassed only by Switzerland. However, a specificity of Austria is a relatively high share of German nationals enrolled in HEIs. This reflects geographic proximity, a shared language, push factors such as admission restrictions in Germany (in some fields such as medicine) and the high quality of life in Vienna and other Austrian university cities (OECD, 2018).

Some Austrian HEIs link their internationalisation strategies with entrepreneurship. For instance, taking advantage of the common language, some HEIs have joined networks with German and Swiss institutions to promote the entrepreneurial and innovation agenda. This is the case of the FH Campus Wien, which is part of the international network of universities of applied sciences, also encompassing UAS from Munich and Zurich. The three institutions have harmonised their curricula and are experimenting together to promote entrepreneurial teaching.[4] Another example is the Medical University of Innsbruck that is collaborating with a German technology transfer partner (a private company) to improve the capacity of the medical school to engage with the private sector and co-operate in research activities with firms. At the post-doctorate level, the University of Innsbruck participates in the Higher Education and Enterprise Alliance P2I-postdocs to innovators project. Besides the University of Innsbruck, this network encompasses the University of Cambridge, the Free University of Berlin, the University of Glasgow and the PSL-Paris University. Private sector partners include large multinational companies in the oil industry as well as other sectors. The aim of this project is to develop the entrepreneurial skills of postdoctoral students in all fields and create an academic and industrial network useful for their careers.

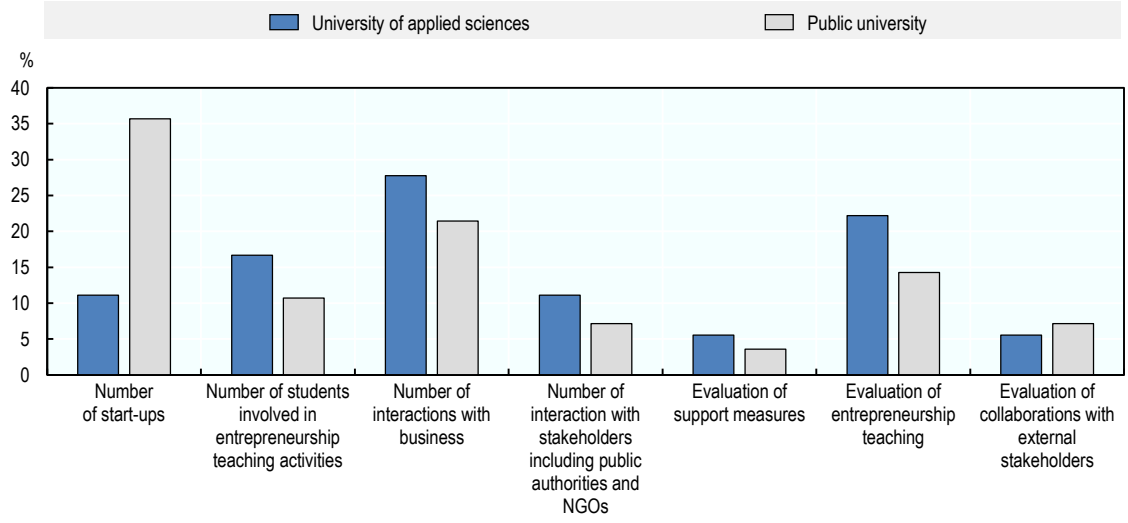
Measuring impact

Measuring impact is a transversal dimension within the HEInnovate framework. Innovative HEIs need to understand the impact of the changes they introduce in their institution and in the wider ecosystem they operate in. Innovative and entrepreneurial HEIs combine institutional self-assessment, external evaluations and evidence-based approaches.

However, impact assessment of innovation and entrepreneurship activities in HEIs remains underdeveloped. This is partly due to the fact that the currently available metrics typically focus on the number of spin-offs, the volume and quality of the intellectual property and of the commercialisation of research results. Such metrics do not take into account important factors such as teaching and learning outcomes, employability of graduates and labour market performance, the contribution to local economic development, graduate entrepreneurship and the impact of the broader entrepreneurial and innovation agenda such as social and cultural dimensions.[5]

Despite these common challenges, evaluation of engagement is gaining importance in Austria. Public authorities have set a system in which Austrian HEIs have to consider entrepreneurship and innovation activities in their strategies (see Chapter 3). Rectors and academic boards support evaluation activities to promote the sustainability of the entrepreneurial and innovation agendas in their respective institutions (legacy). Several HEIs have set indicators and methodologies to measure results and progress in their capacity to generate value for the economy and society. As in most countries, HEIs are challenged by the complexity and variety of engagement activities, as well as by the lack of quantitative indicators for some of these activities. Accordingly, HEIs tend to focus on quantifiable dimensions such as the number of start-ups generated by incubators and the number of interactions with business (Figure 2.9). There are however efforts to generate "narratives" of engagement and to create qualitative indicators assessing, for instance, entrepreneurship teaching.

Figure 2.9. Indicators to measure the impact of engagement



Note: HEI leaders responded to the following question: "What are the indicators that are measured or the dimensions that are assessed?". The total number of responses analysed was 21, of which 12 were from public universities, and 6 from universities of applied sciences (UAS). The survey response rates per HEI type are the following: public universities (81%), UAS (62%), university colleges of teacher education (100%). These response rates, however, need to be interpreted with caution as the survey design does not allow for the exclusion of multiple responses per higher education institution. In total, 45 responses were collected. The total number of higher education institutions in Austria is 67.
Source: OECD (2018b) HEInnovate Leader Survey Austria.

In general, the Austrian system is improving its capacity to assess the impact of engagement but some challenges remain. For example, specific efforts are devoted to monitoring and

evaluating the activities of incubators, including the outreach, take-up and role played by start-up/spin-off support across all faculties and departments. As a result, Austrian incubators are quite efficient and there is plenty of information about their overall performance and about the successful practices they pilot/implement. Conversely, there is no evidence about the evaluation of international activities of HEIs in relation to the entrepreneurial agenda. In the same vein, the evaluation of entrepreneurial teaching and learning activities seems to be limited. It would be important to develop indicators in these areas, also due to the increasing interaction and functions that HEIs are establishing with the specific focus to promote their capacity to engage and generate value for the economy and society in Austria.

Notes

[1] See http://openinnovation.gv.at/wp-content/uploads/2016/08/Open-Innovation-barrierefrei.pdf.

[2] For instance, according to Ecker, Reiner and Gogola (2019), large and long-term programmes, such as COMET and CDG, have played an essential role in promoting collaboration between HEIs and businesses.

[3] Based on information provided by Prof. Dr Andreas Zehetner, Vice President of International Affairs and Professor of Marketing at the FH Upper Austria.

[4] See https://www.fh-campuswien.ac.at/studium/internationales/inuas.html.

[5] The lack of an effective measurement of the impact of engagement activities is that – even in advanced innovation-intensive countries – there is no consensus on the metrics to use to assess many of these initiatives. In addition, due to the wide range of activities, there is no consensus about the timescale to use for measuring such impacts.

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