Policy Brief

Recommendations from the Research Council of Norway's International Advisory Board
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Research, innovation and education: Ensuring better integration

As the world are facing major challenges and crisis, such as climate change, international pandemics and war, knowledge and education are more crucial than ever. Addressing both current and future societal challenges will depend on the concerted efforts of a broad range of R&I stakeholders, both nationally and internationally.

Norway, facing the need to transform the economy, move towards a more competitive and efficient R&I-system and prepare for a post-pandemic and post-petroluem society, needs to develop better national knowledge and innovation eco-systems, including a transformation of the higher education system, with enhanced interplay between research, innovation and higher education.

To realize these ambitions, higher education institutions (HEIs), together with public research institutes (PRIs), the private and public sector, civil society, policy makers and funding agencies must cooperate and interact, moving towards a new and more effective and integrated research, innovation and education system that will:

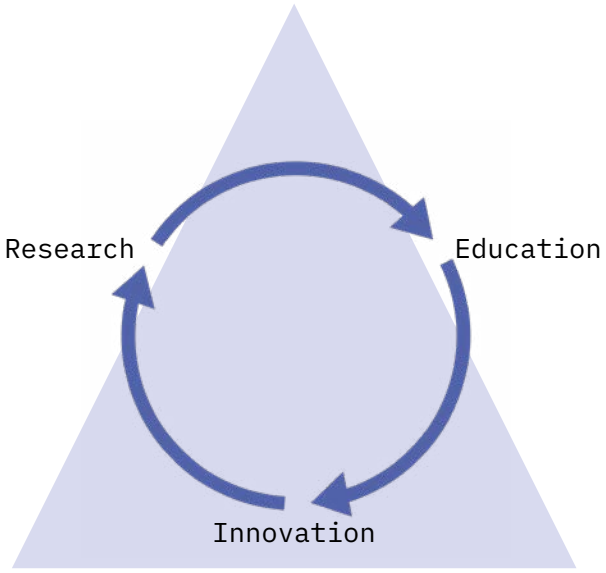
1. Increase cooperation and mobility between the higher education sector, industry and public sector by:

- developing a more challenge-based approach to higher education
- developing a richer portfolio of mobility schemes and deploying it more strategically
- broadening training at doctorate level to better prepare students for a career outside academia
- reforming recruitment to higher education and promotion mechanisms towards skills that goes beyond research and teaching

2. Enhance higher education institutions' contribution to innovation by:

- boosting academic entrepreneurship, commercialization and entrepreneurship education
- increasing collaboration and knowledge co-creation with industry and the public sector

Norway must accelerate the twin green and digital transition, transforming the industry and public sector to secure future welfare in a post-petroleum society. A downward trend in cash flows between academia and industry, indicates reduced cooperation, underlining the need for a focused effort to improve HEIs contribution to public and private sector innovation. Furthermore, as essential educational agents the Higher Education (HE) sector holds a crucial role in shaping and educating the existing and future workforce and citizens. In order to fill their important missions and take the lead in Europe's post-pandemic and post-war recovery, the HEIs need to rethink their role and engage in increasing dialogue with the society.



To aid this transition, there is a need for enhanced interplay between the three spheres of the knowledge triangle: research, innovation and education[1]. Achieving improved synergy between the three spheres will necessitate a better alignment between HEIs research and education agendas and those of societal stakeholders[2], fostering a place-based approach to higher education, research and innovation policy[3]. Institutional diversity and division of labor are important objectives in Norwegian R&D policy. A recent analysis of the HE institutional landscape finds that while some universities focus on research and international cooperation, other HEIs have a greater focus on education and interaction with regional business and working life[4]. This diversity is a strength, as it allows for choice and for creativity and synergy through division of labor and cooperation.

Increase cooperation and mobility between the higher education sector, the public sector and industry

HEIs are currently undergoing a transition, captured by the European University Associations (EUA) vision[5], which describes HEIs as engines of societal change. The development is enhanced by the European Commission's European Strategy for Universities[6].

HEIs are increasingly "opening up" to society and seeking to take on a clearer role as community developers, value creators and innovators. Reform of assessment of research output and researchers are at the core of this development, as it enables differentiated system of incentives and reward of the different paths of careers of researchers regardless the sector of employment or activity.

In line with their increased ambitions as engines of societal change, HEIs need to step up their dialogue with society, developing its role as critical custodians of knowledge, traditions, democratic values, diversity and culture. Regional competence fora (kompetanseforum), where the HEIs meets industry and public entities to discuss regional competence needs, is one example of such dialogue activity. But the HEIs should also engage in dialogues with civil society, establishing the institution as an important arena for public and democratic dialogue.

Mobility and cooperation between higher education and public/private sector has the potential to create a dynamic interplay between basic research, applied science and innovation. Through cooperation initiatives such as joint research projects, external staff can bring new skills and social capital to higher education, including to the classroom, improving student learning. Mobility is also a key element for opening up alternative career paths[7]. In future policy development, HEIs should be encouraged to take a more active and strategic approach to mobility and cooperation across sectoral boundaries, exploiting the potential of HE institutional performance agreements[8].

Develop a more challenge-based approach to higher education

Norway forms part of a Europe-wide transformation of the labour market, with increasing automation of low-and medium-skilled jobs and high-skilled jobs in increasing supply. Learners have become more diverse in terms of background and age, as a much larger proportion of the population enrolls in higher education. As skill needs are rapidly evolving, the HE sector must adapt, meeting the expectations of new generations of students, both full-time students aiming for Bachelor's and Master's degrees and students that combine jobs and studies in order to ensure continuous learning and upskilling. The latter segment is set to grow exponentially as a rapidly changing labour market will increasingly require employees to refresh and complement their initial training.

As new learning needs become increasingly complex, HEIs must adapt its discipline–based system of education to align better with the needs and the dynamic state of knowledge outside the academic world, enabling more problem- or theme-based learning and ease accreditation of interdisciplinary programmes. Industry and public sector entities must, on the other hand, develop plans for long-term competence building, including an assessment of how collaboration with HEIs and research institutes could be of benefit.

Develop a richer portfolio of mobility schemes and deploy it more strategically

Educating more people with doctoral qualifications, e.g. to secure a societal development grounded in research-intensive enterprises, is a key element in the strategy aimed at increasing the level of knowledge in the Norwegian work force.[9] Ensuring a higher number of PhD candidates in the private and public sector will contribute to improving these sectors' ability to adapt and innovate and encourage more interaction and cooperation between the HE sector and working life. In particular, improved recruitment to PhD education within science, technology, engineering and mathematics (STEM) is needed, as recruitment to Norwegian STEM PhD degrees is low compared to the OECD average[10].

However, the high increase in the number of doctoral candidates over the past decade, has not translated into an increase in the proportion of R&I staff with doctoral qualifications in the private sector. It is difficult to determine a specific cause for this, but probable explanations include barriers for cooperation and mobility between sectors. For example, opportunities for cooperation between HEIs and the private sector through contract research has decreased, as industry financing of such research in the HE sector has shown a downward trend over the last five years[11], indicating declining interaction between academia and private sector.

To encourage mobility between sectors, HEIs employ several mobility schemes, such as mobility grants for students and staff, industrial sabbaticals, adjunct positions (Professor II),

mentor/expert schemes, tailor-made courses, competence broker and internships. However, there is considerable variation in the degree to which HEIs employ these instruments in a systematic manner. For the future, there is a need for a more streamlined approach and targeted strategies for efficient deployment of such instruments. Industry and public sector entities can follow up with employing and funding industrial internship or sabbaticals for students, PhDs and researchers.

Furthermore, a broader portfolio of mobility funding instrument at the national level should be developed. HEIs should prepare doctorate holders and students for diverse careers by providing increased opportunities for institutional placements and practice, e.g., industrial masters, and hospitality schemes, during initial and doctoral education. The industrial and public-sector PhD schemes, which as of today are the only available funding instruments from RCN directly addressing mobility, should be complemented with a sector mobility scheme, aimed at individuals having completed their PhDs, e.g. an Industrial Post doctor scheme akin to the Finish PoDoCo scheme[12]. Furthermore, RCN should ensure that when funding is awarded through schemes that support mobility more indirectly, such as center schemes and cooperation projects, the industry/public sector-experience of researchers should be considered as meritorious when relevant.

Broaden training at doctorate level

About half of Norwegian doctorate holders stay in academia (HE sector, PRIs and university hospitals), while about 30 percent go to Norwegian business or private sector[13]. As current doctoral training programs are primarily geared towards developing academic competences, there is a need to better prepare doctorate holders for diverse careers by adjusting the objectives and content of doctoral training, as well as investing in the professional development of doctoral and postdoctoral researchers, including through career advice and mentoring.

Furthermore, there is a need to increase efforts to reduce or remove institutional barriers to the mobility of researchers across sectors. Doctorate holders often face obstacles when attempting to return to academic research after working outside the HE sector[14]. More flexible and new career paths need to be implemented to enable academics to move smoothly between different positions in the HE sector, the public sector and the private sector at different stages of their lives.

Reform higher education and human resource management

The core tasks of institutions in terms of human resource management are to attract and recruit staff, structure career progression and encourage good performance from the HE workforce. To facilitate increased cross-sector mobility, HE institutions should adopt the NOR-CAM toolbox for recognition and rewards in academic careers[15] and commit to the European Commission's statement on Reforming Research Assessment[16]. That means reforming human resource management, adapting systems for promotion, remuneration, professional development and mobility to incentivize and reward skills that goes beyond research and teaching.

It is also vital to secure system-wide regulations that guarantee portability of acquired benefits, such as social security rights, across countries and the right to return to the original position for those who take part in outside placements[17]. Lastly, as research to a greater extent is organized and carried out within larger research teams, there is a need for further developing leadership qualities amongst senior researchers in the HE sector.

IAB recommends that the government and governmental entities should:

- Encourage and develop policy for increased cross-sectoral co-operation, exploiting the potential of HE institutional performance agreements.
- Secure system-wide regulations that guarantee portability of acquired benefits, such as social security rights, across countries.

IAB recommends that the Research Council of Norway should:

- Refine, strengthen and develop efficient funding instruments supporting mobility across sectors, such as industrial and public-sector PhD and center-schemes.
- Consider complementing the industrial PhD scheme with a sector mobility scheme, aimed at individuals having completed their PhDs, i.e. an Industrial/Public Sector Post doctor scheme.
- Develop a funding mechanism for dialogue platforms connecting HEIs with civil society.

IAB recommends that the higher Education Institutions should:

- Adapt its discipline–based system of education to enable more problem- or theme-based learning and ease accreditation of interdisciplinary programmes.
- Improve knowledge transfer and mobility between sectors through dedicated strategies, making active use of established tools for interaction: mobility grants for students and staff, industrial sabbaticals, adjunct positions (Professor II), mentor/expert schemes, tailor-made courses, competence broker and internships.
- Prepare doctorate holders and students for diverse careers by broadening training and providing increased opportunities for institutional placements and practice, e.g. industrial masters and hospitality schemes, during initial and doctoral education.
- Commit to the European Commission's statement on Reforming Research Assessment, and in accordance with the principles laid out there, nurture a set of skills that goes beyond research and teaching through reformed recruitment and promotion mechanisms.

IAB recommends that the private/public sector should:

- Develop plans for long-term competence building, including an assessment of how collaboration with HEIs and research institutes could be of benefit.
- Employ and fund industrial internship or sabbaticals for students, PHDs and researchers.

Enhance higher education institutions' contribution to innovation

The role of HEIs in promoting economic and social development and acting as drivers of human capital and skills development in regional innovation systems is widely recognized. A study conducted on university-industry collaborations in Norway found that the majority of interactions occur with local and regional HEIs, highlighting the role of geographical and social proximity and the importance of having university activities co-located in the vicinity of industrial areas[18]. Another study finds that approximately 70 percent of Norwegian students enter the workforce in the same region where they have studied[19], confirming how important HEIs, and the education they offer, have been for regional knowledge production and development.

HEIs contribute to innovation by state of-the-art education through Bachelor's and Master's degrees, supplying competent individuals to the private and public sector, which in turn enhance these sectors' innovative potential. Challenges that hinders innovation activities at HEIs are the existing reward and incentive system, which primarily rewards research and education activities. As most of the HEI funding follows research and teaching activities, lack of funding streams following the HEI's so-called third mission[20] is another challenge. There is a need to step up HEIs focused contribution to innovation, both directly through academic entrepreneurship, commercialization and entrepreneurship education, and indirectly through industry collaborations, public sector innovation and knowledge co-creation.

Boosting academic entrepreneurship, commercialization, and entrepreneurship education

The process of research commercialization is long and often discontinuous and high risk. A main challenge in the current thinking regarding how HEIs contribute to innovation is that it is measured by number of patent applications, business ideas and licensing contracts[21]. To capture the full complexity of interaction between academia and industry/public sector, HEIs contributions to existing business and society in general, such as research collaborations, development of student entrepreneurial and innovation skills, informal consultations and participation in expert groups, should be included when measuring HEIs contribution to innovation.

Some Norwegian HEIs offer mandatory courses, joint labs and platforms for co-creation with industry or inter-sectorial exchange programmes. Others have hubs offering entrepreneurship education to students, or extra- and co-curricular activities in entrepreneurship offered through mentoring services or incubators[22]. Many HEIs are experimenting with new funding initiatives aimed at cultivating student-led entrepreneurship, such as NTNU Discovery and SPARK Norway (University of Oslo). These initiatives aim to help students and employees transform their initial innovative ideas to more mature innovation project propositions. All these initiatives are important in the development of HEI's entrepreneurial ecosystem[23]. However, given the pressing need to transform the Norwegian economy and move towards a more competitive and efficient R&I-system, there is a need to gear up HEIs efforts, by applying a more streamlined approach

to innovation activities and by integrating entrepreneurship into all PhD- and study programs whenever fit for purpose.

Increased collaboration and knowledge co-creation with industry and the public sector

Common challenges for university-industry collaborations are lack of awareness and connections to appropriate partners for both HEIs and industry, different organizational cultures, differences in motivations, time horizons and communication modes[24]. As the importance of university-industry collaborations differ across science fields and industry sectors, policy should be tailored to correspond to their specific needs.

Approximately 20 percent of Norwegian companies cooperate with HEIs, and most interaction occurs in the form of competence enhancement interactions, whereas knowledge exploitation is less prevalent. Firm's absorptive capacity, to understand and utilize knowledge, can be increased through more effective mobility schemes. Cultural and organizational proximity between firms and HEIs can e.g. be facilitated through programmes and schemes that finance small-scale projects. Such interactions help build trust and mutual understanding between firms and academics, which is necessary for more demanding research and innovation projects[25].

HEIs contributions to innovation in the public sector are often characterized by researchers providing public institutions with research-based knowledge. Innovations can involve changes in the design of services and production processes, administrative and organizational innovations, conceptual innovations and system interaction innovations[26]. The main challenges hampering HEI-public sector interactions are lack of funding for transdisciplinary and cross-sectorial R&I programs addressing the public sector, and lack of understanding of the various channels through

Channels between the three spheres of the knowledge triangle:

Research and Education:
geographic and sectoral mobility of graduates, postgraduate training programmes, research-led teaching and measures to improve skill-matching between companies and graduates, as well as generic skills such as complex problem solving and analytical thinking.

Research and Innovation:
support and intensification of the transfer of knowledge, via 1) public-private partnership models (e.g. clusters, science parks), 2) commercialization of publicly funded research, 3) contract research and development services from universities for the industry sector, 4) university spin-offs and academic start-ups, 5) knowledge and technology transfer offices (TTO), 6) incubators, 7) open science/open innovation platforms, and 8) institutional measure such as centers of research-based innovation.

Education and Innovation:
support for the development of an entrepreneurial culture in the framework of (academic) training programmes and appropriate competences (business plan development, management etc.).

which HEIs impact public sector innovation. There is also potential for further developing how social sciences and humanities can contribute to social innovation and the emerging cultural industry. Increased funding is needed for HEI-public sector interaction mechanisms such as clusters, knowledge parks, capacity building projects, public procurement cooperation initiatives and instruments such as 'Kapasitetsløftet"[27].

Differently from knowledge exchanges, co-creation projects facilitate the transfer of tacit knowledge across participants. By building on a jointly identified challenge, co-creation projects address upfront how research can meet the demands of industry/public sector. The joint creation process in itself provides a flow of knowledge between collaboration partner, increasing industry's and the public sector's absorptive capacities[28]. HEIs would e.g. benefit from entering into more knowledge co-creation activities, such as increased use of long-lasting and comprehensive cooperation agreements with municipalities (e.g. University municipalities) as well as strengthened efforts to develop their research agendas and their educational programmes in cooperation with industry and the public sector within their region.

The sector principle of R&I and the silos between the authorities in charge of research policy and innovation policy, including between RCN and Innovation Norway, represent a challenge to the adoption of policies that transcends sectors. This in turn hinders joint consideration of the variety of collaboration, knowledge transfer and co-creation possibilities between HEIs and industry/public sector, and thus the scope for achieving a coherent and mutually reinforcing set of measures promoting innovation. Policy measures should be implemented to bridge the two policy areas, e.g. experimenting with Missions.

IAB recommends that the government and governmental entities should:

- Reward innovation activities at institutional and individual levels, exploiting the potential of HE institutional performance agreements.
- Broaden how HEI's contributions to existing innovation is measured, by including for example research collaborations, student projects and informal consultations in the innovation indicators.
- Create policies that transcends sectors, and which consider the full variety of collaboration, knowledge transfer and co-creation possibilities between HEIs and industry/public sector, creating a strategic whole.

IAB recommends that the Research Council of Norway should:

- Boost collaborations and knowledge transfer between HE and industry/public sector, through a strengthening of measures such as clusters, knowledge parks, capacity building projects, public procurement cooperation initiatives and further development of mechanisms such as 'Kapasitetsløftet".
- Strengthen student involvement and participation in existing and new funding instruments for research, innovation and education.

IAB recommends that the higher Education Institutions should:

- Further strengthen incentives, rewards and support mechanisms for academic staff innovation activities.
- Apply a more streamlined approach to innovation activities, anchor the commitment to entrepreneurship clearly in the institution's strategy and integrate entrepreneurship and commercialization into all PHD- and study programs whenever fit for purpose.
- Develop long-lasting and comprehensive cooperation agreements with municipalities (e.g., University municipalities) and strengthen efforts to develop their research agendas and their educational programmes in cooperation with industry and the public sector within their region.

Endnotes

[1] OECD considers the knowledge triangle (the three spheres of research, innovation and education) as a policy framework to enhance the contributions of HEIs and to innovation eco-systems at national, local and global levels.

[2] OECD (2017) Knowledge Triangle Synthesis Report: Enhancing the contribution of higher education and research to innovation, OECD 2017.

[3] EU is outlining policy to increase synergies between the European research Area (ERA) and the European Education Ares (EEA), facilitating a closer integration between Erasmus + and Horizon Europe. Cooperation and synergies are also discussed in recent OECD reports and in recent position papers and reports from The League of European Research Universities and European University Association.

[4] Norwegian Directorate for Higher Education and Skills (2022) Tilstandsrapporten for høyere utdanning 2022, Rapport nr. 9/2022.

[5] European University Associations (2021) Universities without walls a vision for 2030.

[6] European Commission (2022) Communication from the Commission on a European Strategy for Universities.

[7] Piro, F,N., Tømte, C., Rørstad, K. and Thune, T. (2013), Langsiktig kunnskapsutvikling på næringslivets premisser? Evaluering av Nærings-ph.d.-ordningen, Nifu Rapport 2/2013, Høiseth-Gilje, K., Lie, C.M., Hernes, S., Riiser, J.S og Skogli, E. (2019), Hvordan lykkes med gjennomføringen av innovasjonsprosjekter i kommunesektoren: Casestudie av prosjekter fra tre av Norges Forskningsråds programmer, MENON-PUBLIKASJON NR. 18/2019 and Mausethagen, S., Prøitz, T.S., Fekjær, S.B., Stenersen, S.R. and Finnanger, T.S. (2021), «En fot i begge leire hadde vært ypperlig». En studie av offentlig ph.d. i utdanningsfeltet, Rapport fra OsloMet og USN 2021.

[8] The Ministry of Education and Research introduced institutional performance agreements in 2017, with the overall goal to increase quality in education and research.

[9] Kunnskapsdepartementet (2019), Meld. St. 14 (2019 – 2020) Kompetansereformen – Lære hele livet.

[10] OECD (2017), OECD Reviews of Innovation Policy: Norway 2017, OECD Publishing, Paris.

[11] NIFU Østby, M. N., Denisova, E., Gunnes H., Olsen B. M., Siversten, G. and Wendt, K. (2019, FoU-ressurser i universitets- og høgskolesektoren 1997 – 2017 Rapport 2019:29.

[12] The Post Docs in Companies funding scheme (PoDoCo) in Finland is an example of such a mechanism.

[13] NIFU (2021) Wiig, O., Gunnes H., Villund, O., Hyllseth, B., Hølleland, H., Mundal, B. and Olsen, B. M. Forskerrekrutteringsmonitoren. Dokumentasjon av system for monitorering av rekruttering til norsk forskning. Pilot 2. Arbeidsnotat 2021:6.

[14] OECD (2021), OECD Science, Technology and Innovation Outlook 2021: Times of Crisis and Opportunity, OECD Publishing, Paris, https://doi.org/10.1787/75f79015-en.

[15] The NOR-CAM Toolbox for recognition and rewards in academic careers is developed by Universities Norway in cooperation with Research Council of Norway, and based upon principles laid out in the report commissioned by the European Commission, Directorate-General for Research and Innovation; Evaluation of Research Careers fully acknowledging Open Science practices; Rewards, incentives and/or recognition for researchers practicing Open Science.

[16] Process towards an agreement on reforming research assessment | European Commission (europa.eu).

[17] OECD (2021), OECD Science, Technology and Innovation Outlook 2021: Times of Crisis and Opportunity, OECD Publishing, Paris, https://doi.org/10.1787/75f79015-en.

[18] Alpaydin, U.A.R and Fitjar, R. D. (2020), Proximity across the distant world of university-industry collaborations, Papers in Regional Science published by John Wiley & Sons Ltd on behalf of Regional Science Association International, 2020.

[19] Rørberg, K.I.K. (2014), Høgskolenes betydning for regional rekruttering til næringsrettede profesjonsyrker, HiOA Rapport 2014, nr. 7.

[20] The term third mission refers to higher education institutions' expanded efforts to engage with industry and society in recent decades. The activities which form the third mission (often comprised of technology transfer and innovation, continuing education and social engagement) are often defined as supplementary to teaching and research, and therefore become known as such in higher education. OECD (2019) Benchmarking Higher Education System Performance.

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[26] Kaloudis, A., Aspelund, A., Koch, P.M., Lauvås, T.A., Mathisen, M.T., Strand, Ø., Sørheim, R. and Aadland, T, (2019), How Universities Contribute to Innovation: A Literature Review-based Analysis, Report 2019, Norwegian University of Science and Technology.

[27] A funding mechanism aiming to increase value creation and restructuring in the business community throughout the country, by making more academic environments at universities, colleges and research institutes more relevant partners for the regional business community.

[28] OECD (2020) Knowledge co-creation for the 21st century, Policy framework report: 56th Meeting of the TIP Working Party, 10-11 December 2020, item 5.

RCNs International Advisory Board

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