Awti Advisory council for science, technology and innovation

SHAKING-UP THE SYSTEM

TOWARDS A FUTURE-PROOF HIGHER EDUCATION AND RESEARCH SYSTEM

The Advisory council for science, technology and innovation (AWTI) advises the Dutch government and parliament on policy in the areas of scientific research, technological development and innovation. The AWTI provides advice when it is applied for or when the council deems it necessary. It enjoys an independent position towards the Ministers and their Departments, as well as towards other parties involved. The advisory council consists of a maximum of 10 members, each originating from different sectors of society, such as research institutes and trade and industry. The members do not represent any special interests.

The office is located in the Netherlands:
Prins Willem-Alexanderhof 20
2595 BE The Hague
t. +31 (0)70 3110920
e. secretariaat@awti.nl
w. www.awti.nl

Shaking up the system

Towards a future-proof higher education and research system

June 2019

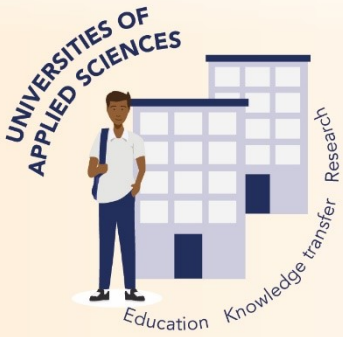
Photography	Bas Kijzers Fotografie
Design	2D3D Design
Printing	Quantes
	June 2019
ISBN	978-90-77005-84-2

All publications may be downloaded free of charge from www.awti.nl.

Copyright

Contents

Shaking up the system.
Towards a future-proof higher education and research system



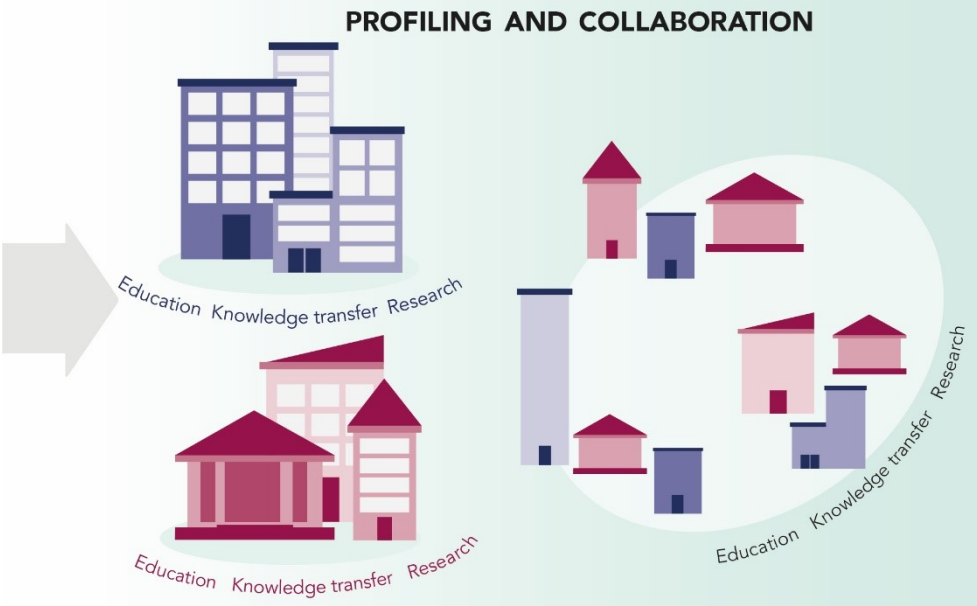
RECOMMENDATIONS

- **Clarify** the public mission of the system in a single **strategic framework** with clear system goals and priorities
- Exercise **active oversight** by monitoring the system goals and steering towards clear profiles for higher education institutions and results
- Ensure that higher education institutions adopt stronger **profiles** which are laid down in **binding institutional plans**
- Offer higher education institutions **more tools** to achieve their chosen profiles by increasing the scope for **selection of students** and introducing **profile funding**
- Promote structural **collaboration** between higher education institutions

SYSTEM NOT FUTURE-PROOF

- Mismatch between education and labour market
- Inadequately prepared for future learning needs
- Global competition in education and research
- Grand societal challenges demand knowledge and innovation

The Dutch higher education and research system performs well compared to other countries, but is insufficiently prepared for the future. Dutch universities and universities of applied sciences need to be guided more by the needs of society.



FUTURE-PROOF SYSTEM

- Students well prepared for the labour market
- Education well adapted to needs of society and to capacities and learning needs of students
- Education and research better positioned on the international playing field
- Greater impact on societal challenges

Summary

Global competition in higher education and research is growing. New developments impose ever-changing demands on workers and offer opportunities for a major shake-up of education and research. Student numbers have increased sharply and the system is becoming overloaded. Is the Dutch higher education and research system adequately prepared for the future? What do all these developments require of Dutch universities (*universiteiten*) and universities of applied sciences (*hogescholen*)?

The Dutch higher education and research system is not future-proof

Dutch higher education and research are not future-proof. Although the system is still performing well compared to other countries, there are a number of key problem areas. The higher education system needs to do more to ensure that students are in the right place within the system. There is a mismatch between education programmes and the labour market, and by no means all students end up on the right programme for them. Moreover, Dutch higher education is inadequately prepared for future learning needs. Dutch research is in many respects among the best in the world, but its position is under threat because of a lack of focus and pressure on research funding. This also limits the appeal of the Netherlands for top research talent and funding. Research could make a much greater contribution to resolving societal challenges than it does at present.

The less than optimum performance of the system is a result of the way it is organised and funded. This is compounded by the lack of a clear framework and overarching system control. Higher education institutes are not making focused choices which are aligned with the future needs of society. The reason is that they are currently rewarded for exploiting as many funding sources as possible and for growing their student numbers. The consequence is that higher education establishments are becoming increasingly similar.

The higher education system needs to be guided more by the demands of society, because only then will universities and universities of applied sciences be able to offer education which prepares students for the labour market of the future. Higher education will then be able to adapt to the qualities and learning needs of students and to the demands society places on graduates. Such a system would also strengthen the position of Dutch research in the international arena and increase its impact on societal issues. A number of changes are needed in order to achieve this. The Advisory Council for science, technology and innovation (AWTI) accordingly makes the following recommendations to the government.

Recommendations

1. Clarify the public mission of the system

The Minister of Education, Culture and Science must periodically clarify the public mission of the system and of higher education institutes by formulating a single strategic framework for higher education, research and valorisation. That framework would define the system goals and ambitions and set priorities.

2. Monitor the system goals and steer towards stronger profiles and results

The Minister should more emphatically embrace her responsibility for the higher education system as a whole. This entails maintaining active oversight of how the system as a whole is performing and how universities and universities of applied sciences are contributing to this. This oversight can take the form of a 'governance cycle' in which higher education institutes first opt for a clear profile and lay this down in binding institutional plans, in which they also set out the agreements they make with other institutes on structural collaboration and how they plan to distribute or concentrate tasks efficiently.

The Minister is responsible for:

- testing whether the joint plans are meeting the public mission of the system and the specific ambitions from the strategic framework;
- monitoring the performance of individual institutes and the system as a whole;
- engaging in a strategic dialogue with higher education institutes; and
- periodically evaluating higher education institutes.

This evaluation will affect the funding in the subsequent period. At the start of each new period, higher education institutes will draw up new institutional plans.

3. Consider entrusting system oversight to a dedicated body

One option worth considering would be to entrust this system oversight to a dedicated body, thus creating a buffer between politics and the autonomous institutes. This body could be constituted in such a way as to ensure its broader embedding in the social context.

4. Ensure that higher education institutes strengthen their profile

Universities and universities of applied sciences must choose a clear profile in terms of higher education, research and knowledge transfer. They must clarify what their contribution is to the system goals: what do they stand for, what are their strengths and development areas, which are their target groups and what are their practical ambitions? They must also liaise with each other to coordinate their profiles and plans at sector level

in order to achieve a joined-up strategic task distribution, specialisation and concentration of supply in research and education. Institutes should then lay down their profile, including the practical ambitions and coordination, in binding institutional plans, formulated in open and active dialogue with stakeholders. A clear profile makes a university or university of applied sciences more recognisable and injects greater variety in the system.

5. Give higher education institutes the tools they need to realise their profile:

a) Expand the scope for selection

Enabling higher education institutes to realise their profile requires that they be given more scope for selection of students at the point of intake. This will put them in a better position to steer the student intake in a way that enables them to achieve their envisaged profile and create a better match between students and study programmes and therefore increase their chances of successful study. The accessibility of the system is still of paramount importance: students must be able to find a place within the system that matches their talents and ambitions. However, this need not be a barrier to selection at the point of intake.

b) Introduce profile funding

The funding must enable the system to achieve the system ambitions and support the profiling of individual higher education institutes. The method of funding must match the profile chosen by the institutes. A proportion of the direct state funding of universities and universities of applied sciences (the 'first flow of funds') therefore needs to be linked to the achievement of the profile and ambitions set out in the institutional plan.

6. Promote collaboration between higher education institutes

Effective and efficient collaboration will enhance the ability of universities and universities of applied sciences to meet the expectations placed on them by society. Institutes need to pool their strengths in structural alliances, which are also open to international partners. These partnerships will span several years and will present a clearly recognisable face to the outside world in the fields of education, top-class research or mission-driven research and innovation.

Universities and universities of applied sciences could work together to organise a complementary range of Bachelor's and Master's teaching programmes in educational networks, with different orientations and targeting different groups. They would offer opportunities for reorientation and switching programmes, thereby improving the transfer opportunities. This would speed up the process of ensuring that students end up in the right place.

Strong research groups from universities and scientific institutes could join forces in top-class research alliances grouped around specific research fields, technology areas and themes in order to jointly secure a place among the world's best in terms of research. Such alliances would enable Dutch research to develop clear leadership in top-class research at global level. This in turn would attract top talent and private investments in research and development.

Universities and universities of applied sciences could work together with other public knowledge organisations, companies and civil-society organisations in mission-driven consortia to enable societal challenges to be addressed effectively. Complex societal issues require intensive collaboration throughout the chain from research through to practice in order to bring together the necessary knowledge and expertise.

ADVISORY REPORT

1

Background: is Dutch higher education and research ready for the future?

Global competition in higher education and research is increasing. New developments place constantly shifting demands on those in work and offer opportunities for major educational and research reform. At the same time, the system is becoming overloaded. What does this mean for Dutch universities (*universiteiten*) and universities of applied sciences (*hogescholen*)? Is the higher education and research system adequately prepared for the future?

1.1 Global developments demand attention

Dutch universities and universities of applied sciences operate in an international environment balanced between society, government and market. Many developments influence the position and functioning of the higher education and research system, and therefore also its performance.

Relentlessly growing global competition

Science today is an increasingly global community in which researchers network, collaborate, seek each other out and share knowledge both digitally and in other ways. Businesses seek out the best research across the world and forge strategic alliances with top-class research institutes.[1] The international mobility of students is rising, and the growth in the number of students is being driven particularly by emerging economies in Asia, South America and Africa.[2] The number of international students in the Netherlands has also increased sharply in recent years, and they now account for 11.5% of the total student population.[3] These international students represent around 170 nationalities, with more and more students coming from outside the European Economic Area and now making up 27% of the total international student population.[4] It is difficult to gauge how the intake of foreign students will develop in the future, but the expectation is that demographic trends will lead to a decline in the number of students originating from the

1. The Economist (2015a); The Economist (2018a).
2. The Economist (2015c); UNESCO (2017).
3. International students make up 6% of the student population at universities of applied sciences and 19% at universities.
4. Steehouder, L. & F. van Donselaar (2019).

Netherlands over the next decade. Universities of applied sciences will be affected by this earlier than universities.[5]

Higher education and research institutes are in global competition for students, top scientists and research funds. From a career perspective, students choose institutes which enjoy an excellent reputation or which offer attractive courses with good career prospects.[6] Several universities are opening branches in other countries.[7] Governments and universities are seeking to entice top scientists by investing in new research centres with attractive terms of employment.[8] Reputation is important, and increasing importance is attached to universities' international rankings. Top-ranked institutes are able to attract more students and top-flight researchers and therefore more funding for both teaching and research. Several countries are accordingly stepping up their efforts to boost the rankings of their higher education and research establishments.

Top universities in the United States and the United Kingdom have traditionally had a strong reputation and receive substantial private funding, partly from wealthy alumni. Switzerland also scores highly, partly thanks to its stable policy, selective, generous funding and clear institutional profiles.[9] These are the main countries to which the Netherlands is losing top scientists.[10] Germany has for a number of years been working to strengthen its universities, partly through the creation of 'Clusters of Excellence' *(Exzellenzcluster)* and targeted efforts to attract top scientists. Flanders is able to draw in top scientists through successful research institutes such as the Flemish Institute for Biotechnology (VIB). In France, several institutes have amalgamated to form a single body, *Paris Sciences et Lettres*, in a bid to rise to the top of the international rankings. Virtually all Dutch universities are in the top 200 in the various rankings, but they are not in the top 50.[11]

International competition is increasingly coming from China. The share of Chinese scientists contributing to the total volume of global scientific publications is rising sharply, as is China's scientific impact, especially in the natural sciences, engineering and mathematics. It will not be long before China overtakes the US in the field of science.[12] All

5. Ministerie van OCW (2018); Minister van OCW (2018).
6. The Economist (2016).
7. The Economist (2018b).
8. Noort, W. van (2018); KNAW (2018a),; Dijck, J. van & W. van Saarloos (2017); Verhagen, L. (2018).
9. Dudenbostel, T. & B. Tiefenthaler (2018); Krcal, A. & B. Bryan (2018).
10. AWTI (2017b).
11. See for example the ranking of Dutch universities in the Times Higher Education World University Rankings 2019. This ranking is based on performance in terms of teaching, research, citations, industry income (knowledge transfer) and international outlook. Seven Dutch universities are in the top 100; the remainder are in the top 200. Based purely on research performance, one Dutch university achieves a top-50 place and a further six are in the top 100. There is wide variation in the position of Dutch universities between the different rankings. See Koens, L. et al (2018a) and Vennekens et al (2018) for more information on the position of Dutch universities in the rankings.
12. Orszag, P.R. (2018).

this is happening in a world where existing economic relationships are being questioned and strategic and geopolitical interests are becoming increasingly important, specifically in relation to knowledge, data and innovation.

Changing demands on workers

Technology is having a major influence on employment, labour productivity and job content.[13] Automation, digitalisation and robotisation are leading to the disappearance of some jobs, causing other roles to change and also helping create new jobs. This applies for all fields of activity, from production to services and consultancy.[14] People will need to continually develop their skills in the future in order to keep pace, in a process of 'lifelong development'.[15]

New teaching approaches[16]

Teaching is increasingly moving into the digital world, with more and more institutions, both public and private, offering online study material. This process is happening more slowly than anticipated, but online teaching is still expected to play a major role in the future, perhaps in combination with in-depth sessions and discussion in traditional seminars. Data analytics can be used to measure, collect and analyse learning processes and attainments, to facilitate evidence-based optimisation of the learning process. Virtual and augmented reality can be used to create realistic digital learning environments, stimulating 'learning by doing' and thus contributing to the effectiveness of the learning process. Technological developments also support the move towards problem-based learning. Students work on projects in teams and attempt to resolve complex problems by combining a range of disciplines. Companies are often closely involved in curriculum development, as providers of the projects.

More scope for 'citizen science'

Technological developments are narrowing the gap between scientists and interested citizens. *Open science* – making scientific knowledge freely accessible, intelligent and potentially reusable[17] – opens the way for *citizen science*.[18] Innovation is also no longer the exclusive preserve of specialists; users of a product or service can now become actively involved in its development and improvement, or even act as initiators.

---

13. Jong, H. de & J.L. van Zanden (2015).
14. Nedelkoska, L. & G. Quintini (2018); Berger, T. & C. Frey (2016).; Est, R. van & L. Kool (2015); Went, R. et al (2015); Weel, B. ter (2015); Zweck, A. et al (2015).
15. Zweck, A. et al (2015); The Economist (2017a).
16. Snijders, D. (2018); The Economist (2015b); The Economist (2015d).
17. AWTI (2016a).
18. The Economist (2017b).

Failure to keep up with new developments

What higher education and research institutes are expected to deliver changes over time and is increasingly embedded in an international context. There are indications that institutes in the system are not managing to keep up with changes in public expectations. Lack of capacity means they struggle to train sufficient students in science and technology subjects, while other study programmes produce too many graduates. The Dutch higher education system is insufficiently geared to lifelong development and is still searching to find the right content, form and role for digitalisation in teaching. Dutch research is in many respects among the best in the world, but this position is under threat because its profile is too low and its funding under pressure. In addition, new knowledge could be deployed more effectively for the benefit of society. The issues involved in aligning with public expectations are discussed in more detail in chapter 2.

1.2 Request for advice: how can the system be adequately prepared for the future?

These developments beg the question of whether the Dutch higher education and research system as it is currently organised and funded is sufficiently future-proof.

Following consultation with the Dutch Ministry of Education, Culture and Science and the Ministry of Economic Affairs, the central question addressed in this advisory report was formulated in the AWTI research programme as follows: *How can the government design the higher education and research system in such a way that institutes (universities and universities of applied sciences) are given the scope and incentive to fulfil their roles adequately and thus to deliver on their importance for society?*

Put more concisely, the question is then as follows:

> ***Is the Dutch higher education and research system adequately prepared for the future? If not, what needs to change to make the system more future-proof?***

1.3 Approach of this report

In order to advise on how future-proof the Dutch higher education and research system is, we adopted an ‘external perspective. What are the public functions of the higher education and research system and its institutions? What does society expect of the system? Against the backdrop of these functions, we look in this report at the functioning of the system as it is **now**. This is supplemented with an analysis of developments that are important for the system going forward, so as to shed light on the key pinch points

and challenges to the future resilience of the system. Our approach is concentrated on funded higher education institutes; unfunded institutes are left out of consideration.

We also looked at experiences in other countries, in two background studies on the organisation and functioning of the higher education and research system: one focusing on the system in England as part of the United Kingdom, and one on the system in Switzerland.[19] We also considered experiences in Flanders, Germany and Ireland. The insights gleaned from these international analyses are incorporated in this report.

In preparing this report we also carried out a literature review and interviewed various stakeholders, including students, researchers, administrators, policymakers and representatives of civil society and the business community. A list of the interviewees can be found in Appendix 3.

Chapter 2 opens by focusing on the issue that is at the heart of this report: the need for the Dutch higher education and research system to focus more on the needs of society. The chapter fleshes out this message by highlighting the pinch points and challenges for the system. Chapters 3, 4 and 5 offer recommendations to the government for making the system more future-proof.

This report was prepared by a project group comprising Council members Sjoukje Heimovaara (chair), Dave Blank, Koenraad Debackere and Arno Peels, and staff members Hamilcar Knops and Annelieke van der Giessen (secretaries), Paula Gouw, Inge van den Bosch and student intern Isabelle Schroeten.

19. The two background studies (Dudenborstel, T & B. Tiefenthaler, 2018; Krcal, A. & B. Bryan, 2018) were carried out by Technopolis Group and are available from the AWTI website (www.awti.nl).

2

Universities and universities of applied sciences need to be guided more by the needs of society

While the Dutch higher education and research system performs well compared with other countries, it is insufficiently prepared for the future. Higher education needs to be guided much more than at present by society's need for graduates. The strong position of Dutch research is under pressure, and the research system could make a stronger contribution to resolving societal challenges.

If the higher education and research system is to be made future-proof, it is essential that institutes turn their focus more towards society. Universities and universities of applied science have a public mission which is formulated broadly in the legislation and affords them the scope to fill in the details themselves. In exercising this autonomy, however, they are failing to make focused choices which are aligned with the future needs of society. The reason is that they are currently rewarded principally for exploiting as many funding sources as possible and for growing their student numbers. Higher education institutes are thus being led by the study preferences of students rather than steering them towards what society needs. As a result, their teaching and research is becoming ever broader rather than more distinctive. This means the system is less able to meet the multiple demands placed on it by society or to respond flexibly to rapid changes in the world. Moreover, the wide autonomy enjoyed by institutes sometimes impedes the coordination needed to enable the system as a whole to perform better.

In a system that is more focused on the needs of society, higher education institutes offer education that prepares students for the labour market of the future. The higher education system is then able to adapt to the qualities and learning needs of students and to the demands placed on graduates by society. Such a system would also improve the position of Dutch research on the international playing field and create a greater impact on the issues facing society. It would in other words make for a more future-proof system.

2.1 Institutes are not sufficiently future-proof

Universities and universities of applied sciences are the product of and work for society. They use public resources and provide public services.[20] Their public mission is to train people to academic or higher professional level, conduct research and transfer knowledge for the benefit of society (see text box). In return, society invests a great deal of public money in the system. Higher education and research institutes derive their legitimacy from the relevance of their contribution to society. Students want to follow programmes which match their qualities and ambitions, while the labour market expects graduates to possess the knowledge and skills it requires. Society expects research to be conducted which pushes forwards the frontiers of science, giving institutes the opportunity to look ahead and create knowledge pathways which society has not yet thought about. Society also expects research to lead to practical applications and solutions to social and economic challenges. All these elements are important for the Netherlands as a knowledge economy.

To maintain their legitimacy, it is crucial that higher education and research institutes stay in touch with the expectations of society and any changes in them. Is there a demand for different programmes and have different skills become important? Is new knowledge being adequately transferred to society and business? Society will watch attentively and critically to see to what extent institutes continue providing the right answers in exercising their public mission. To put it bluntly: higher education and research institutes cannot afford to ignore what society actually expects of them and how those expectations change. Focusing more on what society wants could increase public support for the public funding of higher education and research.

Currently, because of the way higher education and research institutes are currently organised and funded, they are not focusing fully on what society expects from them. As a result, the higher education and research system is not performing as it might, and that performance will deteriorate in a number areas in the future.

20. AWT (2003). For a brief overview of how the different Dutch universities characterise themselves, including in terms of position and mission, see Chiong Meza (2012), p. 4.

Public mission

The public mission of universities and universities of applied sciences incorporates three functions: teaching, research and transfer of knowledge for the benefit of society. The higher education and research system must fulfil the following functions:

- **Teaching**: Striking a balance between the demand for graduates in certain disciplines and at certain levels and the actual supply of graduates. Graduates possess knowledge and skills that can be deployed on the labour market and for the benefit of society. Higher education institutes teach students to interpret, apply and communicate knowledge and skills in an independent, analytical and critical way. They also offer students an opportunity to develop and grow and to follow programmes which match their personal talents, ambitions and interests. This mission applies not only for initial education, but also thereafter.
- **Research:** Carrying out research that contributes to the development of knowledge, expertise and skills in study programmes in which the orientation of teaching and research are aligned. In addition, institutes carry out research that leads to new knowledge and new answers to research questions. This new knowledge creates new knowledge pathways and contributes to the development of new applications and solutions to societal and economic challenges and to the development of professional practice. The broad knowledge base is of an above-average standard and offers a forum for carrying out world-class research in the Netherlands.
- **Dissemination and exploitation of knowledge**: Ensuring dissemination and sharing of produced and acquired knowledge, not only so that society and the business community can make optimum use of that knowledge, but also to feed and enrich the public debate.

Funding system does not encourage focus on public expectations

Within their public mission as broadly formulated in legislation, institutes can select their own profile. However, the present funding system rewards institutes mainly for maintaining or growing their market share in terms of student numbers and engaging in a wide-ranging search for additional sources of research funding. The funding system currently does **not** reward institutes for their actual contribution to society or for making distinctive choices.

Focus on growth leads to broadening of supply and less flexibility

The higher education and research system is a mix of different types of organisations, with institutes offering academic or higher professional (vocational) education, general and specialist institutes (such as universities of technology or universities of applied sciences focusing on the arts), and institutes with strengths in specific disciplines or educational approaches. Having a range of different profiles would enable the system to meet its public mission adequately, continue innovating in a variety of directions and compete on the international stage.

In recent years, however, universities and universities of applied sciences have become increasingly similar as each has sought to broaden its range of teaching and research programmes. This has led to a reduction in the variety within the system (see text box).

Reduced variety in higher education and research

This was the conclusion of the report by the Committee on the Future Sustainability of the Dutch Higher Education System (Veerman Committee) as long ago as 2010.[21] The Committee accordingly called for more differentiation. Despite the measures taken – including creating independent associate degree programmes, funding Master's programmes at universities of applied sciences and targets regarding teaching quality, pass rates, establishment of priority areas and profile development – the Higher Education and Research Review Committee concluded in 2017 that the differentiation in the system had not increased.[22] On the whole, differentiation in the teaching programmes has not increased and individual institutes have if anything broadened the range of Bachelor's and Master's programmes offered. The number of students enrolling on Master's programmes in higher professional education (HBO) is limited, and the number of secondary school students from pre-university education enrolling on HBO programmes has fallen further. The Review Committee also concluded that universities are active in a growing number of research fields, are publishing in ever more subdisciplines, and that there had been no concentration of research activities in priority areas.

Even though the targets agreed between the government and higher education institutes included the development of distinctive profiles, this aspect had received less attention than envisaged, according to the Review Committee. This conclusion was shared by the Evaluation Committee on Performance-based Funding of Higher

21. Commissie Toekomstbestendig Hoger Onderwijs Stelsel (2010).
22. Reviewcommissie Hoger Onderwijs en Onderzoek (2017a); Reviewcommissie Hoger Onderwijs en Onderzoek (2017b).

Education (Van de Donk Committee).[23] The financial impact of meeting the targets was limited and there was therefore no financial incentive to do things differently. Similarly, there was no incentive to undertake fewer activities in order to create a sharper focus.

Lack of necessary coordination across the system

The Dutch system gives higher education and research institutes a great deal of autonomy, enabling them to formulate their own ambitions and make their own choices. They need this autonomy to enable them to operate in a dynamic environment based on their own context, approach and processes. The flipside of this is that institutes are focused primarily on their own activities and priorities and less on overarching, societal interests. As a result, the system as a whole is ineffective and inefficient.

A better balance is needed between autonomy on the one hand and government supervision and steer on the other. The Minister of Education, Culture and Science has overall system responsibility and safeguards the public interests in higher education and research. The present toolkit available to the Minister for supervision and steering, and the way it is used, is not adequate. Each of the available tools relates to one part of the system or one element in the functions of institutes. Individually, they allow no scope for overarching coordination and cohesion at system level. The Committee on the Efficiency of Higher Education (CDHO), for example, assesses the macro-efficiency of a proposed new programme, while the Dutch-Flemish Accreditation Organisation (NVAO) assesses the quality of programmes and the teaching quality standards agreed with institutes. This approach is too fragmented and stands in the way of coordination and coherence of the system as a whole.

Tendency towards complacency acts as a barrier to change

Because the Dutch system performs well compared with other systems and has delivered good results, there is a danger of complacency: “We are doing well, which means we are fulfilling our roles well”. There is also a frequently heard call for trust and a resistance to more demands for accountability.[24]

However, there is no place for complacency. While the system may be functioning, it is not performing optimally and it is not future-proof. This is reflected among other things in a mismatch between higher education graduates and the labour market. Moreover, if

23. Evaluatiecommissie prestatiebekostiging hoger onderwijs (2017).
24. See e.g. reaction of stakeholders to targets in Reviewcommissie Hoger Onderwijs en Onderzoek (2017b); VSNU (2015); Graaf, Th. de (2018); Vereniging Hogescholen (2017).

clear choices are not made, it is not possible to excel, nor to respond flexibly to societal challenges. This is discussed in more detail in the ensuing paragraphs.

2.2 Higher education must do more to make sure students end up in the right place

Dutch higher education trains a large group of mainly young people in a range of academic or vocational disciplines. The Netherlands performs well in an international perspective.[25] Nonetheless, there are a number of areas for improvement. There are three key issues: avoiding mismatches, improving transfers within progression through higher education and creating a clearer distinction between vocational and academic education.

Mismatch between education and labour market, student and study programme

The system is not delivering the mix of graduates that the labour market wants, either in terms of orientation (vocational or academic) or of level and discipline. There are therefore too many graduates who are unable to find work that corresponds with their education level (language, culture, behaviour and society studies), and a shortage of graduates in other sectors (science and technology, care).[26] Additionally, in some disciplines there is a surplus of academic and a shortage of vocational graduates.[27] This is selling both the students and society short.

Moreover, not all students are able to enrol on a programme that is right for them. Dutch students do not necessarily base their choice on labour market prospects; factors such as socioeconomic background or travel distance play an important role. The choice between academic or vocational education is also heavily influenced by the student's previous education, not what is a better match for the individual concerned. Although secondary school students leaving pre-university education can opt to follow either a university education (academic) or a (vocational) higher professional programme, almost all of them choose the former. This is by no means always the right choice; some would be better suited to a more vocational education.[28] The fact that information on university and higher professional programmes is frequently provided separately, making it more difficult for students to choose between the two education types, does not help.[29] It is also often

25. U-Multirank (2019); Oeso (2018).
26. The proportion of STEM students in the Netherlands is the lowest among all affluent countries ROA (2017*)*; UWV (2018).
27. https://www.onderwijsincijfers.nl/; ROA (2017); Vereniging Hogescholen (2018); Nationale Alumni Enquête (2018).
28. Inspectie van het Onderwijs (2018a); Warps, J. et al (2011); Vereniging Hogescholen (2019).
29. Allen, J. et al (2016); Laer, E. Toe (2017); Nimwegen, N. van (2016).

difficult to switch from one type of programme to another, for example after the first year of study.

The study efficiency is also low. Around one in three students at both universities and universities of applied sciences drop out in the first year. Some transfer to a different programme, but the dropout rate after the first year in HBO is high, with 15% of students giving up altogether. The figure for universities is just over 6%.[30] Only 71% of those who continue with their original choice of study at university attain their Bachelor's degree at the end of the formal course duration plus one year. The percentage at universities of applied sciences is even lower, at 61%. Success rates vary depending on the type of student; parental education level has an influence, female success rates are higher than among men and students with a migration background do less well in higher education than other students.[31]

Switching too difficult

Changing direction within higher education is not always a smooth process.[32] Even where Bachelor's and Master's programmes are seamlessly aligned, two out of five Master's programmes impose additional intake requirements, such as extra tests or writing a letter of motivation. In other cases, a selection system applies or students must first follow a pre-Master's programme. Switching from HBO to an academic university programme is also no longer automatic; almost one in five university Master's programmes are not open to students with an HBO Bachelor's degree, even though that is the intention. There are also many differences between individual universities.[33] Moreover, both university and HBO students face financial barriers following the introduction of the student loan system, unfunded pre-Master's programmes and higher tuition fees for additional Master's programmes. Although the aim of these barriers is to raise educational quality, they also constrain the ability of students to switch to different programmes or disciplines.

Vocational education less valued than academic education

Both academic and vocational disciplines in higher education are of great value, but in practice vocational education is less valued than academic education.[34] Secondary school students in pre-university education do not regard higher professional education (HBO) as an appealing option; around 85% of them opt directly for university.[35] The

30. A higher proportion of university students than HBO students transfer to a different degree programme.
31. Inspectie van het Onderwijs (2019b).
32. Inspectie van het Onderwijs (2018a); Inspectie van het Onderwijs (2018b); Inspectie van het Onderwijs (2019a); Herweijer, L. & M. Turkenburg (2016).
33. Inspectie van het Onderwijs (2019a).
34. Inspectie van het Onderwijs (2018b); Warps, J. et al (2011); Nationale Studentenenquête (2017); Allen, J. et al (2016).
35. Inspectie van het Onderwijs (2018b).

information provided to these students tends to encourage them to choose university rather than higher professional education, and there is a general expectation that they will go on to university. They also feel that a university degree is more valuable and carries more status than an HBO degree.[36]

Whether employers prefer someone with a higher professional or university background depends mainly on the nature of the job in question, though university graduates tend to be paid more than HBO graduates.[37] HBO graduates generally enter the labour market immediately after obtaining their Bachelor's degree, whereas almost all university students go on to study for a Master's degree after obtaining their first degree.[38]

Blurring distinction between academic and vocational programmes

The differences between vocational and academic programmes in higher education are becoming less pronounced, at both Bachelor's and Master's level. As long ago as 2010, the Veerman Committee recommended that universities needed to strengthen the academic focus of their programmes and universities of applied sciences needed to stress the vocational aspects, but in 2017 the Review Committee concluded that this had not occurred.[39] The agreements made by higher education institutes on differentiation in education were concerned mainly with how they could tailor their teaching programmes in terms of target group, form and level, for example through the development of broad Bachelor programmes, excellence pathways and professional Master's programmes. No agreements were made on differentiation in orientation (vocational versus academic), nor in terms of discipline or sector. Moreover, the complaint is regularly heard that universities are becoming more vocational (*professional drift*) or that universities of applied sciences are setting up academically oriented programmes (*academic drift*).[40]

The situation is exacerbated by the lack of clarity on what the labour market needs now and in the future in terms of knowledge and skills. Those needs can change rapidly: by the time the graduate, students may find they need different competences than at the start of their study. It is also hard for employers to assess what they will need in the future, and work in many sectors is not organised in such a way that the demand is clear.

36. Warps, J. et al (2011).
37. SEO Economisch Onderzoek (2018).
38. Nationale Studentenenquête (2017).
39. Commissie Toekomstbestendig Hoger Onderwijs Stelsel (2010) and Reviewcommissie Hoger Onderwijs en Onderzoek (2017a and b).
40. Wind, C. (2017); Bormans, R. (2018); Floor, T. (2016).

2.3 Higher education is not adequately prepared for future learning needs

Teaching in higher education is insufficiently flexible and therefore inadequately prepared for the future learning needs and abilities of students. There is a growing need for flexibility in education and training, partly to facilitate lifelong development.

Several bodies – the Veerman Committee, the Dutch Education Council, the Advisory Committee on Flexible Higher Education for Workers (Rinnooy Kan Committee) and the Social and Economic Council of the Netherlands (SER) have previously observed that the Dutch system is not geared to lifelong learning/development.[41] In the recent sector agreements, only universities of applied sciences formulated ambitions in this area; the topic is not even mentioned by universities. Numerous experiments are under way to make part-time education more flexible, but only at universities of applied sciences and only on a small scale, and the experiments are moreover in an early phase.[42] Degrees and certificates are issued by individual institutes, generally at the end of the degree course. It is not easy to construct a flexible programme by combining modules from different institutes (at home and abroad). Another issue is how different types of skills should be accredited. Last but not least, financial constraints mean there is currently limited demand for lifelong learning.[43]

Digitalisation offers ample opportunities for better and more flexible teaching, but the response of higher education institutes is limited and too slow. They are still searching for the right content, form and role for digital applications, and in many cases have no clear vision on the relationship between education and ICT. There are also wide differences between institutes in the goals they wish to achieve with digitalisation of education, and in the course and speed of digitalisation.[44]

2.4 Top-ranking position of Dutch research is under pressure

If the Netherlands is to hold its own in the global research arena, it is key that it takes a visible leading position at world level in a select number of thematic areas. Only then will the Netherlands be able to continue attracting talent and research funding. It is vital that the Netherlands remains attractive as a centre of research.

41. Commissie Toekomstbestendigheid Hoger Onderwijs Stelsel (2010); Onderwijsraad (2012); Adviescommissie Hoger Onderwijs Voor Werkenden (2014); SER (2015).
42. Casteren, W. et al (2018).
43. Onderwijsraad (2016); SER (2017).
44. Onderwijsraad (2017).

Top research underutilised

Dutch scientific endeavour is currently among the best in the world, and the Netherlands excels in a number of research fields.[45] Despite this, its top research apparatus is underutilised. While it is true that the Netherlands conducts a relatively large amount of research in certain fields where its research is classed as excellent, the amount of research carried out in other fields where the country excels is limited.[46]

Broadening of research, without distinctive profiles

Dutch universities have not concentrated their research profiles in recent years around their 'peaks'. The Van Vught Committee concluded in 2017 that in terms of content, their research profiles have tended to become broader rather than narrower. As in education, differentiation has reduced. Universities are active in more and more research fields and publish in ever more subdisciplines. This broadening has been under way for some time at all Dutch universities, but especially at non-generalist universities: universities of technology including Wageningen University & Research, and the less broad-based Maastricht University, Erasmus University Rotterdam and Tilburg University.

At universities of applied sciences, practical research has been strengthened through the development of lectorates, Centres of Expertise (CoEs) and the other knowledge centres. However, seen against the backdrop of the system as a whole, these developments are modest in scope.

The constant quest for research funds,[47] with a high proportion of competitive funding, leads institutes to chase every conceivable funding opportunity. This tends to lead to a broadening of the research portfolio rather than the creation of distinctive research profiles. Moreover, the majority of the research funding acquired through the second and third flow of funds (indirect government funding and contract research funding, respectively) is tied to specific projects with restricted budgets and limited time horizons. In some cases, projects also require the institutes to invest monies from the first flow of funds (direct government funding). All in all, this exacerbates the observed broadening, fragmentation and lack of distinctive research profiles.

---

45. Koens, L. et al (2018a); Elsevier Research Intelligence (2018).
46. See Besselaar, P. van den & E. Horlings (2010), Koens, L. et al (2018a) and Broek, N. van den & A. Vennekens,(2019). The Netherlands conducts a relatively large amount of research in information and communication sciences, clinical medicine, astronomy and political sciences, and the research in these fields has a very high impact. The citation impact and relative scope is also increasing markedly in the disciplines of health, behaviour & society and economics. In a large number of other fields, however, the amount of research is relatively low to average, though the impact is still high or very high. This applies in fields such as physics and materials science, energy, civil engineering, chemistry and production technology.
47. Koier, E. et al (2016).

The Netherlands increasingly a 'transit country' for talent

The Netherlands is increasingly seen as a transit country for research talent. Although it is still reasonably successful in attracting and retaining talented scientists at the start of their careers and in mid-career,[48] it is unable to compete for the world's best scientists with countries such as the United States or Switzerland.[49] The top universities in those countries not only offer higher salaries and often more research freedom, but can also boast a better reputation and research quality. Germany has also tempted a number of top scientists away from the Netherlands in recent years through its Humboldt professorships.[50]

Dutch research attracts too little private investment

The ability of the Netherlands to attract private investment in research and development is under pressure. The Dutch business community funds a relatively high proportion of public research compared with many other countries,[51] but Dutch companies invest more private money in such research in other countries than foreign companies invest in public research in the Netherlands. In other words, the Netherlands has a 'trade deficit' as regards private funding of research and development. The increase in public investments in research and development in some other countries acts as a pull factor for Dutch companies to spend their research funds abroad.[52] If the Dutch government were to emulate other countries by investing more in research, this tide could be turned.[53]

2.5 Impact of research on society needs to be strengthened

Better use needs to be made of knowledge, including outside the world of science. Utilising scientific knowledge and expertise well leads to new products and applications and to solutions for societal challenges, and contributes to public debates. The Netherlands could do more, especially in fields where it can make a difference, including internationally.

Funding impedes collaboration between knowledge partners

Achieving this requires good links between knowledge partners: universities, universities of applied sciences, other knowledge institutes, the business community, civil-society

48. Knaw (2018c).
49. Dijck, J. van & W. van Saarloos (2017); Commissie-Breimer (2016); Dijk, T. van (2018).
50. Own analysis by AWTI based on data from the Alexander von Humboldt Stiftung, see: https://www.humboldt-professur.de/de.
51. Rathenau Instituut (2018).
52. KNAW (2018c).
53. KNAW (2018c).

organisations and the government. Complex societal challenges require complementary knowledge and expertise which is often not available within one single organisation.

The Netherlands has a strong, internationally acknowledged tradition in establishing such links in public-public and public-private partnerships. Despite this, knowledge partners in the Netherlands are unable to bring together sufficient capacity within long-term and stably funded strategic alliances with sufficient size and critical mass. Large, complex challenges cannot be tackled on a sufficiently large scale or for a sufficiently long period.[54] The complexity of the funding is a major problem here. Knowledge partners set up all kinds of alliances, often on a project and programme basis and sometimes institutionalised in the form of a joint centre or laboratory. The public funding for these partnerships often comes not only from the knowledge partners themselves, but from a variety of sources, including national programmes (e.g. run by the Netherlands Organisation for Scientific Research (NWO), regional funds and European framework programmes. These public funds flows and supplementary private funding each come with their own time horizons, objectives and conditions. There is in other words virtually no structural, long-term approach and the funding is often ad hoc and temporary in nature.

Disciplinary boundaries too blurred

The never-ending quest for funding also contributes to the difficulty of establishing the necessary complementary partnerships as the different actors increasingly stray into each other's territory. Universities are for example carrying out more and more applied and practical research, including and increasingly for the private sector. Universities, universities of applied sciences and other knowledge institutes are becoming each other's competitors to an unhealthy extent. It is not possible to draw a sharp distinction between fundamental research, applied research and innovation. Research and innovation are the result of an interplay of different disciplines, of fundamental and applied research. At the same time universities, universities of applied sciences and other knowledge institutes each participate in that process from their own perspective and based on their own competences. Duplication of effort is not efficient and does not contribute to excellence. Collaboration does not thrive in a culture in which potential partners are seen too much as competitors. The establishment of clear research profiles for individual institutes is of crucial importance here.

54. AWTI (2017c).

Too little attention for valorisation

Dissemination and exploitation of knowledge is the third function of the system, in addition to education and research (see page 21). Higher education institutes turn out graduates with state-of-the-art knowledge for the benefit of society. This is insufficiently valued as one of the most important forms of knowledge dissemination and exploitation (valorisation). But valorisation is about more, and includes things such as cultivating an enterprising attitude among researchers and students, or involving external parties in research and in the application of knowledge. Although knowledge dissemination has received more attention in recent years, the evaluation in the Valorisation Programme (2010-2018) shows that structural attention for this aspect within higher education institutes is very partial and that the valorisation infrastructure is inadequate.[55]

Valorisation as a third function of higher education institutes is insufficiently reflected in the funding system and in the evaluation of the institutes' activities and achievements. Although valorisation was included as a component in the performance targets agreed between government and institutes, the results played no role in the financial appraisal of the achievement of these targets.[56] The contribution by institutes to the public debate also receives little attention. The collaboration between higher education institutes and regional valorisation centres and other players, such as institutes for applied research, is limited.[57]

Dissemination and exploitation of knowledge receives too little attention from researchers, especially those at universities and scientific institutes. Researchers believe it is important that their results are used for the benefit of society, but devote relatively little time themselves to knowledge transfer. They point out that this requires joint action within their institute.[58] Society and the business community could benefit more from the application of knowledge gleaned from research. The importance of the impact of research on society and the business community needs to be more securely embedded in research practice, partly through the training and assessment of researchers.[59]

55. Janssen, M. et al (2018).
56. Reviewcommissie Hoger Onderwijs en Onderzoek (2017).
57. Janssen, M., et al (2018).
58. Koens, L. et al (2018b).
59. AWTI (2016a).

3

Recommendation: formulate a clear mission and steer towards profiles and results

The higher education and research system must be guided more by the needs of society. To achieve this, the Minister of Education, Culture and Science must clarify the public mission of institutes and actively oversee the way in which the system as a whole and individual institutes are performing, helping institutes to alter course where necessary.

3.1 Clarify the public mission

Universities and universities of applied science are products of society. They use public funds to fulfil their public mission of providing higher education, teaching and transferring knowledge to stakeholders.[60] Society has expectations with regard to this mission and invests in the system.

Based on its system responsibility, the government must state more clearly what it expects from the system and individual institutes within it. The tools for this already exist, but the government needs to apply them in a more focused way to provide a stronger steer.

Parliament and government must stipulate in the legislation more specifically than at present what the functions and goals of the system are and what this means for individual institutes. Several other countries have laws on higher education and research which could serve as interesting examples here.[61]

The Minister could then develop this further to create a strategic framework for higher education and research. Currently the government has separate strategies for science (Vision for Science (Wetenschapsvisie) and Science Brief (Wetenschapsbrief)) and higher education (Strategic Agenda for Higher Education and Research (Strategisch

60. AWT has previously described universities as public enterprises: organisations which serve the public interest without being part of the government apparatus. They provide services with a public character, have administrative autonomy, perform their tasks without a profit motive, maintain relationships with many different stakeholders and are publicly accountable for their functioning. See AWT (2003). In 2017 the Evaluation Committee on Performance-based Funding of Higher Education (Van de Donk Committee) also highlighted the role of education institutes as public service providers.
61. E.g. the Swiss Bundesgesetz über die förderung der hochschulen und die koordination im schweizerischen hochschulbereich (Hfkg) or the British Higher Education and Research Act.

Agenda Hoger Onderwijs en Onderzoek)).[62] The Minister could establish such a strategic framework immediately based on the existing legislation,[63] but this would require her to periodically restate the ambitions at system level and convert them into specific objectives, taking into consideration the different goals and setting priorities. The Minister would then link this to the policy and resources needed to achieve those ambitions and priorities. This strategic framework would set a clear direction, but would also offer some flexibility for adjustment to take into account new insights or developments. The strategic framework must incorporate education, research and knowledge dissemination and be coordinated with other relevant areas, such as innovation policy.[64] There must be scope for dialogue with stakeholder groups, such as students, alumni, businesses and civil-society organisations.

Possible ambitions for the strategic agenda

The government uses the strategic agenda to translate the public mission for the system into specific ambitions, priorities and objectives to be achieved within a certain period. These ambitions must be clearly formulated and together must encompass the entire public mission of the system. The following are possible examples of such ambitions:

- Higher education
  - Graduates are properly prepared for the future labour market: their qualifications are a good match for the needs of future employers.
  - Students follow study programmes which match their qualities and capacities: the higher education system is accessible to all students who are able and willing to participate, and the teaching is able to accommodate different types of students.
  - Higher education helps prepare students to act responsibly in social contexts, to think and act independently, creatively and critically and to engage with society.
  - Students are able to make the most of their talents: higher education offers flexible transfer opportunities to all students.
  - Higher education creates an ambitious study culture leading to an increase in success rates.

62. Despite its title 'Strategic Agenda for Higher Education and Research', this agenda focuses mainly on higher education.
63. Art. 2.3 of the Dutch Higher Education and Research Act (Wet op het hoger onderwijs en wetenschappelijk onderzoek).
64. The calls for a strategic framework are not new. AWTI has previously advised the Minister to be clear about what she expects from the system and individual institutes as regards teaching, research and knowledge dissemination. In addition, AWTI has for some time been a strong advocate of a national research and innovation strategy for the longer term. See e.g. AWT (2005); AWT (2007a); AWT (2007b); AWT (2010); AWT (2011); AWT (2013); AWT (2014); AWTI (2017b).

- Workers are equipped for permanent and flexible employability on the future labour market: higher education offers flexible, demand-led teaching for workers.
- Higher education is efficient at macro-level: recognisable and compact teaching offer, relevant for the labour market and combating fragmentation.
- Doctoral candidates are adequately prepared for career pathways outside academia.

- Research
  - Research promotes the development of knowledge, expertise and skills in teaching programmes and is geared to the focus of those programmes.
  - Research pushes boundaries and explores as yet unknown knowledge pathways.
  - Research promotes the development of new applications and solutions to societal challenges and contributes to the development of professional practice.
  - The broad disciplinary knowledge base in the Netherlands is of high quality.
  - Dutch research is world-class in specific fields.
  - Research attracts talented researchers from the Netherlands and abroad.
  - Research institutes combine expertise and competences, including with other knowledge partners, to create high-impact knowledge hubs.
  - Research operates across disciplinary boundaries.
- Knowledge dissemination and exploitation
  - Research is keyed into society: it engages in dialogue with society, involves society in research and shares new knowledge with society in an open, transparent and accessible way.
  - Research feeds the public debate with new knowledge and insights.
  - Research actively involves the (SME) business community and civil-society organisations to enhance knowledge dissemination and exploitation.

These ambitions must be translated into specific objectives, for example the number of students who find work after graduating at a level and in a sector that is appropriate for their training, or a place in the world top five for research in a specific field. The strategic framework must also make clear which ambitions have priority. It could also indicate what efforts are expected from institutes in areas such as digitalisation, open access and internationalisation.

3.2 Monitor the system goals and steer towards profiles and results

Higher education and research institutes choose their own profile, in which they make strategic choices on the direction they wish to follow. Those choices must be clearly linked to the system ambitions and priorities in the strategic framework. They decide on the system goals to which they wish to contribute and formulate their own ambitions accordingly. This could generate a range of institute profiles. In turn, this variety will ensure that the system is better equipped to meet the changing needs of society.

Monitor the results of the system as a whole

in a situation where higher education and research institutes have the freedom to make their own distinctive choices about their contribution to national ambitions and priorities, it is of particular importance that the Minister, as the guardian of the public interest, oversees the system as a whole. How is the system performing? What does the performance of individual institutes add up to looking across the **whole** system? Is the quality of teaching and research reaching the envisaged level? Is the bar being consistently raised when setting quality standards for research? Is the system as a whole sufficiently accessible? Is it delivering a good mix of graduates for the labour market?

At present, this oversight and supervision at system level is being addressed too narrowly. The Minister needs to become more proactive here, in permanent dialogue with higher education and research institutes. In the rest of this section we suggest how this might be done effectively and efficiently, ensuring that the system remains consistently focused on its public mission. This gives rise to a varied, flexible and future-proof system for higher education, research and valorisation.

Engage in dialogue with institutes based on their institutional plans

Each institute must set out in its institutional plan which profile it wishes to adopt with regard to higher education, research and knowledge dissemination. What does the institute stand for? What are its strengths? Which groups does it target? What are its specific ambitions? How does all this fit in with the ambitions and priorities in the government's strategic framework? These institutional plans are discussed in more detail in chapter 4.

The institutional plans are binding and guide the dialogue and supervision at individual institute level. In them, institutes record their results against the agreed ambitions and those results are periodically evaluated using measurable indicators. The outcome of this

exercise could be partly linked to funding, as discussed in section 4.3. Several other countries already use this procedure (see text box).

Institutional plans and supervision in other higher education systems[65]

Higher education institutes and education ministries in several countries are reaching agreements on the goals to be pursued by institutes in relation to teaching, research and knowledge dissemination, and what actions they will take to achieve this. Those agreements also stipulate which aspects of performance will be monitored and assessed, and in what way, and what the consequences of this will be for funding.

A first reason for doing this is so that governments can use the plans to encourage institutes to adopt strategic positions and profiles. This gives rise to a more diversified system. In Australia and Ireland, for example, institutes enter into a 'mission-based performance compact' with the government in which each institution describes its mission and profile, sets out its priorities in education, research and knowledge dissemination, states which system goals it will seek to achieve, which strategies and actions it will employ to achieve them, and which indicators will be used to monitor and evaluate the results.[66] In adopting this approach, the Australian and Irish governments are seeking to encourage institutes to pursue distinctive missions whilst embodying the national objectives for higher education. In Hong Kong, higher education institutes describe their mission and distinctive role in 'role statements' which are approved by a University Grants Committee. These role statements, together with the guidelines and objectives issued by the University Grants Committee, form the starting point for the formulation of Academic Development Proposals, which form the basis for the allocation of funding.[67]

A second reason is the desire of governments to improve the performance and efficiency of higher education and research: higher productivity, higher quality and better educational outcomes. Finally, the agreed targets and plans are used to increase transparency and accountability regarding results and use of public resources.

In several countries, national strategic frameworks are the starting point for a dialogue with institutes and for the formulation of institutional plans and agreements on targets.

65. Partly based on a comparative study by Boer, H. de et al (2015).
66. Australian Government Department of Education and Training, Mission based compacts, via https://www.education.gov.au/mission-based-compacts; Higher Education Authority (2018).
67. University Grants Committee (2004).

Austria, for example, uses a national plan for higher education (*Nationaler Hochschulplan*). This plan is the result of collaboration between the Ministry and higher education institutes as well as other stakeholders through a dedicated platform, the *Österreichische Hochschulkonferenz*.[68] The German federal state of North Rhine-Westphalia has a *Landeshochschulentwicklungsplanung* which sets out the system goals and priorities for higher education in the federal state.[69] Higher education institutes must tailor their development plans to this plan at federal state level. The aim is to create a balanced and complementary education structure which is geared to the needs of students and the labour market, and to ensure that research capacity is used efficiently. Ireland has the *National Strategy for Higher Education 2030* and the *System Performance Framework* which ensued from it[70], which form the starting point for agreements with higher education institutes. Institutes are explicitly encouraged to seek regional collaboration to coordinate their teaching offer and activities and to lay this down in the compacts.[71]

Organise advance system supervision of the joint plans

The Minister is responsible for assessing *in advance* whether the combined proposed contributions by higher education institutes will produce the desired system performance. It is important that institutes also describe the strategic coordination of their institutional plans strategically with other institutes and with sector plans (see also section 4.1). Where necessary, institutes can be asked to improve the coordination of their activities in order to resolve unwanted overlaps, unutilised opportunities or gaps.

Monitor the performance of the system and stimulate new developments

The Minister must ensure that performance is monitored at system level. This monitoring could lead the Minister, given her responsibility for the whole system, to assume closer control or make adjustments.

The Minister can make these adjustments by encouraging new developments to make the system more dynamic, for example if the desired developments are not being generated sufficiently by the system itself. Those developments will generally be based on the ambitions and priorities in the strategic framework (see section 3.1). Additional resources, tools or experiments can be employed where necessary.

68. Bundesministerium für Bildung, Wissenschaft und Forschung (2019).
69. Ministerium für Innovation, Wissenschaft und Forschung des Landes Nordrhein-Westfalen (2016).
70. Higher Education Authority (2018).
71. Higher Education Authority, http://hea.ie/.

One key way of improving the overall system performance in a number of respects is to facilitate in-depth, complementary collaboration between institutes. This can deliver benefits for teaching, research and knowledge dissemination. As this potential is currently underutilised, in chapter 5 we formulate five proposals to promote this collaboration more actively.

Look for a suitable form of system supervision

The supervision of the functioning of the higher education and research system as a whole needs to be organised more robustly. The Minister could opt to have all aspects of the system supervision carried out by the Ministry.[72]

An alternative is to entrust the supervision to a dedicated body, for example a system authority. The brief and terms of reference of this body would need to be clearly defined and the desired direction would also need to be made clear in the legislation and the strategic framework. This would create a buffer between politics and the autonomous institutes in the system. Creating such a body could also provide for broader embedding in the societal context. The testing of macro-efficiency which is currently carried out by the Committee on the Efficiency of Higher Education (CDHO) would be a typical task for such a dedicated supervisory body. Course accreditations could remain separate, as examples from abroad have shown, as long as the accreditation frameworks are set uniformly.

Several examples of regulators or committees in other countries which coordinate or supervise the higher education and research system and its institutes could serve as a guide for the precise formation of such a dedicated body (see text boxes).

Governance of higher education and research in Ireland[73]

Higher education in Ireland is provided by seven universities, 14 Institutes of Technology and seven Colleges of Education. There are also institutes offering higher education in specific fields such as the arts, medicine, theology, music and law.

The Irish Minister for Education and Skills sets the policy, selects the goals and the envisaged results and determines the funding. Institutes have institutional autonomy from which they contribute to the national objectives. External oversight and accountability rests with the Comptroller and Auditor General. The Higher Education Authority (HEA) is the central body overseeing that the system and its institutes are

72. The outlined process of planning, coordination, monitoring of progress and results and making adjustments must be efficient. Cf. Werkgroep Profilering en Bekostiging (2011).
73. Higher Education Authority, http://hea.ie/.

together achieving the expectations for higher education and research effectively and efficiently. The HEA is responsible for a properly coordinated system of higher education and research. To this end, the HEA is required:

- to focus on the results and performance of each institute and the system as a whole;
- to enter into a performance contract ('compact') with each institute which clearly reflects that institute's mission;
- to monitor the performance of institutes against the agreed results;
- to allocate funding based on performance.

The HEA develops a funding model for the allocation of resources, oversees the proper spending of those resources and monitors the financial health of institutes and the system as a whole.

A *compact* is the product of a strategic dialogue between the HEA and institutes. It is assessed by an (international) expert panel for its coherence and feasibility. The performance targets agreed in the compacts are monitored through a system of annual reports and strategic dialogue. The HEA has also developed a System Performance Framework setting out the key system objectives and high-level targets for a period of three years.

The relationship between the HEA and the Ministry and the HEA's tasks and goals are governed by a Service Level Agreement. The HEA must send an Annual System Performance Report to the Minister each year, describing progress in achieving the national policy objectives and highlighting any issues in terms of governance or finance, or any broader issues, in the higher education and research system.

Governance of higher education and research in Switzerland[74]

Like the Netherlands, Switzerland has a system of 'equivalent but different' types of institute providing higher education and research, and the policy seeks to maintain this distinction. The different types of institute in Switzerland are as follows:

- Universities: ten cantonal universities and two federal institutes of technology (ETHs);
- 16 teacher training colleges (*Pädagogische Hochschulen*);
- Eight general colleges of higher education (*Fachhochschulen*).

74. Based on a background study to this: Dudenbostel, T en B. Tiefenthaler (2018).

The Swiss Confederation and the Cantons share responsibility for higher education in Switzerland. Responsibility at federal level rests with the *Staatssekretariat für Bildung, Forschung und Innovation* (SBFI), and at cantonal level with the *Schweizerische Konferenz der kantonalen Erziehungsdirektoren* (EDK). The EDK is responsible for coordination and collaboration between the Cantons on higher education, including in the areas of funding and accessibility. The Confederation and the Cantons have set out agreements on collaboration and system goals in the *Bundesgesetz über die Förderung der Hochschulen und die Koordination im schweizerischen Hochschulbereich* (HFKG) and have laid the basis for joint governance of the higher education system. Governance of the Swiss higher education system is thus in the hands of three organisations:

- The *Schweizerische Hochschulkonferenz* is the highest-level body and coordinates the activities of the Confederation and the Cantons. The *Konferenz* takes decisions on aspects such as funding, accessibility and transfers within the system, quality control and accreditation, recognition of competencies and qualifications, the typical profiles of the various institutes, ensuring a level playing field with other vocational education providers and the assignment of cost-intensive missions. The *Konferenz* also supervises the bodies it has instituted. It is chaired by the Confederation and consists of representatives from the different cantonal governments and advisory members delegated by the stakeholders.
- The *Rektorenkonferenz* (swissuniversities) is made up of the rectors and principals of the universities, general colleges of higher education and teacher training colleges. It is responsible for the coordination and collaboration between institutes to enable the system to operate efficiently and meet the national Swiss goals and, where necessary, makes proposals to the *Hochschulkonferenz*, which then takes decisions. The chair of the *Rektorenkonferenz* is an advisory member of the *Hochschulkonferenz*.
- The *Akkreditierungsrat* is appointed by the *Hochschulkonferenz* and consists of representatives from higher education and employers, including a mandatory number of members from other countries. The *Akkreditierungsrat* decides on the mandatory accreditation at institute level and the voluntary accreditation at the level of study programmes.

The institutes work up multi-year development and funding plans, including goals and priority areas. These take into account the guidelines of the *Hochschulkonferenz* and the recommendations of the *Rektorenkonferenz*. The *Rektorenkonferenz* makes a

proposal for the coordination and task allocation between institutes based on the institutional plans, the guidelines of the *Hochschulkonferenz* and the budgets of the Confederation and the Cantons. The *Hochschulkonferenz* determines the coordination and task allocation, sets priorities and takes measures to promote the system goals. The *Hochschulkonferenz* may decide to create study programmes that are important for Switzerland but which are not yet being offered (on a sufficient scale).

The governance structure is also reflected in the funding of higher education. The Confederation funds the ETHs; the Cantons and the Confederation jointly fund the cantonal universities and colleges of higher education and the Cantons fund the teacher training colleges. The institutional funding by the Confederation uses performance indicators tailored to individual institutes, making it possible to compare the performance of comparable institutes. The federal funding is topped up with cantonal funding. Institutes have autonomy in spending this combined budget. They receive funding not only from the Canton where they are established, but also from the Cantons where their students are drawn from.

Governance of higher education and research in England[75]

The English higher education system is made up of three types of institute: universities, Further Education Colleges (FECs) and alternative providers. There are 108 universities in England, some of which are among the oldest in the world, while more recently institutes (polytechnics and vocational education institutes) have been transformed into universities. Although all these institutes are classified as universities, there are substantial differences between the broad-based elite universities and the rest of the sector. There are 240 Further Education Colleges, but only nine of them may confer degrees; the rest issue certificates. There are also 114 alternative providers which receive no public funding. Seven of them are authorised to confer degrees; the others provide qualifications which are validated by universities.

The Higher Education and Research Act 2017 provides the framework for higher education in the United Kingdom. The aim is to promote competition and choice for students, to ensure that students receive value for money and to strengthen research. The Act appoints two regulators with responsibility for the higher education system: the Office for Students (OfS) for education and United Kingdom Research and Innovation (UKRI) for research.

75. Based on a background study: Krcal, A. & B. Bryan (2018).

The OfS is responsible for approving institutes, organising accreditation and allocating funding. It also has the power to deprive institutes of their authority to confer degrees and of their university status. The OfS protects the autonomy of institutes and is tasked with ensuring that students have sufficient study choice and opportunities and are able to follow good-quality education; it also has to ensure that institutes offer value for money, that the system is sufficiently accessible and that funds are spent efficiently.

UKRI facilitates and invests in research and innovation across the UK and, via Research England, finances research and knowledge-sharing at institutes in England. UKRI grew out of a collaboration between seven Research Councils, InnovateUK and the knowledge-sharing activities of the Higher Education Funding Council for England (HEFCE, whose educational role has been taken over by OfS). It accordingly combines the first flow of funds (Research England) and the second flow of funds (the former Research Councils). The task of UKRI is to stimulate world-class innovative research as efficiently as possible and to contribute to the economic and societal impact of research. To do this, UKRI has to develop a coherent national strategy for research and innovation, set priorities, commercialise public research, devote attention to talent and facilitate collaboration in research and innovation. To ensure that the research agenda and the teaching agenda coincide, OfS and UKRI must work together where necessary and seek to coordinate their priorities and activities.

Political responsibility remains with the education minister, who can give general instructions to OfS and UKRI.

4

Recommendation: give higher education institutes the tools they need to realise their profile

A varied array of higher education and research institutes would enable the system to meet its public mission more effectively. With this in mind, ensure that institutes develop more distinctive profiles. They must then coordinate the way in which they jointly deliver the system's public mission. Give institutes more tools to realise their profile by expanding the opportunities for student selection and linking part of the funding to the realisation of the profile.

4.1 Ensure that institutes create more distinctive profiles

Need for clear and distinct profiles needed

Institutes need to choose a clear profile with regard to higher education, research and knowledge dissemination. They must be specific about what their contribution is: what does the institute stand for, what are its strengths and where does it wish to become stronger, what are its target groups and what are its specific ambitions? Such a clear profile would raise the institute's recognisability and increase the variety in the system. Society needs a variety of recognisable higher education and research outlooks (ranging from abstract thought to practical action), at different levels, in different disciplines and for different sectors or target groups. More clearly defined profiles and more variety in the system will ensure a better match between the supply side of education and research and the expectations of society. In conjunction with good arrangements on collaboration, this would counter unnecessary competition between institutes, fragmentation of resources and duplication of activities.

Have the profiles laid down in institutional plans

Institutes must lay down their own profiles in **binding** institutional plans. The law already requires institutes to draw up an institutional plan every six years.[76] However, institutes need to adopt a more distinctive profile in their plans and show a clearer link to the system ambitions and priorities in the strategic framework. Institutes can take as a

76. Section. 2.2 of the Higher Education and Research Act.

starting point their proven strengths and development areas in education and research and key into the national ambitions and priorities as set out in the strategic vision. They choose the system goals to which they wish to contribute and make explicit what their ambitions are in this regard and how they intend to achieve them. Only then can a determination be made of how well institutes are succeeding in achieving the envisaged goals, and only then can the Minister hold institutes to their plans and ambitions.

Institutes set out the different aspects of their profile clearly in their institutional plans, with clear choices on a range of dimensions.

Dimensions for institutional profiles

- Who are their target groups?
- What is the focus of the study programmes (academic, vocational)?
- How do they differentiate their teaching offer by target group, teaching methods, level and breadth?
- What are their ambitions with regard to internationalisation and European collaboration?
- What materials are they developing for lifelong development?
- What are their ambitions with regard to digitalisation in education?
- What type of research do they carry out and how intensive is it?
- What are their specialist disciplines and what are the priority areas in particular disciplines or sectors? Specialisations and priority areas can be explicitly interdisciplinary and multidisciplinary, including between academic fields and technology.
- What are their ambitions with regard to quality, standards and geographical reach (regional or global)?
- What are their ambitions with regard to knowledge dissemination and societal impact?
- How do they involve people from the world of practice?
- How do these choices compare with those of other institutes in comparable sectors and (for example) in the same region?
- With which other institutes, national and international, and for which ambitions do they organise long-term collaboration?

Active dialogue with stakeholders from within and outside the institute

Institutes formulate their institutional plans in open and active dialogue with different groups of stakeholders, both internal and external. They also describe the form of this dialogue in the plans.

Following the introduction of quality targets in 2018, institutes are already developing plans on how they wish to deploy the released student loan funds. This process involves internal stakeholders (students, researchers, lecturers) and relevant external stakeholders (businesses, civil-society organisations, regional governments and other education institutes). It is important to extend this procedure to include the institutional plans, which are broader than the quality agreements. The envisaged institutional plans describe the overall profile and public mission of the institute, and indicate how the institute contributes to the system goals and ambitions and how it approaches stakeholders in the community.

Create scope for different profiles and robust ambitions

In choosing their profile, institutes can build on their own origins and development. The Netherlands has traditionally had a mix of institutes, some with a broad and general focus and others with a narrow, highly specialised orientation, both at universities and universities of applied sciences. Where one institute may for example have a strong tradition in working with the business community, another may traditionally have focused more of its efforts on teaching. It is good that institutes make a clear choice in their institutional plans as to where their ambitions lie for the future, and that they are also willing to set the bar sufficiently high, providing an incentive to consistently raise their performance in these areas. Institutes can then grow in the fields covered by their profile-based ambitions, for example towards excellence in research, attractive Bachelor's programmes, flexible lifelong development options or a focus on regional impact.

Main dimensions on which institutes make clear choices

One fundamental distinction in the profiles is between an academic basic orientation and a vocational and practical focus. In academic education, students learn to interpret and communicate about academic knowledge, working methods and assumptions in their own discipline in an independent, analytical and critical way. All this is embedded in a setting where there is scope for a broader vision and development. In vocational and practical education, students learn specific vocational competences and generic interdisciplinary skills, including problem-solving ability and cooperation and communication skills. They learn to acquire new knowledge and apply it in occupational practice. This is not an absolute distinction because universities, as academic institutions, also train students for a profession, while analytical and critical thinking is also important for students at practice-focused universities of applied sciences. The basic distinction between academic and practical is however essential in making the character of each type of education and research clear, recognisable and attractive.

A second dimension concerns the relative focus on research or teaching. The relationship between the two can moreover vary. There are institutes and study programmes which focus heavily on research and which have solid ambitions in specific research priority areas, whether it be fundamental, problem-based, applied or practical research aimed at increasing the stock of knowledge or developing new solutions for societal and economic challenges. Graduates and postgraduates bring the latest knowledge to the organisations where they go to work, but these institutes also work closely with businesses and civil-society organisations to develop new solutions and applications and to make knowledge accessible for society.

Other institutes and study programmes place more emphasis on teaching, and their research is also more geared to supporting their educational mission. They focus on good teaching in vocational Bachelor programmes or in broad, academic Bachelor studies and Master's programmes, including vocational programmes for certain academic professions such as doctors and lawyers. Their research supports the teaching and helps students to develop analytical and problem-solving skills so that they are able to acquire, develop and apply new knowledge in professional practice. Here again, there is no absolute distinction and hybrid forms are possible, even within one and the same institute.

Institutes also opt for a particular focus on specific disciplines or for a certain teaching approach or for a specific target group. This too contributes to differentiation in profiles.

If institutes make clear choices in all these areas, this will create to a of more distinctive profiles, enabling the higher education and research system to offer optimum opportunities for students to follow a programme which offers the best possible fit for their wishes, ambitions and talents and the needs of the labour market and society. The system will also be able to meet society's needs more effectively as regards research and knowledge dissemination.

Coordination between institutes…

When combined, the different institutional profiles must lead to the realisation of the ambitions and priorities at system level. As described in section 3.2, the Minister of Education, Culture and Science is responsible for overseeing the coherence between these choices, but it is up to institutes themselves to ensure efficient coordination and task division, ensuring strategic coordination at institutional as well as at sector and system level. As part of this coordination process, institutes can also begin to identify areas where they wish to collaborate long-term and intensively in order to achieve better results together. These proposed long-term partnerships with other institutes should also form part of the institutional plan.

… and within sectors

As well as strategic coordination at institute level, effective division of tasks and creation of priority areas for the different sectors in which institutes are active is also important, and will make it possible to achieve the ambitions and goals at system level more efficiently. Good experiences have been gained with substantive coordination at sector level, creating a set of coherent disciplines or study programmes at universities and universities of applied sciences. A national sector plan is formulated for such a sector in which universities and universities of applied sciences coordinate their teaching and research portfolios and make clear choices. Based on an analysis of the strengths and weaknesses in their teaching and research activities, in the sector plans institutes develop a shared vision for the ambitions and priorities in both areas. Individual institutes then make clear within this framework which ambitions and priorities they can help realise given their strengths and profile. These proposals are then coordinated so that they coalesce to a mutual strategic task allocation, specialisation and concentration of existing and future teaching and research activities in the sectors.

This sets in motion an iterative process and dialogue between institutes with their institutional plans on the one hand and the sector plans on the other. Institutes must support the sector plans and the division of tasks and roles within a sector must correspond with the individual profiles of the institutes. Individual institutes also make judgements between sectors and links are organised between sectors, study programmes and research areas. In addition to national coordination in a sector, institutes can also make agreements in regional clusters.

Experience with sector plans

Considerable experience has already been gained in forging sector plans. Committees in several sectors comprising deans, researchers and lecturers from the sectors concerned have drawn up plans for coordination and sharing of tasks. The approach and its effectiveness has varied widely. The Breimer Committee, which developed sector plans for physics and chemistry in the period 2009-2016, developed an integrated approach which brought together national strategy formation, task-sharing and concentration in research, teaching and valorisation. This approach now provides a framework for the development of new sector plans in the exact science and technology sector and the social science and humanities sector, among others. Experience has shown that the following elements are necessary for successful coordination at sector level:

- Sector plans contain clear intentions on task-sharing and concentration of existing and future teaching, research and facilities. They show clearly where efficiency gains can be made and incorporate SMART[77] targets.
- Sector plans are focused on the long term and based on robust strength/weakness analysis, independent and expert opinions and international benchmarking.
- Sector plans offer a comprehensive approach to coordination in Bachelor's and Master's programmes, research and valorisation.
- Sector plans are emphatically geared to the needs of society and practice.
- Sector plans involve both universities of applied sciences and universities and encompass both academic and vocational teaching and research.
- Mutual collaboration and coordination is also necessary in sectors where it is not a standing tradition and there is no overarching national administrative forum. An external 'quartermaster' can be of help here.

4.2 Increase the scope for selection

Before they can adopt a profile, higher education and research institutes must be given the tools to do so. For higher education this means that institutes must be given more freedom to exercise strategic control over student intake and transfers by using selection. As students' choice of study helps determine where institutes need to deploy their academic staffing capacity, having more control over the student intake can help them tailor their student population more closely to their choice of specific subject areas and disciplines. Selection, combined with capacity control, is also a way of steering the numbers of graduates in certain disciplines for which there is high (or low) demand from the labour market. That will increase the efficiency of the system.

It is also important that students end up at an institute and on a programme that is right for them, for their talent, learning style, motivation and interests. Particularly with a larger and wider differentiation in profiles, this requires collaboration between institutes to ensure that students are able to (re)direct their choice of study as easily as possible. One way of achieving this would be for institutes that offer complimentary teaching programmes to work together. Selecting students on suitability could also reduce the high dropout rates, benefiting both study programmes and students. Selection can also help increase the motivation and dedication of students and thus lead to higher pass rates.

77. Specific, Measurable, Achievable, Realistic and Time-bound.

In particular, the ability of institutes to select at the point of intake into Bachelor's programmes needs to be expanded. The current selection opportunities are limited to decentralised selection in the Bachelor's phase of *numerus clausus* programmes or for 'small and intensive' programmes and Master's programmes.[78] Extending the ability to select need not affect accessibility at system level.

Conditions for selection

Institutes use a variety of selection methods and there is discussion about the objectivity, validity and reliability of the tools used when applying non-cognitive criteria. If the scope for selection at the point of intake is expanded, a number of conditions must be met:

- Selection must be supplementary to the final examinations taken in students' preparatory education and the selection criteria must fit with the educational concept of the study programme.
- Selection must not lead to exclusion of students at system level. Institutes have a shared responsibility to guarantee that every student is able to follow a suitable study programme.
- Institutes may determine their own selection methods, but those methods must be tested for effectiveness and any undesirable effects. Institutes must be transparent and provide timely information about their selection methods, criteria and procedures.

Institutes must coordinate their strategic choices in relation to selection at sector level. Selection must not lead to students being excluded from the system. Rather, the system must be accessible for students: they must be able to follow an appropriate course of study, but it may be that it is provided by a different institute from their first choice. They must be able to study at an institute which fits their talents and ambitions. The intentions and choices in relation to selection also form part of the institutional plans, in which institutes argue the need for and purpose of selection, indicate which selection methods they plan to use and make clear how they configure the selection process.

4.3 Introduce profile funding

AWTI has previously pointed out that, if the Netherlands wishes to remain competitive in globalising markets and attractive to innovative businesses, it needs a powerful and internationally embedded knowledge and innovation system. To maintain that system at

78. Study programmes can also impose supplementary requirements and select students for the specific content of the programme. This is the case, for example, for music studies or programmes which require physical stamina.

the desired level of ambition, we advocate a step-up in investments in research, development and innovation, where possible in partnership with the business community; that would enable the Netherlands to achieve the target of spending 2.5% of Gross Domestic Product on research and development.[79] If institutes make clear choices about what they do and do not wish to do, and if they engage in more complementary collaboration, our assessment is that funds will become available for this. These resources can be used to achieve the specific ambitions of individual institutes and the system.

The present funding system leads to all kinds of pinch points in the higher education and research system. The Advisory Committee on Higher Education and Research Funding (Van Rijn Committee) reaffirmed this and made recommendations for resolving the most acute problems in the short term.[80] The Committee's recommendations focused mainly on a different allocation of the government funding between institutes. The Committee argued that a future-proof system will require more fundamental changes to funding over the long term, which go beyond the scope of its advice.

Creating a future-proof system requires that the funding supports the profiling of institutes and their contribution to the envisaged system goals. The direct government funding of universities and universities of applied sciences must therefore be partially linked to their realisation of the profiles as set out in their institutional plans. This funding method offers two distinct advantages. First, it supports institute profiling, as each institute is rewarded for realising its chosen profile. Second, it encourages institutes to focus more on achieving their contribution to the public mission.

Institutes choose their own profile and decide on the measurable results on which they should be assessed. For example, an institute decides that it wishes to secure a place among the world's top research institutes in a given field. It can then formulate the ambition that a certain number of its researchers should be among the most cited researchers in the world in that discipline. As another example, an institute opts to make an additional contribution through its teaching programmes to the societal need for knowledge and skilled people in a certain sector. It can then formulate this as an ambition to train a growing number of students in that discipline who go on to find work in the sector in question after graduation.

79. See letter from the Chair of AWTI to the *informateur, Edith* Schippers, dated 28 March 2017. See also AWTI (2016c) and AWTI (2017c) for an indication of what additional public resources should be used for.
80. Adviescommissie Bekostiging Hoger Onderwijs en Onderzoek (2019).

There is growing international experience with assessment based on performance or results,[81] including in the Netherlands.[82] Performance targets were agreed with Dutch universities and universities of applied sciences between 2012 and 2016 which had financial consequences; new targets were agreed in 2018. However, these targets focus mainly on educational quality and are concerned more with the **input** than the outcome (such as well-educated people). This means that a large part of the public mission of higher education and research institutes is not covered by these targets; and although there are financial consequences attached to the quality plans, there is no financial incentive linked to **results**.[83]

A funding system based on the achievement of ambitions brings challenges,[84] but these need not prevent parliament, government and institutes from availing themselves of this instrument. Funding is an effective mobilising tool. It is however important to ensure at all times that incentives do not have a perverse effect. When introducing any form of funding based on the achievement of profile-based ambitions, the following aspects are important:

- Guarantee that the portion of funding based on achievement of ambitions is large enough. International experience[85] shows that effects become visible when performance-based funding reaches 5% of the public funding of an institute.[86] Percentages exceeding 30% create great uncertainty regarding funding and can lead to major unintended effects. It is therefore not desirable to link funding entirely to results.
- Choose simple, relevant and robust indicators and ensure that agreements on the level of ambition are clear from the start and are not changed midstream.
- Provide clear criteria and comparable indicators for institutes that are striving for similar goals.
- When assessing the realised ambitions, allow scope for qualitative but verifiable rating of the results and the context in which they have been achieved.

---

81. See international comparative studies of performance-based funding, e.g. by O.A. Boer, H. de et al (2015); Jongbloed, B. et al (2018); Boer, H. de and B. Jongbloed (2015); Debackere, K. et al (2018); Reviewcommissie Hoger Onderwijs en Onderzoek (2017b); Jonkers, K. & T. Zacharewicz (2017).
82. Reviewcommissie Hoger Onderwijs en Onderzoek (2017b); Vught, F. van (2018).
83. See ISO, LSVB, Ministerie van Onderwijs, Cultuur en Wetenschap, Vereniging van Hogescholen en VSNU (2018). There are no financial consequences to the evaluation of the achievement of the plan to use student loan funds. See also the advisory report by the Council of State (Raad Van State (2019) on the Besluit kwaliteitsbekostiging hoger onderwijs.
84. See notes 81 and 82. Positive points are that performance-based assessment increases the awareness of performance and costs, promotes transparency and improves the dialogue between government and institutes. Rewarding desired performance works better than punishing non-achievement. There are also drawbacks. It is sometimes difficult to find adequate and measurable indicators. Qualitative indicators can be useful, but are labour-intensive. If a limited number of identical indicators are used for all institutes, they will all focus on the same goal and the system will become more homogenous. There is also a danger that institutes will focus on achieving an optimum score on the indicators rather than on delivering the desired effects.
85. See e.g. Boer, H. de et al (2015); Jongbloed, B. et al (2018); Boer, H. de and B. Jongbloed (2015); Debackere, K. et al (2018); Reviewcommissie Hoger Onderwijs en Onderzoek (2017); Jonkers, K. & T. Zacharewicz (2017).
86. 5% is the lower limit. The performance targets in the period 2012-2016 covered 7% of the first flow of funds.

- If an institute scores well (i.e. above the criterion) it is entitled to a bonus, particularly where it scores well in a benchmark with other institutes. Make budget available for this funding element so that above-par performances are genuinely rewarded with additional funding.[87]
- Provide sufficient funding opportunities for free and fundamental research. It is one of the essential functions of our higher education and research system and is an emphatic part of the public mission.

87. If no extra funds were available (but merely a redistribution of existing funds), there is a risk that institutes which achieve their ambitions could lose out financially, if other institutes perform relatively better. That is undesirable.

5

Recommendation: promote collaboration between higher education institutes

By pooling their strengths, universities and universities of applied sciences will be better able to meet society's expectations. This chapter outlines three forms of collaboration: in relation to teaching, top-flight research and in addressing societal challenges. The outlined collaboration goes further than what is currently the norm.

5.1 Take collaboration a step further for better results

Dutch higher education and research institutes already collaborate a great deal, in both research and teaching. As well as collaborating on temporary research projects and programmes, universities work together in strategic alliances such as the 4TU.Federation, the Leiden-Delft-Erasmus alliance or in national research schools. On the educational front, too, universities are developing joint multidisciplinary Bachelor's, Master's and post-Master's programmes. There are also several strategic alliances involving universities of applied sciences, some of which have led to a merger, in which the institutes pool their knowledge and expertise in a specific area in close collaboration with those in the field. There are also Centres of Expertise in which universities of applied sciences work with the business community and civil-society organisations on research and knowledge-sharing.

However, these alliances are generally limited to universities working with other universities or universities of applied sciences working with their peers; they rarely cross the boundary between the two types of institution, although several universities and universities of applied sciences do offer joint academic primary school teacher training programmes or forge agreements on Master's programmes. Attempts to establish an administrative merger have enjoyed little success to date. There are a few examples of strategic alliances, such as the collaboration between Twente University and Saxion University of Applied Sciences and between Leiden University and The Hague University of Applied Sciences. As well as differences in culture, the funding system means that institutes compete for student numbers and resources for teaching and research. Also, the Higher Education and Research Act permits many forms of collaboration, but joint degrees from a university and university of applied sciences are not possible.

The government encourages and facilitates research collaboration between universities, universities of applied sciences and the business community and civil-society

organisations. Universities, universities of applied sciences work together with other knowledge institutes in the Top Sectors, for example, in the various routes of the National Science Agenda, in the context of City Deals and in European research programmes and NWO programmes. This collaboration is however almost never deep, structural and long-term; it is based around temporary research projects which are barely recognisable to the outside world. Funding is drawn from various sources, each with its own time horizon, objectives and conditions. These constraints mean the full potential of pooling the strengths of different institutes, in which each institution's contribution builds on its own profile and strengths, is not being fully realised.

The relative dearth of in-depth collaboration across the two institution types in the present system means it is up to the Minister of Education, Culture and Science to initiate the desired development. This is even more pertinent in the light of the clearly defined profiles for individual institutes advocated in this advisory report. This requires supplementary collaboration. The Minister could explicitly invite institutes to enter into structural partnerships and ensure that funding can be provided for such ventures over an extended period, going beyond individual government terms. This could be readily linked to the governance cycle as described in section 3.2: this form of collaboration could be included in the profile description in the institutional plan. Institutes should also make clear what form of collaboration they foresee with international partners. Institutes would pool their strengths in these alliances in order to achieve better results together. They would enter into relationships spanning several years, leading to in-depth collaboration that is clearly recognisable for the outside world. They might for example focus on education, top research or mission-driven research and innovation. The functions and features of alliances of this type are discussed in the following sections.

5.2 Educational networks ensure students end up in the right place quickly

Universities and universities of applied sciences working together in educational networks are able to coordinate the organisation of Bachelor's and Master's programmes with differing orientations. Setting up educational networks will enable the system to get students in the right place more quickly, ensuring they are on programmes which match their talents and interests while meeting the needs of the labour market. It will also facilitate the joint development of a flexible teaching structure which is appealing to people in work. Collaboration between general and technical higher education institutes will also offer ample opportunities for developing interdisciplinary curricula. Collaboration in educational networks will also help avoid fragmentation of resources and unnecessary duplication, thereby increasing educational efficiency and maintaining accessibility.

Coordination within educational networks could involve:

- Joint information provision about the study programmes provided by member institutes to ensure that students end up in the right place.
- Offering a range of complementary Bachelor's and Master's programmes aimed at different target groups, for initial education and lifelong development.
- Creating opportunities for smooth reorientation and transfers between programme types and orientations, and making it easier for students to switch programmes.
- Sharing infrastructure and facilities, such as workshops or laboratories.

To ensure a better alignment of and transfers between different programme levels and orientations, it is important that clear and distinctive attainment goals are formulated. This applies for all programmes: vocational and academic, at both Bachelor's and Master's level.

Educational networks are not limited to universities of applied sciences and universities, but also incorporate senior secondary vocational education with continuing learning pathways to ensure a smooth transition to higher professional education programmes which contribute to lifelong development. Involving businesses, civil-society organisations and government organisations will ensure better links with the world of practice.

Educational networks are created on the initiative of higher education institutes, though at the express invitation of the Minister. The institutes concerned formulate the goals of the educational network and state based on their own profile how they wish to contribute to the achievement of those goals. The networks are periodically assessed on their joint results and are rewarded for good performance.

Encouragement, goodwill and funding alone are not enough to achieve this kind of in-depth collaboration between institutes. They may be all kinds of barriers, for example due to legislation and regulation, compartmentalisation of funding streams, or differences in culture, scale or administrative systems. It is therefore important that provisions and rules which impede collaboration are reviewed critically.

Examples of educational networks

Rotterdam Arts and Sciences Lab (RASL) is a partnership between Codarts University of the Arts, Willem de Kooning Academy and Erasmus University Rotterdam (Art and Culture studies and Erasmus University College). RASL provides a platform where the arts and sciences come together. The partner institutes work

together in both teaching and research. RASL offers a five-year programme in which students can obtain a double Bachelor's degree: one from Erasmus University and one from Codarts or Willem de Kooning Academy. RASL also develops joint interdisciplinary research programmes, the partners share teaching experiences and work together to develop new, innovative teaching methods.

Energy Academy is a partnership between the University of Groningen, Hanze University of Applied Sciences, Energy College and the Energy Delta Institute. The Academy provides teaching based around the theme of energy transition at senior secondary vocational, higher professional and university level, with programmes at Bachelor's and Master's level as well as a postgraduate MBA programme. It also offers online teaching modules, a PhD summer school and a range of other teaching programmes. The partners also collaborate on interdisciplinary research and innovation in public-private partnerships and innovation programmes, for example providing an open innovation centre and a field lab where students, researchers and businesses can work together to test and develop energy innovations, and where start-up businesses are given a helping hand.

5.3 Top-class research alliances for top knowledge and top talent

Top-class research alliances bring together strong research groups from universities and scientific institutes such as those affiliated to the Netherlands Organisation for Scientific Research (NWO) and the Royal Netherlands Academy for Arts and Sciences (KNAW) to achieve world-class status in research. These alliances come together around specific fields of research and technology or specific themes. In many cases, they bring together the knowledge and expertise from general universities or universities of applied sciences and universities of technology. To keep the Dutch knowledge economy vital it is essential to excel and reach the top in a number of fields, partly because businesses are increasingly casting their nets worldwide in the search for the best knowledge and talent. To attract or retain this talent and these international companies, it is crucial that the Netherlands is able to offer them a top-class environment across a number of themes. Pooling top-class research combined with a long-term commitment from the government will lead to visible leadership in research focus areas, thus helping to attract foreign investments for research and development.

Top-class research alliances share the following characteristics:

- They focus on fundamental and strategic basic research.
- They bring together national research priority areas, but can also be open to structural collaboration with international top-class research groups.
- They formulate shared goals for the alliance, with partner institutes determining their contribution based on their own profile.
- They are organised as virtual research institutes, in which researchers and their research are embedded in the partner institutes but with the research alliance acting as a 'virtual institute' with its own programming, its own shared facilities, its own administration and its own funding from the Ministry of Education, Culture and Science, laid down in covenants lasting five years.
- They are created bottom-up in response to an 'open call' in which NWO selects between five and ten research alliances on the basis of clear selection criteria.
- The quality and standard of their research is periodically assessed through international benchmarking, and the achievement of the shared goals through evaluation.
- They focus explicitly on knowledge dissemination and exploitation.
- They can offer teaching programmes to specialist research Masters and doctoral candidates.

Examples of top-class research alliances

The Oncode Institute is a virtual research institute carrying out top-class research and translating fundamental insights into practicable methods for cancer diagnosis and treatment. The Institute brings together the highest level of fundamental cancer research. More than 500 Dutch researchers are affiliated to the Institute, working in 43 research groups at nine different research organisations (five UMCs, three research institutes and one university). In addition to carrying out fundamental research, the Oncode Institute works with others on translational and clinical research to develop new diagnostics, drugs and innovative treatments. Knowledge transfer is an emphatic part of the Institute's mission. The Dutch Cancer Society, the Ministry of Economic Affairs and Climate, the Ministry of Education, Culture and Science, the Ministry of Health, Welfare and Sport, Health~Holland, NWO, the Netherlands Organisation for Health Research and Development (ZonMW) and the nine partner institutes are together investing a total of 120 million euros in the Oncode Institute up to 2022.

The Flemish Institute for Biotechnology (VIB) is one of four strategic research centres (SOCs) in Flanders, Belgium. The ambition of these centres is to excel in scientific research and knowledge transfer.[88] They receive long-term grant funding for this which they use to fund strategic fundamental research. VIB carries out research on the functioning of the human body, on plants and on microorganisms. The emphasis is on translating fundamental research into practical applications for medicine and agriculture. VIB operates as a virtual research institute, with 1,470 researchers working in 75 university research groups at the five Flemish partner universities (KU Leuven, University of Antwerp, University of Ghent, Vrije Universiteit Brussel and Hasselt University). As well as the researchers themselves, the research facilities are also based at the university campuses.

VIB has a framework agreement with the partner universities, in which all proceeds are shared out. In other words, researchers have a double affiliation for their publications (VIB and their university), and VIB and the universities share the intellectual property rights. When entering into a new agreement, the participating research groups are evaluated based on critical performance indicators, collaboration and international comparison with other research organisations in biotechnology. A performance that is not up to scratch leads to removal from the VIB network. VIB is recognised internationally as a top-class research institute in Life Sciences, as evidenced by an evaluation in 2016 and the Leiden Ranking for Biomed & Health research (2015), in which VIB took second place behind MIT. Valorisation and application of its research results are also an emphatic part of VIB's mission.[89]

VIB enters into a new agreement every five years with the Flemish government and the partner universities, stipulating what the annual contribution will be from the government and setting the key targets for VIB. As well as quantitative targets, VIB it is also assessed on the basis of more qualitative targets such as the economic impact of its activities in Flanders. Is Flemish industry making sufficient use of knowledge workers, knowledge and technology emanating from VIB?[90] Good results in the evaluation and expansion of the VIB targets have resulted in a 33% increase in the annual contribution from the Flemish government compared with 2014.

Exzellenzcluster. In 2005 the German federal and regional governments created the *Exzellenzinitiative* in order to make the German higher education and research system more attractive to students and researchers. The initiative had a budget of 4.6

88. Stichting Innovatie en Arbeid (2014); Hertog, P. den et al (2016).
89. Bury, J. & J. Cardoen (2017).
90. Dessers, R. et al (2016).

billion euros, spread over two phases: 2006-2011 and 2012-2017. The aim was to promote top-class research at universities and to increase their international competitiveness.[91] The successor to the *Exzellenzinitiative*, the *Exzellenzstrategie*, was launched in 2018 with an annual budget of around 533 million euros.

One of the pillars of the *Exzellenzstrategie* comprises the 'Clusters of Excellence' (*Exzellenzcluster*). These Clusters bring together researchers from different disciplines and institutes to promote internationally competitive research at German universities. Universities with a Cluster of Excellence are eligible for additional funding to support their organisational and strategic development. In 2018, 57 Clusters of Excellence were selected from 88 submitted proposals. Funding of 385 million euros per year is available for these Clusters, initially for a period of seven years with the possibility of extension for a further seven years.

5.4 Effective tackling of societal challenges by mission-driven consortia

Here we repeat our earlier advice to adopt a programmatic, mission-driven approach to complex societal challenges.[92] The renewed innovation policy already incorporates increased attention for a mission-driven approach,[93] and an 'integrated knowledge and innovation agenda' is being developed along the same lines in relation to energy and the climate.[94]

Mission-driven research consortia would offer a good home for the approach advocated in this report. General universities, universities of technology and universities of applied sciences would work together in these consortia with institutes for applied research, other public knowledge organisations, private companies and civil-society organisations. The central focus would be on knowledge and innovation questions in relation to societal challenges, and specifically themes in which the Netherlands is ahead of other countries. Complex challenges such as these require knowledge and expertise that is usually not available within one single organisation, making alliances necessary. The mission-driven research and innovation consortia bring together the priority areas in fundamental, applied and practical research in a range of disciplines. They involve the business community and civil-society organisations in the dissemination of new knowledge and its translation into new applications and solutions. They collaborate intensively on activities

91. Deutsche Forschungsgemeinschaft (DFG) et al (2013).
92. AWTI (2017c); AWTI (2016b).
93. Minister en staatsecretaris van Economische Zaken en Klimaat (2018).
94. Taakgroep Innovatie (2019).

relating to a specific societal challenge along the entire multidisciplinary chain from research to practice.

Mission-driven research and innovation consortia share the following characteristics:

- They are alliances focused on clear missions in relation to topics on which the Netherlands occupies a leading position.
- They link priority areas in different disciplines in fundamental, applied and practical research with practical knowledge and experience from the business community and civil-society organisations.
- They are open to structural collaboration with international partners.
- They formulate joint goals, with each partner determining its contribution based on its own profile.
- They operate as virtual strategic alliances: the researchers are embedded in their own organisations, but the research infrastructure is shared within the consortium. The consortium works on the basis of programmes with clear missions and has its own administration and funding, laid down in five-year agreements.
- They are created bottom-up in response to thematic calls, with the selection of specific consortia taking place under the aegis of the government.
- They assign a prominent role to knowledge dissemination and exploitation.
- They are periodically assessed and rewarded on the basis of the achievement of the shared goals.

Examples of mission-driven research and innovation consortia

WaterCampus Leeuwarden brings together research, innovation and education relating to water technology. National and international knowledge institutes, businesses and governments work together to shape research, education and innovation. For example, the top technology institute Wetsus carries out pre-competitive scientific research, while the Center of Expertise Water Technology (CEW) focuses on applied research, technology development and innovation. More than 20 national and international universities and research institutes and more than 100 companies work together in Wetsus on scientific research and education (Master's programmes). The Center of Expertise Water Technology is a partnership between NHL Stenden and VHL Universities of Applied Science. Like Wetsus, CEW also involves the business community. Both Wetsus and CEW have their own research facilities. WaterCampus Leeuwarden office teaching programmes at different

levels, including for primary school pupils. The programmes are linked so that pupils and students can progress smoothly through the system.

Advanced Research Center Chemical Building Blocks Consortium (ARC CBBC) is a national public-private consortium which performs research on sustainable chemical building blocks for energy carriers, coatings and materials. Top researchers from three universities work closely in ARC CBBC with researchers from three multinationals: AkzoNobel, BASF and Shell. ARC CBBC is a virtual research consortium with three hubs located at the universities, linking together different fields of expertise. ARC CBBC covers the entire knowledge chain, from fundamental research on new chemical conversions and functional materials up to and including the development of new, energy-efficient processes and new energy carriers and components for chemical building blocks.

The Hague, June 2019

Professor U. Rosenthal, Chair

J.J.G. Bovens, Secretary

APPENDICES

Appendix 1 Abbreviations used

4TU	Four universities of technology
ARC CBBC	Advanced Research Center Chemical Building Blocks Consortium
AWT	Advisory Council for Science and Technology Policy
AWTI	Advisory Council for Science, Technology and Innovation
CDHO	Committee on the Efficiency of Higher Education
CoE	Centre of Expertise
CEW	Center of Expertise Water Technology
EDK	Schweizerische Konferenz der kantonalen Erziehungsdirektoren
ETH	Eidgenössische Technische Hochschule
EZK	Ministry of Economic Affairs and Climate
FEC	Further Education Colleges
hbo	Higher professional education
HEA	Higher Education Authority
HFKG	Bundesgesetz über die Förderung der Hochschulen und die Koordination im schweizerischen Hochschulbereich
HEFCE	Higher Education Funding Council for England
KNAW	Royal Netherlands Academy of Arts and Sciences
MBA	Master of Business Administration
mbo	Senior secondary vocational education
MIT	Massachusetts Institute of Technology
NVAO	Accreditation Organisation of the Netherlands and Flanders
NWO	Netherlands Organisation for Scientific Research
OCW	Ministry of Education, Culture and Science
OfS	Office for Students
PhD	Doctor of Philosophy
RASL	Rotterdam Arts and Sciences Lab
SBFI	Staatssekretariat für Bildung, Forschung und Innovation
SER	Social and Economic Council of the Netherlands
SMART	Specific, Measurable, Achievable, Realistic and Time-bound
SOC	Strategic Research Centre
UMC	University Medical Centre
UKRI	United Kingdom Research and Innovation
VIB	Flemish Institute for Biotechnology
VH	Netherlands Association of Universities of Applied Sciences

VHL	Van Hall Larenstein University of Applied Sciences
VSNU	Association of Universities in the Netherlands
vwo	Pre-university education
VWS	Ministry of Health, Welfare and Sport
wo	University education

Appendix 2 References

- Adviescommissie Bekostiging Hoger Onderwijs en Onderzoek (2019), *Wissels om, Naar een transparante en evenwichtige bekostiging, en meer samenwerking in hoger onderwijs en onderzoek*, May 2019
- Adviescommissie hoger onderwijs voor werkenden (2014), *Flexibel hoger onderwijs voor werkenden*, 12 March 2014
- Alexander von Humboldt Stiftung, 'Alexander von Humboldt-Professur', https://www.humboldt-professur.de/de
- Allen, J., C. Meng & R. van der Velden (2016), *Wat verwachten werkgevers van hbo-afgestudeerden*, Researchcentrum voor Onderwijs en Arbeidsmarkt (ROA), Maastricht, ROA-R-2016/1
- Australian Government Department of Education and Training, 'Mission based compacts', via https://www.education.gov.au/mission-based-compacts
- AWT (2003), *Wijsheid achteraf – De verantwoording van universitair onderzoek*, The Hague, June 2003
- AWT (2005), *Tijd voor een opKIQer!. Méér investeren in onderwijs en onderzoek*, The Hague, October 2005
- AWT (2007a), *Balanceren met beleid. Wetenschaps- en Innovatiebeleid op hoofdlijnen*, The Hague, March 2007
- AWT (2007b), *Weloverwogen impulsen. Strategisch investeren in zwaartepunten*, The Hague, November 2007
- AWT (2010), *Briefadvies Crisis als kans*, The Hague, April 2010
- AWT (2011), *Scherp aan de wind! Handvat voor een Europese strategie voor Nederlandse (top)sectoren*, The Hague, August 2011
- AWT (2013), *Going Dutch. De kennissamenleving in internationaal perspectief*, The Hague, November 2013
- AWT (2014), *Boven het maaiveld. Focus op wetenschappelijke zwaartepunten*, The Hague, April 2014
- AWTI (2016a)*, Durven delen. Op weg naar een toegankelijke wetenschap* [*Dare to share. Open access and data sharing in science*], The Hague, January 2016
- AWTI (2016b), *Oppakken en doorpakken. Durven kiezen voor energie-innovatie*, The Hague, November 2016
- AWTI (2016c), *Houd de basis gezond*, The Hague, November 2016
- AWTI (2017a), *Prioriteiten voor het wetenschaps- en innovatiebeleid van een nieuwe regering*, Brief van de AWTI-voorzitter aan kabinetsinformateur mevr. drs. E. Schippers, 28 maart 2017

- AWTI (2017b), *WTI-Diplomatie. Offensief voor de internationalisering van wetenschap, technologie en innovatie* [*STI Diplomacy. An offensive for the internationalisation of science, technology and innovation*] The Hague, May 2017
- AWTI (2017c), *Onmisbare schakels – De toekomst van toepassingsgericht onderzoek*, The Hague, August 2017
- Berger, T. & C. Frey (2016), 'Structural Transformation in the OECD: Digitalisation, Deindustrialisation and the Future of Work', *OECD Social, Employment and Migration Working Papers*, No. 193, Paris, OECD Publishing, 26 September 2016
- Besselaar, P. van den & E. Horlings (2010), *Focus en massa in het wetenschappelijk onderzoek: de Nederlandse onderzoeksportfolio in internationaal perspectief*, The Hague, Rathenau Instituut
- Boer, H. de, B. Jongbloed, P. Benneworth, L. Cremonini, R. Kolster, A. Kottmann, K. Lemmens-Krug & H. Vossensteyn (2015), *Performance-based funding and performance agreements in fourteen higher education systems*, Report for the Ministry of Education, Culture and Science, CHEPS, maart 2015
- Boer, H. de & B. Jongbloed (2015), *Reflections on performance agreements in higher education Practical considerations in delivering system-wide improvements*, CHEPS working paper 09/2015
- Bormans, R. (2018), 'Blijvend actueel', Column in *TH&MA*, nr. 2-18
- Broek, N. van den & A. Vennekens (2019), 'Ontwikkeling van het wetenschappelijk onderzoeksprofiel van Nederland', The Hague, Rathenau Instituut, 6 February 2019, https://www.rathenau.nl/nl/wetenschap-cijfers/output/ontwikkeling-van-het-wetenschappelijk-onderzoeksprofiel-van-nederland
- Bundesgesetz über die Förderung der Hochschulen und die Koordination im schweizerischen Hochschulbereich (HFKG), 30 September 2011, available at: https://www.admin.ch/opc/de/official-compilation/2014/4103.pdf
- Bundesministerium für Bildung, Wissenschaft und Forschung (2019), **'**Hochschulkonferenz', available at http://www.hochschulplan.at/
- Bury, J. & J. Cardoen (2017), 'Presentatie VIB aan het Vlaams Parlement', 15 June 2017, bijlage bij *Verslag van de hoorzitting over de evaluatie van de strategische onderzoekscentra en de nieuwe convenanten,* namens de Commissie voor Economie, Werk, Sociale Economie, Innovatie en Wetenschapsbeleid, available at https://www.vlaamsparlement.be/parlementaire-documenten/parlementaire-initiatieven/1154624
- Casteren, W., J. Nooij, M. van Essen & B. Janssen (2018), *Tussenverslag monitor experimenten flexibilisering en vraagfinanciering hoger onderwijs*, in opdracht van Ministerie van OCW, uitgevoerd door ResearchNed, Nijmegen, February 2018

- Centraal Bureau voor de Statistiek (CBS), Dienst Uitvoering Onderwijs (DUO) en het ministerie van Onderwijs, Cultuur en Wetenschap (OCW) (2019), 'Onderwijs in Cijfers', https://www.onderwijsincijfers.nl/
- Chiong Meza, C. (2012), *De Nederlandse universiteiten. Feiten en cijfers 2012,* The Hague, Rathenau Instituut
- Commissie-Breimer (2016), *Een succesvolle stap. Eindrapportage Commissie Breimer*, April 2016
- Commissie Toekomstbestendig Hoger Onderwijs Stelsel (2010), *Differentiëren in drievoud omwille van kwaliteit en verscheidenheid in het hoger onderwijs*, April 2010
- Debackere, K., E. Arnold, G. Sivertsen, J. Spaapen & D. Sturn (2018), *Mutual Learning Exercise Performance-Based Funding of University Research*, report for Directorate-General for Research and Innovation, Luxembourg, Publications Office of the European Union, 19 maart 2018
- Dessers, R., E. van der Velde & A. Wastyn (2016), *Evaluatie van VIB, managementsamenvatting punctuele evaluatie VIB*, June 2016, op aanvraag van de Vlaamse overheid – Departement EWI
- Deutsche Forschungsgemeinschaft (DFG), federführend Wissenschaftsrat Bundesministerium für Bildung und Forschung (BMBF), Ministerien, Senatsverwaltungen und Behörden für Wissenschaft und Forschung der Länder (2013), *Exzellenzinitiative auf einen Blick, Der Wettbewerb des Bundes und der Länder zur Stärkung der universitären Spitzenforschung, Die zweite Förderphase 2012 bis 2017 Graduiertenschulen – Exzellenzcluster – Zukunftskonzepten,* http://www.dfg.de/download/pdf/dfg_im_profil/geschaeftsstelle/publikationen/exin_broschuere_de.pdf
- Dijck, J. van & W. van Saarloos (2017), *Wetenschap in Nederland: Waar een klein land groot in is en moet blijven*, Amsterdam, KNAW
- Dijk, T. van (2018), 'TU heeft de grootste moeite om toptalent binnen te halen', *TU Delta,* 8 February 2018, https://www.delta.tudelft.nl/article/tu-heeft-de-grootste-moeite-om-toptalent-binnen-te-halen
- Dudenbostel, T. & B. Tiefenthaler (2018), *The Higher Education and Research System in Switzerland – A Country Profile for AWTI,* Technopolis group, The Hague, AWTI, 20 September 2018
- Elsevier Research Intelligence (2018), *Kwantitatieve analyse van onderzoek en innovatie in sleuteltechnologieën in Nederland*, in opdracht van ministerie van Economische Zaken en Klimaat, June 2018
- Est, R. van & L. Kool (eds.), *Werken aan de robotsamenleving: visies en inzichten uit de wetenschap over de relatie technologie en werkgelegenheid*, The Hague, Rathenau Instituut, June 2015

- Evaluatiecommissie prestatiebekostiging hoger onderwijs (2017), *Van aanvinken naar aanvonken*, The Hague
- Floor, T. (2016), HBO versus Universiteit – Zoek de verschillen, *Volkskrant Magazine*, 30 May 2016, https://archief.ukrant.nl/magazine/hbo-versus-wo
- Graaf, Th. de (2018), *Een voorzitter kijkt terug HBO 2012-2018*, The Hague
- Hertog, P. den, W. van der Beken, F. Bongers & B. Erven (2016), *Systeemevaluatie van imec, VIB en iMinds – managementsamenvattin*g, in opdracht van EWI en uitgevoerd door Dialogic en Idea Consult, July 2016
- Herweijer, L. & M. Turkenburg (2016), *Wikken en wegen in het hoger onderwijs. Over studieloopbanen en instellingsbeleid*, The Hague, SCP
- Higher Education Authority (2018), *Higher Education System Performance Framework 2018-2020*, available at: https://www.education.ie/en/Publications/Education-Reports/higher-education-system-performance-framework-2018-2020.pdf
- Higher Education Authority, http://hea.ie/; HE reform via http://hea.ie/policy/he-reform/; http://hea.ie/policy/he-reform/the-changing-landscape/ ; Managing performance via http://hea.ie/funding-governance-performance/managing-performance/system-performance-framework/
- Higher Education and Research Act 2017, Chapter 29, available at: http://www.legislation.gov.uk/ukpga/2017/29/contents/enacted
- Inspectie van het Onderwijs (2018a), *Staat van het hoger onderwijs 2018*, Utrecht, April 2018
- Inspectie van het Onderwijs (2018b), *In- en doorstroommonito*r, Utrecht, June 2018
- Inspectie van het Onderwijs (2019a), *Doorstromen van hbo naar wo. In hoeverre is de wo-master toegankelijk voor hbo-gediplomeerden?*, Utrecht, February 2019
- Inspectie van het Onderwijs (2019b), *Staat van het hoger onderwijs 2019*, Utrecht, April 2019
- ISO, LSVB, Ministerie van OCW, VH & VSNU (2018), *Investeren in Onderwijskwaliteit. Kwaliteitsafspraken 2019-2024*, Amsterdam, 9 April 2018
- Janssen, M., P. den Hertog, L, Korlaar, S. de Haas van Dorsser & P.J. de Boer (2018), *Eindevaluatie Valorisatieprogramma*, Utrecht, Dialogic, in opdracht van het ministerie van EZK, 30 June 2018
- Jong, H. de & J.L. van Zanden (2015), 'Technologische ontwikkeling, economische verandering en de Nederlandse arbeidsmarkt in de twintigste eeuw.' In B. ter Weel (ed.), *De match tussen mens en machine*, Preadviezen van de Koninklijke Vereniging voor de Staathuishoudkunde, Vol. 2015, Amsterdam, Joh. Enschede, pp. 25-43

- Jongbloed, B., F. Kaiser, F. van Vught & D. F. Westerheijden (2018), 'Performance Agreements in Higher Education: A New Approach to Higher Education Funding', in Curaj, A., L. Deca & R. Pricopie (eds), *European Higher Education Area: The Impact of Past and Future Policies*, Springer International Publishing, pp. 671-687
- Jonkers, K. & T. Zacharewicz (2017), *Research Performance Based Funding Systems: a Comparative Assessment*, Luxembourg, Publications Office of the European Union, EUR 27837 EN
- KNAW (2018a), *Aantrekkelijkheid van Nederland als onderzoeksland,* Amsterdam, January 2018
- KNAW (2018b), *Maatschappelijke impact in kaart,* Amsterdam, October 2018
- KNAW (2018c), *Wederzijdse versterking. Hoe publieke en private investeringen in onderzoek en ontwikkeling samenhangen*, Amsterdam, December 2018
- Koens, L., A. Vennekens, R. Hofman, N. van den Broek-Honingh & J. de Jonge (2018a), *Balans van de wetenschap 2018*, The Hague, Rathenau Instituut
- Koens, L., R. Hofman & J. de Jonge (2018b), *Drijfveren van onderzoekers. Goed onderzoek staat nog steeds voorop*, The Hague, Rathenau Instituut
- Koier, E., B. van der Meulen, E. Horlings & R. Belder (2016), *Chinese borden - Financiële stromen en prioriteringsbeleid in het Nederlandse universitaire onderzoek*, The Hague, Rathenau Instituut
- Krcal, A. & B. Bryan (2018), *The Higher Education and Research System in England – A Country Profile for AWTI*, Technopolis group, The Hague, AWTI, September 2018
- Laer, E. toe (2017), 'Leuke studie, maar wat kun je ermee?', *Het Financieele Dagblad*, 7 April 2017
- Minister en staatsecretaris van Economische Zaken en Klimaat (2018), *Naar Missiegedreven Innovatiebeleid met Impact*, kamerbrief, 13 July 2018
- Minister van Onderwijs, Cultuur en Wetenschap (2018), *Internationalisering in evenwicht*, kamerbrief, 4 June 2018
- Ministerie van Onderwijs, Cultuur en Wetenschap (2014), *Wetenschapsvisie 2025, keuzes voor de toekomst*, The Hague, November 2014
- Ministerie van Onderwijs, Cultuur en Wetenschap (2015), *De waarde(n) van weten. Strategische Agenda Hoger Onderwijs en Onderzoek 2015-2025*, The Hague, July 2015
- Ministerie van Onderwijs, Cultuur en Wetenschap (2018), *Referentieraming 2018*, The Hague
- Ministerie van Onderwijs, Cultuur en Wetenschap (2019), *Nieuwsgierig en betrokken. De waarde van wetenschap,* The Hague, January 2019

- Ministerium für Innovation, Wissenschaft und Forschung des Landes Nordrhein-Westfalen (2016), *Landeshochschulentwicklungsplan Nordrhein-Westfalen*, available at: https://www.mkw.nrw/hochschule/hochschulen-in-nrw/hochschulvertraege-und-landeshochschulentwicklungsplan/
- Nationale Studentenenquête (2017), 'Resultaten Nationale Studenten Enquête 2017 bekend!' see: https://www.studiekeuze123.nl/nieuws/resultaten-nationale-studenten-enquete-2017-bekend
- Nedelkoska, L. & G. Quintini (2018), 'Automation, skills use and training', *OECD Social, Employment and Migration Working Papers*, No. 202, Paris, OECD Publishing
- Nimwegen, N. van (2016) 'Gegoochel met cijfers leidt tot verkeerde studiekeuze', *De Monitor*, 14 January 2016, available at: https://demonitor.kro-ncrv.nl/artikelen/gegoochel-met-cijfers-leidt-tot-verkeerde-studiekeuze
- Noort, W. van (2018), 'Nederland kampt met braindrain in artificiële intelligentie', *NRC Handelsblad*, 27 August 2018
- OECD (2018), *Education at a Glance. OECD Indicators.* Paris, OECD Publishing
- Onderwijsraad (2012), *Over de drempel van postinitieel leren*, The Hague, June 2012
- Onderwijsraad (2016), *Vakmanschap voortdurend in beweging*, The Hague, October 2016
- Onderwijsraad (2017), *Doordacht digitaal*, The Hague, May 2017
- Onderwijsraad (2018)*, Inzicht in en verantwoording van onderwijsgelden*, The Hague, July 2018
- Orszag, P.R. (2018), 'China is overtaking China in scientific research', *The Straits Times*, 18 September 2018
- Raad van State (2019), *Besluit kwaliteitsbekostiging hoger onderwijs* W05.18.0410/I 26 April 2019, https://www.raadvanstate.nl/adviezen/@113258/w05-18-0410/
- Rathenau Instituut (2018), 'R&D-investeringen in internationaal perspectief', Factsheet 15 February 2018, https://www.rathenau.nl/nl/wetenschap-cijfers/geld/rd-investeringen-internationaal-vergeleken/rd-investeringen-internationaal
- Researchcentrum voor Onderwijs en Arbeidsmarkt (ROA) (2017*), De arbeidsmarkt naar opleiding en beroep naar 2022*, Maastricht, December 2017, ROA-R-2017/10
- Reviewcommissie Hoger Onderwijs en Onderzoek (2017a), *Stelselrapportage 2016*, The Hague, January 2017
- Reviewcommissie Hoger Onderwijs en Onderzoek (2017b), *Prestatieafspraken: het vervolgproces na 2016. Advies en zelfevaluatie*, The Hague

- SEO economisch onderzoek (2018), *Studie & Werk 2018. De arbeidsmarktpositie van hbo- en wo-alumni*, commissioned by Elsevier Weekblad, Amsterdam, June 2018
- SER (2015), *Leren in het Hoger Onderwijs van de toekomst*, The Hague
- SER (2017), *Leren en ontwikkelen tijdens de loopbaan: een advies over postinitieel leren*, The Hague
- Snijders, D. (2018), *Het eeuwige leren. Over Leren, Technologie en de Toekomst*, The Hague, Stichting Toekomstbeeld der Techniek
- Steehouder, L. & F. van Donselaar (2019), *Incoming degree student mobility in Dutch higher education 2018-2019,* Nuffic
- Stichting Innovatie & Arbeid (2014), *Informatiedossier Innovatiestructuren in Vlaanderen*
- Taakgroep Innovatie (2019), *Innoveren met een missie, Integrale kennis- en innovatieagenda voor klimaat en energie,* The Hague
- The Economist (2015a), 'Top of the Class – rankings', *The Economist Special Report Excellence v. Equity*, 26 March 2015
- The Economist (2015b), 'Not classy enough', *The Economist Special Report Excellence vs. Equity*, 26 March 2015
- The Economist (2015c), 'The world is going to university', *The Economist Special Report Excellence v. Equity*, 26 March 2015
- The Economist (2015d), 'Flying high', *The Economist*, 25 June 2015
- The Economist (2016), 'Class apart', *The Economist*, 19 March 2016
- The Economist (2017a), 'Lifelong learning is becoming an economic imperative', *The Economist*, 12 January 2017
- The Economist (2017b), 'Do-it-yourself science is taking off', *The Economist*, 19 December 2017
- The Economist (2018a), 'How global university rankings are changing higher education', *The Economist*, 19 May 2018
- The Economist (2018b), 'British universities set up shop overseas', *The Economist*, 25 August 2018
- Times Higher Education (2019), 'World University Rankings 2019', available at: https://www.timeshighereducation.com/world-university-rankings/2019/world-ranking#!/page/0/length/25/sort_by/scores_overall/sort_order/asc/cols/scores
- U-Multirank (2019), https://www.umultirank.org/study-in/the-netherlands/
- UNESCO (2017), 'Six ways to ensure higher education leaves no one behind', in: *Global Education Monitoring Report*, policy paper 30
- University Grants Committee (2004), *Hong Kong Higher Education: To Make a Difference. To Move with the Times*,

http://www.ugc.edu.hk/doc/eng/ugc/publication/report/policy_document_e.pdf and https://www.ugc.edu.hk/eng/ugc/activity/academic.html
- UWV (2018), *Technische beroepen Factsheet arbeidsmarkt*, 6 February 2018
- Vennekens, A., N. van den Broek-Honingh & R. Hofman (2018), 'Ranglijsten / rankings, Rathenau Instituut, 11 January 2018, https://www.rathenau.nl/nl/wetenschap-cijfers/werking-van-de-wetenschap/excellentie/ranglijsten-rankings
- Vereniging Hogescholen (2017), 'Verantwoording is en blijft nodig', Standpunt, available at: https://www.vereniginghogescholen.nl/standpunten/verantwoording-is-en-blijft-nodig
- Vereniging Hogescholen (2018), *Factsheet HBO monitor 2017*, The Hague, April 2018
- Vereniging Hogescholen (2019), 'Hoogste instroom in hbo ooit', 1 February 2019, available at: https://www.vereniginghogescholen.nl/actueel/actualiteiten/hoogste-instroom-in-hbo-ooit
- Verhagen, L. (2018), 'Toptalent in kunstmatige intelligentie vertrekt naar China en de VS. 'Je moet een beetje gek zijn om hier te blijven'', *de Volkskrant*, 11 December 2018, https://www.volkskrant.nl/nieuws-achtergrond/toptalent-in-kunstmatige-intelligentie-vertrekt-naar-china-en-de-vs-je-moet-een-beetje-gek-zijn-om-hier-te-blijven-~b9df70b2/
- VSNU (2015), 'Reactie van de Vereniging van Universiteiten op de protesten van studenten en universitair medewerkers', 4 March 2015, available at: https://vsnu.nl/nieuws/nieuwsbericht/189-reactie-van-de-vereniging-van-universiteiten-op-de-protesten-van-studenten-en-universitair-medewerkers.html
- Vught, F. van (2018), 'Performance Contracts: A New Tool in Higher Education Governance', in: Weingarten, H.P., M. Hicks & A. Kaufman (eds), *Assessing Quality in Postsecondary Education, International Perspectives*, Queen's Policy Series, Montreal, London, Ithaca, pp. 107-124
- Warps, J., M. Thomassen & M. Brink (2011), *Kiezen voor hbo of wo. Achtergronden en motieven van vwo'ers die kiezen voor een hbo-studie*, Nijmegen, in opdracht van Ministerie van OCW en uitgevoerd door ResearchNed, April 2011
- Weel, B. ter (ed.), *De match tussen mens en machine*, Preadviezen van de Koninklijke Vereniging voor de Staathuishoudkunde. Vol. 2015. Amsterdam, Joh. Enschede
- Went, R., M. Kremer & A. Knottnerus (eds.), *De robot de baas. De toekomst van werk in het tweede machinetijdperk* [*Mastering the Robot. The Future of Work in the Second Machine Age*], The Hague, WRR, WRR-Verkenning nr. 31, December 2015

- Werkgroep Profilering en Bekostiging (2011), *Naar een meer geprofileerd hoger onderwijs en onderzoek. Een procesaanpak voor profilering en profielgebonden bekostiging,* The Hague: 12 May 2011
- Wet op het hoger onderwijs en wetenschappelijk onderzoek, available at: https://wetten.overheid.nl/BWBR0005682/2019-02-01
- Wind, C. (2017), 'Voor iedere student een doorloopmaster', *HanzeMag*, 12 September 2017, http://www.hanzemag.nl/voor-iedere-student-een-doorloopmaster/
- Zweck, A., D. Holtmannspötter, M. Braun, L. Erdmann, M. Hirt & S. Kimpeler (2015), *Stories from the future 2030, Volume 3 of results from the search phase of BMBF Foresight Cycle II*, Düsseldorf, VDI Technologiezentrum GmbH

Appendix 3 Interviewees

Hanneke Ackermann	FME
Kristel Baele	Erasmus University Rotterdam
Jacky Bax	Nationaal Regieorgaan Praktijkgericht Onderzoek SIA
Babs van den Bergh	VSNU
Tessa Bijvank	Ministry of Education, Culture and Science
Marcelis Boereboom	Ministry of Education, Culture and Science
Ron Bormans	Rotterdam University of Applied Sciences
Karlo van Dam	Ministry of Economic Affairs and Climate
Dirk van Damme	Organisation for Economic Co-operation and Development (OECD)
Simon van Damme	at the time of the interview: Office of the Flemish Deputy Prime Minister Hilde Crevits
Pieter Duisenberg	VSNU
Anne Flierman	NVAO
Stan Gielen	NWO
Marissa Herder	Ministry of Education, Culture and Science
Niek Hinsenveld	FME
Martijn Janmaat	Ministry of Economic Affairs and Climate
Maurice Limmen	Netherlands Association of Universities of Applied Sciences
Daan van der Linde	Ministry of Economic Affairs and Climate
Judith Mesman	Leiden University College The Hague
Inez Meurs	Taskforce for Applied Research SIA
Ron Minnée	Netherlands Association of Universities of Applied Sciences
Erwin Muller	Leiden University Campus The Hague
Wim van Niekerk	Ministry of Education, Culture and Science
Sijbolt Noorda	International Baccalaureate
Mirko Noordegraaf	Utrecht University
Gareth O'Neill	European Council of Doctoral Candidates and Junior Researchers
Bronne Pot	Utrecht University of Applied Sciences
Mirjam van Praag	VU Amsterdam
Maarten Prak	Utrecht University
Jet de Ranitz	InHolland University of Applied Sciences

► Wim van Saarloos	KNAW
► Ineke Sluiter	KNAW
► Roeland Smits	Netherlands Association of Universities of Applied Sciences
► Remco Smulders	VSNU
► Luc Soete	Maastricht University
► Farid Tabarki	Studio Zeitgeist
► Geke van Velzen	Stichting Lezen & Schrijven
► Lucien Vijverberg	Ministry of Economic Affairs and Climate
► Martien Visser	Hanze University of Applied Sciences Groningen / Gasunie
► Frans van Vught	Senior Adviser European Commission / University of Twente
► Marcel Wintels	De Baak

AWTI interviewed 15 university students and 15 higher professional education students during two discussion meetings held at TU Delft and Fontys University of Applied Sciences.