The Role of Universities of Applied Sciences in Implementing the Dutch National Research Agenda

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Introduction

The academic landscape of the Netherlands is divided into two types of universities: research universities and universities of applied sciences (UAS). The universities of applied sciences outnumber the research universities by 37 to 14. They host almost twice as many students as research universities, 446,500 versus 250,000. Both universities offer bachelor and master programmes. Universities of applied sciences provide higher professional education, preparing students for specific professions. The programmes offered tend to be more practice-oriented than programmes offered by research universities. Since 1986, research has been a designated task of universities of applied sciences (Knoers, 1995), but it has only grown into a serious activity since 2001, when the first professors were officially installed. Research can be conducted in collaboration with research universities, but this is not compulsory. If a research results in a PhD thesis, however, collaboration with a research university professor is obligatory. Professors at universities of applied sciences are not assigned with the *ius promovendi*, the legal position to award the degree of PhD.

In this chapter we discuss the possible contribution of UAS to the implementation of the National Research Agenda (*Nationale Wetenschapsagenda*, or NWA). The Netherlands Association of Universities of Applied Sciences has been a member of the knowledge coalition and the steering committee of the Dutch National Research Agenda (Hintum, 2015). Member universities organised ten sessions on various topics resulting in a total of 150 questions submitted to the NWA. In our opinion the universities of applied sciences can also play an important role in the implementation of the NWA. In this essay we shall explore this role. We'll start with providing an overview of the development of the research role of the universities of applied sciences. Then we will reflect on three key issues that touch upon the implementation of the NWA:

1 research programming versus the need for free research;

2 the legitimacy of research in politics and society;
3 the need for focus and clustering.

We will discuss each of these three issues from the perspective of universities of applied sciences whose core strength lies in doing research in close collaboration with professional practitioners. Finally, we will describe three prerequisites for maximizing the contribution of UAS to the implementation of the Dutch National Research Agenda.

Practice-oriented research at universities of applied sciences

Table 1 shows some key figures on research in universities of applied sciences. In this section we describe the nature of research at universities of applied sciences. Since 2001, the nature of this research and the differences with research undertaken in research universities have been strongly debated. The Advisory Board on Science and Technology (in Dutch *Adviesraad voor wetenschap, technologie en innovatie:* AWTI), an influential advisory council of the Dutch government, argued that research in universities of applied sciences should be referred to as 'design and development' (Adviesraad voor Wetenschaps- en technologiebeleid, 2001). According to the advisory board, the task of contributing to science is the exclusive right of research universities and therefore the term 'research' should be reserved for them. However, in 2010, in a new law governing the higher education sector, Dutch Parliament decided to use both the terms 'research' and 'development' for universities of applied sciences, thereby indicating that their role is both to develop new knowledge and solve practical problems.

Table 1 Key figures for Dutch universities of applied science (2014)

Number of universities	37
Number of students	446,500
Core tasks	Education, research, and development
Type of research	Practice-oriented research
Number of professors	592 (65% male, 35% female)
Fte of professors	361 FTEs
Number of researchers	3,548
Fte of researchers	1,037 FTEs
Researchers in a PhD trajectory	865

Traditionally, Dutch universities of applied sciences have strong relationships with practice. Most of them have evolved from educational programmes initiated by trade organisations and similar interest groups (Van Bemmel, 2006). Educational programmes are developed in cooperation with practice and students often do internships at a company or institution. Research conducted at universities of applied sciences has a similar orientation towards practical work and innovation. In 2007, the Association of Universities of Applied Sciences described research at universities of applied sciences as having roots in professional practice and generating knowledge for direct use in professional practice. The research is often multidisciplinary in nature and is based on co-creation with professional practitioners. It is scientifically robust and has strong connections with both education and professional practice.

Some still feel an urge to differentiate research conducted at universities of applied sciences from research at research universities. At one point the term 'applied research' was chosen to make that distinction (HBO-raad, 2000). The downside of this particular term is that it directly refers to the distinction between basic research and applied research first used by Vannevar Bush (1945, p.18): 'Basic research is performed without thought of practical ends. It results in general knowledge and an understanding of nature and its laws. This general knowledge provides the means of answering a large number of important problems, though it may not give a complete specific answer to any one of them. The function of applied research is to provide such complete answers'. This distinction is based on a linear model of innovation in which new knowledge is exclusively generated by basic research undertaken by (natural) scientists that then gets applied to practice through applied research. In applied research no new knowledge is created. Seventy years after Bush this linear view of innovation is outdated (Vasbinder & Groen, 2002). The application of basic research outcomes is not the only source from which innovations spring, nor is the development of new knowledge the exclusive domain of basic research. For that reason, we oppose the use of the term 'applied research' as a label for the research conducted at our universities. The Association of Universities of Applied Sciences agrees and has decided to use the term 'practice-oriented research'. Unfortunately the legacy of Bush has such a strong foothold in the Anglo-Saxon world that our universities are known in English as universities of applied science.

The work of Gibbons et al. (1994) can help to further clarify practice-based research at UAS. They make a distinction between mode 1 and mode 2 knowledge production, where mode 1 is traditional ivory tower research

and mode 2 multidisciplinary research conducted in close cooperation with practitioners. Gibbons et al. claim mode 2 to be a new mode of knowledge production, emerging in the middle of the 20th century and displaying five characteristics: context application, transdisciplinarity, heterogeneous practices, reflexivity, and novel forms of quality control. Research at Dutch universities of applied sciences shows many mode 2 research characteristics, although not all five are equally applicable in all cases.

Practice-oriented research is not the exclusive prerogative of universities of applied sciences. In our view it is not very fruitful to make a strong distinction between the types of research conducted by the two types of universities. In both universities one can come across research that has mode 2 characteristics. In contrast, at Dutch universities of applied sciences, one will not encounter pure basic research. All research is based on questions derived from practice and produces new knowledge that is applicable in practice. In Dutch universities of applied sciences, there is no room for questions that solely spring from the personal curiosity of the researcher or from the blanks in scientific theory.

The core strength of Dutch universities of applied sciences lies in the close relationships with professional practice. All research is based on problems or opportunities that arise in the society, in the daily practice of companies, hospitals, schools, welfare institutions and the like. The research questions are often explicitly articulated together with those working in the field. Examples include research into ways that small and medium-sized companies can benefit from biopolymers and smart materials (Saxion); research into ways that journalists can make use of infographics (University of Applied Sciences Utrecht); research on how to introduce student teachers in conducting and using research (Fontys) and research guiding optimal use of instruments by healthcare professionals (Hogeschool Zuyd).

In fields like social work it is common to involve practitioners in the design and execution of the research. Sometimes a research project is not merely used to generate knowledge but also to implement change within an organisation. Approaches such as action research (Kemmis & McTaggart, 2000) or design-based research are common (Van Aken, 2011). In many cases the result of practice-oriented research is knowledge that can be used directly in local situations, designated by Argyris (1996) as 'actionable knowledge'. This is in contrast with explanatory sciences whose mission is primarily to describe, explain, or predict (Van Aken, 2005). However, proper practice-oriented research aims not only at local problem-solving but also at generating knowledge that has wider implications than a single context. This occasionally remains a challenge.

Research results are disseminated through various means. Peer-reviewed journals are not the primary focus of the Dutch universities of applied sciences. Nevertheless, publishing in such journals is encouraged since peer reviews increase the quality of the research and help to strengthen the relationship with research universities. Research is disseminated through professional journals, reports, books, websites, and by creating products for practice. An important instrument for dissemination is the research process itself. By conducting the research in close cooperation with practitioners, knowledge is disseminated both explicitly and implicitly. Training or empowering the professional in the field may be an explicit goal of the research. Last but not least, the collaboration with students and their teachers within the research projects provides a strong vehicle for early dissemination of research results.

Another core strength of research at universities of applied sciences is that science is not the only source of knowledge in research projects. Because of the close relationships with professionals in the field, knowledge of professionals and clients or patients can be included. This knowledge is made explicit, evaluated, and tested.

The research effort by Dutch universities of applied sciences has grown considerably since the start. In 2001, the first professor was appointed and in 2014, there were 592 professors (361 FTEs) (Vereniging Hogescholen, 2016) of which 35% female. For most of them, the professorship at the university of applied sciences is a part-time job. Many combine it with a position in a company, research university, or other institution. Most professors have their own research group consisting of teachers in the role of researcher. On average a research group consists of 6 researchers, each having 0.3 FTEs to do research, leading to a sum total of 3,548 researchers and 1,037 FTEs, of which 17% have a PhD ibid.).

The Dutch universities of applied sciences have the ambition that 10% of their lecturers will be trained at doctorate level. The majority of the growth comes from teachers following a PhD trajectory at a research university; 865 in total in 2014. The Dutch Ministry of Education, Culture and Science strongly advocates the value of practice-oriented research at universities of applied sciences. It has set the ambition to increase the volume of professors to 580 FTEs by 2024. With the current part-time factor this means an increase to 950 professors (Ministerie van Onderwijs, 2015).

The current €171 million of research funding derives from three sources. 63% is so-called first-stream funding by the Ministry. The remaining 37% is second- and third-stream funding, including funding by a dedicated fund for practice-oriented research at universities of applied sciences (€18 million) and the European Union (€5 million).

Research planning versus the need for free research

The first of the three core issues that are central in this chapter is the role of research planning. What is the origin of research, where do questions stem from and how do researchers assess the importance of these questions in UAS? The Dutch universities of applied sciences feel that free research is the task of research universities. Their own strength lies in the close connection with professional practice. Their research programmes are built on the explicit needs and wishes of professional partners (and on their educational programmes) on the one hand, and the expertise of the professors they attract on the other.

All individual research projects start with a problem from professional practice. All grant funding parties of practice-oriented research judge the relevance of research and the explicit articulation of the research question from a practice perspective. For professors coming from research universities it is sometimes challenging to develop research questions on the basis of professional practitioners' problems. For some professors, however, the practice perspective is the very reason they switched position from a research university to a university of applied science. They feel that the focus in research universities on publishing in high-ranked scientific journals hampers doing useful and relevant research.

The close collaboration between researchers, teachers, and practitioners in practice-oriented research, sometimes even in the form of co-creation, stimulates adoption of findings and shortens the time lag between knowledge creation and knowledge use. Research and dissemination often go hand in hand. Involving practitioners in choosing research subjects, formulating research questions, conducting research, and disseminating results can be a huge learning experience for them. At the same time this collaboration makes it possible for research to gather professional knowledge, smart solutions, tips and tricks that have been developed in practice, and to research the effectiveness of this type of knowledge and make it available for other practitioners to use. In this way, practice is not only a source of data but a source of valuable knowledge as well.

To conclude, within universities of applied sciences no tension is felt between research planning and free research. Therefore, the NWA is seen by many as an opportunity and not as a threat. Many questions in the NWA have a practice focus. Questions like No. 15: 'How can we create more sustainable food-producing systems?', or No. 10: 'How can we make buildings and infrastructure safer, more sustainable and less costly using

new materials, technologies and processes?' address societal problems that practitioners struggle with. Therefore, contributing to research based on the NWA will not be too difficult for UAS researchers. They are used to planning their research from a user perspective. Some NWA questions or 'routes' fit very well with the profile and research portfolio of various UAS. For example, one of the routes through the 140 questions of the Dutch National Research Agenda is about smart, liveable cities. The research programme of the University of Applied sciences Utrecht focuses on improving the quality of living in urban environments.

The legitimacy of research in politics and society

The second core issue in this chapter is about the legitimacy of the research. What is the legitimacy of the research conducted at universities of applied sciences? In as little as fifteen years, universities of applied sciences have developed a research function that has gained trust among politicians and is valued by society. An important factor is that the research questions are close to daily life and are understandable for all. In addition, the practical relevance of the research becomes increasingly evident and parties start to appreciate the work done. For example, in 2014 over 4,600 SMEs were involved in projects funded by the NRPO-SIA, a dedicated fund for practice-oriented research at universities of applied sciences.

However, the legitimacy of research conducted by universities of applied sciences is still fragile in the eyes of research universities and the scientific community. Research universities have been sceptical from the beginning. Questions were raised regarding the critical mass, the academic climate, the rigour of the methodology and the expected quality of results. One reason is that the growing role of research at universities of applied sciences is seen as a threat to the ambitions of research universities. Research funding in the Netherlands does not grow proportionally with the number of parties doing research.

Another reason is that the quality of research within the universities of applied sciences is far less transparent compared to research universities. Research universities have stronger mechanisms in place to ensure quality and to calibrate quality standards within specific areas of research. They have, for example, procedures for consultation of sister faculties when appointing professorships. There are strong research communities in which professors know each other as a result of peer reviews of PhD theses,

papers, and grant proposals. In contrast, the appointments of professors within universities of applied sciences are local procedures that vary between individual universities and in which peers within the field do not play a specific role. The research communities are less strong and professors in the same field sometimes do not know each other personally. Professors at universities of applied sciences do not have *ius promovendi* and are in many cases less involved in the international research community. Their research programmes are not subject to regular calibration with standards in the field. Many professors at research universities are not aware of the work of their colleagues at universities of applied sciences and vice versa.

Research at universities of applied sciences is much less frequently subjected to peer review. International scientific publications are not the key output. Publications are aimed at dissemination to the field of professional practitioners. Furthermore, the organisation and governance structures within universities of applied sciences are not yet fully adapted to the research responsibilities. Research experience is frequently lacking in boards of directors or amongst directors of institutes and other leadership positions. This sometimes results in policies that hamper the work of researchers or lack a focus on research quality. To strengthen this focus, the Association of Universities of Applied Sciences has recently developed a policy demanding the use of explicit quality criteria to review and improve research (Vereniging Hogescholen, 2015). This is a first step; however the effect largely depends on the extent to which the criteria will be applied. A non-binding policy will not enhance the general quality of research from universities of applied sciences.

To conclude, the political and societal legitimacy of research at UAS is growing but the scientific legitimacy needs further improvement. For universities of applied sciences to play an effective role in implementing the Dutch National Research Agenda, it is necessary to improve the visibility of the professors and their work. Moreover, to sustain political and societal legitimacy and at the same time gain the respect of research universities, quality of research is crucial and transparency of practice-oriented methodologies is required. For this a more obligatory quality policy is required. In December 2014, the Association of Professors at universities of applied sciences was formed.[1] The purpose of the association is to promote the quality and visibility of practice-oriented research.

1 www.lectoren.nl

The need for focus and clustering

The third core issue is the need for focus and clustering. How do universities of applied sciences deal with this? In the first decade of research at the universities of applied sciences, research programming was done by individual professors. There was not much cooperation between professors within the universities, let alone between universities. However, in the last five years much progress has been made. A big step was the creation of Centres of Expertise in which universities of applied sciences collaborate with practitioners to close the gap between research, education, and practice.

After ten years of experimentation, most universities of applied sciences have now decided to cluster their professors in knowledge centres that focus on particular subjects. The purpose of clustering research is to increase focus and combine research capacity in order to improve research quality and impact. The positioning of these centres within the university varies. Some are tied to educational faculties and led by the faculty dean, others are positioned close to the board of directors of the university.

Many universities of applied sciences are in the process of developing research programmes based on societal themes. For example, University of Applied Sciences Utrecht focuses on improving the quality of living in urban environments, and Saxion focuses on Living Technology. However, the way in which these programmes actually steer research is not yet fully crystallized. Several models coexist but we will mention only three. First, in some cases research programming is merely a language game in which prioritizing is nothing more than semantics. Second, sometimes research programming takes the form of identifying focal points for which additional resources beyond base-funding are available. And third, and this is the most extreme form of steering, a centralized body within the university decides on research projects to be undertaken. To conclude, at many universities of applied sciences research programming is still very much a paper exercise. Individual professors find it hard to give up their autonomy in deciding what research to undertake. A certain level of autonomy is important, but some coordination of research efforts is needed to improve excellence and impact, and financial incentives can help. The NWA can be a useful tool to stimulate the debate, to develop connections between research programmes, and to strengthen ties with research universities. Moreover, working within collaborative programmes between different universities provides a strong mechanism not only to improve quality but also to reduce research waste. There are many causes of research waste, ranging from poor

research programming to the choice of methodology or a lack of consistency between research phases. The NWA can help to create unifying pathways from basic to applied science and vice versa, thereby reducing research waste.

Contributing to the Dutch National Research Agenda

In our opinion, the Dutch universities of applied sciences are very well-positioned to contribute to the implementation of the Dutch National Research Agenda. The focus of UAS on practice-oriented research and their strong network in professional practice will ensure that the Dutch National Research Agenda truly contributes to society. Many questions posed within the NWA have a practice-oriented dimension and demand clear-cut answers that can change the way we build our cities, organise our healthcare system, and deal with migration.

Implementation of the NWA requires strong collaboration between all parties. In our view, three prerequisites are essential to optimize this collaboration, each involving a changing view on research and innovation:

1 transition from a linear to a cyclical and network view;
2 transition from a monodisciplinary to a transdisciplinary view;
3 transition from a hierarchical to a non-hierarchical view.

These three transitions are briefly expanded on below.

From a linear to a cyclical and network view

As described earlier, innovation is not a linear process from basic research through applied research to new products and services. It is an iterative process in which many parties are involved, each bringing their particular strengths to the table (Vasbinder & Groen, 2002). In cyclical innovation, basic research is very much needed. However, this basic research can be supplemented with more practice-oriented research that studies practical problems and can inform basic research about instruments, applications, important factors that have been overlooked, implementation issues and the like. It can also be complemented with entrepreneurial activities that involve experimentation and risk-taking. Crucial to success is the creation of networks that can facilitate this collaboration. Early crossovers between basic and practice-oriented research can catalyse and speed up findings in both. In a network view on innovation it is not useful to create a strict

division of labour between research universities and universities of applied science but to profit from the strengths of both.

The Dutch National Research Agenda can be a strong catalyst for the creation of these networks. Many questions in the Dutch National Research Agenda have both a basic and practice-oriented component. Many include both descriptive and explanatory questions as well as design questions. For example, question No. 5: 'What is the role of micro-organisms in eco systems and how can these be used to improve health and the environment?' includes both an explanatory question that requires basic research and a design question that requires practice-oriented research. In order to fulfil this catalyst role, much more effort must be put into identifying parties involved in each of the 140 questions and in validating the information entered in the database.

From a monodisciplinary to transdisciplinary view

Solving the complex problems of today's society requires knowledge from various disciplines. Not only by looking at these problems from different perspectives (multidisciplinary research), but also by creating new knowledge through combining various disciplines (interdisciplinary research) and by thinking from each other's perspectives and disciplines (transdisciplinary research) (Rosenfield, 1992). One of the challenges for universities of applied sciences is to incorporate more of the tools, methods, and theories of basic research into their work. The scientific merit of practice-based research can be improved. At the same time the challenge for many research universities is to incorporate a practice-oriented perspective into their work and make more use of research methodologies that have been developed with this in mind.

From a hierarchical to a non-hierarchical view

Transdisciplinary research requires close collaboration between disciplines and between research universities and universities of applied sciences. For this to happen, we need to leave behind the tendency to think in terms of a hierarchy of forms of knowledge or research. The Netherlands is praised for its non-hierarchical culture and some ascribe the success of Dutch science to the fact that in Dutch culture researchers dare to oppose their professors and debate among equals is common. Yet, in our experience, thinking in terms of a hierarchy is still very much present when it comes to the relative positions of research universities and universities of applied sciences.

The idea that research at research universities is of higher quality or more profound hampers a closer collaboration between all universities. The fact that universities of applied sciences don't have *ius promovendi* creates a hierarchy and dependency between the two types of universities that impedes integration of knowledge, ideas, and methods. At the same time it hampers the calibration of quality standards across the knowledge system and the full recognition of each other's work. Competition for research funding hinders the close collaboration that is needed to implement the Dutch National Research Agenda. To realise the ambition of answering all questions incentives for a change of attitude and behaviour and for collaboration across the entire university landscape are recommended.

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