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Visible

DISCOVERING THE IMPACT OF RESEARCH CONDUCTED BY UNIVERSITIES OF APPLIED SCIENCES

SARAH K. COOMBS

ABSTRACT

This dissertation aims to address the following questions:

- What are the requirements for evaluating the research impact created by Dutch Universities of Applied Sciences' (UASs) research?
- How can these requirements be applied within the context of the goals of Dutch UASs?

It sets out to discover the requirements for evaluating the research impact made by UAS research and explore how these can be implemented in real-life within the current policy landscape. Answering these questions has resulted in two distinct yet interlinked segments as we moved from theory to practice. Firstly, we sought to delineate the rules governing the evaluation of UAS research impact. Secondly, we analysed the current practices within the contextual playing field in which Dutch UASs find themselves and experimented with applying the requirements to the impact evaluation process of Dutch UAS research. Our results culminate in recommendations for conducting UAS research impact evaluation as well as discussing how our conclusions can be applied by researchers, administrators and policy-makers in practice.

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CHAPTER 1

INTRODUCTION

I think it is pretty safe to say that I am a rule follower. Let me explain. I am not a sheep that blindly follows because that is what I am told to do. In fact, I greatly dislike doing something just because I was told to do it. My brain needs to know and understand the framework into which things fit. I need to know why things are being done a certain way. In life, if the rules make sense, I can then use them and if they do not, I can adapt accordingly. In science, this is, of course, different. You cannot always pick and choose what you can or cannot follow. However, that need to know why something is done in a particular way remains the same. That framework is essential to begin with. Apparently, this is the case for many neurodivergent people (Nerenberg 2021).

It is because of this need to understand rules and follow them that I started this journey towards answering the following questions. What are the requirements for evaluating the research impact created by Dutch Universities of Applied Sciences' (UASs) research? How can these rules be applied within the context of the goals of Dutch UASs? Too many people were asking me questions I could not answer, about the rules I did not know. Consequently, the goal of this dissertation is to discover what the rules for evaluating the impact made by UAS research are, and how we can implement these rules in real-life within the current policy and organizational landscape. By doing so, it is my intention to assist in uncovering the impact created by UASs and making it visible to the rest of the world.

In the rapidly evolving world of academic inquiry, the pivotal role of universities in fostering research and driving innovation is undeniable. Particularly, the emergence of research in UASs offers a fresh perspective on addressing real-world challenges. While traditional universities often emphasize theoretical knowledge, Universities of Applied Sciences champion practical applications of this knowledge. However, the research landscape of applied sciences in these institutions is relatively nascent, making it a fertile ground for investigation.

The relative newness of research at UASs presents its own set of challenges. As with any emerging field, it grapples with nuances and intricacies that are distinct from the well-trodden paths of conventional research. These institutions confront issues that may have been resolved or are perceived as non-issues in mature research disciplines.

A pressing challenge for Universities of Applied Sciences lies in effectively conveying their research's significance. It becomes crucial for these institutions to showcase the tangible and intangible impacts of their research on society at large, bridging the gap between academic pursuits and societal benefits. Against this backdrop, the central research question emerges: How can research impacts be evaluated in the context of the goals of UASs? Furthermore, in the context of Dutch UAS research, it becomes essential to ensure that our evaluation mechanisms are congruent with overarching policies and are workable for the researchers involved. How can this evaluation be embedded within the evaluation process and policy context of the Netherlands Association of Universities of Applied Sciences (NAUAS) ? This study aims to address these questions, discovering what the rules for evaluating the research impact made by UAS research are and how we can implement these in real life within the current policy landscape.

EXPLORING THE PLAYING FIELD

Understanding the evaluation of research impact, especially within the realm of UAS, is a multi-dimensional issue, marked by both its depth and complexity. However, before we can dive into the evaluation component, we need to first understand the context. This includes the relative short history of Dutch UAS's research, the evaluation framework currently being used, and the strategic agendas in which the Netherlands Association of Universities of Applied Sciences (NAUAS) have stipulated a desire to create research impact within specific themes.

A Brief History of Dutch UASs

Traditional universities have been an established element of Dutch society since 1575 with research playing a central role in these institutions since 1800. Nearly 200 years later, in 1960, research became the primary purpose of traditional Dutch universities with the introduction of the Law of Scientific Education (Wet op het wetenschappelijk onderwijs) (van Gageldonk 2017).

The history of Dutch Universities of Applied Sciences is much shorter than that of traditional universities. The oldest examples date back as early as 1842 (Delft) and 1876 (Wageningen). Agricultural, Nautical, Music and Arts schools, as well as other institutes with a strong connection to societal needs and business that were initiated in the nineteenth century are also understood to be predecessors of the UASs of today. These institutions were seen as separate entities from traditional universities and were clearly linked to both business and societal organizations. They were not, however, officially accepted as part of the higher educational system until much later. Indeed, it was not until 1986 that Universities of Applied Sciences as we know them today became part of the binary educational system of the Netherlands (van Gageldonk 2017).

In the years between 1970 and 1990 there was much debate around the positioning of the institutions that would become the UASs. The debate centered on questions such as: should traditional universities attempt to offer degrees in minor professions, or should that be the purview of UASs; should the practical educational institutions be seen as comparable to traditional universities and offer recognized bachelor or even Master's degrees; what kind of research responsibilities should a UAS be permitted. During this period, cooperation between the two institutional structures was encouraged but impossible to accomplish as the differences in size, autonomy and maturity in research practices were too divergent (van Gageldonk 2017).

In 1986, the passing of the Law on Higher Professional Education granted UASs the right to conduct research but did not remove the obstacles that made accomplishing research difficult. One such obstacle was the lack of qualified researchers. At that time, teachers at UASs were hands-on instructors from the field, positions that required only the basic education of a Bachelor's degree. With 50 per cent of teachers holding a Master's degree and only 5 per cent holding a Ph.D., they lacked the research background necessary to actualize quality research (van Gageldonk 2017).

An additional obstacle was related to the lack of funding. The only funding available was that which was gleaned through contracts with industries or other partners rather than support from the institution or the predecessor to the NAUAS, the HBO-raad. Without consistent comprehensive funding, conducting research was not possible with the result that, after 1986, many of the smaller institutions merged to form larger ones in anticipation that it would result in additional funding. While this attracted more students, it did not result in the funding from the Ministry of Education that was necessary for research (van Gageldonk 2017).

This situation is similar to the challenges and evolutionary processes that other countries with Universities of Applied Sciences are wrestling with (van Gageldonk 2017). According to the Organization for Economic Cooperation and Development (OECD), Universities of Applied Sciences reached a level of "recognition and legitimacy" that meant they were considered qualitatively equal to standard universities in 1991 (OECD 1991, 66). However, it was not until the end of the decade that legislation concerning research in Dutch UASs was addressed.

The Higher Education Act of 1993 in the Netherlands brought both pillars of the binary system, UASs and traditional universities, together in one law. This Act stipulates that the aim of both UASs and traditional universities is knowledge transfer. It specifically states that UASs of the Netherlands can conduct research applicable to the education offerings of their institutions. While it was initially thought that this knowledge transfer was accomplished through the professional development of teachers and staff, and through the education of students, it has evolved over time to also include research (de Weert and Leijnse 2010).

It was not, however, until 1999 that visible changes in the research function at UASs occurred. Not only did a strengthening economy free up necessary funding for higher education, changes at the European Union level also had an effect. Between 1999 and 2000, member countries of the European Union worked together on the Bologna Declaration. This new policy established a harmonious degree system throughout the Higher Educational Institutions of the EU as well as agreement on the need to stimulate research in every level of this system. The Lisbon 2000 Agenda highlighted among other things, the need for greater financial support for research and education (de Weert and Leijne 2010). In that agenda the European Commission declared that higher educational institutions were essential for strengthening the knowledge triangle of Education, Research and Innovation. Because of the existing strong ties European UASs had with business, they were seen as key players in ensuring research was done in response to the needs of business (Maassen and Sternsaker 2010). While this had an effect on all EU UASs, for UASs of the Netherlands this meant not only more funds for research but also the introduction of 'Lectoren', often translated as professor, equivalent to university professors, and a consequential professionalization of UAS research in the Netherlands (van Gageldonk 2017).

In 2001, the introduction of professors into the employment pool of UASs was made possible by the combination of a sudden influx of funds and an external review by the Inspectorate for Education that indicated the level of inadequacy of the quality of research in UASs. On the advice of the Inspectorate for Education, the Ministry of Education and Sciences and the HBO-raad entered into a covenant agreement that required the Universities of Applied Sciences to retain professors. The funding for this new position was to be distributed by an independent group contracted by the HBO-raad. Known as the Stichting Kennisontwikkeling HBO, or SKO, this group was responsible for assessing if a UAS could begin a research centre. Based on their evaluation, UASs would be given the funds needed to install a lector for a four-year period. The ex-ante evaluation process included a framework of 11 criteria wherein the specific goals and tasks of the proposed research centre were considered. Requests for them had to include an area of expertise and how the research centre, in measurable terms, would work towards improvements in education and the professionalization of the research skills of teachers and staff (van Gageldonk 2017).

In 2005, as agreed upon in the covenant of 2001, the SKO commissioned Consort, an external consulting company to evaluate how the professors had fared thus far. This three-part evaluation included: the size and financial situation of the research group; a measurement of the knowledge transfer; and a quick scan to give an indication of how a lector interacts with their environment. The quick scan raised concerns about both the quality of the evaluation and the evaluation results itself. Not all professors were included in the evaluation and those that did participate found the quality of the questions unsatisfactory and unclear. Many were concerned that they were being evaluated using indicators that were not applicable to their work and that they had no influence over. Consequently, the SKO sought assistance from a professor at the Hogeschool Utrecht, Frans Leijnse, to assist in understanding how to proceed. His findings were that of the three-part evaluation only the quantitative financial information could be used; the measurement of knowledge transfer and the quick scan were methodologically unacceptable. Important stakeholders, such as the SKO and the HBO-raad themselves, agreed (van Gageldonk 2017).

In response, the SKO set up a workgroup, primarily composed of professors, that confirmed that the methodology used during the evaluation process was incorrect. They further determined that there was insufficient understanding of knowledge transfer, and how it was to be evaluated or even considered as part of the evaluation process. Although this underlined the lack of clarity on the basis of the evaluation there was agreement that an evaluation process was required for professors (van Gageldonk 2017).

As a result, in 2006, the SKO advised the government that an external accountability tool was needed for professors that took into consideration the type of research done by UASs in the Netherlands. They suggested that the number of indicators required at the national level should be limited. UASs should have the freedom to choose the indicators that best evaluated the quality of their research group. These indicators were, in fact, developed by the research group themselves. They further recommended that the evaluation take into account the current national discussion over societal impact. This evaluation used purely quantitative indicators such as size of the research group and finances, to evaluate the same group of professors that had been used in the controversial evaluation the previous year in order that a change could be monitored.

A review by the OECD that same year found research within Dutch UASs lacked quality. They suggested that introducing a new UAS specific funder would not only help financially but would help to create competition between UASs and thereby increase the number of professors and the quality of their research (OECD 2008). In 2008, this funding became known as RAAK Pro under Stichting Innovatie Alliantie (SIA) (van Gageldonk 2017).

Concurrent with the SKO's evaluation, the HBO-raad initiated the development of a quality control system for research by initiating a strategic research workgroup. This requirement was included when the Covenant between SKO and the HBO-raad was extended in 2004. With this extension, the decision was made that the SKO would cease to provide financing for the professors, and daily costs would be transferred to the UASs where they were employed. In addition, the responsibilities associated with the professors, including evaluation, were transferred from the SKO to the HBO-raad which was the first time that a workgroup specifically for research and its quality was introduced by the HBO-raad. The workgroup sought input about the evaluation system from members of the UASs themselves as well as calling upon the expertise of groups such as the KNAW (Koningklijke Nederlands Akademie van Wetenschappen, Royal Netherlands Academy of Arts and Sciences), the NWO (Nederlandse Organisatie voor Wetenschappelijk Onderzoek, The Netherlands Organisation for Scientific Research), employer organizations, and the Ministry of Education, Culture and Science (van Gageldonk 2017).

Introduced at the beginning of 2009, the quality control instrument used by the HBO-raad became known as the *Branchprotocol Kwalitieitszorg Onderzoek* (Sector Protocol for Quality Assurance in Research, BKO). Instead of an ex-ante approach as taken by the SKO, the Netherlands Association of Universities of Applied Sciences chose an ex-post evaluation made up of three components. The first component was an independent external national validation committee that would approve the quality control system of UASs once every six years. The second component was made up of an independent evaluation committee that would evaluate a research group or group of research groups every six years. And the final component was an annual report describing the developments of research at UASs by the HBO-Raad. The BKO contained a description of UAS's research including the fact that it was something relatively new for Dutch UASs, and that the focus was on societal impact, and relevant scientific practice rather than publication-based evaluation. It also stipulated that this evaluation should require minimal administrative time. What it did not include were indicators or criteria other than that the research had to be methodologically sound (van Gageldonk 2017).

The BKO

Currently in its third iteration, the BKO remains the evaluation tool utilized by the NAUAS. This national research evaluation framework is a general research evaluation conducted at research group level. Like its predecessors (2009-2015, 2016-22), the current BKO evaluation is conducted every 6 years. Initially conducted by a committee made of both peers and stakeholders, today the evaluation is done by the 'Evaluation Committee of Quality Assurance in Research'. The purpose of the BKO is to provide a monitoring evaluation tool for accountability that is complementary to the institutional quality assurance systems. Using indicators the research groups are asked to conduct a critically reflective self-evaluation narrative report on the results achieved within the context of the ambitions and objectives the individual research group has set out. The report discusses how the research is organized and carried out, the output of the last six years, and the ambitions for the next six years.

Initially, the BKO was considered summative (van Drooge 2016) and consisted of 5 criteria. However, with the intention of emphasising the formative character of the BKO, this iteration incorporated the fifth standard of "regular and systematic evaluation of research process and results" into the other four: the research profile and program; the impact of the research; the quality of the research; and the organization of the research unit (NAUAS 2022).

It is Standard 2 that is of particular interest for our journey. These standard states: “The research unit makes transparent what its contribution is to the development of Professional Practice and society at large, of Education, and of the Research domain” (NAUAS 2022, 7). Here, it is stated that research impact affects:

- “Professional practice and society at large. Research carried out by universities of applied sciences is rooted in professional practice and strongly linked to an application context. The questions are prompted by professional practice (real life situations) in both for-profit and not-for-profit sectors. The research generates knowledge, insights and products that contribute to the solution of problems in professional practice and/or to the development of this professional practice and/or to society at large;
- Education. The research at Universities of Applied Sciences is strongly connected with other higher professional education activities. This broadly occurs along two routes: the connection with education and the professional development of teaching staff (from lecturer to lecturer-researcher), and;
- The Research domain. The research at Universities of Applied Sciences contributes to knowledge development within the Research domain concerned.”(NAUAS 2022, 7)

This is to be done through the selection of qualitative and quantitative indicators. The indicators of the BKO are to substantiate the self-evaluation through the use of ‘basic indicators’ used by all UASs as well as optional indicators that are defined by the UAS themselves. These optional indicators are aimed at illustrating the research impact of the group within the Knowledge Triangle of Professional Practice, Education and Research domain and should give details into the output, use and valuation of the research.

The basic indicators are broken down into 2 categories. The first category is the research input in which the research group is asked to indicate the total research income per year including primary, secondary, tertiary, and other sources of funding. The second category is that of research staffing. Research groups are asked to indicate the total number of people, Full-Time Equivalent (FTE), and number of PhD degree holders within their group. This is further differentiated by functions such as professors, lecturers and other research staff, PhD candidates, Professional Doctorate candidates and support staff.

Table 1.1 provides the matrix of the optional indicators as well as the examples given in the current BKO.

	Output	Use	Valuation
Professional practice/Society	-Professional journal papers -Lectures -Workshops -Prototypes -Measurement instruments -Learning community	-Implementation in a policy or professional practice -Participation in professional practice in research -Consultancy activities -Participation in public debate	-External assignments -Follow-up assignments -Satisfaction of commissioners/partners -Being asked for advisory boards as a speaker, expert in the media, etc. -Awards from the discipline
Education	-Course modules -Research oriented curriculum -Minors -Teaching materials	-Degree programmes that use the research output -Students participating in the research oriented curriculum	-Student satisfaction -Lecturer satisfaction -Assessment of research ability
	-Graduate theses placements -Reports	-Research minors -Lecturer participation in research -Participation of professors/researchers in committees/management of a degree programme	-Satisfaction of supervisors (e.g. placement supervisors) in the industry
Research Domain	-academic/ scientific publication -Expert meetings, patents, licenses -share of open access publications	-Citations -use of research data -use of knowledge products in research of third parties -reviews -income from patents, licenses	-Awards of grant applications for knowledge development or valorisation -Academic/scientific awards -Being asked for academic/scientific advisory boards/editorial boards, as a speaker, expert in the media,etc.

Table 1.1: Matrix of Optional BKO Indicators as Found in the BKO Itself (NAUAS 2022, 21-22)

The Research Themes

At the beginning of this journey towards learning the rules for evaluating the research impact of UAS research, the strategic agenda of the NAUAS 2016-2022 stipulated that their research aims to impact ten specific areas of society.

- Health: Care and Vitality;
- Education and talent development;
- Resilient society: in community, city and region;
- Smart technology and materials;
- The Built environment: sustainable and liveable;
- Sustainable transport and intelligent logistics;
- Sustainable agriculture;
- Water and food supply;
- Energy and energy supply;
- Art and creative industries; and
- Business: responsible and innovative.
(NAUAS 2016)

Reflecting the Sustainable Development Goals (United Nations 2015) and Grand Challenges, as well as reflecting the Dutch Research Agenda these ten areas were believed to also reflect the work being done by researchers at Dutch UASs (NAUAS 2021). The strategic agenda of 2023-2028 has welcomed the addition of two more themes: Security; and Tourism and Hospitality, to better reflect the current research interests of the researchers under the NAUAS (NAUAS 2022). However, neither document discusses how this impact within the themes is to be evaluated.

The Knowledge Triangle

The tripartite Knowledge Triangle (KT) comprising Education, Research, and Innovation emerged initially to grasp the intricate connections among Higher Educational Institutions, the business sector, and society at large (Sjoer et al. 2012). This framework departed from the conventional notion of a unidirectional flow of knowledge absorption, akin to valorisation (Etzkowitz and Leydesdorff 2000). Unger et al. (2020) defined KT as "a network of actors and policy domains (education, research, innovation) spanning the arena for collaborative activities with the goal of offering integrated approaches across these three domains" (808). Innovation serves as the bridge to the business sectors or Professional Practices (Unger and Polt 2017). They argue that sustained and systematic interactions among these spheres are vital for optimizing the impact of investments in all three domains. Furthermore, a functional relationship among research, education, and innovation is deemed crucial for tackling societal challenges.

Despite potential challenges in the dynamics of the KT (Maassen and Stensaker 2010), Dutch research policies have evolved in alignment with the described conceptual framework (Unger et al. 2020). In June 2005, the "Lectorsplatform," a network of lecturers, released a memo introducing their interpretation of the KT, known as the KOP-model: Kennis (Knowledge), Onderwijs (Education), and Praktijk (Practice) (Miedema et al. 2013). The interconnectedness of these elements was considered a pivotal criterion for achieving high-quality UAS research (van Gageldonk 2017). This interpretation remains the cornerstone of Dutch UAS research today, as evident in the NAUAS report "Meerwaarde in het hbo" (Added Value in Higher Professional Education) (Franken et al. 2018). Figure 1.1 provides an English translation of this KT interpretation, illustrating the cyclical flow of knowledge through the Triangle in both directions. Interventions and interactions among the three components of the Triangle extend from Education and Research to Professional Practice. Professional Practice encompasses organizations, businesses, and other stakeholders constituting society. While interactions involve an exchange among the various components of KT, interventions originate from Education or Research toward Professional Practice (Miedema et al. 2013).

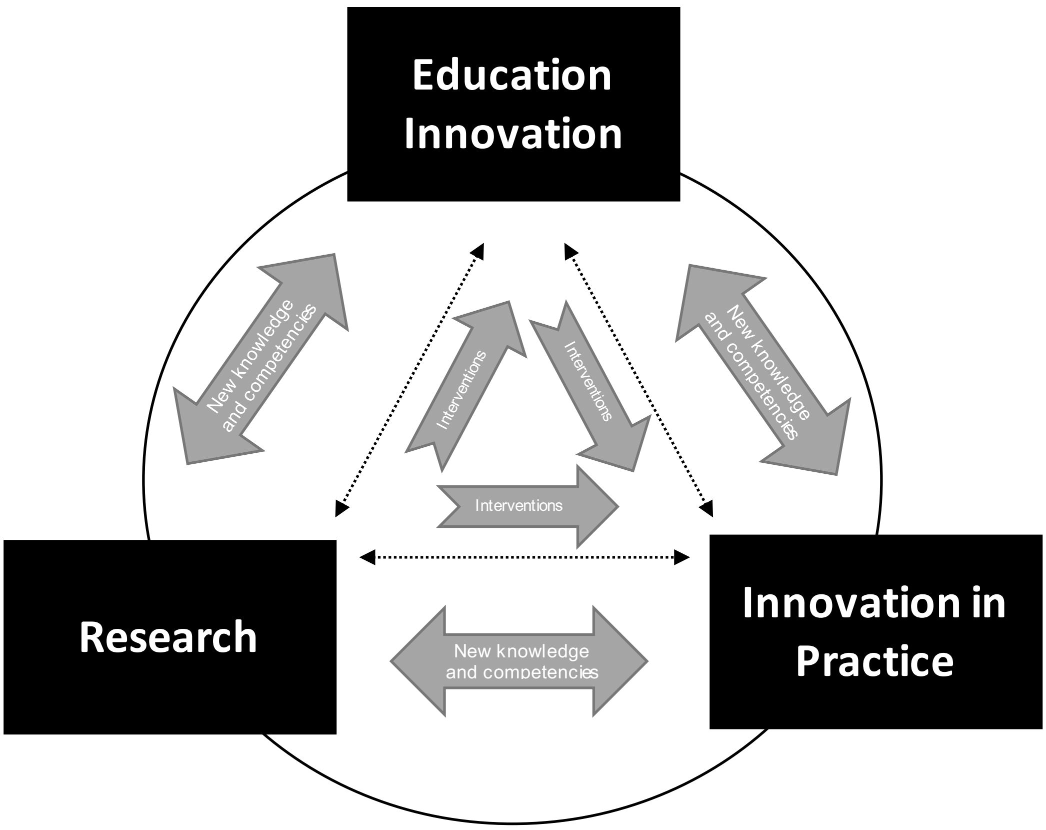

Figure 1.1: Knowledge Triangle of Dutch UASs (Franken et al. 2018, 11)

EVALUATING RESEARCH IMPACT

The KT provides a foundation for understanding UAS research's collaborative and applied nature and forms the basis of much NAUAS research policy including the BKO and its impact evaluation component. Research impact evaluation, in its essence, aims to determine the significance and influence of academic pursuits on society. However, specificities arise when seeking a 'robust' methodology. 'Robustness' here implies a method that is comprehensive, replicable, and less susceptible to biases. While substantial literature exists on research impact evaluation, few delve into its applicability to UAS contexts. General universities often take centre stage, possibly due their longstanding tradition in research.

Impact

A prominent observation from existing literature is the lack of universal consensus on defining 'impact' (Bornman 2012, Greenhalgh et al. 2016) and the methodologies best suited to evaluating it (Budtz Pedersen et al. 2020, Reed et al. 2021). The NAUAS makes use of the term *Doorwerking*[1]. The direct English translation of "effect" says little about what the word actually implies. A less direct translation could be "Influence", which better reflects what the term Doorwerking suggests: the subtle and less subtle changes that occur throughout the research process similar to the ripple effect when a stone is thrown into a body of water or an ecosystem in which minute developments create a succession of changes for adaption. This is much the same as Sivertsen and Meijer's (2020) 'Normal' impact.

Sivertsen and Meijer (2020) make a differentiation in types of impact between 'Normal' and 'Extraordinary' impact. Normal impact extends beyond productive interactions, where interactions between researcher and stakeholder create 'scientifically robust and socially relevant' impact (Spaapen and van Drooge 2011). Instead, Sivertsen and Meijer suggest that Normal impact is simply generated through interactions at a personal or organizational level that occur through decisions made and activities participated in on a daily basis. They suggest that this Normal impact is the most common form of impact, but it is Extraordinary impact that while rarest, is the most frequently evaluated. Extraordinary impact is the impact written about in case studies and narratives because of its positive widespread effect on society (Sivertsen and Meijer 2020).

Lykke et al. (2023), building on the work of Sivertsen and Meijer, refer to Normal impact as micro impacts. They suggest that rather than focusing on impact as the outcome of a causal link between scientific breakthroughs and societal changes, micro impacts continuously occur in the interactions between research and throughout the research process, and facilitate an unexpected and unplanned effect. Budtz Pederson and Hvidtfeldt (2023) go on to say that it is these micro impacts (distinct events, communicative impulses, or material artifacts) that may eventually lead to macro level impact. It is these micro impacts that Dutch Universities of Applied Sciences would like to evaluate but it is the macro impacts that are most often referred to in research impact assessment literature and in the suggested indicators of the BKO.

This confirms that the evaluation field is in flux, with evolving metrics and criteria (Reed et al. 2021). While this vastness offers flexibility, it also brings ambiguity, especially when looking to standardize criteria across various research fields.

The Research

The research done by UASs has been referred to as, among other things, Applied, Triple Helix, Third Mission, Entrepreneurial, Mode 2 or Edison's Quadrant research (Bornmann 2012). The

[1] The term doorwerking will be used throughout this dissertation. While it is translated into English as 'effect', its acutal meaning is more nuanced and a better description of what Universities of Applied Sciences wish to evaluate.

literature does offer insights into evaluating the impact of Mode 2 research. The NAUAS's initial BKO stated that the research done by Dutch UASs can be considered Mode 2 research (NAUAS 2007). This theoretical framework initiated by Gibbon et al. (1994) in their book, *The New Production of Knowledge,* suggests that in addition to traditional, fundamental research (Mode 1 research), a new form of knowledge production is being created, i.e. Mode 2. Mode 2 research is described as transdisciplinary, heterogeneous, heterarchical and transient (Gibbon et al. 1994). Among other things, this knowledge production is generated within the context of applications and utilizes a broad range of theoretical perspectives to solve problems. The results of this are shared through formal channels and informal interactions with participants (Gibbon et al. 1994) which is solution-driven and context-specific, often engaging multiple stakeholders. Transdisciplinary research also finds mention, with its emphasis on transcending disciplinary boundaries (Gibbons et al. 1994). The term Mode 2 was specifically created by Gibbon et al. (1994) because terms such as 'applied', 'technological' or 'research and development' were insufficient to describe the research or knowledge production being done outside of traditional knowledge production (Gibbon et al. 1994).

The applicable, problem-solving nature of UAS research is also reflected in Stokes' Pasteur's Quadrants theory (1997). Stokes' theory of technological transfer suggests that knowledge production is composed of four quadrants. He describes three of these quadrants as categories of research: pure basic; use-inspired basic; and, pure applied research, to illustrate the three different ways in which knowledge is produced. There is no information regarding the fourth quadrant. Both the AWTI and the NAUAS have suggested that research undertaken by UASs falls into the "Edison" quadrant (de Weert and Leijnse 2010). This is characterized by pure applied research that seeks to solve a specific problem rather than to understand any broader scientific phenomena resulting from what is being discovered (Stokes 1997). However, it has been questioned as to wheather this accurately describes the research taking place at UASs (Kyvik 2012).

Gulbrandsen and Kyvik (2010) have said that while policy has used terms like 'basic' and 'applied', the differentiation between these two forms of research maintains the idea that research is a linear process. In fact, the heterogeneous nature of research makes definitions and concepts such as Mode 2 and Pasteur's quadrants insufficient in explaining the type of research occurring. Kyvik and Lepori (2010) suggest that the term used to refer to the research taking place at UASs is inconsequential. Be it Mode 2, design and development, practice-oriented research, design research, or applied research, the term 'research' at UASs has come to represent two distinct processes; a narrow interpretation for statistical purposes, and a broader one that describes the scholarly activities taking place. They conclude that what is important is that UASs participate in research activities 'to strengthen the scientific basis of professional practice' (Kyvik and Lepori 2010, 9), that 'the scientification of the knowledge core through the establishment of a research capability'(Kyvik and Lepori, 2010, 10) is required for professionalization, and should be part of UAS's core business to improve both education and professional practices as well as contribute to regional development (Kyvik and Lepori 2010). Gibbon et al. (1994) and Stoke's theories do not recognize the importance of the region and education in UAS research. Research that is initiated for the development of regional needs, and research that strives to improve education and professional practice are key to UAS research (Jongbloed 2010).

Brouns (2016) takes the contribution of the professional practice a step further in her explanation of research done by UASs. She prefers the term, Praktijkgebonden (Practice Related). She suggests this term reflects the non-linear nature of UAS research. Additionally, she argues it emphasizes the continued role of professional practice throughout the research cycle, and the valuable combining of the scientific knowledge of the researcher and these experiences. Regardless of its name or title, it can be argued that what is important is that the research contributes to the linkage of the KT.

The type of research being done in UASs in response to these challenges and problems is also not strictly basic/applied. As previously illustrated, the types of research being done by these institutions cannot be limited to a concise definition. Rather they are complex interactions between requests for problem solving from professional practice, and problem solving as a reaction to observed and experienced problems encountered by the researchers themselves.

It can be proposed that the research conducted by UAS is comparable to Carayannis and Campbell's (2009) concept of Mode 3 and Quadruple Helix Innovation Systems (Meister Broekema 2023). Mode 3 research builds on the traditional academic knowledge production of Mode 1 and the collaborative, transdisciplinary knowledge production of Mode 2. Adopting a systems analysis approach, Mode 3 emphasizes integrating diverse knowledge sources and contextualizing knowledge to address real-world problems, given the multi-layered, multimodal, and multimodel nature of knowledge production practice. Carayannis and Campbell (2009) expand on Etzkowitz and Leydesdorff's (1998, 2000) 'Triple Helix' by introducing a 'Quadruple Helix' model. This model not only involves collaboration between government, industry, and academia but also includes the active participation of civil society or the public. Emphasizing the importance of diverse stakeholders in fostering innovation, this model mirrors the dynamic interplay between various knowledge types in an ecosystem of partners and stakeholders, akin to the dynamics observed in UASs.

UASs Beyond the Netherlands

A research impact evaluation approach applicable to research conducted by UASs in the Netherlands can also be internationally applicable. Countries including Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Ireland, Lithuania, Norway, Portugal, Spain, Sweden, and Switzerland, all have a binary educational system with traditional universities and Universities of Applied Sciences (UAS4EUROPE 2017). While not homogeneous in execution, UAS4Europe, a network of European UASs working together to further professionalize UASs and their research, recognizes the following four criteria as the essence of UAS research:

- "Focus on practical applicability: research at a UAS focuses on practical innovative solutions for companies, governments, and societal organisations. More important than scientific publications in magazines or books, UASs primarily want to bring concrete solutions to the workplace.
- Demand driven and targeted research: through its close contact with the labour market, UAS education directly addresses and responds to a (future) demand from either the business world, organisations and/or government as applied research is demand driven and applied to changes within society.
- Collaborative and multidisciplinary research: UAS researchers and world actors work closely together with a view on building synergies most commonly found in collaborations or clusters with multiple companies or institutions, which are active in the same domain and complement each other (co-creation).
- Connected to education: applied research outcomes are brought back to, and used in the development of the curricula, in order to offer state of the art knowledge to students and make them reflective practitioners with the right set of skills for the labour market. " (UAS4EUROPE 2017, 8)

These pillars reflect the Knowledge Triangle of Research, Education and Professional Practice. Like so many other research institutions, the framework of the KT is of particular importance to Dutch UASs.

These ideas provide a foundation for understanding UAS research's collaborative and applied nature. Initial literature assessments suggest a growing need to tailor evaluation mechanisms to these distinctive research modes (Reed et al. 2021).

The Actual Evaluation

Research impact evaluations set out to determine if there is a causal relationship between research and positive or negative effects of research. They can take place along diverse scopes of time, social or special scales, and across realms of impact such as economic, environmental, health, or policy (Reed et al. 2021). They typically revolve around certain foundational components: the theoretical typologies of the evaluation; their underlying assumptions; the methodologies; and tools employed for the evaluation.

Several theoretical typologies for impact evaluation have been identified in the literature (Mostert 2008). A literature review conducted by Reed et al. (2021) has suggested that the purpose of the evaluation, be it external or internal in design are one of two ways in which impact evaluation frameworks can be categorized. The external evaluation or summative design, focuses on being held accountable through providing evidence of achievements and claims of impact. The internal or formative design, instead, focuses on taking responsibility for creating impact and monitoring, learning and adapting to ensure that evaluation takes place. The level of aggregation must also be taken into consideration. The impact can be evaluated at the level of Discipline, Institution, the Research group, the Research Line or Project Level (Mostert 2008). Also of importance, is when the evaluation takes place: Ex Ante (beginning before the research); Ex Post (following the research); or in Real-Time (throughout the research) (Budtz Pedersen, Følsgaard Grønvad and Hvidtfeld 2020).

Using these theoretical typologies as a starting point, models and frameworks for the evaluation of research impact are constructed out of different methodologies that aim to better understand the process of knowledge translation, implementation and impact creation within the context in which they take place. These different approaches make different assumptions about the purpose of research, how knowledge is produced, the role values play, and the mechanisms used to create and evaluate impact (Budtz Pedersen, Følsgaard Grønvad and Hvidtfeld 2020).

As indicated in Raftery et al. (2016), research impact evaluation approaches have five 'philosophical assumptions' on which the approach is based. Be it Positivist, Constructivist, Realist, Critical or Performative, specific assumptions are made regarding the links between research and impact, how knowledge is produced, its purpose, and its relevance, as well as the mechanism of impact, and how these things should then be evaluated (Greenhalgh et al. 2016, Penfield et al. 2014, Raftery et al. 2016, Budtz Pedersen, Følsgaard Grønvad and Hvidfeldt 2020). These assumptions act as the lens through which research is viewed and help to form and enhance the methods and tools used to evaluate its impact (Raftery et al. 2016). Table A.1 of the Appendix describes the various perspectives and assumptions held when evaluating research impacts as discussed by Raftery et al. (2016) and visualized by Greenhalgh et al. (2016).

Beyond the philosophical assumptions, Reed et al. (2021) have used Grounded Theory Analysis to identify five types of research impact evaluations clustered around frameworks, methods and approaches found in research impact evaluation literature. These types include experimental and statistical methods, systems analysis methods, textual, oral and art-based methods, indicator based approaches, and evidence synthesis approaches. Table A.2 of the Appendix presents the types of research impact evaluations and the examples of commonly used methods and approaches, including examples of diverse frameworks that fall under these types. The first three types include related evaluation methods whereas the last two types include the related approaches.

Different frameworks focus on different aspects of impact and in so doing require different methods and tools to accomplish this. A literature review conducted by Budtz Pedersen, Følsgaard Grønvad and Hvidtfeld (2020) has identified the most common tools used in research impact evaluation frameworks be they qualitative or quantitative. Table A.3 of the Appendix identifies these tools and provides a summary of their purpose. These tools include case studies (narrative approaches), surveys, peer review, Impact plans, theory of change and logic models, stakeholder/user evaluations, and many more options (Budtz Pedersen, Følsgaard Grønvad and Hvidtfeld 2020).

In a study into research impact conducted by Greenhalgh et al. (2016), it has been suggested that the most commonly used tools in many current evaluation methodologies include:

- A logic framework: This allows for a visualisation of the input activities and output and outcomes of impact (Greenhalgh et al. 2016). The presence of a logic model almost exclusively correlates to methodologies with a positivist philosophical assumption (Raftery et al. 2016);
- Case studies: Case studies aid in explaining the process and interactions that come as a result of knowledge production impacting society; and

- A narrative: Narratives are often required to help explain the feedback loops and non-linear nature of impact as well as why certain outcomes expected to make impact fail (Greenhalgh et al. 2016).

Interviews, surveys and document analysis are also used with frequency to apply the logic model (Raftery et al. 2016). Raftery et al suggests that the frameworks and methods used are influenced by the aim of the evaluation (Raftery et al. 2016). Guthrie et al. (2013) take this further by saying that the current tools used for evaluation fall into two categories based on what they wish to accomplish. One set of tools are those required to create "formative, flexible tools able to deal with cross-disciplinary and multidisciplinary assessments" (Guthrie et al. 2013, 9). The second set of tools are those required for creating an evaluation that is "scalable, quantitative, transparent, comparable, free from judgement, and suitable for high frequency, longitudinal use" (Guthrie et al. 2013, 9). In order to create a framework that incorporates these two options, two or more complimentary tools are required (Guthrie et al. 2013). (Two tools that fall outside either of these groupings are data visualization and logic models (Guthrie et al. 2013).) Table A.4 of the Appendix lays out the commonly used tools for research evaluation, including societal impact, as discussed by Guthrie et al. (2013, 9).

What is clear from each of these literature reviews is that one must be aware of the following 5 W's before proceeding:

⇒ Who are we evaluating? Researcher, research group, institution?
⇒ Why are we evaluating? Summative verses formative?
⇒ When are we evaluating? Ex-ante, ex-post, real-time?
⇒ What are we evaluating?
⇒ How are we evaluating?

The "what" and the "how" go hand in hand and are in many ways dependent on each other. It is the "what", the definitions of impact, the context of research, the process of knowledge production that influences the way in which research impact evaluation takes place and the "how" required for doing it. In order for the "how" to be effective, there needs to be an understanding of what is being evaluated as well as the details of how the tools and frameworks function and are constructed to ensure that what is desired can be accomplished with the chosen 'how". Numerous frameworks exist for research impact evaluation, each originating from distinct paradigms and making use of these tools. The various literature reviews suggest that the "how " should always be a combination of qualitative and quantitative data to provide a robust evaluation that takes multiple perspectives into account to facilitate responsible research and innovation.

In order to evaluate the research impact created by UASs we must first understand what we are evaluating and be able to answer the other 5 W's before being able to decipher the "how" of this evaluation. It is essential that we know what we are striving to evaluate and take careful consideration in understanding the purpose of the tools and possible frameworks best suited for the job. The challenge then lies not only in deciphering and understanding the vast existing knowledge but also in innovatively tailoring it to the unique characteristics of Universities of Applied Sciences. To date this has not yet been done. This is the crux of this dissertation.

THE UNDISCOVERED TERRAIN OF UAS RESEARCH EVALUATION

The academic landscape of research evaluation is vast and varied, with much knowledge accumulated over the years. However, specific areas remain uncharted, especially when navigating the unique context of UASs.

The most evident omission in the literature is the lack of studies explicitly focused on evaluating the impact of research conducted by UAS. While a plethora of articles dive into the intricacies of evaluating research impact for general universities, UAS remains conspicuously absent from the discourse. This gap underscores a critical need for dedicated studies in this niche area.

Understanding research in UAS is paramount because of its distinctive nature. Drawing inspiration from models like Pasteur's Quadrant, Mode 2 and 3 research and transformative innovation, one can discern that UAS research straddles the line between pure and applied research. Unlike traditional 'ivory tower' universities that often function in theoretical realms, UAS takes a grounded approach. It not only implements established theories to solve real-world problems but also collaboratively engages stakeholders from inception to conclusion. This direct application to societal issues and multidisciplinary lens differentiates UAS from its counterparts.

Research impact evaluation, by its very nature, is context-sensitive (Budtz Pedersen, Følsgaard Grønvad and Hvidtfeld 2020, Reed et al. 2021). Yet, most UAS have looked towards traditional universities for evaluation guidance. This emulation might lead to incongruities since the contexts are distinctly different. Traditional university research often occurs in isolation from societal applications, while UAS research is deeply entrenched in practicalities. Applying a one-size-fits-all evaluation approach might therefore not do justice to the unique contributions and challenges of UAS research.

Given these observations, several questions arise. Specifically, what are the requirements for evaluating the research impact created by Dutch UAS research? How can these be applied within the context of the goals of Dutch UASs? This dissertation investigated these questions in detail.

In conclusion, the current state of academic knowledge about research evaluation casts a wide net but seems to miss the peculiarities of Universities of Applied Sciences. Addressing this gap is not just an academic exercise but is crucial to ensuring that the value and impact of UAS research are assessed appropriately, giving due credit to its distinctive contributions to academia and society.

THIS DISSERTATION ON UAS RESEARCH IMPACT EVALUATION

The journey through this dissertation is divided into two interconnected parts; identifying the rules, and exploring how the rules can be implemented within the specific context of the Dutch UAS research and policy.

Chapter Two presents a comprehensive literature review aimed at identifying the rules for UAS research impact evaluation. There is a clear deficit in the literature: the absence of a theoretically grounded method for evaluating the impact of UAS research. Much of the existing knowledge on research impact evaluation appears to be more oriented towards conventional universities. This chapter identifies recommendations based on a thorough assessment of diverse research methodologies presented in the impact literature. The foundational concepts, or rules including the need for formative, real-time evaluations, the significance of the realist and performative assumptions, the need for co-creation in evaluation and the debated relevance of logic models offer important insights for future UAS impact evaluation.

Part of the strength of this dissertation lies in its application and testing of these above-mentioned rules. By critically analysing the current evaluation tools, juxtaposing them with the actual desires of UASs, and field-testing new evaluation methods, this work offers the start of a tangible alternative for a more accurate, context-specific means of evaluation. This is the role of Chapters Three, Four and Five where the results of Chapter Two are used to assess what takes place in practice and how this stands up against what we have discovered to be the recommendations for evaluating the impact created by UAS research. Through the use of Principle Component Analysis, specifically Factor Analysis, conducted on questionnaire results, Chapter Three examines the inner working of the research group by making use of the ‘basic indicators’ of the BKO to examine the roles and functions of the research group members. Making use of questionnaire and workshop results, Chapter Four examines the desired impacts of UAS researchers and the outputs they create to facilitate this impact. By doing so we hope to provide a better understanding into not only what impact researchers want to create and what output they produce but also whether the BKO provides the correct tools for evaluating the impact of UAS research. Chapter Five presents a case study in which one of the frameworks that follows several of the recommendations is tested. In this chapter we use Contribution Mapping to follow the actors, activities, outputs, and alignment efforts in a UAS project to help identify contributions to doorwerking.

This dissertation strives to provide scientifically grounded recommendations about UAS research impact and its evaluation for those associated with a University of Applied Sciences, be it as a researcher, administrator, or policy-maker. It provides the tools and knowledge required to ensure that the research impact of UAS research is recognized, celebrated, and most importantly, accurately evaluated. After all, accurate evaluation is not just about validation; it’s about refining our practices and ensuring that our research genuinely makes a difference in the real world. Transparency in research impact evaluation is not just a fiscal responsibility; it is a testament to the value that Universities of Applied Sciences bring to the table. By accurately evaluating and showcasing the impact of UAS research, we can demystify the academic process for stakeholders and the public alike. It ensures that the knowledge generated is not just housed within academic silos but is actively contributing to societal betterment.

Furthermore, as traditional universities and Universities of Applied Sciences take on new forms and formats, there is a growing need to establish the uniqueness and importance of the latter. UAS research, with its practical orientation, bridges the gap between theoretical knowledge and real-world application. By accurately evaluating and emphasizing this aspect, UAS can position themselves as essential contributors to practical solutions for contemporary challenges.

A clear, robust evaluation system also benefits the research of UASs. It gives a structure to align their efforts, ensuring that they not only create tangible outcomes in the communities they serve but also contribute to the academic discourse. In an age where accountability and real-world impact are emphasized, having a sound evaluation system in place for UAS research is no longer a luxury; it is a necessity. This process contributes to making the impact of UAS research visible and aids in bettering the impact on society in the future. In doing so, it reaffirms the value and significance of Universities of Applied Sciences in today's academic and societal landscape. Let us get started and find out what these rules are for evaluating the research impact of Universities of Applies Sciences.

CHAPTER 2

TOWARDS EVALUATING THE RESEARCH IMPACT MADE BY UNIVERSITIES OF APPLIED SCIENCES

ABSTRACT

Given the mandate of Universities of Applied Sciences (UASs) to create an impact on society, the evaluation of their research impact is of great importance. And yet, the methodology for evaluating this impact appear less explicitly in research literature than other forms of research. The purpose of this article is to present a literature-based analysis to discover from the complex world of existing theories and frameworks what criteria, assumptions and requirements are relevant for evaluating the impact of applied research. This paper will also discuss the relevancy of frameworks currently used for research impact evaluation and the potential they have for operationalising, enriching and supporting the current national evaluation framework used by Dutch UASs. Finally, this article will conclude that the recommendations necessitate the creation of a new framework where the context and process of practice-based research and their stakeholders are included.

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INTRODUCTION

A binary higher educational system is one in which a distinction is made between academic universities and other higher educational institutions (Kyvik and Lepori 2010). Several European countries including the Netherlands maintain this system known by names such as Technikons, polytechnics, Fachhochschulen and hogescholen. These Universities of Applied Sciences (UASs) deliver a highly trained workforce that is innovative and knowledgeable about research that supports or enhances innovation (Jongbloed 2010). They fulfill the triple role of a UAS which is to: educate; connect to industry and society; and do research that facilitates these endeavours (Kyvik and Lepori 2010).

The nature of research conducted by Universities of Applied Sciences, applied oriented and practice based, often differs from research done at traditional Universities (Kyvik and Lepori 2010). The requirements for evaluating the societal impact of this type of research may, therefore, also differ. Given the nature of applied sciences, to conduct problem-oriented research that originated in society, and the mandate of UASs to create an impact on society, the evaluation of research impact is perhaps more important for the applied sciences (Kyvik and Lepori 2010). Yet how the evaluation of such research should be accomplished appears less explicitly in literature. As a recent article by David Budtz Pedersen, Jonas Følsgaard Grønvad, and Rolf Hvidtfeldt (2020) illustrates, there is a wealth of frameworks, theoretical assumptions, contexts for research impact evaluation but what is required and applicable to the research done by UASs is less well recognized.

The purpose of this article is to present a literature-based analysis to discover from the complex world of theories and frameworks what criteria, assumptions and requirements are relevant for evaluating the impact of applied research. This paper will also discuss the relevancy of currently used frameworks for research impact evaluation and the potential they have for operationalizing, enriching and supporting the current national evaluation framework used by the Netherlands Association of Universities of Applied Sciences (NAUAS) known as the *Branchprotocol Kwaliteitzorg Onderzoek* 2016-2022 (BKO). Based on the analysis, this article will include recommendations necessary for creating a framework suitable for evaluating practice-based research at Universities of Applied Sciences.

While scholarly research in Dutch Universities of Applied Sciences has been a part of their mandate for less than 20 years (van Gageldonk 2017) the purpose of its research is clear. Since their inception, the role of a UAS has been to influence the world by training future generations to improve, innovate and enhance the development of professions and society (van Gageldonk 2017). This original goal of training students for real-world professions rendered the function of conducting research secondary to the development of training capacities. The emphasis was on teaching students the newest techniques and theories that they could then apply to the professions for which they are trained (van Gageldonk 2017). In the last two decades, however, there has been a transition within Dutch UASs as research has been elevated to an accepted component of its core functions in combination with teaching (de Weert and Beerkens-Soo 2009).

UAS research then is to focus on practical applicability, be demand driven and applied to changes within society, be collaborative and multidisciplinary, and, connect to education by incorporating the results into curricula (UAS4Europa 2017). This is accomplished in two ways: through research that is initiated for the development of regional needs; and, through research that strives to improve education and professional practice. By doing so, UASs return to their initial mandate, that is, to educate students for professional careers (Kyvik and Lepori 2010).

These characteristics of University of Applied Sciences research fit into what Gibbon and colleagues' call Mode 2 research (Gibbon et al. 1994; de Weert and Leijnse 2010) as well as Stokes' Pasteur's Quadrant where applied science is recognized as Edison's Quadrants (Stokes 1997; Kyvik and Lepori 2010).

The Policy

In its publication '*Onderzoek met Impact*' (2016) ('Research with Impact'), the NAUAS outlined a strategic agenda for its 2016-2020 research program. This document describes the ten areas of society in which Dutch UASs aim to collectively have impact. Reflecting both the European Commission's Grand Challenges and the United Nations' Sustainable Development Goals, these areas include: Health and Vitality; Education and Talent Development; Resilient Society in Community, City and Region; Smart Technology and Materials; The Built Environment: Sustainable and Liveable ; Sustainable Transport and Intelligent Logistic; Sustainable Agriculture; Water and Food Supply; Energy and Energy Supply; Art and Creative Industries; and Responsible and Innovative Business (NAUAS 2015).

The intent of the 'Research with Impact' document clearly illustrates the NAUAS's increased concern with impacting society through UAS research. In a follow up publication, '*Meer Waarde in het hbo*' (2018) ('More Value in Higher Professional Education') the NAUAS states the need for an evaluation and monitoring framework that would recognize the impact of research done by Dutch UASs. Such a framework would enable the NAUAS and the UASs they represent to evaluate the extent to which they are fulfilling their impact responsibility (Franken et al. 2018). It would also help to determine if a differentiation exists between policy and practice. This document does not, however, include a means of evaluating the success of the research in impacting society but rather requests that an appropriate evaluation and monitoring framework with practical applicability be found or created (Franken et al. 2018). This underlines the necessity and immediacy of developing such a framework.

The BKO

Dutch UASs are not completely without evaluation. The national evaluation framework currently used, *Branchprotocol Kwalitietzorg Onderzoek* 2016-2022 (BKO), is an ex-post general evaluation approach used to provide the NAUAS with an all-encompassing evaluation of a *lectoraat* (research group) (van Drooge 2016). The NAUAS refers to it as '*Kwaliteitszorgstelsel*' (quality assurance system) for the maintenance and bettering of the quality of practice-based research; how it is organized, and the organizations supporting it (NAUAS 2015). The current version spans from 2016 to 2022 and is the second version (van Gageldonk 2017). It was developed in parallel with the well-known SEP protocol (KNAW, VSNU, NWO 2016). It consists of five criteria: research group vision and indicators to express this; organization of the group including people power, finances, internal/external partnerships, networks and relationships; research quality; relevance and impact on: Professional ractice and society, Education and professionalization, knowledge development within the Research domain; regular and systematic evaluation of research process and results. This evaluation takes place every six years and includes experts, peers and stakeholders in the evaluation committee. These evaluations are not centrally archived nor are they openly shared.

According to the BKO the evaluation of relevance and impact on professional practice and society, education and professionalization, and knowledge development within the Research domain, UASs are asked to choose indicators that reflect the following three components of practice based research: research contributes practical knowledge for the professional field and society at large and thereby contributes to innovation; research contributes practical knowledge whereby UAS's education remains current and the professionalization of teacher; research contributes to knowledge development. While examples of indicators are given, UASs are responsible for selecting their own. At this time, a critical reflection (narrative) including strong and weak points/characteristics, measures taken for improvement in accordance with the previous evaluation, introduction and accountability for the self-reflection with respect to approach, method, stakeholders and a conclusion on strengths weakness, improvement measures, priorities for the future is requested of the evaluated research group. This critical reflection can also be used to support qualitative indicators where use and impact are included. (For monitoring purposes, UASs are required to annually report on research budget and personnel to the NAUAS.) While adjusted for UAS implementation, the SEP protocol served as the starting point for the BKO and mirrors its format (KNAW, VSNU, NWO 2016).

The current agenda of the NAUAS states that creating impact in society in ten research themes is its priority but is not explicit on how to accomplish this. The BKO contains components often used in a research impact evaluation framework (indicators, narrative) but is far broader than an impact evaluation framework. While stating that context matters, it is not explicit, and there is little guidance in the operationalization. UASs of the Netherlands require an impact evaluation framework that provides a solid evaluation of the impact their research projects are generating that supports the ex-post BKO evaluations of research groups occurring every 6 years. The question then arises as to how can societal impacts be evaluated in the context of the goals of UASs? What is required to accomplish this? And what has already been done that can be applied to evaluating the societal impact of research done by UASs? The following section sets out the theoretical requirements for reaching these goals.

THEORETICAL REQUIREMENTS FOR EVALUATING THE RESEARCH IMPACT OF UAS RESEARCH

Recommended Philosophical Assumptions

The need to accurately and comprehensively evaluate the societal impact of research is not strictly a UAS problem - it is a very relevant problem for all institutions participating in research similar to the UASs (Bölling and Eriksson 2016). This research is referred to, among other things as, Applied, Triple Helix, Third Mission, Entrepreneurial, Mode 2 or Edison's Quadrant research (Bornmann 2012). In addition, it can overlap with research conducted by traditional universities (de Weert 2011). Nevertheless, pinpointing the specific requirements for evaluating the societal impact of research done by UASs has proven difficult. Raftery and colleagues address this issue directly in their systematic review where they state that evaluating the research impact of Mode 2 research is best suited to a methodology created from a *realist or performative philosophical assumption* (Raftery et al. 2016)**.**

Often an evaluation approach is based on 'philosophical assumptions' made regarding the links between research and societal impact. They include assumptions about 'the nature of research knowledge, the purpose of research, the definition of research quality, the role of values in research and its implementation, the mechanisms by which impact is achieved, and the implications for how impact is measured' (Greenhalgh et al. 2016: 2). These assumptions relate to the area of research and help to form and enhance the methods and tools used. These philosophical assumptions include positivist, constructivist, critical, performative and realist assumptions (Raftery et al. 2016).

Recommendation One: Realist Evaluation

According to Raftery and colleagues, an impact evaluation done from a realist philosophical assumption must consider the different means through which knowledge is taken up and research is used, based on a Context-Mechanism-Output-Impact configuration. Within this realist evaluation, frameworks with a realist philosophical assumption consider the mechanism through which the impact is made and make common assumptions about what works for whom under what conditions (Raftery et al. 2016). Initially introduced by Pawson and Tilly, realist evaluation suggests that research creates output only in so far as they introduce appropriate ideas and opportunities (mechanisms) in the appropriate settings (context) (Pawson and Tilley 1997). Realist evaluation 'elaborates how mechanisms could work in a given context and asks the people who could know about it to provide evidence' (Stame 2004: 62). The presupposed mechanism for impact with a realist philosophical assumption is the interaction between the people involved and the resources available for the implementation of findings (Greenhalgh et al. 2016).

Raftery and colleagues' recommendation of a context driven methodology is of particular importance for research done by UASs. Context determines the operationalization of the concept of societal impact, and, thus, context is essential for creating an applicable evaluation approach. In order to understand the context-mechanism-output, realist evaluation requires the contribution of the 'people who know' (Stame 2004: 62). It is assumed in a realist evaluation that the mechanism through which impact is achieved is the interaction between the reasoning of policy makers and practitioners, and the resources available for implementing the findings (Raftery et al. 2016). The stakeholders, in their various forms, who contribute to UAS research, must, therefore, be a part of the evaluation process.

Recommendation Two: Performative Assumption

Raftery and colleagues (2016) also suggest that *performative assumption* is possible. According to Greenhalgh and colleagues (2016), a performative assumption relies on Actor-Network Theory to focus on the connection established between people and technology that lead to the creation of new entities. In order for research to have an impact, a realignment of actors, human or technological, must occur. Thus, a societal impact evaluation with a performative assumption must 'focus on the changing actor scenario and how this gets stabilized in the network' (Greenhalgh et al. 2016: 3). Frameworks from this philosophical assumption assume impact mechanisms are changes in the actor-networks that occur through the creation of new configurations between actors. These changes come about as a result of both formal and informal interactions. Societal impact evaluations based on a performative assumption thus take the process of impact creation into account and attempt to map these interactions and changes (Raftery et al. 2016).

Recommendation Three: Co-production Model

Raftery and colleagues suggest that an impact evaluation from a performative assumption should be accompanied by a co-production model (2016). They go so far as to say that it can in fact be referred to as a co-production model (Raftery et al. 2016). Initiated in the 1970s by Elinor Ostrom, co-production models stress the need for contribution from stakeholders throughout the creation process including planning, designing, delivering, and auditing of the service (Boyle, Clarke and Burns 2006). Further, there is an expectation that through their contribution to the creation of the service, in this case, the evaluation, stakeholder contribution will create synergy between the various people and groups involved (Brandsen and Pestoff 2006). The use of a co-production model also assumes a long-term perspective for the results. Creation of a co-production model often results in stakeholders experiencing a shared responsibility for the outcomes. A true co-production model results in a shift in power whereby the stakeholders take the lead from the evaluator and take responsibility for the outcome (Bovaird 2007). Ramaswamy and Ozcan (2014) have suggested, in order for this to occur, stakeholders must see the value of the process and outcome. This is best created by focusing on the stakeholder experiences and giving stakeholders the opportunity to interact with each other face to face.

However, recent work by Oliver, Kothari and Mays (2019) suggests that although this type of research practice is often recommended, it is not without its challenges. Co-production requires personal interaction and all the inherent challenges that human nature brings. These challenges include disagreements within the stakeholder groups, pressure to produce certain outcomes or omit certain results, and being 'too helpful' with analysis and resources, thus creating the potential for bias and other scientifically questionable results. Each of these challenges results in costs, be it financial, temporal, relational, reputational or ethical. Therefore, the advantages and disadvantages should be weighed before embarking on this type of process (Oliver, Kothari and Mays 2019). Nevertheless, because of stakeholder inclusion, the results of co-production research are often ready for implementation earlier than other models because needs, capacities and priorities have already been taken into account (Oliver, Kothari and Mays 2019). The effect created by including the stakeholders in the process suggests that the very nature of the recommended methods for creating a usable evaluation approach for Mode 2 research initiates the adoption process (Adam et al.2018).

Recommendations Four and Five: Formative and 'Real-Time' Evaluation

The recommendation of a co-production model is further supported by recent work done by van Drooge and Spaapen (2017). They suggest, like Raftery and colleagues, that Mode 2 research should involve formative evaluation. They also suggest that trans-disciplinary research requires formative evaluation 'where learning is the prime motive for evaluation, the focus is on the variegated context in which research and innovation takes place' (van Drooge and Spaapen 2017: 2). They, too, stress the need for context of application to be considered when evaluating Mode 2 research, as well as stakeholder inclusion to create a joint responsibility between participants where 'mutual learning and improving the research effort' is central for improving the research impact of Mode 2 research (van Drooge and Spaapen 2017: 6). By using a bottom-up approach, accountability for impacting society is no longer something to be assessed through ex post means - it is assumed. Because society has been included in the research, the question becomes not if society has been impacted but how society has been impacted and how it can be further impacted in the future (van Drooge and Spaapen 2017).

Raftery and colleagues state that an impact evaluation of Mode 2 research should be formative and in 'real-time', and, take the 'messy, unpredictable and evolving interaction' into account (Raftery et al. 2016). In the RAND publication, 'Measuring research: A guide to research evaluation frameworks and tools', Guthrie and colleagues agree with this, suggesting that formative evaluation complements the characteristics of Mode 2 research (Guthrie et al. 2013).

More specifically, Guthrie and colleagues (2013) state that a formative societal impact evaluation of cross or multidisciplinary research should utilize case studies, document review and peer-review as tools for accomplishing this. Raftery and colleagues (2016) also state that in-depth case studies are required for understanding the shifting nature of applied sciences. According to Greenhagh and colleagues (2016), current evaluation frameworks for evaluating societal impact frequently consist of three parts: case studies for explaining the process and interactions that come as a result of knowledge production impacting society; a narrative required for explaining the feedback loops and non-linear nature of impact, as well as why certain outcomes expected to make impact fail; and a logic model which is a visualization of the input activities and output and outcomes of impact (Greenhalgh et al. 2016).

The authors of these publications appear to agree that the requirements for evaluating the societal impact of research done by UASs are formative, real-time evaluation, where stakeholders are included to create a bottom-up approach for research. They also agree on the use of the case study as a tool for formative research evaluation. However, these experts do not necessarily agree on the use of a logic model.

Recommendation Six: Logic models

Guthrie and colleagues (2013) present a neutral stance on the subject of logic models. They suggest that the logic model, like data visualization, is a tool that can be used for any type of societal impact evaluation. Raftery and colleagues (2016), however, are quite passionate about the use of a logic model. They suggest that many evaluation frameworks utilize a positivist logic model as one of their tools to illustrate how:

> 'causal connections in the temporal sequence of inputs (research funding), process (execution of discrete projects or programmes of research, usually following a predefined protocol), outputs (e.g. publications and presentations) and outcomes (impacts on end-users of research), the study of knowledge production has emphasised the non-linearity, messiness and unpredictability of the collaborative knowledge production process' (Raftery 2016: 59).

However, the 'collaborative knowledge production process' in Mode 2 knowledge production is created through application (Raftery et al. 2016: 59). Raftery and colleagues (2016) suggest that an approach including a logic model is inadequate for Mode 2 research because of the complex levels of interactions that occur in Mode 2 research. This study goes on to say that most Mode 1 research can be effectively evaluated with a logic model but that attempting to squeeze Mode 2 research into these types of frameworks does not do it justice. They further suggest that a logic model is in fact a tool primarily utilized by evaluations with a positivist philosophical assumption where knowledge is seen as fixed and stable (Greenhalgh et al. 2016). Thus, the presence of a logic model in a framework implies it is not suitable for evaluating the research impact of Mode 2 research.

Based on these considerations, it can then be suggested that the recommendations for requirements when evaluating research done by UASs include:

- a realist philosophical assumption where evaluation is based on context-mechanism-output, or;
- a performative philosophical assumption in which knowledge is a process; and
- a co-production model; and
- a focus on formative, 'real-time' evaluation; and,
- no reliance on an existing logic model.

What Existing Methods can be Applied to Evaluating the Impact of Applied Research?

It is against this backdrop of requirements that current models can be reviewed for applicability. Recent work by Adam and colleagues (2018) suggests that the use of a conceptual framework is important for the simplification of research impact evaluation. Frameworks also increase comparability and communication over the results. The use of a framework also assists in addressing hurdles frequently encountered when striving to evaluate impact. These methodological issues include 'attribution (assigning the right impact to a specific piece of research or vice versa), time-lag (determining the time for impact and the right timing to engage in research impact assessment) and the counterfactual (examining what would have happened if the given piece of research did not occur)' (Adam et al. 2018: 9). Table 2.1 provides an overview of established frameworks and assesses how suitable they are for evaluating the research impact of UASs according to the requirements stated earlier.

Main Framework	Derivative Framework	Co-production model	Philosophical assumption	Formative/ Summative	Ex Ante/Ex post/Real - time	Logic model
Payback	Payback (Buxton and Hanney 1996).		Positivist	Summative	Ex post	✓ (Raftery et al. 2016; Greenhalgh et al. 2016)
	CAHS (Canadian Academy of Health Sciences 2009)		Positivist	Summative	Ex post	✓ (Raftery et al. 2016); (Greenhalgh et al. 2016)
	RIF (Kuruvilla et al. 2006; Kuruvilla et al. 2007)		Positivist	Summative	Ex post	✓ (Raftery et al. 2016; Greenhalgh et al. 2016)
SIA	ERiC (van Drooge 2007; ERiC 2010)		Performative and Constructivist		Ex Ante or Expost	
	SIAMPI (Spaapen, et al.)		Performative and Constructivist	Formative or Summative (Penfield et al. 2014)	Ex Ante or Expost	
	Waardevol (van Drooge et al. 2011)		Performative and Constructivist			
Monetisation (Raftery et al. 2016); Greenhalgh et al. 2016)						✓(Raftery et al. 2016; Greenhalgh et al. 2016)
REF (HEFCE 2012)						
Contribution Mapping (Kok and Schuit 2012)			Performative	Summative of Formative	Real-time	
ASIRPA (Joly et al. 2015)			Realist	Formative	Ex Post	
PIPA (van Droog and Spaapen 2017)		Co-production	Realist and Performative	Formative	Real-time	✓(van Drooge and Spappen 2017)
PRO (van Beest, Baljé and Andriessen 2017)						✓ (van Beest, Baljé and Andriessen 2017)

Table 2.1: Overview of the Suitability of Established Frameworks

Comparison of Frameworks for UAS Research

In a study comparing research impact frameworks conducted by Greenhalgh and colleagues (2016), more than 20 existing models and frameworks for research impact evaluation were referenced. Of those original 20, six approaches were repeatedly referenced. These include the Payback Framework and two of its derivatives, Research Impact Framework (RIF) and Canadian Academy of Health Science Framework (CAHS). The Payback Framework has been used as a starting point for more than 40 other approaches for evaluation but in addition to Payback itself, RIF and CAHS are the most frequently cited (Raftery et al. 2016). Also included are Monetisation, the UK Research Excellence Framework (REF), and, Societal Impact Assessment (SIA). Two well known frameworks ERiC and SIAMPI fall under the heading of SIA. Several of the same authors were involved in a little-known Dutch research evaluation guideline known as Waardevol (Valuable) (van Drooge et al. 2011). This too falls under the heading of SIA.

Greenhalgh and colleagues (2016) suggest that as a consequence of their consistent reference, international influence, and impact on policy, the above mentioned six approaches, Payback, RIF, CAHS, Monetisation frameworks, REF and SIA can be considered established approaches for measuring research impact. Because of its innovation, Contribution Mapping introduced by Kok and Schuit was also included in their study. Not viewed as an established framework, this approach can be seen as a variation on SIA with different authors and a noticeable shift of philosophical assumption (Greenhalgh et al. 2016).

Also included above is the ASIRPA framework. This framework was developed in the context of an agricultural impact project to develop an international methodological standard for assessing societal impact (Joly et al. 2015). There is currently no evaluation model available for or from UASs themselves, other than the general BKO. However, based on the Technology Readiness Levels model, the Praktijkgereedheid van Onderzoek (Practical Readiness of Research) (PRO) model by van Beest, Baljé and Andriessen (2017) strives to provide researchers with a tool that can be used regardless of the research theme. While it appears as a logic model, the PRO-Model strives to aid in: identifying research goals and connected activities to be pursued in this project; assessing which research activities are to be left for others; and, identifying in which order previously selected goals are to be pursued for the creation of change. This approach encourages discussion over the practical relevancy and methodological grounding of UAS research (van Beest, Baljé and Andriessen 2017: 53). For the sake of completeness, the PRO-Model has been included in the comparison presented in Table 2.1. Finally, the evaluation and monitoring system PIPA as executed by van Drooge and Spaapen has also been included (van Drooge and Spaapen 2017). This process driven evaluation and monitory system strives to evaluate the societal impact of transdisciplinary research.

What Fits?

It can be concluded from the above table that there is no perfect fit between the established frameworks and the proposed requirements for evaluating the societal impact of research done by UASs. The majority of the described approaches are created from positivist and constructivist assumptions (Raftery et al. 2016). None of the established examples mentioned are co-production and many of them are summative instead of formative. Also, many of these established frameworks utilize a preconceived positivist logic model as one of their tools (Greenhalgh et al. 2016) that does not take the nature of Mode 2 research into account (Raftery et al. 2016). However, as Table 2.1 also indicates, there are three frameworks that fulfill parts of the recommended requirements that can act as possible starting places. These include ASIRPA, Contribution Mapping, and the PIPA evaluation and monitoring system from van Drooge and Spaapen.

Although increasing in number, examples of realist evaluations, and co-production in impact evaluation are few (Raftery et al. 2016). ASIPRA is a theory-based realist evaluation that makes use of contribution and productive interaction to help assess long-term impact (Joly et al. 2015). While creating it, the authors also took Payback, the most cited framework to date (Greenhalgh et al. 2016), into account (Joly et al. 2015). What makes ASIRPA stand out is its attempt to create a useable framework in practice through the use of standardized case studies that combine quantitative and qualitative methodologies that can be used over a range of disciplines, are comparable, and can be aggregated (Joly et al. 2015). Stressing the need for context-mechanism-impact, this framework utilizes a set of tools including chronology and vector of impacts. It uses Participatory Impact Pathways Analysis (PIPA) first introduced by the Consultative Group on International Agricultural Research (CGIAR) that stress the non-linearity of impact and the need for stakeholder contribution to the generation of impact. However, ASIRPA is currently an ex-post framework and falls short in the real-time and co-production areas. Although stakeholders are interviewed, and networks and stakeholders are taken into account, there is no concrete co-production component to this framework. The inclusion of stakeholders from the onset in the creation of the evaluation process is essential for creating an approach that can be used for the applied sciences (Greenhalgh et al. 2017). ASIRPA will need to be modified to real-time and be more of a co-production model in order to be fully useable for UAS research use.

Kok and Schuit's (2012) Contribution Mapping also fulfills several of the requirements previously identified. This is clearly a performative, real-time, formative evaluation based on actor-network theory. It focuses on contribution to impact rather than the attribution of the ultimate impact of the research. It uses structured interviews with stakeholders in in-depth case studies to 'map research-related contributions and relate these contributions to alignment efforts' (Kok and Schuit 2012: 2). This three-phase mapping framework focuses on activities and what they refer to as 'alignment efforts' of 'linked actors' and 'key users' that ultimately contribute to the impact of research (Kok and Schuit 2012). By doing so it focuses on process and strives to create 'an account of how the network of actors and artefacts shifts and stabilizes (or not)' (Greenhalgh et al. 2016, 11). Although it identifies linked actors and key users, their contribution to the evaluation is limited. The inclusion of stakeholder interviews introduces a co-production component, but like ASIRPA, there is a very limited use of stakeholder contribution and thus, a limited concrete co-production component.

Van Drooge and Spaapen's (2017) approach, however, has a very intense co-production component. This approach fulfills the real-time, formative, co-production model requirements from a clear realist perspective. Taking the co-production model a step further than Kok and Schuit, van Drooge and Spaapen (2017) state that stakeholders and evaluators should, in fact, work together to create what they refer to as a logic framework. Using the same impact pathways (PIPA) initiated by the CGIAR mentioned earlier by ASIRPA as a starting point, van Drooge and Spaapen (2017) state that when evaluating transdisciplinary research, a realist 'theory of change' is required. Written as a narrative and taking stakeholders expectations, assumptions, needs and requirements into account this 'theory of change' aims to explain the logical steps, or 'pathways' towards a desired ultimate impact. These are set into a logical framework based on 'inputs, outputs, outcomes and impacts' (van Drooge and Spaapen 2017). From there, the theory of change is strengthened through discussion of possible relationships between the components of the logic framework as well as the 'causal assumption' required to reach the end impacts. By doing this, van Drooge and Spaapen (2017) believe that a 'theory of change opens up this linear narrative and it allows for different contributions coming from different angles in society to participate in the debate about how to achieve a particular desired change' (van Drooge and Spaapen 2017: 50). This appears then to take the 'collaborative knowledge production process' into account as well as the non-linearity stressed by Raftery and colleagues (2016). However, this proposed work process is extremely time consuming and consequently not necessarily feasible for regular use (van Drooge and Spaapen 2017).

A Critical Reflection on the Proposed Requirements

Is it then the use of an existing logic model that is the issue rather than one created with stakeholders? Is Raftery and colleague's objection to a logic model in fact an objection to an existing logic model? It appears that a logic model created through co-production may be able to bring the various layers and messiness of Mode 2 research into view. However, it may also bring with it the same preconceptions that occur with the use of an existing logic model. Raftery and colleagues (2016) also state that the presence of a logic model correlates to methodologies with a positivist philosophical assumption which is not appropriate for Mode 2 research (Raftery et al. 2016). Given this discrepancy, it is preferable to focus on co-production as a paradigm, rather than explaining that logic model use is permitted if it is not preconceived.

One could also argue, however, that the entire bases of a realist evaluation is in and of itself a logic model. The formula of context-mechanism-output-impact could be interpreted as a linear expression of impact creation. This would then lead to the same argument that Mode 2 research cannot be squeezed into the linear confines of a logic model. This leads to the question of whether a realist philosophical assumption that is based on context-mechanism-output-impact is useable for evaluating the research done by UASs.

As the previous analysis shows, the concept of working with a philosophical assumption is confusing. Whereas a realist philosophical assumption is clearly based on a tradition with history, a performative assumption is based on Actor-Network Theory and is easily confused with a performance-based evaluation. It is difficult to find corroborating information on performative assumptions.

What each of these requirements share, however, is a focus on the process of impact creation. Be it through context-mechanism-output-impact, Actor-Network Theory, learning through evaluation in real-time, it is the process that stands centrally. It is the research process and thus the process of impact creation that needs to be monitored in order for evaluation to be possible. While the BKO is not currently designed to do this, a theoretically grounded impact evaluation would act to enhance it by describing not only the outcomes but also the process through which research impact is created.

DISCUSSION

From Theory and Frameworks into Operationalization - The Inclusion of Stakeholders

The stakeholder is central for the operationalization of the requirements for evaluating the impact of research done by UASs. The nature of this research means that a broad range of stakeholders exist in this type of research. In this case, while the direct researcher is the primary stakeholder, the partners they work with must also be included. It is in fact the engagement of non-academic stakeholders that can make this process successful (Adam et al. 2018). These partners come from relationships with industry, government, and society, as well as the funders that support them (Greenhalgh et al. 2017). For Dutch UASs, this includes a wide range of groups and organizations; health centers like hospitals and retirement homes, museums, sports clubs, educational institutions, large and small businesses, and industrial partners, to name only a few. All of these stakeholders are potential end users of this evaluation approach at different levels.

A component of the BKO Standard Two requires that the relevance, intensity and sustainability of internal and external partnerships, networks and relationships in people and resources be evaluated with respect to the realization of the research profile. It also asks for self-reflection on stakeholders in the narrative. While this includes information about the stakeholders, it does not include the participation of stakeholders themselves. The BKO asks for stakeholder participation in the evaluation committee but this is limited to one or two participants. The inclusion of stakeholders in a co-produced impact evaluation is necessary for the insight into the diverse and variegated societal impact of UAS research. It is a necessary, theoretically grounded step towards augmenting the function of the general BKO.

The recommendation for a co-production model and a performative or realist evaluation requires that an evaluation of the impact of research done by UASs is based on a bottom-up approach that includes the various stakeholders involved while taking the process of impact creation into consideration. Raftery and colleagues' (2016) suggestion of a context driven methodology is of particular importance for research done by UASs. Context determines the operationalization of the concept of societal impact, and, thus, context is essential for creating an applicable approach. The real-time component of these requirements means that these stakeholders need to be included from the beginning of the process. This, too, is part of Mode 2 research as the inclusion of the stakeholder from the beginning also helps create more socially robust knowledge that can be effectively translated into practice (Adams et al. 2018).

The contribution of stakeholders is also required at the end of the process when output comes to fruition. Unlike INRA, where a database of information is available for the in-depth, standardized case studies set out by ASIRPA, Dutch Universities of Applied Sciences lack such a resource. Currently 27 Dutch UASs make use of a shared repository for print output. To date, five Dutch UASs also make use of a Current Research Inoformation System. Three subscribe to a well-known commercially obtained Current Research Information Sysytem. Another is preparing for the implementation of a recently revamped system designed by a Dutch University. The last example has designed their own system based on the needs of their researchers, quality control office and other support staff. This institution also has its own repository where research output can be stored regardless of form. However, although they are working towards achieving it, even this system lacks the relevant societal information required for evaluating research impact (van der Graaf 2018; Woertman and Doove 2019).

CONCLUSION

Finding an appropriate means of evaluating the research impact of research done by Universities of Applied Sciences has proven complicated. Raftery and colleagues (2016) backed up by van Drooge and Spaapen (2017) and Guthrie and colleagues (2013) suggest that in order to best evaluate Mode 2 research similar to that achieved in Dutch UASs, a formative real-time evaluation should be used from a realist perspective that includes context-mechanism-output. Or a performative philosophical assumption with a co-production model without making use of a preformulated logic model. If these recommendations are to be put into place, there is, to date, no 'established' framework or approach that is 'cut and paste' ready for use by UASs.

Three frameworks present possible starting points for creating a suitable approach:

A. ASIRPA provides a realist evaluation that incorporates Participatory Impact Pathways suggested by van Drooge and Spaapen (2017) as well as in-depth case studies, made easier through standardisation for realistic utilisation. It does, however, neglect the co-production and real-time evaluation;
B. Contribution Mapping is real-time and formative. This framework provides a performative assumption where the process of impact creation is key. However, stakeholder inclusion is limited to structured interviews; and
C. van Drooge and Spaapen's evaluation and monitoring use of PIPA is a formative, real-time, realist evaluation focused on the 'theory of change'. Unfortunately, the use of stakeholders for creating a logic model which is central to the evaluation and monitoring use can become impractical (van Drooge and Spaapen 2017).

What each of these three frameworks have in common is that the process of impact creation is what is important. And what the recommended components of impact evaluation for research done by UASs suggests is that relevant stakeholders are essential from the beginning of this process. This need for stakeholder inclusion in the process means that regardless of which framework is chosen, a new evaluation approach for UAS research is required. By including the relevant stakeholders, the missing link between the general BKO and the theoretical foundations is bridged.

Given the short history of research conducted by Universities of Applied Sciences, it is not surprising that there is no recognized approach for evaluating the impact created by the research of these institutions. The nature of Mode 2 or Edison's quadrant research puts research impact at the heart of its mission and the process whereby the research impact is produced. In order to assess if the Netherlands Association of Universities of Applied Sciences has accomplished their goal of creating impact in society in their research themes, an evaluation approach for research impact is required. This approach will assist in providing insight into the impact of research carried out by researchers of Dutch UASs. The motivation for this is found in the research task of UASs, to conduct research that stems from a challenge in society. As challenges change and research done by UASs continues to mature it is increasingly important that it appropriately conveys the impact it is creating.

CHAPTER 3

EXPLORING RESEARCH GROUPS AT UNIVERSITIES OF APPLIED SCIENCES AND THE IMPLICATIONS FOR RESEARCH IMPACT EVALUATION

ABSTRACT

The purpose of this study is to better understand the roles and functions of researchers in Dutch Universities of Applied Sciences (UASs) within the Knowledge Triangle (KT) in order to better understand how best to evaluate the impact of UAS research. Using a set of basic indicators provided in the Dutch national research evaluation framework as a starting point, we ask how the roles of the actors in Dutch UAS research function within the context of the KT; and how demographics influence this function. Through dialogues with members of Dutch UAS research groups, and Principal Component Analysis and regression factor scores conducted on questionnaire results acquired from research staff, differences and specificities of these actors are identified. The results suggest that to ensure a functioning KT, the role of each actor, whether Professor, Associate Professor or Researcher, should be defined and fulfilled as each contributes significantly to knowledge transfer.

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INTRODUCTION

As part of their mandate, Universities of Applied Sciences (UASs) of the Netherlands and their researchers are charged with creating an impact on society (van Gageldonk 2017). Like so much of the rest of the academic world, they are grappling with how to effectively and efficiently evaluate this impact. When UASs were first founded, their principal function was to teach the professionals of the future. The last two decades, however, have seen an increasing emphasis on research, with an aim to creating an impact on society not only through human capital but also through practice-oriented research (van Gageldonk 2017). Additionally, UASs, like other publicly funded research institutions, wish to demonstrate their impact and justify their work (NAUAS 2022).

The 36 UASs affiliated with the NAUAS currently utilize the *Branchprotocol Kwalitietzorg Onderzoek* (Sector Protocol Quality Research Assurance, BKO) as a research evaluation framework at the research group level (NAUAS 2022). Reflecting the better-known Strategy Evaluation Protocol (SEP) (Palstra et al. 2020), this evaluation occurs every 6 years and is conducted by an external evaluation committee. Like much of the policy of the NAUAS, the BKO is centred around the Knowledge Triangle (KT) and the knowledge transfer taking place within these three spheres of Research, Education, and Practice. The three-part KT was initially developed as a means of understanding the interconnections between Higher Educational Institutions, the business sector and society at large (Sjoer et al. 2012). Central to this idea is the essential interconnections of the three parts in creating an impact on society.

The BKO is comprised of 4 standards by which research groups are evaluated. Standard 1 pertains to the research groups' research ambitions, profile, and program. Standard 3 pertains to conducting research in compliance with research conduct standards in the applicable field. But it is Standards 2 and 4 that are of particular interest for this study. Through the use of indicators and a self-reflective narrative, Standard 2 attempts to bring the impact of the research group into view ex-post. However, the BKO as an impact evaluation does not conform to the recommendations indicated in previous research for evaluating research impact at UASs (Coombs and Meijer 2021). These recommendations include that the evaluation be formative, in real-time and in co-production with stakeholders, and does not utilize a preconstructed logic model (Coombs and Meijer 2021). While the BKO is believed to be formative, it is ex-post and not co-production. Nevertheless, it is the current means through which Dutch UASs attempt to make their impact visible.

The BKO Standard 4 includes two sets of basic indicators that can provide a starting point for examining the roles and functions of actors in a UAS research group. While including a set of indicators referred to as “Research Income of the Research Group”, the “Research Staffing Realised” is a component applicable to the roles and functions within a research group. The “Research Staff Realised” takes the functions held within the research groups into consideration, requesting information concerning numbers of people, FTEs, and the number of PhD holders in the research group (NAUAS 2022). Our research examines these indicators.

Understanding who the actors are and how they contribute can provide a window into understanding the broader context and process in which UAS research takes place. While research has been conducted into how roles and functions within standard university research groups has taken place (Kyvik 2012), there appears to be little known about how this works within UASs. This study moves towards understanding the context of Dutch UAS research by exploring the BKO's “Research Staff Realised” indicators of Standard 4, to discover what members of the research groups are doing and how this all fits within the Knowledge Triangle.

The purpose of this study then was to explore the roles and functions of researchers in Dutch Universities of Applied Sciences within the KT. Making use of the basic indicator “Research Staff Realised”, we sought to better understand the context in which research takes place in relation to the Professional Practice and Education elements of the Knowledge Triangle. To do so, this article specifically addresses the following questions: how do the roles of the actors in Dutch UAS research function within the context of the KT; and do demographics influence this function? With this information we aim to better understand a piece of the context and process of research at UAS that is essential for developing a framework suitable for evaluating the impact of UAS research.

Digging deeper into the Knowledge Triangle

As indicated, the knowledge transfer principles of the KT are the foundation for much of Dutch UAS policy. Unger et al. have defined the KT as 'a set of actors and policy spheres (education, research, innovation) that span the space for collaborative activities with the aim to provide integrated approaches across these three spheres' (Unger et al. 2018). The spheres of Research and Education are self-evident. Innovation is seen as the link to business sectors or Professional Practices (Unger and Polt 2017). It has been suggested by Unger et al. (2018) that systematic and continuous interactions between these three spheres are required for creating and improving the impact of investment in all three areas. This is predominantly accomplished through 'activities' (Unger et al. 2018). 'Activities' can be understood as interactions between components of these three areas, for example; research results being incorporated into curriculum, stakeholders participating in research, or students participating in internships. Additionally, a functioning relationship between Research, Education and Innovation is considered essential for addressing societal challenges. The KT, therefore, replaces the traditional concept of a one-way stream of knowledge uptake, similar to valorisation, and replaces it with interactions between the three components (Etzkowitz and Leydesdorff 2000). In comparison to other actor focused paradigms such as the triple or quadruple helix, the KT is interested in the activities taking place between these three areas of interest which allows for the codified and uncodified spillover of knowledge between Research, Education and Innovation (Unger et al. 2018).

It has been suggested that the essentially theoretical dynamics of the KT can be problematic (Maassen and Stensaker 2010) in that it can provide incentives or obstacles for certain types of collaboration (Unger et al. 2017). Similarly, Sjoer, Nørgaard, and Goossens (2012) have suggested that the implementation of the KT is hindered by gaps in expectations in policy, mindset, and practice. Nevertheless, like many other countries involved in similar types of research, European and Dutch research policies have evolved to reflect the three elements and interactions of KT (Unger et al. 2017)).

This connection between the three elements of the KT is seen as essential for attaining quality in UAS research (van Gageldonk 2017). An English translation of how the NAUAS has interpreted the KT can be seen in Figure 3.1 (Franken et al. 2018). This figure illustrates that the development of knowledge and competencies runs cyclically through the Triangle in both directions. The activities linking the three components of the Triangle move from Education to Research to Professional Practice and vice versa. As mentioned above, Innovation is seen as the link to the Professional Practice. In this KT interpretation, Innovation is directly referred to as Professional Practice which is the organizations, businesses and other stakeholders that make up society. Interactions and activities conducted during UAS research are exchanges between the various components of the KT that are expected to result in knowledge transfer (Franken et al. 2018). For example, the inclusion of students in research projects or the inclusion of research output in curriculum are forms of interactions between Research and Education. Activities between Education and Professional Practice or Innovation can include internships or guest lectures.

While the interactions and activities are taking place, the need for intervention may also occur. An intervention consists of specific actions taken to improve a specific situation. As seen in Figure 3.1, interventions are seen as specific actions taken by Education or Research to improve the situation of Professional Practice (Miedema et al. 2013). The interventions between Research and Innovation in Professional Practice often come in the form of research questions that the Professional Practice requires assistance in answering. This link, the intervention, has become a notable characteristic of UAS research (Franken et al. 2018).

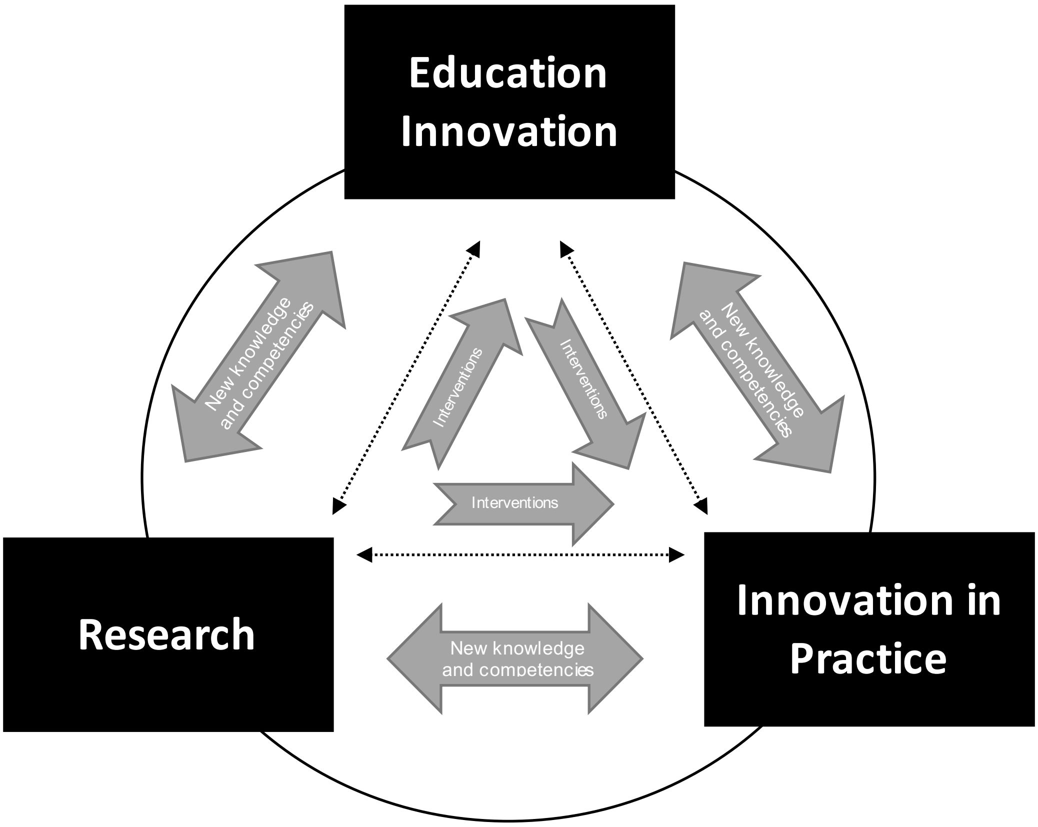

Figure 3.1: Knowledge Triangle of Dutch UASs (Franken et al. 2018, 11)

UASs of the Netherlands are not unlike UASs and universities worldwide. UASs in countries such as Finland, Denmark, Belgium and the Netherlands, are in various stages of developing a framework for evaluating impact. Initially, European UASs were focused on the Education and Innovation components of the KT. In reaction to the Bologna Declaration of 1999 (Teuscher 2019), countries, including Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Ireland, Lithuania, Norway, Portugal, Spain, Sweden, and Switzerland, have adopted a form of binary educational system that combines universities and UASs. Largely heterogeneous in implementation (Lepori 2021), changes in law, policy and financing have since expanded the focus of UASs to encapsulate all three components of the KT (de Weert and Beerkens-Soo 2009).

A study of European UAS research policy indicates that there are three consistent characteristics of this research: it emanates from the needs of professional practice; is relevant for the quality and innovation of education and the professionalization of the teaching faculty; and, is practice-driven in that it is oriented to solving problems and intensifying collaboration with external constituencies (de Weert and Leijnse 2010). In essence, these characteristics contribute to all three areas of the KT.

Similarly, UAS4EUROPE, the European network platform under which the NAUAS falls, has defined specific characteristics of UAS research. Its position paper on the Framework Program 9 states that UAS research is to: focus on practical applicability; be demand driven and applied to changes within society; be collaborative and multidisciplinary in interaction or co-creation with stakeholders; and connect to education by incorporating the results into curricula (Universities of Applied Sciences for Europe 2017). This, then, reflects the knowledge circulation of the KT. While the research described in this article presents the Netherlands as a case study, the results may be applicable to other countries. The Dutch situation has similar challenges and evolutionary processes with which other countries with UASs have grappled (van Gageldonk 2017).

The Research Group

In 2001, *lectoren,* often translated as Professors, were charged with the responsibility of making and maintaining connections between the three components of the Knowledge Triangle. This took the following form: knowledge creation for the professional practice; innovation with professional practice; and education quality and professionalization of the teaching staff (van Gageldonk 2017). Professors were given the central role of reaching out to practitioners in a wide range of organizations and institutions, to collaborate with them, and other organizations to solve local/regional needs through research. The goal was to have this new knowledge circulate and flow into the education of UASs (de Jonge 2016).

Initially, the Ministry of Education, Culture and Science, together with the NAUAS (formerly the HBO-Raad) was concerned that Professors would become self-contained within the UASs. Consequently, a group of teachers was positioned around the Professor to assist in linking the Professor to the education and professionalization of teaching staff (van Gageldonk 2017). This is a common response by institutions wishing to create a more research-intensive environment (Vabø 2016). University research groups are primarily comprised of a principal investigator and a team of colleague investigators (Etzkowitz 1992). Similarly, UAS research groups consisted of the Professor and other staff such as teachers (de Weert and Leijnse 2010). Although at this time UAS teachers were principally employed for teaching, by including them in the research group, they were now also expected to learn how to conduct research.

Today, these research groups are often made up of one or more Professors and a team of researchers consisting of Associate Professors, Researcher/Teachers, and PhD candidates (NAUAS 2020). There are an estimated 707 Professors and 4,738 Researchers in the 36 government funded Universities of Applied Sciences of the NAUAS (Rathenau Institute 2022). These researchers are no longer just teachers asked to perform research tasks but are increasingly researchers with a PhD (NAUAS 2020). And, as set out in the NAUAS vision document for the development of the research group, knowledge circulation through Research, Education and Professional Practice is no longer reserved for the Professor alone but is the responsibility of the research group as a whole (NAUAS 2020). Through this evolution of the research group, the expectation is that they fulfill the activities and interactions of the KT. It is, however, unclear exactly how this is to be achieved.

In 2016, the Rathenau Institute published *Praktijkgericht Onderzoek bij Lectors van Hogescholen* (Practice-Based Research by Professors at Universities of Applied Sciences) that presented findings for the first time on the role of the Professor and research groups. Data for this report was gleaned from a combination of readily available information and a questionnaire. Focusing on the Professor, the questionnaire examined the research function of the research group by examining the networking function required for knowledge circulation, and the influence of the research group on education (de Jonge 2016). The research concluded that the Professor's role is primarily involved in networking with professional organizations in business and the public sector. This implies that Professors may not execute all the functions required for accomplishing the KT that they were initially charged with but are reliant on the other members of the research group to accomplish them.

Roles within the Research Group

Hage and Powers (1992) have suggested that roles are collections of 'rights' and 'obligations' attributed to anyone holding a specific position within a social system. In this case, the social system is the research group and the complex network of relationships that exist between the individual researchers. There is an expectation that the holder of a specific position will act according to implicit and explicit rules and regulations proceeding from that position (McCance et al. 2023). This study recognizes 3 positions; Professor, Associate Professor, and Researcher within the research group. Studies into the roles of academics have found that academics often fulfill multiple roles (Kyvik 2012). Building on the work of Zuckerman and Merton (1969), Blaxter et al. (1998) have indicated that the 5 academic roles are teaching, researching, managing, writing, and networking. Kyvik (2012) has suggested that there are 6 roles: networking; collaborating; managing; doing research; publishing research; and evaluating research. There are, of course, many analytical categories for these roles that can be applied. For the purposes of this study, the roles of Research, Teaching, External Networking and Internal Organization are believed to reflect the theory, the work tasks and the expectations within the context of the KT and the research group.

The demographics of the researchers within the research groups have been shown to alter the context of research (Paswan and Singh 2020; Fabila-Castillo 2019; Levin and Stephan 1989). Age, gender and level of education can potentially influence the roles and functions of research group members and thus also the research group as a whole and how they function within the KT. For this reason, we have specifically examined these demographics.

MATERIALS AND METHODS

Understanding the context and process of research done by UASs is essential for creating a systematic impact evaluation of UAS research (Coombs and Meijer 2021). By examining the roles and functions of the researchers involved in Dutch UAS research we begin to understand the context and process of this research. To move towards this understanding, we conducted a mixed methods study. Data for this study was drawn from both conversations/interviews and a questionnaire, conducted with the purpose of learning more about the context, process, and impact of research done by Dutch UASs.

Conversations/Interviews

To begin understanding Dutch UAS research and its researchers, 22 exploratory conversations were conducted between March 2019 and March 2020. Ten additional conversations were conducted with support staff involved in a broad range of functions. The aim of the semi-structured dialogues was to collect input of activities and interventions in research, education, and practice in a range of academic fields and UAS themes in order to understand the context of the KT. Also, inductive analysis of the conversations led to thematic categorization of topics to be included in the development of a questionnaire that covered all relevant aspects. Ten of the dialogues with researchers were also used to help create and pretest a questionnaire. The majority of these conversations were conducted in person and recorded, with permission. Three were conducted by telephone or video conferencing. There were, therefore, no coded transcripts made. Quotations from these conversations are paraphrased in our findings, with permission, for illustrative purposes.

Respondents were selected based on the profiles available on institutional websites. To strive for an accurate representation of Dutch UAS research, researchers were selected based on the size, specialization, and geographical location of the UAS they worked for. This included general UASs with a diverse portfolio, and UASs specializing in areas of agriculture, education, or the arts.

Participants were selected based on their membership in a research group. The various roles, functions, and positions that a researcher can have were taken into account including Professor, Associate Professor, and Researcher, with or without a Ph.D. Gender, ethnic, and cultural backgrounds were additional criteria used to reflect the diversity of Dutch UAS researchers.

Questionnaire

Questionnaire Design

Using the Rathenau study as a starting point, we developed a questionnaire to gain further understanding of the functioning of the research group as a whole, the networking and research functions of Professors, and the context and process of their research. This questionnaire aimed to, among other things, give greater insight into the roles and functions of researchers in UAS research groups within the KT. The inductive analysis of the interviews and conversations led to categories of questions reflecting the various roles of the researchers (Kyvik 2012). The result is an extensive questionnaire that addresses topics such as opinions on policy, tasks, research drivers and motivations, research output, desired impact, networks and collaboration, and other subjects relevant to the contextualization, process, and impact frameworks. Some of the questions in the questionnaire were selected to correlate with the questionnaire conducted by the Rathenau Institute in 2015 (de Jonge 2016). Other questions reflect the themes identified from the dialogues. Questions were verified and pretested with ten researchers prior to distribution.

As indicated earlier, this questionnaire was extensive, the details of which are beyond the scope of this paper. To explore the role research group members have within the KT, the questionnaire asked respondents to indicate through the use of a Likert scale of 1 to 100 in increments of 10, the percentage of time spent on Research, Teaching, External Networking, and Internal Organization. External Networking is a proxy representing the Innovation in Practice component of the KT. These four categories reflect the four primary activities of UAS researchers (Kyvik 2012).

Respondents were also asked to specify other formal tasks they have as a Professor, Associate Professor, or Researcher, in addition to their key function in the research group. Reflecting the BKO basic indicators for “Research Staffing Realised”, we asked the following question: ‘How do you perceive yourself according to your skills and expectations of you?’ Respondents were then asked to indicate which category they felt was applicable; ‘Professor’, ‘Associate Professor’, ‘Researcher’ or ‘Other’. We also asked questions concerning the research and teaching components of their work, such as: ‘How many hours of your week are contractually allocated for research related tasks?’, ‘How many hours of your week are contractually allocated for teaching related tasks?’. Respondents were asked: ‘How many hours of your week do you realistically spend on research related tasks?’. Similarly, they were asked: ‘How many hours of your week do you realistically spend on teaching related activities?’. Time indications were in increments of 5 hours from 1 to 40. We used these responses to specifically examine the dimensions underlying research activities at UASs, the differences between the role holders along these dimensions, and the effects that themes can have on these roles.

Procedure

The majority of Dutch UASs do not have a Current Research Information System or other centralized registration system for researchers to generate a complete list of researchers. Consequently, a list of researchers affiliated with a research group was collected through institutional websites. People affiliated with a research group are by default involved in research and can be involved in teaching. However, it is important to clarify that not all UAS teachers are part of a research group nor are they necessarily involved in the research function.

All 36 UASs affiliated with the NAUAS were included in the list regardless of the size of their research staff. A list of researcher email addresses was collected through public websites such as those of the institution, open repositories, or Google. As a result, 2700 researcher names and email addresses were collected. Where possible, the list was checked by a member of the research support staff from the specific institution. Participants were recruited through an email invitation sent directly to all 2700 researchers. The recruitment message explained the aims of the study and provided a link to the online questionnaire. Participation in the online questionnaire was voluntary, anonymized and in compliance with the ethical rules of the University of Leiden. To encourage participation, questions were not made mandatory. The questionnaire was initially issued in May 2019 and a reminder was issued in October 2019.The responses were combined into a single dataset.

Sample

The sample consisted of 467 respondents. This is a 17 percent response rate with an error margin of under 5. Approximately 27 percent of the respondents were female, 33.2 percent were male, and 37 percent chose not to indicate. The age of respondents ranged from under 25 to 70. Twenty percent of the respondents indicated they were Professors; 3 percent indicated they were Associate Professors; and 38.3 percent indicated they were Researchers. The remaining 38 percent did not indicate their role. Of the 467 respondents, 38 percent stated they had a PhD.

	N	Percentage
Participants	467	
Gender		
Female	128	27,4
Male	155	33,2
Other	184	39,4
Age		
<25	3	0,6
26-30	10	2,1
31-35	25	5,4
36-40	41	8,7
41-45	38	8,1
46-50	30	6,4
51-55	40	8,6
56-60	31	6,6
61-65	42	9,0
66-70	10	2,1
>70	1	0,2
Unknown	196	41,9
Function		
Professor	94	20,1
Associate Professor	14	3,0
Researcher	179	38,3
Other	180	38,6
Education Level		
PhD	175	38,0
No PhD	292	62,0

Table 3.1: Demographic Overview

Statistical Analyses

Exploratory Factor Analysis (EFA) in SPSS was used to identify potential underlying dimensions of the principal activities of researchers at UASs. Specifically, we performed Principal Component Analysis (PCA) (DiStefano, Zhu and Mindrilã 2009) on the respondents' answers to the number of hours spent on: 1. Teaching; 2. Research; 3. Internal Organization; and 4. External Networking.

Regression factor scores (DiStefano, Zhu and Mindrilã 2009) for relevant questions were then plotted on the PCA results. These questions included: the hours of research contractually required; the realistic number of hours spent on it; the position held by the respondent; and how they perceive their function based on actual tasks performed; education level; research themes; age of respondent; and gender. The regression factor scores were calculated for each question using the least square regression approach available through the regression option of the factor analysis function specific to SPSS. This type of analysis allows for the examination of the relationship between multiple sets of variables by determining the line of best fit. It also provides a visual demonstration of these relationships as each point of data in the scatterplot represents the relationship between the individual variables and the dimensions.

Results

As illustrated in Table 3.2, our PCA did not reveal the four dimensions of Research, Teaching, External Networking, and Internal Organization, nor the three dimensions of the KT, but instead two distinct dimensions underlying research practice in Dutch UASs. The first dimension shows high factor loadings, indicating a high correlation between the item and the factor, for Teaching and Research with a negative loading for Teaching, a positive loading for Research, and no substantial loadings for Internal Organization and External Networking. We refer to this first dimension of research/teaching activity as 'Content' because the activities on this dimension pertain primarily to the production and conveyance of Content. From these findings we can infer that the Content is divided into opposites of either Teaching or Research but not both. This is reflected in the positive loading of Research and negative loading of Teaching on this dimension.

The second dimension indicates high positive factor loadings for Internal Organization and External Networking, and no substantial loadings for Teaching and Research. This second dimension, entitled 'Connectivity', suggests that this reflects efforts to connect to relevant internal and external stakeholders in the UAS research practice. In this instance, we observe that Connectivity converges in positive factor loadings for both. This suggests that respondents involved in Internal Organization are also involved in External Networking, and respondents not involved in Internal Organization are not involved in External Networking.

	Component	
	Content	**Connectivity**
Time spent on Internal Organization matters	-0,212	0,808
Time spent on Research	0,844	-0,361
Time spent on Teaching	-0,794	-0,402
Time spent on External Networking	0,241	0,649
Extraction Method: Principal Component Analysis		
a2 components extracted		

Table 3.2: Factor Loadings: Content (1); and Connectivity (2)

Through PCA, therefore, the three elements of the KT become essentially two dimensional. We used these two dimensions of Content and Connectivity to contextualize the activities of the various UAS researchers. With these two dimensions we plotted the regression factor scores of: the hours of research contractually required; the realistic number of hours spent on research; the position held by the respondent; how they perceive their function based on the actual tasks performed; their education level, age, and gender.

Scatterplots: Degree of Hourly Research Commitment

Role	**1-5**	**6-10**	**11-15**	**16-20**	**21-25**	**26-30**	**31-35**	**36-40**	**Other**
Contractual									
Unknown	6	10	5	15	8	3	10	6	6
Researcher	13	40	21	32	17	15	16	9	17
Lector	3	8	11	22	11	12	10	12	6
Associate Lector	2	1	1	4	4	1	0	2	0
Total	**24**	**59**	**38**	**73**	**40**	**31**	**36**	**29**	**29**
Realistic									
Unknown	6	12	8	9	9	8	8	5	3
Researcher	22	33	20	35	22	18	12	12	6
Lector	6	14	11	14	11	10	7	16	6
Associate Lector	0	0	3	2	3	2	1	3	1
Total	**34**	**59**	**42**	**60**	**45**	**38**	**28**	**36**	**16**

Table 3.3: Number of Respondents to Questions of Contractual/Realistic Research Hours Per Hourly Category and Role

Table 3.3 illustrates the number of respondents per hourly category for both contractual and realistic research hours. This table indicates that the number of respondents doing research per category are relatively evenly distributed. Figure 3.2 indicates the degree of research commitment in terms of the number of hours along the dimensions of Content and Connectivity. Similarly, Figure 3.3 reflects the amount of time actually spent on research activities in terms of number of hours along these two dimensions. The 9 hourly categories reflect this commitment.

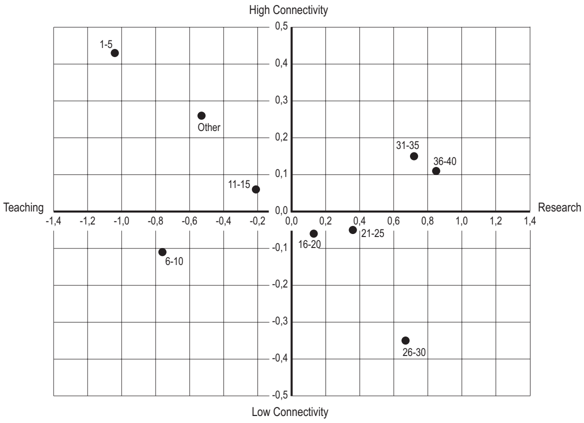

Figure 3.2: How Many Weekly Hours Are Contractually Allocated for Research Related Tasks

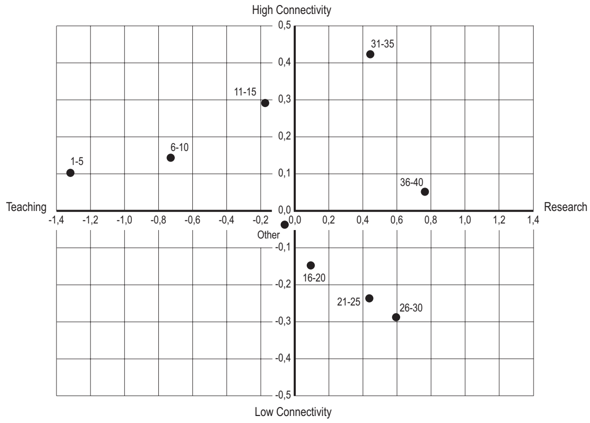

Figure 3.3: How Many Weekly Hours Do You Realistically Spend on Research Related Tasks

Figures 3.2 and 3.3 indicate a very clear relationship between the number of hours and the Content dimension with those having few contractual research hours spending more time on Teaching while those having more contractual research hours spending more time on Research. This underscores the validity of the Content dimension, which reflects the relative commitment to Teaching versus Research.

The relationship between contractual hours and realistic hours spent on Research and Connectivity is less clear. It would appear that regardless of hourly commitment to Research, engaging in Internal Organization and External Networking also occurs. Figure 3.3 indicates that when it comes to actual research hours the variation in Connectivity is primarily found among those who spend more time on Research than on Teaching, i.e. the right hand side of Figure 3.3. Hence, the differentiation between those who spend more time on Internal and External Networking and those who do not, is greater among the group that actually (as opposed to contractually) focuses primarily on Research as opposed to those who primarily focus on Teaching. Also, those who primarily teach are less active in networking. This underscores the reality that in the context of UASs there are multiple roles in the research theme. Some individuals in this research theme focus fully on Research (‘specialists’) whereas other individuals focus on Research in conjunction with Connectivity activities. To better understand this differentiation, it is essential to take into account the positions of the various members of the research group.

Scatterplots: Contractual Function in a Research Group Versus Respondents’ Perception

Figure 3.4 illustrates the various members of the research group in the function they contractually fulfill; Professor, Associate Professor, and Researcher. Respondents, as shown in Figure 3.5, were also asked to indicate which function they felt their tasks actually fulfilled. These functions include Professor, Associate Professor, Researcher and Other.

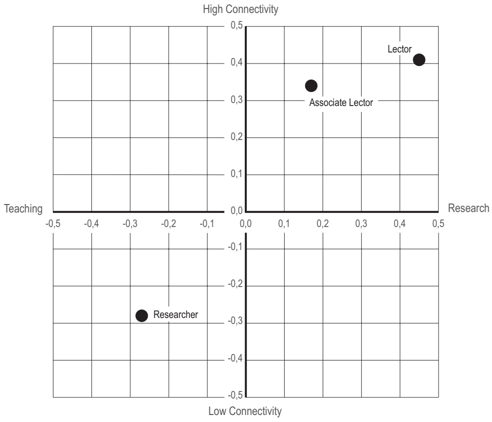

Figure 3.4: Are You a Lector, Associate Lector or Researcher?

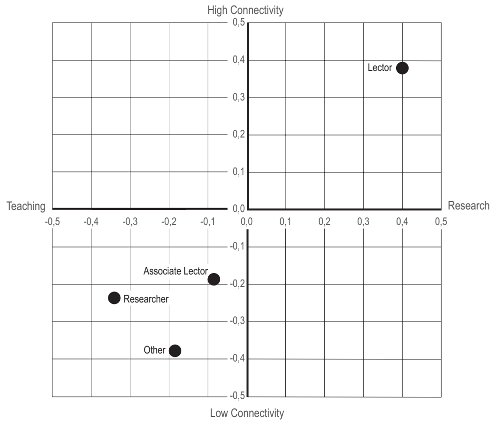

Figure 3.5: How Do You Perceive Yourself According to Your Skills and Expectations of You?

Figure 3.4 suggests that Professors and Associate Professors are contractually obligated to spend most of their time on Research and Connectivity, as reflected in their positive positioning on the Content dimension as well as the Connectivity dimension. As reflected in Figure 3.5, that is exactly what Professors perceive they do. The interviews of several Professors supported these results as they reflected on their roles as spiders in a web tying the various projects[2] and networks together. One Professor from the agricultural sector went so far as to initiate various agricultural endeavours to solve particular problems encountered in professional practice (L7M).

However, the respondent Associate Professors appear to face a different reality than their contract indicates. These Associate Professors actually spent more time on Teaching than on Research and were not significantly involved in Internal and External Networking, as reflected in their positioning in the lower left quadrant of Figure 3.5. One Associate Professor interviewed stated that they work with as many students as possible. This Associate Professor strives to encourage students to become active researchers by permitting students to undertake their own research and discoveries. Consequently, this Associate Professor saw their job as networking and generally understanding what is happening in practice and education to facilitate students' research (L8M). However, because the number of Associate Professors made up only 3% of the respondent rate, it is difficult to draw substantial conclusions from the data.

Both Figures 3.4 and 3.5 indicate that researchers in reality predominantly spend their time Teaching, while they have limited involvement in Internal and External Networking. They can be seen as 'doers' within the research group.

In the 'Other' option of Figure 3.5, 19 respondents indicated that they were a variation on teacher or lecturer, and researcher. Some suggested that they were more closely aligned with project managers or leaders rather than the options indicated. One respondent's answer suggested that while they were considered a junior researcher, their skill set was so specific that their colleagues and most Professors could not do the work that they do.

[2] Projects at Universities of Applied Sciences encompass a wide range of categories. For example, these can be projects within a single research group, ones that connect various research groups within a single institution or multiple institutions. These projects can also be, for example, internally funded, externally funded, in-kind contributed or a combination of funding sources.

Differences in PhD and Non-PhD Responses

We analysed the regression score differences between PhD and non-PhD respondents. We found that relative to PhD respondents who spend more hours on Research than on Teaching, non-PhD respondents spend by far the most time on Teaching relative to Research (regression scores for the content dimension: -0.303 for non-PhDs versus 0.157 for PhDs). We also found that PhD respondents spend more time on Connectivity while the time spent on networking was limited for non-PhDs (regression scores for Connectivity dimension: -0.200 for non-PhDs versus 0.104 for PhDs). One conversation within the Smart Technology and Materials themes saw the results of this stratification of degrees and roles as a negative for UASs. Their experience led them to feel that having a PhD does not ensure better quality of research, and to prefer to conduct their research with Master level researchers (R4M).

Scatterplot of Age Variance

Figure 3.6 illustrates the variance of Content and Connectivity dimensions per age group. Respondents were asked to indicate within which age group they fell: <25; 26-30; 31-35; 36-40; 41-45; 46-50; 51-55; 56-60; 61-65; 66-70; and >70[3].

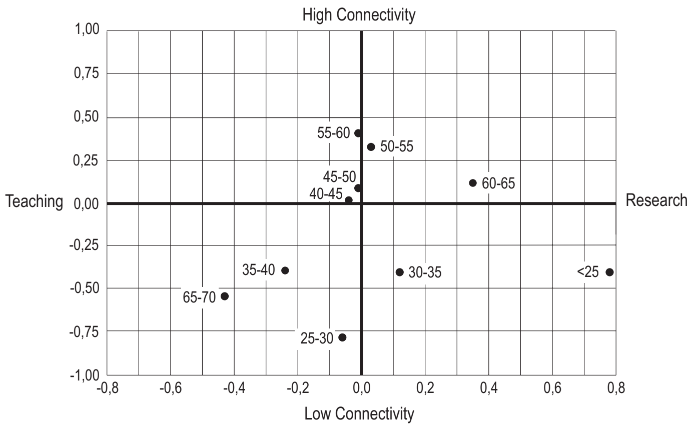

Figure 3.6: Age

The results of Figure 3.6 suggest that age is strongly related to the Connectivity dimension and, to a lesser extent, to the Content dimension. Those of older age show in the upper side of the Connectivity dimension suggesting they are more involved in Internal and External Networking. In contrast, younger individuals appear on the lower side of the Connectivity dimension suggesting they are less involved in Internal and External Networking. Moreover, there is a dispersion along the Content dimension among the younger age group with some heavily involved in Teaching whereas others are involved in Research. This is not the case for the older age groups which appear to have a more balanced set of tasks related to both Teaching and Research. Those of older age are involved in all activities associated with the KT whereas those of younger age participate in a higher degree of specialization. It is also possible that researchers with more seniority are permitted more leeway in their activities.

Gender Differences

Finally, we considered differences in gender along the Content and Connectivity dimensions. We found women to be more involved in Research relative to Teaching whereas we found the opposite tendency for men, with regression scores on the Content dimension (for women

[3] Only one respondent was over 70. For this reason, >70 does not appear in the figure.

0.079 versus men -0.065). We also found men to be more involved in Connectivity relative to women with regression scores on the Connectivity dimension of -0.135 for women and 0.129 for men.

DISCUSSION

With the exception of the Rathenau questionnaire, this questionnaire appears to be the only other externally conducted questionnaire in Dutch UASs regarding research, teaching and practice, as well as contractual and realistic time allocations. Moreover, the substantial number of respondents, ie. 467, proves very informative in terms of the nature and functioning of the staff of the research group. Further exploration is required, for example, through workshops and focus groups to provide verification of the findings. The response rate of this questionnaire may introduce potential biases as a result of the current sample composition. In particular, there were a limited number of Associate Professors involved in the study. However, we believe this should not be a reason for ignoring what the questionnaire provides as insights into the workings of the Triangle and the roles and functions of the research group.

How do the roles of the actors in Dutch UASs function within the context of the KT?

Clearly, there are explicitly defined roles between actors in the research groups, with variances between hours allocated and hours spent on the aspects of the KT. Keeping the three areas of the KT linked was initially seen as the function of the Professor. Our results, like that of the Rathenau study (de Jonge 2016), indicate that the Professors dominate Research and Connectivity. They are often the link between the research and professional practice. Initially Professors were taken out of professional practice to teach and do research at UASs. However, some UASs now discourage their researchers from participating fully in professional practice by not permitting them to own their own companies. The possibility of a conflict of interest, as well as full agendas may account for this, as was the case for one Professor (L10M). Other respondents also indicated they were not permitted to own their own businesses while others were. Removing researchers from practice seems to counter the initial idea of bringing practitioners into UASs to conduct research and link the three areas of the KT together (van Gageldonk 2017). This would appear to reduce diversity and can signal a shift towards a more academic culture which may weaken the workings of the KT.

Our results indicate that respondents who participate in Internal Organization matters are the same as those participating in External Networking. The Professor appears to be the person predominantly responsible for this. As such, they become the face of the research group both within the organization and to the professional practice. This may suggest that the role of Professor as primary link to professional practice renders them a position of power within the research group. This power is tenuous and can pose a risk to the UAS because the link to professional practice is reliant solely on the Professor function.

There appears to be a significant gap between what Researchers and Professors do. Ideally, an Associate Professor spends time supporting the Professor in networking with the Professional Practice, but Figure 3.5 indicates that they may in fact spend more time on Teaching than on Connectivity. This effectively results in their function being very similar to Researchers and the educational element of the KT which reduces their ability to influence. A Connectivity driven Associate Professor who takes more responsibility for linking with the Professional Practice would assist in bringing balance to the research team.

From our study it is not entirely clear what role and function Associate Professors fulfill. This may be related to the relative newness of the position, as well as a lack of formal job description (Houterman, Oden and de Haas 2019). Further inquiry is required to address this point especially given the relatively small number of Associate Professor respondents.

Researchers with an average of 26-30 or 36-40 weekly research hours do just that, they research. What is required contractually is also done realistically, primarily with some Connectivity. It is interesting to note that in this grouping, the number of Professors who responded to this question outnumbers the Researchers by 3 respondents. It is thus not possible to state that these results are based on the number of Researcher respondents.

The results of the 31-35 hours category appear different than the rest. While the number of respondent Researchers outnumbered the Professors, this category appears to contain a higher number of Connectors. There is no clear reason for this as the number of Professors, who we established are more connected, is less than the number of Researchers. A Timetell exercise in which Researchers record their consequential activities over the course of a set period of time could be helpful to gain further insight into the daily processes of conducting research.

How do diverse demographics influence how actors function within the context of the KT?

Our results suggest that Education is primarily performed by those with little time for research; ie. the less time a researcher has for research, the more time they appear to spend teaching or networking. In doing so, they fulfill the link between Education and Professional Practice. Our study indicates that non-PhDs are positioned to connect the Education section of the KT. Post-PhD researchers appear to spend their time differently. Kyvik and Ole-Jacob Skodvin's (2003) Norwegian study of policy dilemmas initiated by the professionalization of research in non-university higher educational institutions, attributes this difference to the increased number of staff with a PhD. They suggest that this increase results in a differentiation between those with academic interests and research motivation, and those without a PhD who adhere to traditional norms of education. Griffioen and de Jong (2014) have also suggested that the educational level of a researcher within the UAS directly influences how involved a researcher, specifically a Professor, is in research.

These results also suggest there are some differences between age groups. This differentiation may reflect the career planning and age structure of UASs. Younger persons seem to be employed for their teaching skills, with the youngest for their research skills. It would be interesting to determine if they are hired for a particular research skill. One respondent indicated that they were hired for a particular skillset very few people have. Middle aged respondents show few differences, hovering around the center of the Content/Connectivity dimensions. While the 61-65 year old respondents are primarily Professors, the 66-70 year old respondents were composed of an equal number of Professors and Researchers. This may reflect a shift from intense networking and research to sharing their expertise and experience through teaching. Impending retirement and subsequent reduction in work may also play a role (Levin and Stephan 1991).

The gender variable distinguishes between Content and Connectivity. Given the previously discussed results in which Professors appear primarily responsible for Connectivity, the negative Connectivity score for females would imply that these respondents were not Professors. This would be in line with other studies that have shown women in academics to be primarily in teaching functions (Uhly, Visser and Zippel 2015). While 49% of PhD students in the Netherlands are women, the latest SheFigures report states that women make up 26.44% of Dutch university researchers. Women make up 27% of Professors in Dutch universities. Specific statistics concerning women in Dutch UAS research appears unavailable (European Commission, Directorate-General for Research and Innovation 2021). Further inquiry would need to be made to determine if the results of our study are indicative of gender representation in UASs or are dependent on the roles and functions of the respondents.

Potential implications for impact creation and evaluation

Current formal evaluation practices of Dutch UASs occur at the research group level and are structured around the KT. In practice, our results suggest that should the various roles of the research group not function together the KT will remain incomplete. There is an element of risk in depending primarily on Professors for Connectivity. It appears that in order to fulfill the obligations of the Triangle and create impact in all three areas, the Researcher, Associate Professor and Professor are compelled to work as a team. It is an important foundation that should be taken into consideration when forming research groups. The basic indicators for 'Research Staffing Realised' appear to provide more insight into the potential for impact creation than simply who does what and for how many hours. Through refinement, these indicators can provide richer information about the impact of a research group than only that provided by Standard 2 of the BKO.

Our results may also reveal that evaluation at the team level (Palstra et al. 2020), which is the current movement being encouraged in research institutions, may need to consider the different roles held within the project team (NAUAS 2020; Regiorgaan SIA 2021). Our results do not make distinctions between the standard activities and interactions between the three spheres of the KT and the conscious activities of the interventions. Consequently, what our research shows is a relative disconnect between Education and Research and Practice, and that a combination of the right people are required to fulfill the KT as a whole. This would be easier to organize at the project level than at the research group level. By doing so, project teams can be created to maximize the potential impact within the KT based on the roles and functions of the research team members.

CONCLUSION

The results of our study suggest that the KT may be too simplistic to do justice to the interactions that take place between Research, Education, and Professional Practice. In practice, the linkages between these three entities are more complex than Figure 3.1 illustrates. This is demonstrated in how members of the research groups function within the context of the KT. As evidenced in our findings, the layers of roles, focal points in tasks, and all the complex interactions between them may not be adequately summed up in a one-dimensional diagram. This is the case for both Content and Connectivity. In practice, the linkages between Research, Education, and Professional Practice are more complex, and seem fragile or even unidirectional. While Professors at UASs were once expected to connect the KT components, we have found that they require the assistance of others in their research group to connect the three parts of the KT.

All the roles and functions identified in this study are required for a working research group. The compilation of the group influences the potential impact created at both a research group and project team level. The UAS Professor is the primary connector, responsible for making connections with Professional Practice. The Professors are also engaged in making connections within the institution and organizational operations. While they participate to some extent in research, the activities of the research group around them are required to create the innovative research content and the connection to education that enables them to fulfill the links of the KT. The role of the Researcher is required to connect the educational portion of the Triangle to the other two portions. It is important to acknowledge and include these diverse roles and functions not only at the research group level but at the project level to ensure that the knowledge transfer through the KT is being fulfilled. Other factors such as demographics and time can influence how the links between Research, Education and Practice of the KT are created.

It is also important to stipulate that this study has been conducted from the viewpoint of Research and the evaluation of Research and not from the perspective of Education. Examining the Triangle from the Education perspective could indicate a different connection to Research and Practice as Education has a different focus and purpose of teaching students.

An increased understanding of the roles and functions within Dutch UAS research groups within the context of the KT contributes to an understanding of the context and process of Dutch UAS research. However, a fuller understanding of motivational drivers, types of created outputs, desired impacts and contributing stakeholders are some of the areas requiring further exploration in order to better understand the context in which Dutch UAS research occurs. The diversity of research activities done by Dutch UASs needs to be understood, and the complexity appreciated, before the creation of an applicable impact framework can be embarked upon.

Recognizing that these results rely on the answers of the respondents, they nevertheless suggest that these differentiations may need to be highlighted and contextualized for a better understanding of their complexity. It is important to create a means by which the impact of research done in UASs can be systematically evaluated in a qualitative, quantitative, and robust manner. This, then, could be applied to the daily routine of UAS researchers in a user-friendly form and potentially feed into the BKO. By beginning to understand the context in which UAS research takes place we can move towards constructing an evaluation of its impact.

CHAPTER 4

EVALUATING THE RESEARCH IMPACT OF DUTCH UNIVERSITIES OF APPLIED SCIENCE: AN EXAMINATION OF THEIR THEMES; THEIR OUTPUT; AND DESIRED IMPACTS

ABSTRACT

Universities of Applied Sciences (UASs) of the Netherlands, like many publicly funded institutions, wish to make their impact on society visible. Policy of the Netherlands Association of Universities of Applied Sciences (NAUAS) indicates that the NAUAS wish to make impact in specific themes. The purpose of this article is to assess the question of how the research impact of the ten themes of NAUAS policy can effectively be evaluated. To do so, this article will closely examine how Dutch UAS researchers view their work within the initial ten themes, the impact they wish to create in those themes, and the output created during this process using data gathered from a national questionnaire and workshops. We will reflect on these results against the backdrop of the specific UAS policy aims around impacts, *doorwerking* (effect or influence), and the broader impact literature.

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INTRODUCTION

The impact of research has become an international topic of discussion by governments, higher educational institutions, and funders with the result that institutions are increasingly considering its importance and the need for evaluation (Ravenscroft et al. 2017). Universities of Applied Sciences (UASs), institutions for higher education that focus on professional practices worldwide, are no different. UASs have, for decades, impacted society through educating future professionals (van Gageldonk 2017). Now, with an increased emphasis on research, UASs are striving to highlight other impacts on society.

The mandate of UAS research is to specifically impact society through focusing on practical applicability, being demand driven, and applied to societal changes. It is collaborative, multidisciplinary, and connected to education by the incorporation of the results into curricula (Universities of Applied Sciences for Europe 2017). In response to this increased emphasis on impact, UAS associations in several countries, including Belgium, Finland, Denmark, and the Netherlands, are striving to construct means to allow the systematic evaluation of research impacts.

Research conducted by Coombs and Meijer (2021) into the appropriate means of UAS impact evaluation has suggested that the philosophical assumptions underlying such an evaluation must first be considered. Seen as the lens through which you view the research, and which influences the way links between research and impact are viewed, appropriate assumptions for UAS research are said to be either a realist or performative assumption. Research impact studies from a Realist assumption aim to explore the context-mechanism-output-impact configuration and strive to address the variability in knowledge uptake through the research. Mechanisms of impact are believed to be achieved through interactions between policy makers, practitioners, and resources. A performative assumption, however, is based in Actor-Network Theory. Evaluation of research impact is believed best accomplished by assessing the greater effects of interactions between research and society through mapping the actors, activities and resulting changes that take place over time (Greenhalgh et al. 2016). The theoretical requirements suggest that pertinent evaluation is conducted in real-time and is formative in nature with the goal of learning and improving. These requirements stress the need for a framework that follows the messy process of practice-oriented research without constricting it with a logic model which connects objectives, input, output, and impacts in a linear way. This evaluation framework should be done in co-production with stakeholder involvement from the outset. The culmination of these requirements emphasizes the importance of understanding the context and process of research done at UASs to evaluate its impact (Coombs and Meijer 2021).

The Netherlands Association of Universities of Applied Sciences (NAUAS), known in Dutch as the Vereniging Hogescholen, currently strives to impact society in twelve research themes (NAUAS 2021). In its publication *Onderzoek met Impact* (2016) ('Research with Impact'), the NAUAS outlined the initial ten areas of society on which UASs aim to collectively create impact. Reflecting the Sustainable Development Goals of the United Nations (United Nations 2015), these themes include health, education, society, built environment, transport, agriculture, energy, the arts, business, and technology. It is intended that these themes follow the Dutch Research Agenda and reflect the current research trends within Dutch UASs (NAUAS 2016). Table 4.1 provides an overview of these themes and the corresponding short name by which they will be referred to throughout this article. These themes are intended to be broadly recognized areas in which UASs conduct sizeable amounts of research and are to be dynamic (NAUAS 2016). In its current strategic research agenda of 2022-2025, the NAUAS has added two additional themes. These are Security, and Tourism and Hospitality (NAUAS 2021). These new themes were introduced after this study was conducted and, consequently, are not included in this article. The NAUAS strategic agendas call for the evaluation and monitoring of the impact of these themes (NAUAS 2016).

The research questions this article addresses are: 1. how Dutch UAS researchers view their work within the ten themes; 2. What impacts do UAS researchers wish to create? 3. What types of outputs do they create to achieve this impact? Through answering these questions, the purpose of this article is to assess the larger question of how the research impact of the ten themes of NAUAS policy can be evaluated in a meaningful way. We will reflect on these results against the backdrop of UAS policy aims around impacts, doorwerking, and the broader impact literature.

Netherlands Association of Universities of Applied Sciences Theme Name	Corresponding Abbreviation
Health: Care and Vitality	Health
Education and talent development	Education
Resilient society: in community, city, and region	ResilientSoc
Smart technology and materials	Materials
The Built environment: sustainable and liveable	BuiltEnv
Sustainable transport and intelligent logistics	Transport
Sustainable agriculture, water and food supply	Agriculture
Energy and energy supply	Energy
Art and creative industries	Art
Business: responsible and innovative	Business
No Domain	

Table 4.1: Netherlands Association of Universities of Applied Sciences Theme Name and Corresponding Abbreviation Throughout Article

‘Impact’: A Journey

Defining ‘Impact’ has been an evolutionary process for Dutch UASs in much the same way as it has been for the rest of science (Riley et al. 2018). While it may at first appear to be a word game, the definitions and intentions of the word have ramifications for evaluation. They, also, reflect the maturity of practice oriented research in the Netherlands as they move from accepting words and definitions that are common but do not reflect the fullness of UAS research, to using terms and definitions that reflect the nature and practice of it.

Today, the most frequently used term when referring to impact in Dutch UAS policy, if not in discussion, is the term *doorwerking*. The term doorwerking is directly translated into English as ‘effect’. The NAUAS has defined effect as: “The influence of both the research process and the research results on Education, Professional Practice and the Research domains” (NAUAS 2022, 22). This is a difficult word to do justice to in the English language, but the inference of the word is more detailed than what that relatively traditional definition conjures up. It includes all the subtle implicit and explicit changes/effects that occur during both the research process and dissemination of its output. Andriessen (2022) speaks to it as similar to the growth of a seed that slowly grows in each direction, and where value is created throughout the subtle, non-linear growth process (Tielen, 2022).

This is very different from the term that Dutch UASs originally used. Initially, the term used was ‘valorisation’ (de Jong 2016). The 2009 definition of ‘valorisation’ adapted by the Ministry of Economy states:

> “Valorisation is the process of creating value from knowledge by making knowledge suitable and/or available for economic and/or societal use and translating that knowledge into competitive products, services, processes and entrepreneurial activity” (Nederland Ondernemend Innovatieland 2009).

In 2012, the word ‘competitive’ was removed to soften the economic implications of the definition (de Jong 2016).

On an international level, the term ‘valorisation’ primarily applies to the economic value of research impact (van Drooge et al. 2011). While valorisation is seen as a legitimate component of research impact, the current focus tends to overlook the non-economic component of research impact (van Drooge et al. 2011). The policy and support focus around impact has until recently been on the entrepreneurial output. Centres of Entrepreneurship have been set up to facilitate spin-offs, incubators, and the like, through which valorisation is achieved (OECD 2018). De la Torre et al. (2017) argue that by focusing on the economic value, full engagement in the broader spectrum of impact is neglected.

Further limitations of this economic focus have been identified by Etzkowitz (1998) who suggested that it implies a one-directional flow of knowledge from science to society rather than an exchange of knowledge between science and society. However, the idea that knowledge flows in a single direction has been superseded by the concept of the Knowledge Triangle (KT) of Education, Research, and Innovation. Van Vliet echoes this concern by suggesting that, in principle, the word valorisation as defined by the Ministry, can be used by UASs. However, it primarily reflects only a portion of the role UASs fulfill in impact creation (van Vliet 2022). The KT acknowledges the interconnectedness of Higher Education, the Business sector and society at large (Unger, Marsan, Meissner et al. 2020). The KT forms the foundation of UAS research and much of the policies of the NAUAS (Miedema, van der Sijde and Schuiling 2013).

The NAUAS continued to use the term valorisation until approximately 2015 (NAUAS 2015). However, with the introduction of 'Research with Impact' the term valorisation was no longer considered appropriate. Instead, 'Research with Impact' made use of the term impact**.** Echoing the work of productive interaction (Spaapen and van Drooge 2011), this policy document generally referred to research impact as "the interaction between knowledge out of the real-world and knowledge for the real-world" (NAUAS 2015, 10).

Current thinking in UASs, reflected in policy, does not make use of either valorisation or impact, instead it uses doorwerking. Taking productive interactions further, the word conjures up visions of an ecosystem in which minute developments create a succession of changes for adaption. It is the continual interactions through people and output (Brouns et al. 2023) resulting in knowledge transfer between the areas of research, practice and education, that create doorwerking (Andriessen 2019).

Placing this idea in the broader impact discourse, the process focus of doorwerking is much the same as Sivertsen & Meijer's (2019) 'Normal' impact. Sivertsen and Meijer make a differentiation in types of impact between 'Normal' and 'Extraordinary' impact. Normal impact extends beyond productive interactions, where interactions between researcher and stakeholder create 'scientifically robust and socially relevant' impact (Spaapen and van Drooge 2011). However, Sivertsen and Meijer suggest that Normal impact is simply generated through interactions at a personal or organizational level that occur through decisions made and activities participated in on a daily basis. They suggest that this Normal impact is the most common form of impact, but it is Extraordinary impact that while rarest, is the most frequently evaluated. Extraordinary impact is the impact written about in case studies and narratives because of its positive widespread effect on society.

Lykke et al. (2023), building on the work of Sivertsen and Meijer (2019), refer to Normal impact as micro impacts. They suggest that rather than focusing on impact as the outcome of a causal link between scientific breakthroughs and societal changes, micro impacts continually occur in the interactions between research and throughout the research process, and facilitate an unexpected and unplanned effect, be it positive or negative (Derrick et al. 2018). Budtz Pederson & Hvidtfeldt (2023) go on to say that it is these micro impacts (distinct events, communicative impulses, or material artifacts) that may eventually lead to macro level impact. It is these micro impacts that Dutch Universities of Applied Sciences would like to evaluate, and which have implications for the evaluation process (Lykke et al. 2023).

The Potential Effect of the Themes

The activities, interactions, and relations between the three areas of the KT, and thus the impact of the research, are believed to differ between themes (Lykke et al. 2022). Other factors contributing to the differences include what the researchers themselves wish to contribute to society, the impact they wish to make and how they accomplish this in output. Theme specific elements may be required of a research impact evaluation of the ten themes, to reflect the shared values of these specific themes (Williams 2020). It is, therefore, necessary to garner more information concerning the themes and how they function, in order to best serve them, and avoid modifying the practices of UAS researchers to conform to the evaluation. This speaks to the importance of avoiding perverting evaluation by creating a situation in which researchers feel compelled to act and produce in a specific way (Gläser and Laudel 2007) which does not reflect the reasoning behind the NAUAS's ten chosen themes. Rather than being chosen to steer research in a certain direction, the themes are intended to reflect the work already being done by UAS researchers. (NAUAS 2022). It is not the goal of the NAUAS that researchers choose projects based on their compatibility with a specific theme. The expansion of the NAUAS themes to include Security, and Tourism and Hospitality exemplify this. Nevertheless, the practice of working with themes may in fact cause these changes to occur as researchers attempt to fit into the specified themes. This is a continuous battle; to showcase the impact UAS research has on society in a way that does not alter how researchers conduct themselves and their research (Whitley 2007).

METHODS

By examining the impact and output of UAS research at a theme specific level, we can investigate commonalities and differences between these themes. These differences may be addressed when integrating the themes into the evaluation process of Dutch UASs. To assist in assessing this, we conducted a mixed methods study. Data for this study was drawn from both a questionnaire and a set of workshops conducted with the purpose of learning more about practice-oriented research, its researchers, impacts and outputs, and the themes.

Questionnaire Sample

The sample consisted of 467 respondents. Respondents represented 31 of the 36 UASs in the Netherlands. Of the 467 respondents, 434 respondents indicated the impacts they wish to create. 355 respondents indicated what output their research produces. 293 respondents indicated the theme in which they felt their research best fit and the multiple themes into which they felt their research could fit.

Table 4.2 indicates the specific questions asked and the number of respondents per question.

Question	N=467	%
Please indicate one theme where you feel your research best fits.	N=293	62,7
Please indicate all the themes where you feel your research fits.	N=288	61,7
What kind of impact do you want your research to have?	N=434	93
What kind of output does your research produce?	N=355	76

Table 4.2: Questions/Respondents

Questionnaire Design

Building on the work of the Rathenau study, *Praktijkgericht Onderzoek bij Lectoren van Hogescholen* (Practice-Based Research by Professors at Universities of Applied Sciences) (de Jonge 2016), we developed a questionnaire in which we sought to gain further understanding of not only how the networking and research functions of the professors' work, but also how the research group as a whole works with their various functions, and the context and process of their research. We explored research, teaching, networking, collaborating, evaluation, and internal organizational matters such as management. This approach also reflects the insights of Kyvik (2012) in his work on the roles and functions of Norwegian researchers, as well as Zuckerman & Merton (1972) and Blaxten, Hughes & Tight (1998), who discuss the various roles and functions of academics. The questionnaire was extensive, beyond the scope of this particular paper, and investigated the activities of the researchers forming these research groups as well as information about tasks, motivations, functions, backgrounds, and desired impacts (Anonymous forthcoming).

Importantly for this component of our study, we also asked questions concerning the respondents' theme(s), desired impact, and the output they create during their research. Components in the questionnaire were inspired by the questionnaire conducted by the Rathenau institute (de Jonge 2016), while also reflecting input from exploratory conversations with 33 researchers and support staff. Questions were verified and pretested with ten researchers (one per theme) prior to distribution. The results of this questionnaire give greater insight into the impact and output of UAS research as well as the legitimacy of the ten themes stipulated by the NAUAS.

Participants were asked into which of the NAUAS's ten themes they felt their research **best** fit. They were then asked to indicate **all** possible NAUAS themes into which they felt their research could fit. In addition, they were asked if there was a theme not included in those of the NAUAS into which their research better fit. We used these responses to specifically examine the practicality of the themes, the impacts researchers desire to make, and the output they create to aid in impact creation. These responses assist in determining how the evaluation of the impact of research conducted by Dutch UASs can be embedded into the evaluation process of the research themes as set out by the NAUAS. Figure 4.1 provides the exact questions asked and illustrates the distribution of respondents over the themes, including those who did not indicate a theme.

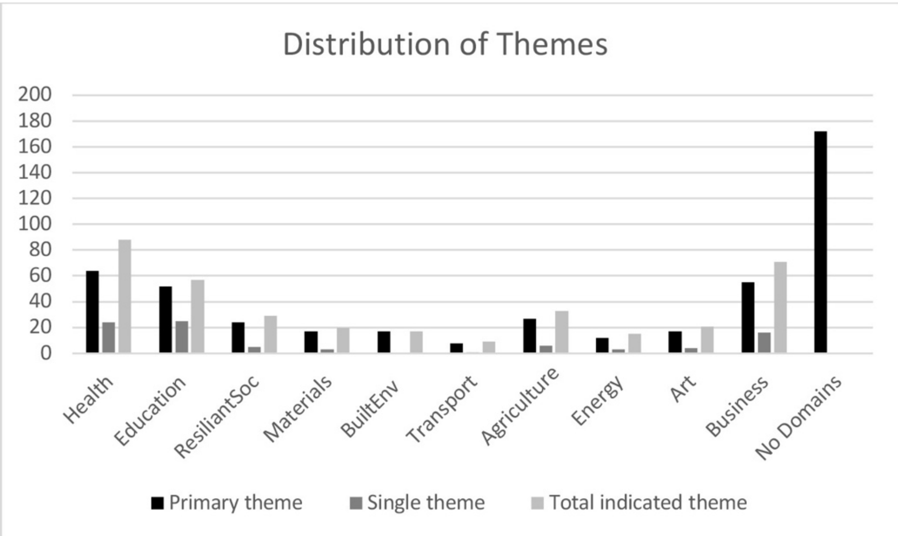

Figure 4.1: Overview of Respondents and Theme Choices

We asked respondents to indicate the desired impact of their research. The options were based on policy vernacular with a text box for other options and explanations as required (Guthrie et al. 2013). Specifically, researchers were asked to choose the types of impact for which they strive. Figure 4.2 illustrates the specific types of impacts and number of corresponding respondents.

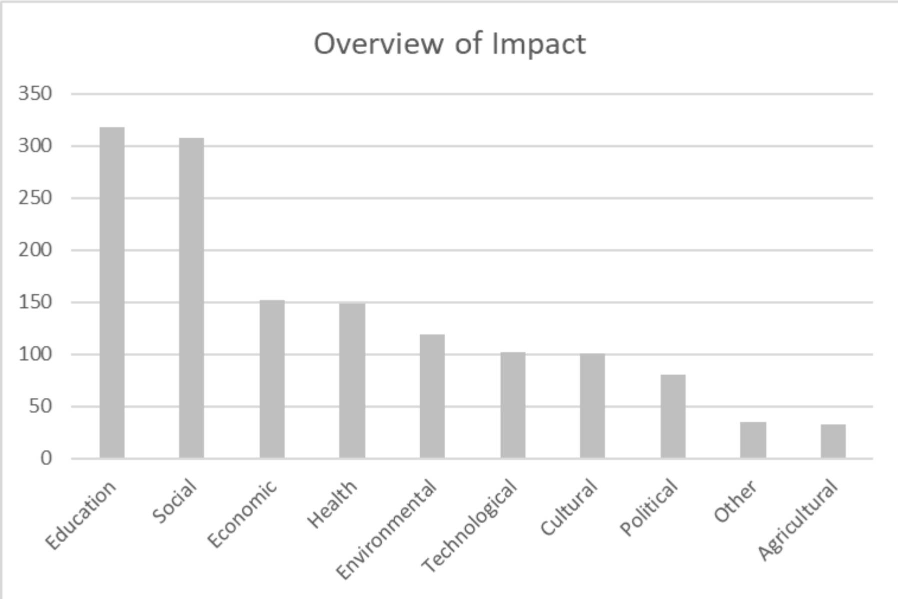

Figure 4.2: Overview of Questionnaire Results Concerning Impact

Respondents were asked to specify what types of output their research produced. Options of output were based on diverse sources of information including interviewee input, the Dutch national database for UAS research output, the HBOKennisbank, and the project database from the largest UAS research funder, Regieorgaan Stichting Innovation Alliantie (SIA) (Regieorgaan SIA 2021). Figure 4.3 illustrates the 45 types of output and number of corresponding respondents. An option of 'Other' as well as a textbox for additional personal options was made available. The order of types of output was randomly presented in the questionnaire.

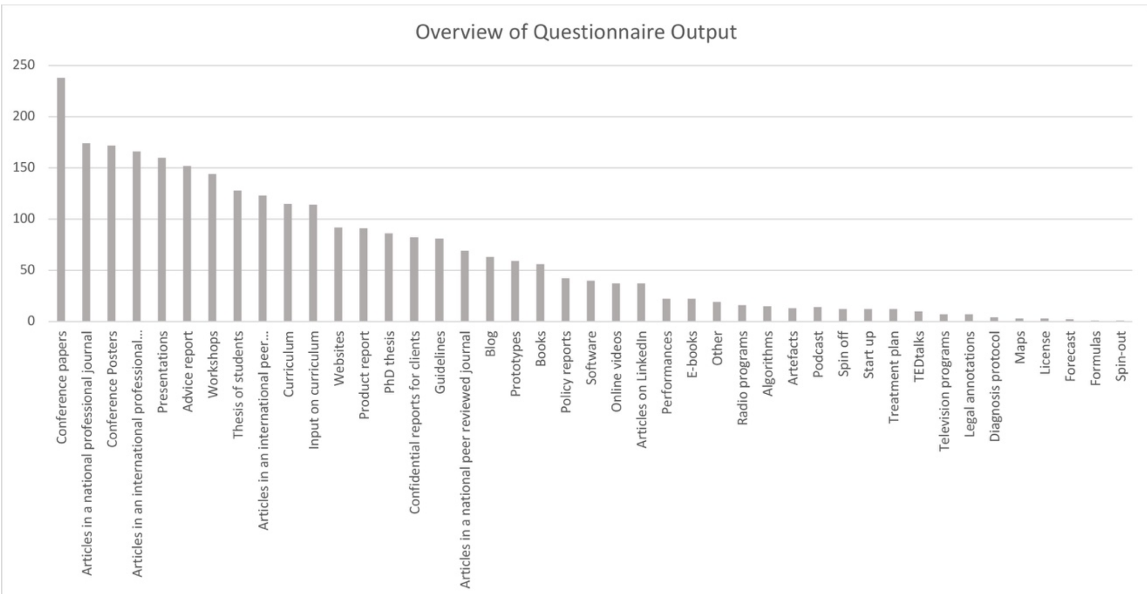

Figure 4.3: Overview of Questionnaire Results Concerning Types of Output

Respondent Recruitment

Currently, five of the 36 Dutch UASs affiliated with the NAUAS make use of a Current Research Information System or other centralized registration system for researchers. Consequently, a list of all researchers affiliated with a lectorate was collected primarily through institutional websites. All 36 UASs under the NAUAS were included regardless of the size of their research staff. A list of 2700 researcher names and email addresses was collected through the public websites of the institutions, open repositories, or Google. When possible, the list was checked by a member of the research support staff from the specific institution. Participants were recruited directly through an email invitation that explained the aims of the study and provided a link to the online questionnaire. Participation in the online questionnaire was voluntary, anonymized and in compliance with the ethical rules of the research institutions involved. Questions were not made mandatory to encourage participation. The questionnaire was issued in May 2019, and again in October 2019.

Workshops were conducted to verify, discuss, and gain further understanding into the results of the questionnaire.

Workshop Sample

The total number of participants was 21 from 8 different Dutch UASs. There were two participants for each of the ten themes and one additional participant engaged in the healthcare theme giving that theme 3 participants.

Workshop Design

Each of these workshops, which were focused on the ten themes of the NAUAS, began with an introduction to the study. Participants were then given the opportunity to consent to participate. Written consent was also obtained. Further to introductions, a more in-depth presentation was made about the research project and findings concerning the evaluation of research impact created by UAS research. Opportunity for questions and discussion as initiated by participants was available. Participants were then led through a series of structured activities designed for data collection. Pertinent to this component of our study, participants were asked to identify the theme in which they felt their research best fit. Based on this decision, participants were asked the types of research impact their theme wishes to create and what they felt was the most important research impact for the theme. Finally, they were asked to indicate the types of output they produce during their research. Participants were given the freedom to write their answers as they deemed appropriate. When participants felt it was applicable, participants placed their answers in one of four quadrants: HEI (Higher Education Institution) activities, individual Research, Educationally Driven, and Practice Oriented.

Workshop Procedure

Initially, five multi-themed live workshops were organized. As a result of the Covid-19 pandemic and subsequent restrictions, only three of these workshops could be held in a physical space. To allow each theme to be represented at least twice, two additional individual or paired workshops were held online. Participants were initially recruited through the questionnaire and when necessary, were specifically asked to participate in accordance with the theme they felt best suited their research. This was to ensure each theme had a minimum of 2 participants. Participation in the workshops was voluntary and in compliance with the ethical rules of the research institution. Workshops were held between February 2020 and November 2020. Table 4.3 presents an overview of the workshop, the number of participants and the themes represented.

Workshop	Participants	Themes
1	6	Health, Education (2), Agriculture, Art, Business
2	5	Health, ResilientSoc, BuiltEnv, Energy, Art
3	7	Health, ResilientSoc, Materials (2), Agriculture, Energy, Business
4	1	Business
5	2	Transport (2)

Table 4.3: Workshops, Participants and Themes Represented

Workshop results concerning outputs are presented in Figure 4.4. Here responses are displayed in replica of the workshop results. When indicated by the participant, the results have been placed in the appropriate quadrant, including when participants felt that their answer was applicable to more than one quadrant. Results without a specific quadrant can be found clustered on the right-hand side of the figure.

<table>
<tr>
<td>HEI Activities</td>
<td>• PhD Thesis (1R1)
• Articles(national), presentations, workshops, conference posters, conference papers (2R1a)
• Articles, workshops, prototypes, work form/tool (3L3)
• Conference papers, conference posters (4L3)
• Papers and articles, for all focused on congress papers, some journal papers (5R4)
• Conference papers and presentations(6R5)
• Articles (6L5)
• Advice reports, workshops, organising conferences, presentations (7L1)
• Publications that are frequently connected to research with a university (8L3)
• Science and technology research, conference papers, articles in international peer reviewed journals, conference posters, articles in national peer reviewed journals, articles in national professional journals, PhD theses, workshops, presentations, manuals, work forms, self-assessment instruments (9L1)
• Dissertation (9R2)</td>
<td>Individual Research Activities</td>
<td>• Articles, PhD, workshops(university), tweets((1L2)
• Articles, peer-reviewed (PhD) (3R2)
• Articles, congresses, workshops(3L3)
• Conference proceedings (abstract, poster, presentations) (4R3)
• Articles and books (6L5)
• Articles, papers, presentations (7L1)
• Articles (7R3)
• Dissertations (9R2)</td>
<td rowspan="2">No Quadrant Indicated
• Articles peer-reviewed, articles conference paper, articles professional journals, reports, films, newsletters for project participants, project page on website of UAS, tools, podcasts, interviews(8L2)
• Outputs:
1. Calculation models,
2. Physical measurement setups (lab, practice),
3. Reports and underlying documents,
4. Tools for practice (methodology, calculation models, action perspectives or frameworks),
5. Drawings and diagrams,
6. Articles and publications (usually only if these is a PhD, at most one per year without a PhD in the group),
7. Presentations, workshops, etc.
8. Guest lectures (8L3)</td>
</tr>
<tr>
<td>Education Driven Activities</td>
<td>• Input or curricula, book (chapters), thesis, blogs, vlogs, newsletters, websites, presentations, conference papers, scientific publications, readings, workshops, inspiration sessions, games (1R1)
• Professional products, protocol, e-learning, toolkits, articles, posters/factsheets (1R3)
• Workshops, modules, educational papers, readings (1L2)
• Advice reports, curriculum, articles (national), presentations, workshops, conference posters, conference papers (2R1a)
• Workshops, presentations, input curricula, thesis, blog(2R1b)
• Readings, work form for ethical reflection over the effects of technology tool, guest lectures and modules, curriculum on the integration of ethics and technology, science café for the general public (3L3)
• Guest readings/guest lectures, theses, project reports, internship reports (4L3)
• Supervising bachelor students, making educational modules, guest lectures, teaching classes, case studies(6L5)
• Curriculum (7L1)
• Lesson development about nature/human/technology, quartermaster learning line nature/human/technology (7R3)
• Presentations, workshops, guest lessons (8L3)
• Input over curricula (10R1)
• Intervention sessions with students over entrepreneurship, changes in educational curricula, annual entrepreneurial questions from faculty/entrepreneurial indicators (10L3)</td>
<td>Practice Oriented Activities</td>
<td>• Professional publications, advice reports, prototypes, software, hardware (1R1)
• Schooling, professional publications, policy, changed environment, changed behaviour, changed perceptions (1L2)
• Advice reports (2R1a)
• Websites, espl lab, platform for citizens, influencing policy through trainings (3R2)
• Workshops, advice reports, methods for MVI (3L3)
• Prototypes/demonstrators (4L3)
• Changed/new methods, new policy (city, province, NGO), presentations, papers (5L2)
• Applied research reports, tools(data), concepting, spatial planning concepts (5R4)
• Conference papers and presentations, professional journal articles (6R5)
• Reports, prototypes, theses, workshop, input in curricula (7L1)
• Advice, reports, brainstorms, presentations, networking (7R3)
• Advice reports, confidential reports, workshop, presentations, online video, blog, website (9L1)
• Software, workshops, articles for work field, interventions, presentations (9R2)
• Intervention sessions with external partners (10L3)</td>
</tr>
</table>

Figure 4.4: Overview of Workshop Results on Outputs

Workshop results of the questions concerning the types of impacts participants wish to create in their theme, and what they view as the most important impact for them, and their theme can be found in Figure 4.5 in the participant's own wording. Moving from left to right, this figure states the ten themes, the corresponding participant per theme and their exact answers. These answers have been plotted along the types of impacts asked in the questionnaire. Grey squares are all the impacts wished to be created. Black squares are those impacts believed most important. It indicates that, for example, while Educational impact is often mentioned with a series of other impacts, when specified, it relates to teachers benefitting from research, and students knowing how to conduct research. Hence, there are diverse connotations and contexts relating to educational impact, each depending on different outputs.

Theme	Respondent	What is the most important impact for your theme?	What types of impact do your theme want to create?	Health	Agricultural	Cultural	Economical	Educational	Environmental	Political	Societal	Technological	other
				Impact									
Health	**1R1**	Health & Education =1	Political, technological, educational, health: health promotion, prevention, cure, care, societal	■				■		▒	▒	▒	
	1R3	Health/environmental in a health work environment	Health, Social: work, economic, political, technological, environmental: work	■			▒		■	▒	▒	▒	
	1L2	Behaviour	Behavioural change, opinion change, policy change, adding value, awareness, increase of knowledge								■		▒
Education	**2R1a**	Educational	Educational					■					
	2R1b	Societal	Societal and cultural (maybe), economic, educational, impact on the work floor that professionals/ teachers really benefit from the research! That they can use it			▒	▒	▒			■		▒
ResilientSoc	**3R2**	Resilient society through co-creation	Academic, cultural: change culture of UAS, societal: citizens using it, political: change perceptions			▒				▒	■		▒
	3L3	Cultural	Educational, societal, cultural, environmental, academic			■		▒	▒		▒		▒
Materials	**4L3**	Technological - economical	Educational: Educate young professionals in doing research Technological: New technological solutions Health/Environmental: technological solutions to improve health & environmental aspects Economical: Improve business for partner companies.	▒			■	▒	▒			■	
	4R3	Technological in line with social issues	Political/institutional: implementation of impact in institutional processes and by funders (top down) Technological: bettering technology							▒	■	■	
BuiltEnv	**5L2**	Satisfied residents	Environmental: less energy efficient, Economic: Also financially sustainable, Political: new municipal/provincial policy, Societal: Widely supported sustainable behaviour, educational				▒	▒	▒	▒	▒	■	
	5R4	Environmental: The core of the research group is precisely to find a good balance between the objective in these domains. Balance between accessibility (economy) & environment & enjoyable/livable cities is a key	Environmental, Societal, Health, Educational, Technological. Comes down to livable and accessible cities.	▒				▒	■		▒	▒	
Transport	**6R5**	PPP(People, planet, profit), Environmental (sustainability), Technological (development of technology), Educational (education of Masters and bachelor students)	PPP (People, planet, profit), Environmental (sustainability), Technological (development of technology), Educational (education of Masters and bachelor students)					■	■			■	
	6L5	Environmental	Environmental (SDG's, waste reduction and CO2, reduction in noise pollution)						■				
Agriculture	**7L1**	Economical	Economical, Technological, Health	▒			■					▒	
	7R3	Ecological, Cultural	Ecological, Social, Economic, Educational, Political, Cultural, Health	▒		■	▒	▒	▒	▒	▒		
Energy	**8L2**	Stimulating and supporting bottom-up involvement of citizens in the energy transition is (for my own research) the most important goal	The main contribution of the energy and energy supply domain is realizing/promoting/ accelerating the transition to a sustainable energy supply. This means research into sustainable energy sources, but also into energy conservation. Impact can also be realised in the field of a better embedding in or acceptance of energy by society, or contribution to a just energy transition.						■				▒
	8L3	Within our research, we mainly work on technology development and application-related projects from our partners. The impact on the environment has not yet been achieved by the project. The impact on the environment is only achieved much later when the innovation we are working on is frequently applied in practice. Environmental impact is therefore the focus for us, but it is not measurable as the output of our work. Environmental impact is our main motivation.	economic, societal, environmental, technological, educational				▒	▒	■		▒	■	
Art	**9L1**	Science and technology research, research in UAS's	Science and technology research impact on the practice of practice-based research									■	▒
	9R2	In terms of the question, it is not easily answered either, but, if I have to try it anyway, it is the added value for the common person. With my sector we are always committed to societal challenges and the role of the individual should not be underestimated in this. If we want to make an impact, we must have 'done' something with that individual. And not only for now (such as raising awareness), but also for later. Make it actionable.	Economic, health, societal, technological, educational	▒			▒	▒			▒	▒	■
Business	**10R1**	Societally responsible entrepreneurship	Economic, Responsible, Sustainable, Educational, Innovative instruments				▒	▒					■
	10L3	This is personal and their goals. Sometimes it is education impact but sometimes it is scholarly impact and that impact on the external stakeholder is especially important.	Economic impact: Personal impact on the company of the person who wants to do business- starting as a stand in the east of the Netherlands. Agriculture, environmental, a little educational impact (not educational science but content for education)		▒		▒	■	▒				■

■ = most important impact

Figure 4.5: Overview of Workshop Results on Desired Types of Impact and the Most Important Impact

RESULTS

Themes

Questionnaire Results

Figure 4.1 indicates that a considerable number of respondents did not indicate a theme (n=172). It also shows the number of respondents per theme, the number of respondents within each theme that indicated only one appropriate theme and the number of times a theme was indicated as a possible theme.

It is interesting to note the discrepancy in respondent numbers per theme, with Health being represented most frequently (n=64) and Transport being the least (n=8). While Health and Education have the largest number of representatives, they also have the largest number of respondents who suggest their research fits exclusively in those themes. This is plausible given that the professional curricula for nurses and teachers are within these themes. Similarly, in the business themes, many respondents felt that this was their primary theme. While there is no profession directly connected to the business theme, it may be broad enough to host many topics. This characteristic is disproportionate to the number of single theme representatives in the other themes.

Most respondents indicated that they do not feel connected to a single theme. Four respondents indicated that that they felt their research fit into all the themes: 3 from Education, and one from Transport. It is interesting to note that no respondents felt that they exclusively fit into the Built Environment theme. We can conclude from this that researchers feel that they are either not represented by these themes or are represented by multiple themes. There are very few who indicated they fit perfectly into a theme.

Some researchers who did answer the questions indicated a single primary theme. This was particularly true for themes Health and Education where 38% and 48% respectively of the respondents, felt they exclusively fit in those themes. Most respondents, however, indicated that they fit into various themes. Given the mandate of UAS research to flow back into education, as well as the importance of education within the KT, it is particularly relevant to note that Education was one of the most selected themes.

The NAUAS has stipulated their desire to make impact in ten specific themes. These themes are believed to reflect the research trends of Dutch UASs. When asked into which primary themes they best fit, and all the themes into which they could fit, approximately 2 in 5 respondents did not respond. Possible reasons for this lack of response could be because of the positioning of the questions towards the end of questionnaire, however, it could also reflect how these researchers view the themes. It is possible respondents have not answered this question because they do not feel that their research fits into any of the given themes.

Workshop Results

The overlap in possible themes was further discussed by workshop participants. Some participants found it extremely difficult to hone in on one theme. Passionate discussions of the themes resulted in the conclusion that some research may serve many or all the themes rather than one specific theme. Researchers and their groups may also serve more than one theme. Workshop participants were asked to fill in the theme they considered most appropriate for their research. This resulted in discussions in the first and second workshops as to how to decide what was the most appropriate theme. Some participants were easily able to indicate where their research best fit, others found this to be a challenge. They stated that they serve each of the themes dependent on the context of the research they engage in. Participants of the second workshop went as far as to say that the NAUAS decision to make use of what they referred to as Dutch Research Council or European Union domain names means that many of the research topics worked by UASs do not fit into these constructs. This, they suggest, is especially true for research that serves each theme, depending on the project. Participants who found it difficult to identify one theme participated in the workshop using the themes in which they had most recently conducted research. It is within this chosen theme that participants were asked to answer questions concerning impact and output. As indicated in

Figures 4.2 and 4.3, researchers in the workshops confirmed the results of the questionnaire. They feel exclusively bound to a single theme within the context of a project and not at research group level.

Impact

Questionnaire results

Figure 4.2 shows the results of the questionnaire responses concerning desired impact. As indicated, Educational impact (318) is the overall most desired impact. This is understandable considering it is a critical part of the KT and practice-oriented research itself.

Social impact (308) was the second highest overall desired impact followed by Economic impact with 152 respondents. Agricultural impact (33) is by far the lowest scoring desired form of impact. 'Other' answers given included Academic impact (3) and Organizational impact (3) as well as Sustainable impact, Professional impact, impact for Practice, and Business impact.

Several respondents indicated the desired impact depended on the project. "It depends on the project and its scope. All these impacts are relevant, but you can't address them all in the same project, because in some cases it is not related!" One person suggested that 'impact' was too strong a word and that 'awareness' was more appropriate.

Workshop results

One participant in the second workshop said it was insufficient to raise awareness. Instead, in answer to which impact is most important for his theme, he stated that his theme is committed to social challenges where the role of the individual is central, and impact is created by doing something with that individual to create a long term added value.

Figure 4.5 provides an overview of the workshop answers to the question "What are impacts your theme wants to create?" and "What is the most important impact for your theme?". The workshops provide a more diverse overview of desired impacts. It is interesting to note the prevalence of certain types of impact that themes want to create regardless of the theme itself. This includes Educational impact, which was suggested 13 times, a minimum of once per theme. Economic impact was indicated 8 times, once in all themes except for ResilientSoc and Transport. Also, Technological impact was mentioned 9 times, Environmental 9 times, Health 7 times, Political 7 times, and Cultural 5 times. Once again, Academic impact was indicated twice as an "other" form of impact, both in ResilientSoc but also in separate workshops. Agricultural impact was indicated once.

Answers to what the most important impact is for a particular theme were diverse. Some themes, like Health, Materials, and BuiltEnv share the same answers of Health impact, Technological impact and Environmental impact respectively. However, most participants have divergent ideas and took the time to explain what they meant. Several participants stated the importance of the stakeholder in making impact possible and influencing the type of impact created (6R5, 8L2, 8L3, 9L2, 10L3).

One workshop participant stated clearly that the specific desired impact is dependent on the goals and stakeholders. This was further discussed during the workshops in which not only themes were an issue at project level but also the desired impact. While the results of the workshop utilized the policy vernacular at times, participants were also clear that these terminologies are often not specific enough for the type of impact they are trying to create. Participants in Workshop 1 went so far as to state that these terminologies are insufficient for evaluating the impact of research because they miss the impacts created through daily interactions. This corresponds to the concept of doorwerking or micro impact that has become important to Dutch UASs.

The results confirm the focus of Educational impact while at the same time, more specific forms of impact became apparent such as Technological and Environmental impact. Also, the importance of project-based stakeholder engagement affects the desired forms of impact. This is presented in Figure 4.5.

Outputs

Questionnaire Results

As can be seen in Figure 4.3, the highest output overall is Conference Papers (238) with just over half the respondents indicating it as output. The top five outputs were Articles in a National Professional Journal (174), Conference posters (172), International Professional Journals (166), Presentations (160) and Advice Reports (152). As Figure 4.3 illustrates, there are 11 outputs named more than 100 times. These include: Educational related output such as Theses Supervision of Students (128); New Curriculum (115); input into Curriculum (114); or PhDs (86). However, there are also 21 forms of output mentioned less than 25 times, including Entrepreneurial Output such as Spin offs (14), Start ups (12), Licenses (3), Patents (3), and Spin-outs (1).

From these results we can conclude that Entrepreneurial based outputs are limited. Researchers put much more emphasis on the professionalization of their peers through conference output and reports. Surprisingly, Educational outputs are not as prominent as would be expected from the frequency that Educational was indicated as a desired impact. This may be because curriculum remains the primary responsibility of teaching staff and a researcher's role in education is often dependent on the distribution of their hours (Anonymized forthcoming). It may mean that educational impact of research is conveyed through people (researchers) that are teaching rather than through outputs.

Workshop Results

Workshop participants also presented a variety of outputs. As seen in Figure 4.4, articles in either scientific or professional journals as well as contributions to conferences were found in each theme. Educational output is, however, not always included in the themes, and Entrepreneurial output is not mentioned at all. It is interesting to note that several themes in the workshops indicated that prototypes are created as research output (Health, ResilientSoc, Materials and Agriculture). Also, social media output such as blogs, vlogs, websites, and films were mentioned by Health, Education, ResilientSoc, BuiltEnv, Energy, and Art. It is important to point out that only half of the workshop participants indicated a form of Educational Output. The form of this output was through thesis/dissertation supervision, input into curricula, modules, or guest lectures. Several themes, such as Transport and BuiltEnv did not indicate any form of Educational Output.

These results confirm the results of the questionnaire and again point to the relevance of more specific social media-based outputs that can be more difficult to capture (Tahamtan and Bornmann 2020). Once again, Educational output and Entrepreneurial output are underrepresented.

DISCUSSION

The purpose of this study was to explore how researchers see their work within the ten themes of the NAUAS as well as to explore the impact they wish to create and the outputs they use to help facilitate this impact. In doing so the aim was to assist in answering how the research impact of the ten themes of NAUAS policy can be evaluated in a meaningful way. To accomplish this, we conducted a questionnaire concerning the themes, impact, and output. To triangulate the findings, we also presented workshop results in which participants were asked about these same subjects and where we discovered that: choosing a theme is not an easy task; stakeholders play a key part in both the themes of the research and the desired impacts; desired impacts and the outputs created appear to differ greatly; and outputs appear to reflect the KT but not always in the way we would expect.

Question 1: How Dutch UAS researchers view their work within the ten themes

Our results show that few researchers are comfortable in one theme but recognize that their research can fall under multiple themes. Understandably, some researchers have difficulty choosing appropriate themes. The inability to specify a theme may be the effect of conducting multidisciplinary research. Multidisciplinary research is an important pillar of the research conducted in UASs (Universities of Applied Sciences for Europe 2017), which by its nature encompasses different expertise and disciplines to find the solution to a problem (Guimarães, Pohl, Bina and Varanda 2019). In doing so, multiple themes are brought together, and consequently, the research can be viewed from multiple perspectives. While the themes of the NAUAS align with the policy of the SDG's and grand challenges, as well as the Dutch Research Agenda, the multidisciplinary nature of UAS research makes choosing just one of these themes virtually impossible. This means that for the evaluation of impact within the themes, the ability to indicate more than one theme is needed.

Further, many researchers appear to feel that the relevant theme is dependent on the project and the stakeholders involved. In order for the Themes to be best included in an impact evaluation, a project level evaluation may serve best for capturing the themes in which the research takes place rather than at the research group level. The formation of research groups is not proactively centred around the themes. Multiple projects take place within a research group with different research group members and stakeholders and thus also in different themes. As suggested by both the workshop members and questionnaire respondents, the applicable theme or themes may be dependent on the stakeholders or project initiators. Consequently, their themes changed per project. The possibility to indicate the doorwerking of the research group, institution, or a higher aggregation level on a research theme then becomes difficult to pinpoint. Assessing impact at the aggregation level of research groups or higher makes the impact of individual projects invisible. Moreover, this also tends to make it more difficult to specify theme specific impacts. As a result, the evaluation may become too general or abstract to be meaningful. Consequently, room for multiple themes will need to be taken into consideration when evaluating.

There are many tools that can be used for evaluating the impact of these themes as presented on the website doorwerkinghbo (https://doorwerking-hbo-onderzoek.nl/). However, it is important to consider the right tool. Recent research by Lykke et al. has suggested that the evaluation of micro impacts may be better suited to contribution analysis (Lykke et al. 2023). While the use of narratives and indicators are frequently used tools for research evaluation (Guthrie et al. 2013) they may not do justice to the minutiae of daily practice of micro impact creation through the research process and thus also not the doorwerking (Lykke et al. 2023). Contribution analysis sets out to visualize the interactions that take place between society and research which may lead to an effect on society and taking the wide array of factors, actors and interactions into account when evaluating the links between research and impact (Riley et al. 2018). Contribution analysis at project level may be of assistance. At the research group level, it would be interesting to create a collective overview of the micro impacts they want to produce and do produce. From such collectives of micro impacts, different narratives can emerge and indicate how the research group operates as a whole. While narratives are often seen as subjective stories, by using contribution analysis as a basis for that narrative a solid foundation on which macro impacts are created can emerge.

Question 2: What impacts do UAS researchers wish to create?

In relation to expected impacts, evidence pointing to the necessity of an impact evaluation occurring at the project level is the role stakeholders play in creating impact. Similar to the discussion concerning the appropriate themes being in part reliant on the stakeholders included, impact, with the exception of Educational impact, is also dependent on the stakeholders involved, and stakeholders are project related.

Brouns et al. (2023) have identified stakeholder contribution to practice oriented research as one of the primary ways in which impact is created. These stakeholders and the projects they contribute to are situated in networks. These networks, be they simple or complex, are typically built and expanded upon over the course of the project, increasing the potential impact on not only the stakeholders, but the networks in which they are embedded (Brouns et al. 2023). Research into the roles and functions of Dutch UAS research groups has suggested that the networking between these stakeholders and the research group falls primarily on the shoulders of the professors (Anonymous, forthcoming). This can make the link to Professional Practice fragile as one person appears responsible. Nevertheless, it remains an important means of impact. It has recently been suggested by Bowen et al. (2022) that a mixed methods network evaluation can be an important tool in impact assessment. Similarly, Teirlinck and Spithoven (2015) have suggested this is particularly important for applied research. The fact that stakeholders are already involved creates impact. And, as the projects and stakeholders change so does the desired form of impact.

The impact that does not appear to change is the importance of Educational impact. This is a natural conclusion given the nature of UAS research (Anonymized forthcoming). As previously suggested, not only is Educational impact the original purpose of Universities of Applied Sciences, it is also one of the core principles of practice-oriented research. However, discussion in Workshop 3 suggests that a connection between research and education is not always possible. For some, the research undertaken, and the subsequent findings are too specific to be included in curricula. The inability to link research and education may be attributed to the diverse "types" of research that take place in UASs to find answers to the problems they encounter (Kyvik and Lepori 2010). This presents a dilemma concerning the KT and ensuring (or not) that the circulation of knowledge throughout the KT continues even when the research does not directly appear useable in curricula. At this point, student participation in the research process itself becomes of greater importance and stresses the importance of taking the various diverse forms that research can flow back into education. This underlines the fact that sometimes the role of the researcher is to help faculties educate future researchers and ensure that they have the tools required for doing research themselves. Other times researchers are directly connected to creating new curricula where the methodology and results of specific research is used.

Question 3: What types of outputs do they create to achieve this impact?

The various means through which Educational impact can be created may also account for the relatively low numbers of educational outputs. Given the consistently high numbers related to creating Educational impact, the actual number of respondents that indicated Educational output is surprisingly low. As discussed in the previous paragraph, this lack of correlation may indicate a relationship between the types of research required to be conducted in order to answer the societal issues UASs are tackling. Alternatively, it may suggest that the successful relay of information is reliant on something other than the output. This unknown factor could be the mechanism rather than the output itself as the small amount of Educational output and the high desire for Educational impact do not correspond. It is possible that this may relate to the roles and functions of the researchers within the research group or project. Research into the roles and functions of UAS research groups suggests that for the knowledge transfer within the KT to occur, a certain combination of people with certain tasks and skills are required (Anonymized forthcoming).

The disconnect between desired impact and output is further seen in other areas such as that of Political, Cultural, or even Environmental impact. However, as one respondent suggested,

> "The impact on the environment has not yet been achieved by the project. The impact on the environment is only achieved much later when the innovation we are working on is frequently applied in practice. Environmental impact is therefore the focus for us, but it is not measurable as the output of our work. Environment impact is our main motivation" (8L3).

This may also be the case for Economic impact and Entrepreneurial output. The output results of this study do not reflect the importance of industry and business for UASs. This, like Education, is one of the cornerstones of the KT, and the impact created in this area is not visible through the output created. The output also does not reflect the involvement of Centres of Entrepreneurship. Given the policy focus on Entrepreneurial output, it would be expected that the study results would reflect the policy. The fact that it does not could suggest that the policy focus reflects the impact discussion which was initially focused on valorisation Economic impact but does not reflect what is happening in practice. While Economic impact was indicated by many respondents, in practice Entrepreneurial output is not a primary output of Dutch UAS research. This is consistent with other studies into the commercialization of research activities. They, too, have found that patents, spin-offs, and other Entrepreneurial output is very limited (Atta-Owusu and Dahl

Fitjar 2021). One specific lector indicated that while his research could result in IP (Intellectual Property) and patenting, he has clearly chosen to work with a complete chain of manufacturers to work together to find a solution to the problem, and prepare them to work together in the future, rather than claiming it for themselves or their institution (4L3). However, the initial results of this study would suggest that UAS researchers are focused more on the paper-based outputs similar to a university rather than focusing on the practical sphere of the KT.

While Academic impact was infrequently mentioned by both participants and respondents, the desire to create impact in the profession through research output is evident. Academic impact created through peer reviewed output continues to be the primary form of knowledge development and output for universities. However, as indicated by a respondent from the third Workshop, knowledge development as produced by universities is not the goal of UAS research. Nevertheless, Article output is surprisingly high given the focus of practice-oriented research. The order in which choices were given in the questionnaire options was explicitly done in random order to avoid the perception that paper-based output was of more importance than other forms of output. These results can reflect the fact that respondents either view paper-based output more as output than other forms or that the output of Dutch UAS research really is paper based. Alternatively, it may reflect that the impact on the profession, as indicated by one of the respondents, may be a priority.

Output that can be used to create impact on all three areas of the KT are those related to social media. It is interesting to note how low social media scored in the questionnaire but how relatively prevalent these forms of output were in the workshops. These low scores may reflect the need for more time to lapse to gain popularity rather than reflecting the importance of the output in UASs. Or it may reflect the difficulty in capturing social media output in traditional data infrastructures. Additionally, this may result from an opinion on social media where it is not seen as a form of output (Tahamtan and Bornmann 2020).

This study has suggested that there may be a disconnect between the research outputs and the desired impacts of researchers. However, the full impact on the KT is not visible through output alone. Researchers, stakeholders, and outputs are all individual means of creating impact. The fact that stakeholders are included in this form of research already creates impact. But working together has the potential to exponentially strengthen that impact. In addition, the network that UAS researchers collaborate in is an important form of impact that sometimes requires more work to initiate and sustain and has a greater benefit than that of standard outputs.

CONCLUSION

This study into Dutch UAS research impact evaluation consisted of a comprehensive questionnaire the results of which were further validated by workshops. Through our mixed methods study we have attempted to assess how Dutch UAS researchers view their research in light of the themes of the NAUAS, the impacts they choose to create in those themes, and the outputs they create to achieve these impacts. This was undertaken to better understand how the research impact of the themes of NAUAS policy can be evaluated in a meaningful way.

The results of our study suggests that in order for the impact of the themes to be evaluated, impact evaluation should take place at the project level. Specific impacts and outputs, along with the themes themselves, appear to be best considered at the project level. This approach considers the stakeholders involved and the project output. It is important to state that the outputs are not the micro impacts themselves. Instead, micro impacts are the interactions that take place that may lead to outputs. These interactions do not need to be productive but merely occur or emerge from the research work (Lykke et al. 2023).

Because the temporality of the projects allows a research group to easily fall into more than one theme, a clear vision and policy concerning desired impacts, themes. and stakeholders, would allow the researcher group to make conscious decisions about their impact and create their own narrative. The results of this would assist in reducing the risk of Educational impact being underproduced. In addition, it would allow research groups to make conscious decisions not only about the outputs they create but the diverse roles and functions present in project groups. A research group policy would also allow research groups to develop their micro impacts into macro impacts.

The current national evaluation framework used by the NAUAS, the *Branchprotocol kwalitietzorg Onderzoek* (BKO), focuses on doorwerking at the research group level. From our results doorwerking is equivalent to micro impacts which take place throughout the research process of a project. This should be considered when aggregating to the BKO research group level.

Impact evaluation at the project level should then be done in alignment with the recommendations for the impact evaluation of UAS research (Coombs and Meijer 2021). These recommendations suggest that an appropriate evaluation of impact made by practice-oriented researchers requires that it be done in co-production with the stakeholders (Coombs and Meijer 2021). Among other aspects, it should also be conducted in Real-time and for learning purposes (formative). Contribution analyses may be well suited for this. Contribution analyses may also help with monitoring the doorwerking of practice-oriented research. It is perhaps in this monitoring that the doorwerking becomes evident. Monitoring can provide insight beyond the indicator of output and illustrate the mechanisms through which the doorwerking takes place. By understanding more about these mechanisms, we can also learn more about how practice-oriented research impacts society.

CHAPTER 5

USING CONTRIBUTION MAPPING TO EVALUATE THE RESEARCH IMPACT OF UNIVERSITIES OF APPLIED SCIENCES

ABSTRACT

Research conducted by Universities of Applied Sciences (UASs) is frequently driven by professional practice where researchers are challenged with finding solutions to real-life problems. These real-life solutions are significantly enhanced by the participation of stakeholders. Through this inclusion and the resulting interactions, activities, and knowledge transfer, between the stakeholder and research(ers), impacts occur at a micro level. These micro impacts are what UASs strive to make visible. Contribution analysis has been recognized as a viable method for evaluating micro impacts. One recognized contribution analysis framework is Kok and Schuit's (2012) Contribution Mapping. It is also one of the frameworks acknowledged as conforming to several of the recommendations for evaluating UAS research impact. The purpose of this article is to test how this framework works in real-life by asking the question: how can we implement Contribution Mapping theory as a formative impact evaluation tool in collaborative projects in which UASs are involved? This article will examine the specificity of UAS research, the relevance of Contribution Mapping for evaluating UAS research, and the theoretical and practical implications of Contribution Mapping. Through inductive analysis conducted on information gleaned from interviews and a focus group, observations, challenges, and limitations are identified, and modifications suggested to aid in the implementation of Contribution Mapping. In doing so, we hope to understand the theoretical and practical implications of this approach.

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INTRODUCTION

Evaluating the impact created by research done by Universities of Applied Sciences (UASs) has been a point of discussion for a considerable number of years. While initially founded to create impact through the education of future professionals, UASs have spent the last two decades professionalizing their research role. Today, research conducted by UASs is frequently driven by professional practice where researchers are challenged with finding solutions to real-life problems. These real-life solutions are significantly enhanced by the participation of stakeholders. The nature of practice-oriented research, therefore, is such that stakeholders play a profoundly important role in it.

Co-creation, co-production, societal and public engagement, and citizen science have become means of describing the participation of stakeholders in the different phases of the research cycle. Each of these examples provides a different level of stakeholder inclusion in the research process. Through this inclusion and the resulting interactions, activities, and knowledge transfer, between the stakeholder and research(ers), impacts occur at a micro level (Budtz Pedersen and Hvidtfeldt 2023). These micro impacts are what UASs strive to make visible (Anonymous in review).

One method of evaluating the micro impacts created by UAS research has been identified as Contribution Analysis (Lykke et al. 2023, Coombs and Meijer 2021). One recognized contribution analysis framework is Contribution Mapping created by Kok and Schuit (2012) (Greenhalgh et al. 2016). It is also one of the frameworks acknowledged as conforming to several of the recommendations for evaluating UAS research impact including a performative assumption. An assumption is the lens through which research and its evaluation is viewed. A performative assumption is based on Actor-Network Theory, bringing the actors, activities, outputs, and interactions into view. This framework is formative and is thus for learning purposes. It is also adaptable to real-time in co-creation with stakeholders (see 2.2, Coombs and Meijer 2021). The purpose of this article is to test how this framework works in real-life by asking the question: how can we implement Contribution Mapping theory as a formative impact evaluation tool in collaborative projects in which UASs are involved? This article will examine the specificity of UAS research, the relevance of Contribution Mapping for evaluating UAS research, and the theoretical and practical implications of Contribution Mapping.

THEORETICAL FRAMEWORK

What are the Specificities of UAS Research?

The application of research to solve problems in practice is acknowledged as one of the key attributes of UAS research (de Weert and Leijnse 2010). The applied, problem-solving nature of research done at UASs is reflected in the two terms frequently used to describe Dutch UAS research, *Praktijkgericht* (Practice Oriented) and *Toegepast (*Applied). While Applied is perhaps the best known, it has been suggested that the term Practice Oriented research best describes the nature of UAS research (Borgdorff, van Staa and van der Vos 2007). Practice Oriented research is known for its practical application when attempting to tackle Grand Challenges. It emphasizes the importance of collaboration and co-production between researchers and stakeholders, with researchers working alongside practitioners to, among other tasks, identify problems, gather data, and develop interventions (van Beest 2021).

Brouns (2016) takes the contribution of the professional practice a step further in her explanation of research done by UASs. She prefers the term, Praktijkgebonden (Practice Related). She suggests this term reflects the non-linear nature of UAS research as it follows practice. Additionally, she argues it emphasizes the continued role of professional practice throughout the research cycle, and the value of combining scientific knowledge of the researcher and these experiences. Regardless of its name or title, it can be argued that what is important is that the stakeholder contributes to research that links the three components of the Knowledge Triangle of Education, Professional Practice and Research (Miedema et al. 2013).

Countries, including Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Ireland, Lithuania, the Netherlands, Norway, Portugal, Spain, Sweden, and Switzerland, all have a binary educational system that includes traditional universities as well as Universities of Applied Sciences (Universities of Applied Sciences for Europe 2017). While they are not homogeneous in how they express this binary system (Lepori 2021), UASs around the world participate in a similar type of research and produce similar output (Universities of Applied Sciences for Europe, 2017). This research has been referred to as, among other things, Applied, Triple Helix, Third Mission, Entrepreneurial, Mode 2 or Edison's Quadrant research (Bornmann 2012; Carayannis & Pirzadeh 2014; Carayannis & Campbell 2009; Leydesdorff and Zwadie 2010). Mode 2, a theoretical framework initiated by Gibbon et al. (1994) in their book, *The New Production of Knowledge,* suggests that in addition to traditional, fundamental research (Mode 1 research), a new form of knowledge production is being created, i.e. Mode 2. Mode 2 research is described as transdisciplinary, heterogeneous, heterarchical, and transient (Gibbon et al. 1994). Among other characteristics, this knowledge production is generated within the context of applications and utilizes a broad range of theoretical perspectives to solve problems. The results of this knowledge production are shared through formal channels and informal interactions with participants (Gibbon et al. 1994). The Netherlands Association of Universities of Applied Sciences (NAUAS) has recognized that the research their institutions conduct can be viewed as Mode 2 (NAUAS 2008).

They have also stated that the applicable, problem-solving nature of UAS research is also reflected in Stokes' Pasteur's Quadrants theory (1997) (van Gageldonk 2017). Stokes' theory of technological transfer suggests that knowledge production is composed of four quadrants. He describes three of these quadrants as categories of research to illustrate the three different ways in which knowledge is produced: pure basic (Bohr); use-inspired basic (Pasteur); and, pure applied research (Edison). The fourth quadrant has been left undefined. It has been suggested that research undertaken by UASs falls into the Edison's quadrant (de Weert and Leijnse 2010). This differs from the other quadrants as it is characterized by pure applied research that seeks to solve a specific problem rather than to understand any broader scientific phenomena resulting from what is being discovered (Stokes 1997). Whether this accurately encompasses the work done by UAS research has been questioned (Kyvik and Lepori 2010).

It can also be suggested that that the research done by UASs is in fact comparable with Carayannis and Campbell's (2009) concept of Mode 3 and Quadruple Helix Innovation Systems (Meister Broekema 2023). Mode 3 research builds upon Mode 1's traditional academic knowledge production and emerging, collaborative, transdisciplinary knowledge production of Mode 2. Using a systems analysis approach, Mode 3 emphasizes the integration of different knowledge sources and the contextualization of knowledge in addressing real-world problems because knowledge production practice is a multilayered, multimodal and multimodel system. Carayannis and Campbell's (2009) work extends Etzkowitz and Leydesdorff's (1998, 2000) concept of the 'Triple Helix" to that of a 'Quadruple Helix' model. They suggest that the Quadruple Helix model involves not only the collaboration between government, industry, and academia in the innovation process but also the involvement of civil society or the public. This model emphasizes the importance of involving diverse stakeholders to foster innovation. This interplay between the different types of knowledge in an ecosystem of diverse partners and stakeholders reflects what occurs at UASs.

Gulbrandsen and Kyvik (2010) have stated that it can be difficult to separate the types of research done in practice. In reality, the research done at UASs encompasses different types of research at different moments because research projects require several types of activities, contributing to theory or practice, for completion (Kyvik and Lepori 2010). This is not to suggest that the research done by universities cannot be applied or vice versa but it provides a starting point from which UASs can establish how to evaluate the impact of the research they conduct (de Weert and Leijnse 2010). Contribution Mapping has been identified as one of the appropriate frameworks for evaluating the impact of the types of research conducted at UASs as it focuses on the various types of activities that can take place (Coombs and Meijer 2021).

Why Contribution Mapping is Relevant for Evaluating UAS Research

The importance of the impact of research on society and how this can be evaluated continues to be an international point of discussion (Budtz Pedersen, Følsgaard Grønvad and Hvidtfeld 2020, Smit and Hessels 2021). Several countries with a binary tertiary system such as Denmark, Finland, Belgium, and the Netherlands are currently examining how their research impacts the world at large. To provide a scientific basis for the necessary evaluation, previous research has suggested that there are several elements that require consideration to evaluate the impact of the practice related research done by UASs. As indicated in Raftery et al. (2016), often the evaluation approach is based on 'philosophical assumptions' made regarding the links between research and impact. The philosophical assumption on which the evaluation is based must, therefore, first be established. These assumptions assist in forming and enhancing the methods and tools used for evaluating (Raftery et al. 2016). Applicable philosophical assumptions for practice related research are either a realist assumption based on context-mechanism-output-impact or a performative one grounded in actor network theory (Greenhalgh et al. 2016). Additional recommendations suggest that this evaluation should focus on formative, 'real-time' evaluation allowing for learning throughout the process of the research as well as in the future (Guthrie et al. 2013). This should be done in co-production with the stakeholders (Raftery 2016, van Drooge and Spaapen 2017). Finally, the nature of practice related research should not be constrained through the use of a logic model where a linear representation of the process does not do justice to the messy feedback loops of UAS research. Linearity suggests that impact is created through an immutable context-independent process (Kok 2021). Instead, these recommendations stress a need to understand the process and specific context of the research done at UASs to evaluate the impact of it and the importance of the stakeholder throughout the process (Coombs and Meijer 2021). These recommendations emphasize the need for process and context to be taken into consideration throughout the evaluation (Meister Broekema, Bulder and Horlings 2023).

Contribution Mapping is part of a larger family of contribution analysis frameworks that focus on the research process. Other examples, including Morton's (2015) Research Impact Assessment, build on the work of Mayne (2011), and are frequently from a realist assumption based in a 'Theory of Change' (Riley et al. 2018). They focus on programmatic activities rather than emphasizing external factors and events as Contribution Mapping does (Garcia Diaz Villamil et al. 2023). Contribution Mapping, however, is based on Actor-Network Theory and thus begins with a performative assumption (Greenhalgh et al. 2016). The process of research and the impact created throughout the process is central to the framework (Greenhalgh et al. 2016). It is formative in nature and, while originally ex-post, it can be done in real-time. It stresses the importance of stakeholders as an active part of the evaluation process in co-production at the project level (Kok and Schuit 2012).

The Use of the Stakeholder in Research and Evaluation

Terms such as co-production, co-creation, societal engagement, public engagement, and citizen science, all speak to the inclusion of stakeholders throughout the research process (Cohen 2022). A systematic literature review conducted by Voorberg et al. (2015) has suggested that the terms 'co-production' and 'co-creation' have come to be not only related but interchangeable. Both terms involve collaboration between stakeholders to design and deliver services, products, or policies with active involvement throughout the process (Voorberg et al. 2015). They recognize that three specific forms of stakeholder participation are addressed in the literature on co-creation/co-production; co-implementer, co-designer, co-initiator. While much of the literature attributes these 3 roles to both co-creation and co-production, Voorberg et al. (2015) suggests that co-creation is perhaps best connected with the involvement of stakeholders as co-initiators and co-designers, and co-production is better defined as including stakeholders in co-implementation.

By including stakeholders, it has been suggested that synergy is created between the various types of contributors (Brandsen and Pestoff 2006). As an added benefit, it is believed that by using stakeholders the results will be used beyond the duration of the project as stakeholders develop a shared sense of responsibility for the outcome. Through this sense of responsibility, a power shift can occur where the stakeholders begin to lead in the project and its outcomes (Bovaird 2007). For this to occur, the stakeholders need to see the value of both the process and the outcome of the research (Talsma and Molenbroek 2012). This will also aid in the adoption process (Adams et al. 2018).

However, it is important to note that the use of stakeholders in research does not come without risk. As Oliver et al. (2019) have identified, stakeholder participation can result in extra costs. While these can be financial costs, temporal, relational, reputational, and ethical costs are also a risk. These challenges are all potentially created by the human factor. The risk of bias and other issues potentially affecting scientific integrity can be caused through issues as human as disagreements or over-eagerness to be of assistance with analysis and resources. In addition, pressure on the researcher to produce a certain outcome or to withhold information to achieve a certain outcome beneficial to the stakeholder can be a source of significant stress.

Recent work by Pel et al. (2023) notes that while the use of stakeholders in research can lead to solidarity, it can also lead to an insular situation and the exclusion of important participants. This can be caused by the nature of the subject itself in which, for example, there is a certain associated socioeconomic level. This can also be because of the unintentional focus of the interests and perspectives of specific stakeholders in much the same way as the results of questionnaires need to be methodologically representative. They also speak of several unseen “costs” that come with working intensely with stakeholders. These include, among others, information costs required for educating the stakeholder, negotiation costs associated with negotiating agreements among different stakeholders, and coordination costs involved in coordinating activities and efforts among the various actors.

The work of Boaz et al. (2021) has also suggested that the use of stakeholders throughout the research process presents a set of challenges to the researchers in ensuring that the stakeholders are in fact engaged in the research process as intended. While intentions and expectations for stakeholder inclusion may be initially set at a certain standard, time and energy on the part of the researchers may be required to sustain it. This is particularly true when stakeholders are unsure of the outcome (Talsma and Molenbroek 2012).

METHOD

Contribution Mapping

Through interactions between the researchers and the stakeholders, micro impacts are created throughout the research process (Lykke et al. 2023). The aim of Contribution Mapping is to bring attention to these interactions, to illustrate how knowledge is converted into action. Like other forms of Contribution Analysis, this framework helps to identify and understand the many links, factors, and actors that all contribute to creating impact in applied research. The approach focuses on the research process and how the actors involved convert knowledge into ‘actor scenarios’ to make a contribution (Hegger et al. 2016). It systematically maps out what efforts are made to achieve additional contributions from the research to assist in solving a specific (social) problem. It focuses on the many connections between process, individuals, organizations, and actors, and other factors to create impact rather than on the linear output-impact concept (Boshoff and Sefatsa 2019). This mapping allows for the feedback loops of research to be taken into consideration and attempts to reveal the multiple mechanisms of impact (Beckett et al. 2018).

Contribution Mapping identifies 4 types of actors. The first type is the ‘investigator’, those who are directly involved in the research. Secondly, ‘linked actors’ are those with whom interaction occurs during the research. This can be through contribution to the research plan, participation in the implementation, or the interpretation of results. The third type of actor is the ‘potential key users’. These people are ‘linked actors’ who play a central role in relevant networks and seem most capable of translating the research into new ways of acting. They can for example include policy makers, representatives of patient associations. Finally, the ‘unlinked actors’ are those who are not connected to the research process, such as people in practice, but who become aware of it and create new action scenarios themselves.

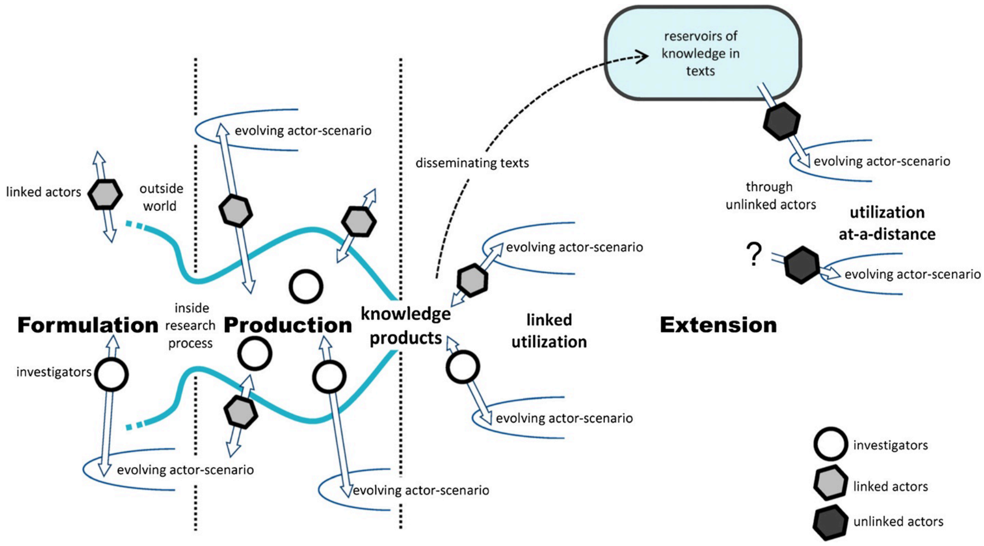

Figure 5.1: Diagram of Contribution Mapping (Kok and Schuit 2012, 5)

Contribution Mapping recognizes that there are 4 types of contributions being sought. One type of contribution relates to changes in competency, behaviour, and relationships of researchers and linked actors created by activities that take place during the research. A second is knowledge products or outputs being added to 'codified knowledge reservoirs'. These products include outputs such as protocols, publications, and methods. 'Codified knowledge reservoirs' can be understood as journals, scientific databases and repositories or other ways of disseminating output. A third form of contribution is new actor scenarios being created between the researchers and linked actors. Finally, applications of the knowledge by actors who are not involved in the research are seen as a fourth means of contribution. Contribution Mapping states that the conscious efforts made to generate more contributions from the research are 'alignment efforts'.

The Contribution Mapping framework divides the research process into three phases. The first phase is Research Formation. This phase includes the exploration of possible research questions, the search for funding, discussions with potential actors and the setting of priorities. Kok and Schuit have suggested this phase closes when funding is awarded. The second phase is called the production phase. This is the stage where knowledge production takes place. This includes the myriads of activities that take place while doing research such as recruitment, purchasing equipment, theory development, experimentation, and statistical analysis. Knowledge can be shared at this point in the process; however, this phase is closed when the researchers determine the final results of the study. The third phase, knowledge extension, makes the acquired knowledge available to potential users and stimulates the application of the knowledge. This can be done through different forms of output such as presentations, publications, and data depositing. Linked actors can also play a role in this stage by applying the knowledge in practice.

The original method of Contribution Mapping involves a step-by-step mapping plan, in which the characteristics of the research being evaluated are mapped out with the contributions made, when, and by whom throughout the research project. There are 4 Stages divided into 10 steps in this plan beginning with Stage 0. This is understood as the setup stage where the research team conducting the mapping reviews what contribution mapping is, its purpose, roles, expectations, and benefits. Stage 1 involves interviewing the researchers to attain a first impression of the process and possible contributions. This is followed by Stage 2 in which potential key users and other relevant actors are interviewed to trace, explore, and coordinate possible contributions. Stage 3 maps out and analyses the (possible) alignment efforts. Preliminary results are shared with relevant stakeholders for feedback and validation. The final mapping is then shared with the stakeholders in order for them to learn, improve, and be accountable.

The Case Study

To test the theory of Contribution Mapping, we used GO!Noord Nederland as a case study. GO!Noord Nederland is a collaborative project funded by a large Health oriented Dutch funder. This particular project, which ran for four years, was selected because it is an example of the type of research that takes place in a UAS where there is a clear link to practice, is transdisciplinary, utilizes a variety of stakeholders throughout the process, and flows back into education in several ways. This type of research stresses the active role of the stakeholder throughout the research process whereby an impact is created in the profession and education through this knowledge transfer. It appears to lend itself well to analysis through Contribution Mapping.

GO!Noord is a large consortium of 2 Universities of Applied Science, 5 municipalities, 3 provincial public health departments, the Dutch National Institute for Public Health and the Environment, and a regional Safety and Security Organization. Their collective ambition is to identify and utilize opportunities to enhance the living environment in municipalities. The aim is to accomplish this by implementing adjustments to the public space in co-creation with residents.

A central element of the GO!Noord project is the GO! Method. The GO! Method is a six-step process that begins with data collection related to the area of interest in order to create an overview of important themes and social developments. This is followed by collecting statistical data on; the municipality population, housing, health, safety, facilities, and green space. Using this information as a basis for conversation, dialogue with residents and local stakeholders is initiated to assess opportunities, threats, and needs for improvement. Based on this work, an overview of options is generated, in which different combinations of possible changes for creating a healthier environment for the municipality are presented. In consultation with the residents, the municipality could then select and implement the desired changes. Finally, the effects of these changes on the health of the residents are monitored and evaluated (GO!Noord Nederland 2023).

Application of Contribution Mapping

The purpose of this case study was to test the implementation and applicability of the Contribution Mapping method by following the designated phases as presented in the article by Kok and Schuit (2012) in “Contribution Mapping: A method for mapping the contribution of research to enhance its impact,”. In doing so, we hoped to understand the theoretical and practical implications of this approach. While the recommendations for impact evaluation of UAS research suggests that an evaluation should take place in real-time, this study followed the initial instructions of Contribution Mapping and performed the evaluation ex-post. This allowed the research team to assess the model in its originality in the hopes of making informed decisions for any alterations that may be required to meet the requirements for UAS research impact.

The process of evaluation began with an analysis of documents including research proposals, project plans, and a project website. To facilitate the performance of this evaluation, we utilized a detailed summary of Kok and Schuit’s Contribution Mapping framework created by van Vliet (2021). This provided a step-by-step guideline distilled from Kok and Schuit’s (2012) initial article on Contribution Mapping. It was used primarily as a guide for the semi-structured interviews. These interviews were in correspondence to Stages 1 and 2 and focused on establishing the roles of the actors and the contributions made in the form of activities, outputs, and alignment efforts throughout the three phases of the project. Online interviews were conducted by two members of the research team (one that knew the project and one that had no prior knowledge of the project) over the course of two months. A total of 12 interviews were conducted, one with each member of the consortium and project participants (researchers, linked actors, and key users). Interviews were conducted in accordance with the ethical rules of the research institutions. Transcriptions of the interviews were verified and approved by the participant.

Using the description of the Contribution Mapping framework as a guide, the focus group was conducted online by two members of the research team with the members of the project team in correspondence with Stage 3 of the framework. This allowed for verification of the interview content as well as the receipt of feedback.

Each member of the research team also took notes during the interviews and focus group. Following each of these events, these notes of observations, findings and points of interest were discussed and compiled. These were included in the verification process with participants. It was also an opportunity to discuss the actual process of conducting Contribution Mapping and what was needed to be more successful in capturing the micro impacts of the research being evaluated.

Inductive analysis of the interviews and notes was conducted by members of the research team. The information contained in the interviews as well as the research team notes were placed per respondent in a matrix according to the stage in the Contribution Mapping process (Stage 0-2) and the stage in the research process (formation, production, and extension). Commonalities such as activities, outputs, roles, language use, and alignment efforts were colour coded. This resulted in a thematic categorization of data for both the assessment at hand and the larger question for evaluating the impact of UAS research.

In accordance with the final Stage of Contribution Mapping, a visual representation of the actors, activities, outputs, and alignment efforts based on both the interviews and focus group, was constructed in idraw. This was initially done by one member of the team and then built upon by the other two members in an attempt to illustrate the areas of potential micro impact. This was further developed with a graphic designer and can be found in Figure 5.2.

The observations and conclusions of the mapping process (Stage 3) were then added to the matrix. Table 5.1 presents the analysis matrix prior to utilization.

	Step 0: Set-up of evaluation	**Step 1: Interviews with Investigators**				**Step 2: Interviews with Key Users**			**Step 3: Mapping**
Observations throughout the process									
Formation	Observation of the phase	U1	U2	R1	R2	M1	V1	G1	
Production									
Extension									

Table 5.1: Results Matrix

The themes were grouped according to observations, challenges, limitations, and modification suggestions to aid in the implementation of Contribution Mapping as an impact evaluation tool. Table 5.2 provides an overview of this data.

RESULTS

As can be seen in Figure 5.2, this mapping of the research process for GO!Noord attempts to visualize the various actors, activities, outputs and alignment efforts that took place throughout the Go!Noord project. The three stages of the research process, Formation, Production, and Extension have been set out, as have the involved actors, the activities that have taken place and the new people that have participated in the activities. As indicated in Table 5.2, the evaluation research team were not satisfied with the initial results. In an attempt to enhance the story and begin to provide context, information about the new actors/stakeholders has also been added. This was added after much puzzling as to how to make the mapping less flat and linear.

Table 5.2 presents the final results of the thematic analysis and includes the observations of the evaluation research team throughout the evaluation process. Based on the research team's reflections, these have been clustered according to the stage in the Contribution Mapping framework and if they are perceived as a challenge, a limitation, or a need for modification by the participants or the research team. The participants from which these themes have been gathered are indicated.

Figure 5.2: Anonymized Visualization of GoNoord! Contribution Mapping

	Stage 0: Set-up	Stage 1: Interviews	Stage 2: Interviews	Stage 3: Mapping
Observation	While for the purpose of this study it is important to have both an emic and etic perspective, the actual act of Contribution Mapping required inside knowledge from the beginning of the project. A project manager would be better suited to doing this than an external research team as they are already cognizant of the project details.	The use of too much structure during the interview process results in very stilted answers. Semi-structured interviews are better suited.	While institutions were specifically chosen to participate (R1), a project often appears to be reliant on a particular person in the consortium rather than the institution itself. Should that person leave, there is the potential for the commitment to the project. The role changes with a new person and appears to often lose momentum (M1, R1, V1, G1).	The outcome of the mapping is very flat and does not meet our expectations. Perhaps our expectations were too high but we had hoped to see a rich tapestry that told the viewer the story of the project.
	Set up often consists of negotiations with potential stakeholders and getting partners on board, a process that is highly dependent on networks. Content is less prominent (U1, U2, R1, M1, G1).	Participants often have differing experiences, focuses, and ideas about their roles and that of others in the project (U2, M1, V1, G1, R2).	How funding is divided and who specifically gets this funding is very backwards. The stakeholders are expected to give in-kind. The partners who do not get funding appear to have less influence on the project (G1, R1, V1). The stakeholders are in an environment that pays attention to the numbers and hours, while you as a researcher just want to seize opportunities yourself. As a result, the people in the project sometimes had to go back to their managers and financial departments to see, for example, how the project could be (co)financed (R1).	People leaving the project are difficult to account for. They take their knowledge with them. This can potentially increase the impact, but it is difficult to indicate. Similarly, the new people coming into the project need time to get to know the project.
		The project team wanted to create more research output than their project budget and time allowed. They intend to continue creating some of these things without a project extension (R1, U2, U1, M1, G1).	The continuation of the extension Phase beyond the output is reliant on the person involved and their commitment (U2).	The context of the processes does not show well.
		Covid 19 clearly influenced the project. Rules and regulations made it difficult to meet and continue as planned (U2, R2, M1).	Many activities were done to ensure a scientific basis for the project. However, changes needed to be made in order to fit with the 'practice' and accomplish something for them (M1). It is necessary to have and build a common understanding with stakeholders who work on the project to make a positive, supported, impactful project (U1, R2, M1).	There are many different routes that are sometimes interlinked and dependent on some of the partners.
			There are people who primarily work as internal networkers in their own organization to make the institutional participation and the importance of the project internally recognized (U1, V1). There are some people who are primarily busy with the stakeholders and external partners to bring the project further (connectors) (R2, M1). There are very few who work as both, but these people seem to serve as translators (G1, R2). This does not appear to be a conscious decision but is the result of the demands of the project, partners and circumstances, as well as the skills of the translator. The link to Education appears to be dependent on particular participants organizing the participation while others are responsible for ensuring it happens (U1).	The use of a preconceived line of impact can be impossible to predict from the beginning. The twists and turns that the process takes cannot be predicted. Direct and indirect impacts also need to be accounted for. Indirect impact can be more important in the long run than the direct impact (R1).
				Maximum impact is not purely about what the direct results are of this project but through being an ambassador for the method the impact of the project is maximized. This reiterates the importance of people in creating impact (R1).

	Stage 0: Set-up	Stage 1: Interviews	Stage 2: Interviews	Stage 3: Mapping
Challenges		Even though it was practice based research, the translation and shift from academia to actual practice was difficult (V1, G1, U2, R2).	The calendar agendas and research agendas differ between the different actors of the project (G1, M1, U1). This is something that should be discussed at the beginning of the project and can make it difficult to include students in the projects (M1, R2).	How do we make it not so linear?
		The exiting of partners and introduction of new people into a project directly affects the flow and continuity of a project. It also influences the mapping process (U1, U2, R1, R2).	The exiting and introduction of new people into a project directly affects the flow and continuity of a project. It also has a result on the mapping process (G1, M1, V1).	
Limitation		Participants found it difficult to identify themselves in the roles of the Contribution Mapping methodology (U1, R2).	Participants did not understand the language of the Contribution Mapping framework (M1, V1, G1).	The actual mapping of the interviews and the overlap made it difficult to separate the individual stories from each other and to connect to each other.
			Participants did not find themselves in the types of roles available in the framework. It was too structured for them. (M1, V1, G1, R2).	The whole process is extremely time intensive.
Modification	Should be real-time to meet the criteria for UAS research impact evaluation and executed by an internal research/project manager.	Addition or modification of the roles and terminology.		Addition of extra information over stakeholders, impact level, context or the like.

Table 5.2: Final Results of the Thematic Analysis

DISCUSSION

By implementing Contribution Mapping, the aim of this study was to assess how Contribution Mapping can be utilized for evaluating the impact created by UAS research. As one of the recognized frameworks for evaluating UAS research, Contribution Mapping provides a sufficient starting point for investigating how an impact evaluation framework could potentially be structurally introduced to research projects. It clearly gives insight into the potential impacts created through actors, interactions, activities, and outputs. It provides a visualization through which these potential outcomes can be traced. As a formative tool, these mappings allow you to see where the links in the Knowledge Triangle are functioning as well as where they need to be strengthened. It provides an opportunity to explain the reasoning behind the choices made. It is, however, not without its challenges, limitations and need for modifications in the process and results.

Challenges

Testing theory in practice does not come without its challenges and conducting Contribution Mapping in real-life proved to have several. The method of Contribution Mapping is very structured and theoretical which created challenges in both the execution of the framework and the participation of the stakeholders.

The use of participant interviews and focus groups highlights the differences in experiences and goals of those being interviewed. For many participants, interviews gave them the opportunity to share their side of a larger story. They were open about their feelings and experiences. At the same time, focus groups allowed for a common narrative to be told. It became the job of the evaluation research team to plot these experiences together. By doing so it became evident that people were less open to reveal their opinions in the focus group session. In contrast, they could be more vocal in the interview. This confirms the importance of hearing each person's interpretation of the story and confirms the theories behind using interviews in impact evaluation frameworks (Budzt Pedersen, Følsgaard Grønvad, Hvidtfeldt 2020). Fortunately, the research team was quick to realize that the questions to be asked were too structured. Because participants did not understand exactly how to answer the questions and did not see themselves reflected in the jargon, momentum was lost. The team switched to a semi-structured interview system with a focus on people, activities, interactions, outputs and ‘alignment efforts’. This resulted in interviewees being more comfortable and more likely to provide fuller responses which in turn garnered more information.

Who conducts the interviews would also appear to be important. To fully understand the results, inside knowledge of the project and participants is required. The research team was made up of both people from the project and people outside the project. It became clear that conducting this study as an outsider is more difficult because you lack the nuanced information of the project. The project manager may be best suited for this role as they know the full story and consequently can prioritize and manage the intersection of the people and the project. This is especially relevant given the time required to conduct this evaluation.

The constraint of time is most definitely a challenge throughout this framework. It is very time intensive. Proper application requires a commitment from both the participants and the funders to include sufficient time in planning and in the budget, as in this situation, time is literally money. Funders need to be aware that stakeholder participation requires additional resources such as time and money (Beckett et al. 2018). Funding is allocated in favor of the researchers. Stakeholders are often expected to give in-kind without financial incentive but with the promise that the project may result in useful and tangible results for them. While co-production in the research project and evaluation often leads to stakeholders feeling responsible for the research outcomes, proper financial recognition for their time could increase this commitment (Voorberg et al. 2015).

The language used in the framework such as ‘linked’ or ‘unlinked’ actors, ‘key users’, ‘alignment efforts’, and ‘codified knowledge reservoirs’ was frequently difficult for participants to grasp. The research team spent time explaining what each of these terms meant in the hopes that participants would be able to identify what role they felt they played. This point moves the discussion from challenges to limitations, as participants were unable to recognize their roles and functions within the research project in the terminology used.

Limitations or Opportunities?

The suggested roles of participants, as ‘linked actors’ or ‘key users’ are perhaps too limited for the degree to which stakeholders are utilized in UAS research. The ‘linked actor’ concept, because of its dual role with ‘key users’, creates confusion. In addition to not always understanding what the terminology meant, participants in this case study did not feel they were represented by the terminology. Within each role, there were varying degrees to which participants felt they related. The role they played also had the potential to change over the course of the project. Other participants did not find their role included in the terminology at all. One specific role participants felt was important to specify was that of ‘translator’. One stakeholder who neither identified as a ‘link actor’ nor as ‘key user’ instead identified as a ‘translator’. Their role within the consortium was to translate the academic language of the researchers to the practical language of the other stakeholders. They recognized that they had a similar responsibility for translating the differing agendas, both research agendas and calendar agendas of all partners. It became clear that the needs of the stakeholder or research are not the same and the academic school year differs greatly from that of the stakeholder. Beckett et al. (2018) acknowledges that all of these components included in the term ‘translator’ are key for the success of co-production projects. Perhaps the roles defined within Contribution Mapping could be further refined in a similar way to Arnstein’s (1969) “Ladder of Citizen Participation”. Though not directly reproducible for this situation, the “ladder” presents a gradual increase in role and responsibility of the stakeholder that could be adapted to the evaluation framework, thereby increasing the opportunities for stakeholders to identify with their position in the process (Voorberg et al. 2015).

The limitation in roles represented in Contribution Mapping is perhaps just an example of a broader limitation. While the end product of this framework presents an overview of the ‘Key Users’, ‘Linked’ and ‘Unlinked” actors, activities and output throughout the 3 phases of the research process, the results remain almost flat and do not reflect the rich information captured in the interviews and focus groups. Researchers such as Cohen (2022) and Beckett et al. (2018) have presented possibilities for augmenting the results of Contribution Mapping through the collection of additional information. Cohen's (2022) research into the institutionalization of public engagement presents a framework for analysing the barriers and enablers of public engagement so that impacts created with stakeholders can be better recognized, facilitated, and extended. The research done by Beckett et al. (2018) makes use of Davies et al.'s (2015), Knowledge Mobilization Archetypes, itself a multimethod mapping study, Pawson's (2013) ideas of context, and Pfadenhauser et al.'s (2017) micro, meso, macro levels to enrich the mapping exercise. This provides more specific information about impact created through the co-production process.

Perhaps these 'limitations' should not be seen as limitations but as 'opportunities' to create a more meaningful evaluation specific to the context of the research taken on by UASs. To do so, however, requires that the evaluator has a deeper understanding of the stakeholders and the context in which the research takes place in order to make these important components of the evaluation explicit. While some have suggested that Contribution Mapping leaves room for the multiple contextual factors of the research being evaluated (Riley et al. 2018), others have suggested that it is not explicit enough to do justice to the specific context of research conducted by UASs (van Beest et al. 2021). The work of van Beest et al. (2021), the Research Pathway Model, strives to create a more explicit means of identifying the context of research. They present a matrix of 9 research activities and contexts through which the practice-oriented research process can follow to generate impact. This appears to be from a researcher's perspective rather than that of a stakeholder. Additionally, a certain flexibility is required here as context may not always be reduced to the 9 options, and the contexts in which research is conducted changes throughout the project (Oliver and Parolin 2018). A deeper examination of both the options and changes could potentially aid in mapping the different contexts in play during a research project. It may also assist at the level of the individuals participating as each participant brings their own context and 'actor scenarios' that can potentially influence the process and the horizontal and vertical alignment efforts (Hegger et al. 2016).

The actual mapping of the interviews and the overlap made it difficult to separate the individual stories from each other and how they connect to each other and the context in which it occurred. It should be recognized that context is different for the stakeholders than for the researchers. While for a researcher this is research, for a stakeholder it is a different scenario and what they do, what they create, and their interactions are often from a different perspective than that of the researchers. In a true co-creation/co-production process both perspectives are equally acknowledged whether this be as co-implementer, co-designer, or co-initiator. It is important that in evaluating we do not lose sight of the process and interactions from both stakeholder and researcher perspectives. This is more than context alone and should stand centrally in the evaluation process.

Another 'Opportunity" would be to follow the paths of those stakeholders who left the project. Herein lies a point of discussion around the responsibility of the individual participant or the institution stakeholder and their commitment to the project. From a practical point of view in those instances where stakeholders exit the project prior to completion the remaining participants are left scurrying to find appropriate replacements who then must become quickly familiarized with the project. It also results in changes in dynamics, time lag in the project, and potential outcomes and impacts (Beckett et al. 2018). However, those leaving the project leave with the potential for future impacts created by bringing the knowledge and experiences they have had in one project, to different contexts and experiences in the future. By indicating this in the mapping exercise, the potential for future impacts can be acknowledged.

These are but three ways in which others have experienced the limitations of Contribution Mapping and have tried to create a fuller picture of impact creation through modification. This would suggest that perhaps Contribution Mapping presents a starting point on which to build what is needed for a particular scenario. What is clear is that changing the 'limitations' to modification would allow Contribution Mapping to tell a richer story and become a stronger framework for identifying contributions to impact and becoming a more formative tool that can be used in the systematic evaluation of UAS research impact. This would then also allow for more co-creation and a demand driven research process and real-time evaluation. This could be in the area of context, stakeholders' participation, types of interactions that take place with which type of institution, and the like. Including this type of information in an impact evaluation would aid researchers in being able to trace contributions, align efforts and in doing so, tell the story of their research impact in a more insightful way showing potential micro impacts that can lead to macro ones.

Modifications

In addition to the numerous ways in which Contribution Mapping can be enriched to strengthen the story the visualization tells, there is one modification that would need to be made for Contribution Mapping to fulfill all the recommendations for the evaluation of UAS research impact. As previously touched on, this changes the framework from ex-post to a framework that begins to evaluate the impact from the start of the project. This is similar to an exercise ASIRPA has recently conducted (Matt et al. 2023). There are several advantages to this timing.

A real-time impact assessment is ideally built in from the planning stage where the links between how research is done, who is engaged, and its potential impact are all considered at the beginning (Morton 2015). This could be time saving as the mapping becomes part of the routine. A monitoring function built into the process allows the contributions and alignment efforts to be purposefully made. This would aid researchers in accounting for decisions and changes as well as attempting to ensure the desired impacts and outcomes are reached and opportunities for alignment are not missed (Hegger et al. 2016).

In addition, by including Contribution Mapping from the onset, it may be possible to avoid the miscommunication and adverse differences while encouraging the positives. In a nonlinear process, adaption is critical (Matt et al. 2023). However, through impact evaluation in real-time you run the risk of steering too much rather than allowing the impact to take its own course. As discussed by Oliver and Parolin (2018), conducting this in real-time can lead to pre-specifying the outcomes. By plotting details step-by-step beforehand, in much the same way as impact pathways function, creates the risk of losing that flexibility and becoming linear in a preconceived logic model that isolates specific parts of the process rather than the whole process becoming real (Kok 2021). By attempting to compress all opportunities into Contribution Mapping or any contribution analysis we run the risk of reducing it to a strict set of requirements that results in the messiness of UAS research spilling over and not being able to accomplish the evaluation of impact as desired (Oliver and Paroline 2018). Further research into how to balance a more informed evaluation, without becoming overly constrained and linear, is required.

Conclusion

It is important to realize that frameworks are theoretical and thus open to change. A balance between the framework and its applicability needs to be found. This study into the use of Contribution Mapping in UAS research impact evaluations set out to do just that, to bring theory into practice.

This study explored the application of Contribution Mapping in evaluating the impact of UAS (University of Applied Sciences) research. The framework, while providing a starting point for understanding potential impacts, faced challenges and limitations in real-life implementation. The structured and theoretical nature of Contribution Mapping posed execution and stakeholder participation challenges.

Interviews and focus groups reveal diverse experiences and goals among participants, emphasizing the importance of nuanced information. Challenges included the structured interview format, the role of interviewers, time constraints, the complexity of terminology, and the changing of roles and priorities over time. The limitations in participant roles highlighted the need for a more comprehensive categorization, akin to Arnstein's (1969) 'Ladder of Citizen Participation.'

Perhaps viewing these challenges as opportunities would enrich the evaluation process. Additional frameworks, such as those addressing barriers and enablers of public engagement, were proposed to enhance Contribution Mapping's results and the role of stakeholders in the research and its evaluation. Acknowledging context variations and understanding stakeholder dynamics are required for a more meaningful evaluation.

Further modifications to Contribution Mapping would also enhance its useability. Results of this study advocate for a shift from an ex-post evaluation to a real-time impact assessment integrated from the project's planning stage. This approach aims to be expeditious, facilitate purposeful contributions, and mitigate miscommunication. However, caution is advised against over-restriction and linear pre-specification of outcomes.

Contribution Mapping has potential as a formative impact evaluation tool for UAS research, contingent on modifications, increased flexibility, and stakeholder orientation. Further research is required to create a taxonomy of evaluation, balancing structure with adaptability to assess UAS research impact systematically and robustly.

Based on this case study, and in answer to our main research question, we conclude that this framework of Contribution Mapping theory as a formative impact evaluation tool in collaborative projects in which UASs are involved can be implemented, provided the methodology is modified and more flexible. This framework can provide a theoretical foundation that can be modified to meet the needs of evaluating the impact created by UAS research projects. Even without meeting all the requirements stipulated for evaluating the impact of research done by UASs this has proven to be insightful. To meet the rest of the recommendations for evaluating UAS research impact, further pilots with this framework will need to start at the beginning of the project to allow for real-time. Future research will need to look at how to modify Contribution Mapping to create a taxonomy of evaluation that can assist in telling a more textured story without becoming entangled in a structured, linear framework that does the opposite of what is desired. In doing so we become steps closer towards evaluating the impact of UAS research in a robust and systematic way.

CHAPTER 6

CONCLUSION

This dissertation was driven by the need to understand the rules for critically evaluating the impact of research conducted within Dutch Universities of Applied Sciences (UASs) and how these rules can be applied.

Specifically, we sought to answer the following questions:

- What are the requirements for evaluating the research impact created by Dutch UAS research?
- How can these requirements be applied within the context of the goals of Dutch UASs?

Answering these questions has resulted in two distinct yet interlinked parts to this dissertation as we moved from theory to practice, from understanding to implementation. Firstly, we sought to delineate the rules governing the evaluation of UAS research impact. Secondly, we analysed the current practices within the contextual playing field that Dutch UASs find themselves and experimented with applying the rules to the impact evaluation process of Dutch UAS research.

To gain understanding and to achieve the objectives of this research, a multifaceted methodological framework was employed. This approach was designed to capture a broad spectrum of insights and data, ensuring a comprehensive understanding of the field.

The investigation began with a literature analysis. This analysis entailed a systematic examination of existing academic and policy literature, encompassing both quantitative and qualitative studies. By combining diverse methodologies, the review endeavoured to create a richer, more nuanced understanding of the current state of research impact evaluation for Universities of Applied Science and the research conducted by it, setting a solid theoretical foundation for the study.

While the literature analysis established theoretical grounding, interviews and dialogues offered personal, experiential insights. Further depth was added through exploratory interviews and dialogues with researchers and support staff across different themes and from various Universities of Applied Sciences. This provided valuable first hand accounts of the challenges and nuances associated with research done at UASs, as well as impact creation and evaluation. This stage was followed by the distribution of a questionnaire to a wider audience of UAS academic professionals. This questionnaire provided quantitative data regarding the perceptions, practices, and experiences related to UAS research, its researchers, its output, impact creation, and its evaluation. Workshops acted as dynamic platforms for deeper engagement and inquiry among experts and practitioners in the field. They provided a focused, practical examination of, among other things, impacts, outputs, partners and priorities. These sessions were instrumental in triangulating the results gathered in the questionnaire and refining the application process of the results identified in the literature analysis and interviews. This facilitated a collaborative environment for a further understanding of impact, impact creation, and evaluation, that was required prior to testing and enhancing possible evaluation frameworks. A detailed case study of a research project within a selected University of Applied Sciences provided a contextual, in-depth analysis of how research impact evaluation can be conducted in practice. Doing so highlighted practical challenges and opportunities, and served as a microcosm to test the applicability and efficacy of the identified rules and proposed integrations in a real-world setting. Collectively, these methods aimed to provide a well-rounded, deeply informed exploration of how research impact can be evaluated and enhanced in Dutch Universities of Applied Sciences.

In the following sections, this concluding chapter discusses the findings from each of these methods, bringing together the insights that they collectively offer. It summarize the key findings and contributions of this research, as well as reflecting on the broader implications of these insights for the academic community and policymakers within higher education. This chapter provides practical advice on how to integrate the results of this study into practice and suggests possible areas for future endeavours in the realm of UAS research impact evaluation.

AN OVERVIEW OF THE STUDY AND ITS CONCLUSIONS

Research Impact Evaluation Theory

The initial phase of this research was dedicated to discovering the governing principles and criteria essential in assessing the impact of UAS research. This pursuit was a foundational step towards establishing a more nuanced and effective framework for evaluating UAS research impact outcomes.

By examining the theories, methodologies, standards, and metrics currently in use, this dissertation has aimed at highlighting both the strengths and limitations inherent within the existing systems. To accomplish this, an extensive literature analysis was undertaken to establish foundational rules for evaluating the research impact of Universities of Applied Sciences. As very little appears to be written about evaluating the research impact of UAS research, the results were drawn from diverse sources, including transdisciplinary and multidisciplinary evaluations, general impact evaluation literature, and practical applications within the universities themselves. The aim was to adapt theoretical understandings from various fields to the unique context of applied sciences research. The analysis provided several recommendations beginning with the importance of recognizing the philosophical foundations that influence these evaluations (Greenhalgh et al. 2016). The philosophical foundation is the perspective through which research is interpreted, shaping the link between research and impact and brings various assumptions with it. The recommended philosophical assumptions for evaluating UAS research are realist or performative (Raftery et al. 2016).

Research guided by a realist assumption seeks to unveil the context-mechanism-output-impact configuration. It strives to tackle the variability in knowledge assimilation by investigating interactions among policy makers, practitioners, and resources as impact mechanisms. Conversely, a performative assumption, grounded in Actor-Network Theory, advocates for evaluating research impact by scrutinizing the broader consequences of interactions between research and society. This entails mapping actors, activities, and resulting changes over time (Greenhalgh et al. 2016).

These theoretical recommendations underscore the importance of conducting real-time, formative evaluations that foster learning and improvement. They advocate for a flexible evaluation structure that resonates with the dynamic nature of practice-oriented research, cautioning against the constraints of a linear logic model linking objectives, input, output, and impacts. Additionally, these recommendations emphasize the importance of a co-production approach, involving stakeholders from the outset. Currently there do not appear to be any established frameworks that conform to all of these recommendations. ASIRPA (Joly et al. 2015), PIPA (van Drooge and Spaapen 2017), and Contribution Mapping (Kok and Schuit 2012) all meet several of the recommendations that could provide a starting point for evaluating the impact of UAS research. Ultimately, these recommendations underscore the need to comprehend the context and process of UAS research for an effective evaluation of its impact.

Investigating the Current Context of Dutch UAS Research and Applying the Rules

The second part of this investigation was to understand what is currently happening in the field of UAS research practice and compare it to the newly understood recommendations, the rules. To do so, our focus first shifted to include examining the roles and functions of research groups within the Knowledge Triangle (KT).

Research Groups and the Knowledge Triangle

This section discussed the distribution of functions among various academic roles and their interaction within the KT. The Netherlands Association of Universities of Applied Sciences (NAUAS) currently uses a national framework for research evaluation. This Brancheprotocol Kwalitietzorg Onderzoek (Sector Protocol for Quality Assurance in Research, BKO) is a general research evaluation conducted at the research group level. Mirroring the better-known Strategy Evaluation Protocol (SEP) used by the Universities of the Netherlands (UNL), the BKO is executed ex-post every six years by an evaluation committee comprised of external and internal members. It aims to evaluate and monitor research quality for accountability purposes.

The current version of the BKO is comprised of 4 standards in which evaluation takes place. These are:

Standard 1: The research unit has a relevant, ambitious, and challenging research profile and research programme;

Standard 2: The research unit makes transparent what its contribution is to the development of Professional Practice and society at large, of Education, and of the Research domain;

Standard 3: The research unit's research complies with the standards applicable in the field with regard to conducting research; and

Standard 4: The way in which the unit is organised, the deployment of people and resources, and the internal and external partnerships, networks, and relationships, make it possible to achieve the research profile. (NAUAS 2022)

Utilizing a set of the basic indicators, "Research Staffing Realised" (Function and Time) required for Standard 4 of the BKO, principal component, and regression analysis was conducted on questionnaire results. Based on the work of Kyvik (2012), we selected four primary functions in which academics participate; Teaching, Research, Internal Organization and External Networking. Demographics such as age, gender, and education level were taken into account as they could potentially influence how the researcher groups functioned.

The analysis revealed two primary dimensions of Connectivity and Content. In this context, 'Content' refers to the teaching and research activities in which researchers participate. The activities on this dimension pertain primarily to the production and conveyance of Content. 'Connectivity' refers then to activities pertaining to Internal Organization and External Networking. These dichotomies challenge the three potential dimensions of the KT; Education, Research, and Professional Practice, and the four potential dimensions of academic functions. The results of the analysis highlighted the strategic significance of balancing involvement in Research, Education, and Practice, emphasizing the pivotal role of each member of the research group in synthesizing and disseminating knowledge.

The position of the professor appears to be a position of power. This can result in the knowledge transfer with the Professional Practice being vulnerable as they appear to be solely responsible for External Networking and matters of Internal Organization. Similarly, the link to education appears reliant on those members with the most teaching hours. The research would appear to be primarily conducted by those with more hours for research. The more hours they are given for research the more they may participate in External Networking. The innerworkings of these roles and functions reflect the hierarchy of the University research group in which the professor is the primary decision maker. The question is whether this is beneficial to research at UASs. The relative newness of UAS research means that there is still the opportunity to shape the roles and functions within the group in such a way that each area of the KT is connected. Emulating how universities have organized their research and teaching may not be sufficient to reach the UAS goals. It may, in fact, be a hindrance to it.

The results of this chapter indicate a need for clearer decisions on member functions and roles in the research group as well as at the project level to maximize the impact within the KT. It also illustrates the importance of looking beyond the standard concept of the basic indicators to reveal more about the impact created by research done by UASs. It appears that this set of indicators can tell more about a research group's potential impact than initially realized.

Impact

Chapter 4 of this dissertation made a deeper exploration into the impacts of Universities of Applied Sciences. Through the use of questionnaire results and workshops/focus groups, this section explores how Dutch UAS researchers view their work within the themes, the impact they wish to create in those themes, and the output they create during the research process.

At the start of this study, ten themes had been discussed in the Strategic Agenda of 2016-2021. These are:

- Health Care and Vitality;
- Education and Talent development;
- Resilient Society: in Community, City and Region;
- Smart Technology and Materials;
- The Built Environment: Sustainable and Liveable;
- Sustainable Transport and Intelligent Logistics;
- Sustainable Agriculture, Water and Food Supply;
- Energy and Energy Supply;
- Art and Creative Industries; and
- Business: Responsible and Innovative.
  (NAUAS 2015)

Aligned with the United Nations Sustainable Development Goals (United Nations 2015) and the Dutch Research Agenda, and believed to reflect the research work conducted by UAS researchers (NAUAS 2021), the NAUAS has indicated twelve themes in which they wish to make impact. The current Strategic Research Agenda 2022-2025 has added Security, and Tourism and Hospitality (NAUAS 2021). Because of the timing of this study only the first ten have been taken into consideration.

Both a questionnaire and workshops were utilized to facilitate a comprehensive understanding of: the impacts researchers wish to create; the actual outputs created to facilitate this impact; and the themes in which they strive to do it. Our study reveals that researchers find it challenging to align their work with a single theme. They often engage in multidisciplinary research with a wide variety of stakeholders which requires flexibility in indicating multiple themes. Project-level evaluations may better capture theme-specific impacts. This is especially true as stakeholders play a crucial role in impact creation, and the choice of theme often depends on project-specific stakeholders.

Further, this part of the study revealed a disconnect between the intended impacts and actual outputs. This was particularly true for both educational impact and outputs, and economic impacts and outputs. These results suggest that perhaps the impact is not purely created through the outputs but through the people who are involved. Harkening back to the results of Chapter 3, this would appear to emphasize the importance of personal engagement in translating research findings into tangible impacts.

Chapter 4 also discusses the desired form of impact, *doorwerking* or micro impacts, that Dutch UASs wish to evaluate. The concept of 'impact' for UASs has evolved over time. Currently, the term *doorwerking*, translated as 'effect' in English, is widely used in UAS policy discussions. The current definition, as per the BKO, describes 'effect' as the influence of both the research process, and its results on Education, Professional Practice, and the Research domain, encompassing implicit and explicit changes during research and dissemination (NAUAS 2022). According to Brouns et al. (2023) it is fostered by ongoing interactions among individuals and their output. Andriessen (2019) suggests that these interactions and outputs facilitate knowledge transfer across the spheres of the Knowledge Triangle.

Initially, Dutch UASs used the term 'valorisation,' to describe focusing on creating economic and societal value from knowledge. Internationally, 'valorisation' is often associated solely with the economic value of research impact, overlooking non-economic aspects (de Jong 2016). The limitations of the economic focus include a one-directional flow of knowledge from science to society (Etzkowitz 1998), contrasting with the KT model that acknowledges the interconnectedness of Higher Education, the business sector, and society (van Vliet 2022).

Within Dutch UASs, the term doorwerking appears to be preferred over 'valorisation' or 'impact.' Doorwerking implies an ecosystem where minute developments lead to a succession of adaptive changes, akin to Sivertsen and Meijer's (2020) concept of 'Normal impact'—everyday interactions creating scientifically robust and socially relevant impact. Sivertsen and Meijer differentiate between 'Normal' and 'Extraordinary' impact; Normal impact stems from daily interactions, while Extraordinary impact, though rare, has a widespread effect on society.

Lykke et al. (2023), further build on this differentiation between Normal and Extraordinary by suggesting that Normal impact is made up of micro impacts that occur throughout the research process, contributing to expected and unexpected, planned and unplanned effects. Budtz Pederson and Hvidtfeldt (2023) suggest that these micro impacts may lead to macro level impacts and require different tools for evaluating the different types of impacts. They suggest that the evaluation of macro impacts is better suited to indicators and a narrative while micro impacts are best made visible using a contribution analysis.

Contribution Analysis

The final stage of this study was a case study aimed at applying and evaluating the effectiveness of contribution analysis as a micro impact, or doorwerking, evaluation tool in the context of Universities of Applied Sciences. Structured around Kok and Schuit's (2012) Contribution Mapping framework, we evaluated a transdisciplinary project based in the Netherlands. While many forms of contribution analysis are based on a Realistic perspective, Contribution Mapping was selected because of its Performative assumption. This assumption is based in Actor-Network Theory. As such, it focuses on the actors, interactions, activities and outputs throughout the research process. It aligns with other recommendations for evaluating UAS research impact in that it is formative and stresses the importance of stakeholders throughout the evaluation process in co-production.

The use of stakeholders in research and its evaluation have come to take on many different terms such as co-production, co-creation, societal engagement, citizen science (Cohen 2022). While these terms have come to be used interchangeably, a systematic literature review conducted by Voorberg et al. (2015) suggests that there are, in fact, three forms of stakeholder participation that are addressed in the literature. These are co-implementor, co-designer, and co-initiator. They suggest that the use of stakeholders in co-creation is best defined as co-designer, and co-initiator and co-production as co-implementation.

Regardless of how these words are precisely used, the use of stakeholders in research and evaluation comes with positives and negatives. Stakeholder inclusion is seen as fostering synergy (Brandsen and Pestoff 2006) and long-term commitment, leading to a power shift where stakeholders play a leading role (Bovaird 2007). However, potential risks and challenges also come with it in the form of, among other things, extra costs (Boaz et al. 2021), bias (Oliver et al. 2019), or the possibility of excluding important participants (Pel et al. 2023).

In line with co-production, semi-structured interviews with each member of the research team including stakeholders were conducted. A focus group with the whole research team was also held. These were conducted following the completion of the project, making use of the Contribution Mapping framework in its original ex-post form. Conducting this case study led to several observations, challenges, limitations. It indicated the need for modifications to Contribution Mapping in order for it to be fully useable and able to tell a broader narrative around context and impact.

While effective as a starting point, Contribution Mapping itself presented challenges, such as time intensity, the necessity of insider involvement, and results that often lacked depth and contextual richness. These findings led to recommendations for enriching contextual details in the mapping and adopting an iterative, non-linear evaluation approach conducted in real-time. Chapter 5 demonstrated the practical challenges and potential of using novel evaluation methods in real-world settings, suggesting that Contribution Mapping's effectiveness in the UAS context depends on addressing its limitations and refining the approach.

APPLYING THE CONCLUSIONS

Collectively, the chapters of this dissertation outline the rules for evaluating the impact of research conducted by Universities of Applied Sciences. It examines impact within the current context of Dutch UAS research and experiments with putting those rules into practice. As previously indicated, these findings lead to several conclusions that are closely connected. What do these findings mean for the research group, policy maker, executive boards, the Netherlands Association of University of Applied Sciences and even UAS researchers? Let's make this practical.

The Recommendations for UAS Research Impact Evaluation

The rules or recommendations for evaluating the research impact of UAS research indicate that there are several principles that need to be kept in mind when evaluating the impact of UAS research.

a. The Philosophical assumption: This evaluation should utilize one of two options for assumptions. One option is a Realist philosophical assumption that includes context-mechanism-output-impact (CMOI). A performative perspective based on Actor-Network theory, is also applicable with the result that theoretically speaking, both assumptions are applicable. However, from a practical perspective, a Realist assumption risks being too linear as this is the nature of the CMOI formation. Regardless of the assumption it is based on, the evaluation should be a co-production model without making use of a preformulated logic model which supports linear thinking.

b. Real-time evaluation: Impact creation and its evaluation start at the beginning of a research project. This is when a researcher and group should be considering the desired impacts (micro and macro) and how these are going to be realized. It is important to be aware of the framework chosen, i.e. it is applicable to the desired impact (micro, macro, or a specific sort of impact), and the research the evaluation strives to evaluate. It is important to be aware of the assumptions on which the evaluation is based, as these are reflected in how the research and impact evaluation process are viewed. Also, the level of evaluation should be taken into consideration; is it at a research group level, a project level, or, if possible, at a theme level?

c. Prefabricated logic-models: It is important to be aware of becoming too rigid in ‘pathways’ to impact. The ‘what’ and ‘how’ is not cast in stone. One of the joys of practice-oriented research is its non-linearity and the feedback loops that take place in order to accomplish the research. The stakeholders also play a fundamental role in this process and often contribute to the messiness of the research process. Likewise, the impact created throughout the research process occurs in both predictable and unpredictable ways. This stresses the need to regularly monitor what is taking place in projects and goes beyond looking at only outputs as a form of impact. It includes both the deliberate and unintentional interactions and activities that take place before, during, and after a project as well as the people involved.

d. Formative: While a summative evaluation may remain relevant for evaluating research as a whole, impact evaluation should be formative. The aim is to learn from the evaluation. The implication is that impact is always being made. What is to be accomplished through evaluation is making the impact visible so that it can be built on for further impact and improvement in the future.

e. Co-production: The inclusion of stakeholders is a fundamental part of UAS research. Stakeholders should be included at both the start of the project and the evaluation. It is, however, important to recognize that there are blatant and hidden costs for all those involved. 'Participation' for the stakeholder means something different than participation for the researcher and the research team. It is, thus, necessary to ensure that stakeholders are compensated for both the research and the evaluation in a reasonable manner that is beneficial to them as well as the researcher.

These recommendations for evaluating the research impact created by UASs could be translated into criteria for evaluation. The NAUAS and policy makers should consider how to implement these recommendations to aid in making UAS research impact visible. Equally, these recommendations are applicable to the researchers and their teams because it concerns evaluating the research impact itself. By implementing these recommendations into their evaluation practices, researcher groups can make their impacts more explicit.

Roles, Functions, and Impact

The results of our study emphasize the importance of team composition, as could be expected from a functional Knowledge Triangle. The roles and functions of each member of the research group have a direct influence on the impact created. Those with significant teaching time link to impacting education while those with much research time create impact through their research and output with some impact through networking. This may indicate the links between Education and Research may be weaker than expected. The more hours a member has for teaching, the stronger their link to education. Similarly, the more time researchers have for researching, the more research they do. Those with high numbers of hours for research may also make steps towards External Networking. However, the role and function of the professor is primarily responsible for the link to practice through External Networking and Internal Organizational matters. This is the biggest risk to the efficacy of this model as it means that the link to the Professional Practice falls solely on that role. The result is that the flow of knowledge through the Knowledge Triangle is dependent on the people involved, making the Knowledge Triangle vulnerable. In order to mitigate this vulnerability, it is important researchers and professors are aware of their position in the Knowledge Triangle. Each position is a vital part of ensuring the knowledge transfer happens in each area. In doing so, the purpose of UAS research is fulfilled.

It is important for research teams, and those who support them, to be aware of the various roles and functions that are present in the team as well as in each of the projects in which that team participates. Ideally, these decisions are determined together as a team. Each role and function contributes to the impact created as well as the knowledge transfer that occurs. Knowing who does what enables well informed decisions to be made when deciding what impacts are desired to be created, the activities and outputs used to facilitate this.

While technically each project should contribute to each area of the KT, there are justifiable reasons for not requiring this. Cases where this does not occur should be the result of a conscious decision rather than one born out of chance and/or poor planning. The vision, mission and plan for a research group and the support structure is an essential tool for facilitating impact as a research group at both micro and macro levels. By having a clear vision and mission, choices for impacts can be explained. It will also assist the group in working towards building micro impacts into desired macro impacts which require regular monitoring of the work at both a project level and research group level.

The gap between research conducted by research groups and the education component of the KT is large. Researchers want to create educational impact, but this is not significantly accomplished through the output created. Instead, it appears that this impact is accomplished through the people involved. The results of this study show the importance of not only focusing on output for impact creation, as it now appears to be the case within the BKO, but also on people.

Ensuring the right person with the right role and function is involved is necessary to maximize impact, in particular balancing research and educational tasks and ensuring the connection between them. This can then be seen through the additional use of the basic indicator of the BKO as a potential indication of impact.

The BKO's basic indicators for "Research Staff Realised" can be used to ensure that the staffing required to make the desired micro and macro impacts are available. Knowing who and what is available can also help the decision-making process when trying to determine what micro and macro impacts the group wishes to make as a project team and research group. For example, choosing to make educational impact while not having someone in the team who teaches can make it more difficult. These considerations should also be made when forming project teams.

The gap between research and education may reflect an historical consequence as research at Dutch UASs is relatively young. It may be that the connection between research and education continues to flow primarily through student research assignments rather than the research groups themselves. It is important to recognize this now and assess the need for change as research at Dutch UASs reaches new levels of professionalization. It is especially relevant to take this into account given the current implementation of the professional doctorate, the UAS counterpart of an academic PhD.

Similarly, despite the strong focus on entrepreneurship in policy, the actual research activities and processes steering this type of impact are currently limited compared to other types of output and impacts realized. It is important to remember that all forms of research impact are valid. However, if economic impact is viewed as important, new means of support should be created to facilitate this type of impact creation.

It may be advisable for institutional policy makers and the NAUAS to consider strengthening policy around the Knowledge Triangle. It is important to ensure that responsibilities for the KT are not dependent on single members of the research group; otherwise, the Knowledge Triangle becomes fragile. Specifically, a formally recognized job description or profile for Associate Professor may help reduce the responsibility of the professor as primary link to the Internal Organization and External Networking. A formal description of how research is coupled with Practice and Education, and what kinds of processes it goes through, should also be part of the discourse.

Impact and the Themes

The NAUAS's previous two strategic agendas have indicated a desire to make impact in specific themes, while leaving room for how this should be evaluated and monitored. As indicated in Chapter 4, in the opinion of researchers, their research often falls into multiple themes. The results of the analysis in Chapter 4 raise questions concerning the validity of using the ten (or twelve) themes. In order to incorporate them into the impact evaluation as set out by the NAUAS, this study suggests a more project-based evaluation approach. This would allow for a tailored assessment of impact. Evaluating at this level will allow for multiple themes to be taken into account for each project and each research group as well as the stakeholders involved. A project evaluation can then serve to feed a research group evaluation such as the BKO.

Wrestling with Research Impact Evaluation Theory, Our results and the Dutch UAS BKO

These recommendations appear to differ from what the NAUAS currently uses for indicating the potential impact that their research creates. The Brancheprotocol Kwalitietzorg Onderzoek (Sector Protocol for Quality Assurance in Research, BKO) is a general research evaluation conducted at the research group level. Mirroring the better-known Strategy Evaluation Protocol (SEP) used by the Universities of the Netherlands (UNL), the BKO is executed ex-post every six years by an evaluation committee comprised of external and internal members. It aims to evaluate and monitor research quality for accountability purposes. The BKO suggests it serves "as a source for further development of research" (NAUAS, 2022, 5). This statement may be interpreted as a formative evaluation. However, the preceding BKO's were summative (van Drooge et al. 2016).

The exact philosophical assumption underpinning the BKO is difficult to assess because there is little information available. It is perhaps a Positivist assumption. According to the work of Greenhalgh et al. (2016) this assumption suggests that 'facts, especially statements on relationships between variables, are independent of researchers and transferable to new contexts' (Greenhalgh et al. 2016, 3). Research findings are then disseminated, taken up and used for societal benefits in what appears to be a linear means through the indicator categories of Output, Use and Valuation.

The specific impact component of the BKO evaluation is situated in Standard 2 wherein institutions are required to create indicators to demonstrate impact in the areas of the Knowledge Triangle, Research, Education and Professional Practice. There is to be a minimum of 3 indicators per area of the KT. The indicators are further substantiated with a narrative written by the research group itself. This may point to a dichotomy between current evaluation tools of indicators and a narrative, and the form of impact, doorwerking or micro impacts, that is to be evaluated. While the BKO strives to evaluate the doorwerking or micro impacts of Dutch UASs, it provides indicators and narratives as the tools of choice which are typically used for the evaluation of macro impacts (Budtz Pederson & Hvidtfeldt (2023). Consequently, the current BKO tools provide insufficient information concerning the impact resulting from the interactions, activities and outputs created through the researchers and stakeholders involved in the project. These actions occur throughout the process of Normal micro impact creation.

Collectively, these observations suggest that the BKO is perhaps not the correct tool for evaluating the impact of UAS research. It may also suggest that the BKO is insufficiently grounded in theory.

That said, the NAUAS has provided a guide to facilitate the use of the BKO. One of its suggestions is making use of https://doorwerking-hbo-onderzoek.nl/. Initiated by the research group "doorwerking practice oriented research," this website provides, and explains potential tools for research impact evaluation. It can be a great resource for both researchers and policy makers. However, the guide provides very little additional information for aligning these tools with those of the BKO itself. With additional help, researchers, groups and support staff could select an appropriate tool from this site to comply with the recommendations for evaluating the impact created by UASs allowing for bottom-up development that is context specific.

A Possible Starting Place

Contribution Mapping is one of these tools that can be considered to help accomplish this evaluation. As our study suggests, Contribution Mapping has illustrated that impact creation is dependent on networks of intertwining organizational and personal contexts that occur at different moments in time, and in different roles. The needs and expectations of different types of stakeholders differ as well. While the overarching thinking within impact evaluation is currently in favour of impact pathways, and Theory of Change as theoretical models, the reality is that the directionality of these impact methods appears insufficient in capturing the complexity and intricacies of impact creation in UAS research. By focusing too much on pathways, hypothesis and planning, the more important Normal impact that takes place can be missed. The linearity of these pathways also counters the knowledge transfer that takes place in multiple directions through the KT. A narrative may aid in making these transfers visible, as well as potentially augmenting the mapping of the interviews to describe individual stories and overlap in contributions.

By modifying Contribution Mapping to be used in real-time, these complexities can be highlighted beyond the linear, showing the links to all aspects of the Knowledge Triangle and connecting the partners with impact in mind. By doing it in real-time both micro impacts and macro impacts can be considered while allowing the freedom of the research to take its natural course through all the feedback loops. This requires subtle research management to achieve maximum impact. Real-time impacts should be continually monitored and evaluated by a capable research manager. This could be done within a project alone or, it could be executed by someone within the research group. That individual can take the real-time impact of all the projects into account thereby building a narrative for the group as a whole, establishing it as powerful tool for making both the micro and macro impacts visible.

However, Contribution Mapping is not the complete answer as it requires modifications such as timing, roles and terminology, and supplementary information about stakeholders, impact level, and context to produce a fuller, more complete story. It is crucial to keep in mind that while there is theoretically a position for the stakeholder and users, in practice their contribution to both research and evaluation remains limited. In order for research to be demand driven and in co-creation where stakeholders play a significant role, something that is more stakeholder centred may be required whereby co-design, co-implementation and co-evaluation are instead achieved. In this way, innovation may also be supported.

It is important to be aware that the use of research management tools such as Elsevier's PURE and other commercial Current Research Information Systems cannot assist in showing the impact of UAS research because they simply cannot capture the outputs, or more importantly the interactions and activities throughout the process of impact. As this study would suggest, impact through UAS research happens not only through output but through the research process and the personal interactions that take place between research, practice, and education. Networks are crucial. This cannot be captured in a commercial research information system.

Alternatively, this study recommends that new or altered tools combining qualitative and quantitative sources be integrated into the BKO framework to reflect upon the intricacies of impact creation in UASs. This may require modifying existing evaluation tools within the BKO framework to better assess the impact of Dutch UAS's research. Investigating ways to merge project-based evaluations with a BKO research group-based framework could involve developing a hybrid model to capture the full range of impacts. By aligning these tools with both micro and macro level impacts, UASs can better demonstrate and enhance the real-world impact of their research.

Reflections for the Future

This journey began by examining scientific literature in order to learn the rules of how to evaluate the impact of UAS research. There was little to go on. Throughout the process of writing this dissertation it became increasingly difficult to find scientifically based information about areas of importance for UAS research and policy. This search on my part may be reflective of something larger than this study. As the results of this study have shown, it may reflect the priorities of UASs in creating output and networks that serve the purpose of their stakeholders and their professional partners. As UASs continue to mature it is important that they make clear decisions concerning their vision, mission and polices to ensure that they maintain their identity and commitment to impact creation. It is not about gradually evolving into a university. Maturity does not mean doing it as others do. UASs need to embrace what makes them unique. It means carving out your own space, not comparing but learning from each other. Instead, there needs to be an acknowledgment that each are a valid and valued contributor to the academic process. In order to alleviate the current tension that appears to exist between UASs and Universities, it should be recognised that each is an important link in the binary system.

At the same time, part of claiming that space involves entering in the national and international dialog. In a binary system where scientific output has long been the priority, often associated with 'good research', the other half of the system cannot easily see what UASs are doing. Both UASs and Universities would benefit from an open dialog and exchange. According to what defines UAS research, it can by nature contribute to a better understanding of transformative, mission driven research because UASs are by definition, transdisciplinary. The outputs and the mandate to create impact mean that UASs can make a constructive contribution to the recognition and rewards discussion, specifically making a valuable contribution to initiatives like the Coalition for Advanced Research Assessment (CoARA) working group 'Towards Transformations: Transdisciplinarity, Applied/Practice-Based Research.

Additionally, what UASs are researching, creating and evaluating may be applicable for universities. This is especially true as universities become more focused on topics like citizen science and public engagement. As universities strive to create more impact through their research, it may be beneficial for them to learn from the more than 20 years' experience UASs have in making an impact on society throughout the knowledge triangle. At the same time, it is important to recognise the many different facets of impact that this study has explored. Normal and extraordinary, micro and macro impacts, and doorwerking, highlight the potential differences implied in the word 'impact'. The impact within these two different contexts may not always be the same. Likewise, many of the impact frameworks and words to define impact were developed in the universities context and, as this study illustrates, may not mean the same in the UAS context. Yet they have inspired this research through the literature.

And what does that mean for the future of impact evaluation at UASs? It means developing a research impact framework(s) that works for UAS's research, ensuring that the underlying aim of the evaluation remains to make the impact being created through UAS research visible. That is their mandate, to create impact through their research. By making the impact of UAS research visible, it ensures UASs are accomplishing what they are mandated to do. This evaluation needs to be done in an open, transparent and honest way wherein advocacy, analysis and accountability are the drivers: advocacy in the sense that by showing what is being realised it garners, more research, more resources and more respect; analysis in terms of being able to show the impacts that are being realised, or not being realised and assessing how those impacts can be built on and enhanced; and accountability not in the sense of bureaucratic under the thumb thinking but making visible what is occurring to reflect what is happening. As the recommendations discussed throughout this dissertation state, it is formative. We are not asking "have you done what you are supposed to?" We are stating, "We know you have made an impact through your research, show us what you have done and how we can build on that in the future". Through good, systematic impact evaluation we can strive to maximise the positive impacts while being aware of the potential negatives. Once it is realized, UASs can go a step further to see what can be learned from both the evaluation and the process leading to it. This can result in increased research quality at UASs. It can also result in strategic choices being made, ones that align with the vision, mission and policy of UAS research. The results of our research show, this can also result in efficient use of the people in a research team, the stakeholders included in research projects and networks and the range of output created (people, activities, interactions and outputs).

SCIENTIFIC RELEVANCE

This study examines the impact evaluation of research done at UASs. It aims to contribute to the field of academic research, particularly in addressing several aspects within scientific inquiry. Firstly, this research aims to address a knowledge gap. There is a noticeable scarcity in existing scientific literature concerning the rules, requirements, or recommendations for evaluating the impact created by UAS research. By focusing on this area, the study hopes to enrich current academic understanding by filling a void that currently exists in contemporary research literature.

In addition, this study intends to deepen the knowledge base by providing insights on specific subjects. These subjects include: the pro's and con's of logic models; the theory and practice of impact pathways; the connection between previously disparate concepts such as Normal impact, doorwerking, and micro/macro impacts. The practical implications of these theories, in the context of UAS research, is also examined.

This research also aims to provide an in-depth comparison and analysis of different evaluation frameworks and their appropriateness for evaluating specific types of research. With respect to the relevance of research on impact evaluation at Dutch UASs, this research strives to contribute to creating a foundation for future studies, enriching the scientific narrative around applied research, and translating it into concrete recommendations. It is hoped that these outcomes will guide future UAS research towards societal needs and challenges, thereby increasing their visibility and relevance in affecting positive social change.

Furthermore, by offering a systematic approach to evaluating the impact of research conducted at these institutions, this study provides a foundation of recommendations for implementing an appropriate framework for subsequent scholarly endeavours. These recommendations can be instrumental in guiding future research, enabling a more structured and insightful examination of the ways in which Universities of Applied Sciences contribute to broader scientific knowledge, innovation, and impacts on society. The methodologies and insights derived from this study have the potential to influence and steer future studies, marking a significant step in academic research related to Universities of Applied Sciences.

Additionally, the findings of this study strive to enrich the scientific narrative surrounding UAS research. Research from these institutions are often overlooked or undervalued in wider scientific discussions. This study, by highlighting and scrutinizing the impacts of UAS research, brings these contributions into view. It facilitates a broader and more inclusive conversation about the role and significance of UAS research in driving societal and scientific progress. This is especially true in view of the current policies focusing on transformative changes of science, technology and innovation with regard to sustainable transitions that are further supported by the global SDG's. The integration of this research into larger scientific dialogues can contribute to UASs being appropriately recognized and valued. This in turn promotes a more diverse and comprehensive understanding of science and its applications in society.

This study is intended to bridge a knowledge gap and create new paths for future research. It enriches the overall narrative of scientific inquiry, particularly highlighting the unique and impactful contributions of Universities of Applied Sciences.

SOCIETAL RELEVANCE

The societal relevance of this dissertation, which focuses on the impact evaluation at UASs, extends significantly beyond the academic realm, touching on various aspects of societal development and enhancement. Primarily, this research equips UASs with a deeper and more precise understanding of how to increase the visibility of their impact on society. This enhanced awareness is critical as it informs and guides the strategic decisions, policymaking, and future research trajectories of these institutions. By having a clearer picture of how their work affects society, UASs can make better informed choices that align with their social objectives and mission. This clarity also assists UASs in demonstrating their societal value, potentially increasing support, collaboration, and funding opportunities.

Moreover, UASs have a specific mandate to generate societal impacts. This study aids in providing clarity on how effectively these institutions can meet this responsibility. It sheds light on the tangible ways through which UASs contribute to societal impact, thereby enabling them to refine and optimize their roles and societal contributions. This, in turn, assists the efforts of UASs to be more closely aligned with societal needs, leading to enhanced social welfare and progress.

A significant aspect of this dissertation's societal relevance is how it assists UASs in demonstrating their value and relevance to society. Through this research, UASs can showcase their impact in a transparent and comprehensive manner, thereby reinforcing their legitimacy and importance in the public eye. This enhanced visibility not only bolsters societal support but also opens doors for greater collaborative opportunities and potentially increases access to funding sources. The ability to explicitly demonstrate their impact assists UASs in securing the necessary resources and partnerships to further their societal contributions.

By outlining the impacts of UAS research and proposing methodologies for their evaluation, this study offers a template that can assist in shaping future studies and initiatives at UASs. This template can provide guidance for upcoming research to be more closely tailored to address contemporary societal challenges and needs, leading to more impactful outcomes for communities. By making the impacts of UAS research more visible and comprehensible, this dissertation contributes to the recognition of the role UASs play in society. It highlights how these institutions are not just academic entities but are crucial players in driving social change and advancement. This increased understanding of UASs' roles and impacts fosters a more favourable environment for these institutions to affect positive change.

LIMITATIONS

This dissertation, focusing on the impact evaluation at Dutch UASs, has certain limitations that are important to acknowledge for a comprehensive understanding of its scope and applicability.

Firstly, the research is specifically tailored to the Dutch context. The Netherlands features a unique binary system of higher education, including Universities of Applied Sciences. While other countries also have similar institutions within their binary systems, the execution and integration of UASs can differ significantly across different national educational landscapes. Due to these variations, the direct applicability of all the findings and methodologies of this study to other countries may be limited. Each nation's higher education system has its own set of policies, cultural contexts, and operational frameworks, which can influence how research impacts are evaluated and perceived. Therefore, while the ideas and concepts derived from this study are broadly relevant and can offer valuable insights, their one-to-one application in different countries or systems may require careful adaptation and contextualization.

While this dissertation offers insights and contributes to the understanding of research impact evaluation at Dutch UASs, its specific focus on the Dutch context and the timing of the study relative to the fast-paced evolution in the field are potential limitations. These aspects highlight the necessity for ongoing research and adaptation of the study's findings to maintain their relevance and applicability in a rapidly changing academic and professional environment.

Secondly, the timing of the study presents another limitation. The dissertation captures the state of Dutch UAS research during the particular period of 2018-2023. However, the field of UAS research in the Netherlands is rapidly evolving and maturing. For example, the professional doctorate, as a relatively new development, signals a shift in how research is conducted and perceived in the applied sciences landscape. This evolution marks a significant step towards the professionalization of research within these institutions. It fosters a more practitioner-oriented, industry-focused approach to research.

Given this evolving context, this study's findings, while insightful and significant at the time of research, may not fully capture these recent developments and their implications for research impact evaluation. The speed at which changes are occurring in Dutch UAS research suggests that some of the dissertation's conclusions and recommendations may need revisiting or updating to stay relevant and effective.

Thirdly, this dissertation's journey was influenced by the COVID-19 pandemic, leading to alterations in the research process. The necessary shift from live workshops and focus groups to an online environment was not just a simple change of medium. It represented a fundamental modification in how the research was conducted. This transition potentially affected the dynamics of interactions and engagement with participants and even the approaches to data collection, potentially differing from what might have been achieved in person.

Conducting this research amidst a global crisis underlined the crucial role of resilience and flexibility in academic endeavours. This research was in the focus group and workshop stage when the first lockdown occurred. At that point the use of online platforms such as MS Teams or Zoom were rarely accessible. The constraints and possibilities inherent in the online interactions likely had an impact on the nature of the discussions, the depth of the analysis, and possibly the research outcomes.

In conclusion, the adaptation to the conditions imposed by the COVID-19 pandemic was more than just a logistical shift; it represented a comprehensive transformation of the research process. This experience has highlighted the need for adaptability and resilience in research, offering critical lessons for conducting impactful studies in times of crisis or unexpected challenges.

DIRECTIONS FOR FUTURE RESEARCH

Future research, building upon the findings of this study, opens up several promising directions to enhance the understanding and evaluation of research impact, particularly within the context of UASs. This study has produced a significant body of research that can be utilized for future research. This includes a database of stakeholders that participate in UAS research and questionnaire data on Open Science, Networking, and other impact related topics.

A significant area for future investigation is the refinement and evolution of Contribution Mapping. Contribution Mapping is acknowledged as a valuable tool for understanding the impact of research, but in its current form presents some challenges for practical, everyday application. To address this, future studies should explore how this tool can be adapted to provide a more comprehensive and nuanced understanding of research impact. This could involve simplifying its methodology for easier application in various settings or enriching its framework to capture more information about context and a broader range of detail.

Another key area for future research is a deeper exploration of the role of stakeholders and networks within UASs. Stakeholders (including students, industry partners, academics, and the wider community) play a crucial role in shaping and experiencing the impact of research. Understanding their perspectives, needs, and contributions can provide a more holistic view of the impact created by UASs, as well as the operationalization and intricacies of transdisciplinary research. Additionally, examining the networks within which these stakeholders operate can shed light on the broader systemic and relational aspects influencing research impact. This exploration could involve case studies, surveys, or network analysis to uncover how these relationships function and contribute to the generation of impact.

Investigating the network component of the BKO framework is another intriguing direction for future research. The BKO is instrumental in evaluating and understanding UAS research, but there is potential to deepen this understanding of impact by examining how networks within and beyond UASs contribute to and amplify this impact. For instance, how do collaborations, partnerships, and community engagements facilitated by UASs extend the reach and significance of their research outcomes? This is of particular relevance for the Research-Education axis within a UAS, as well as for the entrepreneurial component of UAS activities. Exploring these dimensions could lead to a more dynamic and interconnected understanding of impact, moving beyond traditional metrics and evaluations.

In summary, future research should aim to:

1. Enhance and adapt Contribution Mapping to make it more applicable and representative in various contexts;
2. Delve into the roles, perceptions, and contributions of stakeholders within UASs to gain a more complete view of impact creation; and
3. Investigate the network dynamics around UAS research groups, examining how these connections shape and extend the impact of their work.

By doing so, the future BKO can be enhanced by taking these mechanisms of impact into consideration. Such research will not only provide a richer understanding of how impact is created and experienced in the UAS context but also offer practical insights for improving impact evaluation and strategy in these institutions. In the meantime, it would be advisable that at the strategic level, be it the Boards of UASs or the NAUAS, time and effort is expended into discussing and solidifying how impact can be strengthened within the Knowledge Triangle. By doing so we not only follow the rules, but make the impact created by UAS research visible.

I set out on this journey to discover the rules for evaluating the research impact of Dutch UASs. I have a strong aversion to engaging in activities without understanding the underlying reasoning. In my opinion, this study has provided sufficient information for me to avoid blindly adhering to the practices of universities, complying with policy directives, or mimicking others who may be following instructions without a deep understanding of the details. While there is certainly more to uncover, I hope this work will assist both myself and others in making informed decisions, complex decisions about what we mean in the words we use, the policies we write, the tools we offer. These are impactful decisions about who we involve in our research, the output we generate, and the research process itself. These are weighty decisions about our expectations for researchers, institutions, and the future of Practice Oriented research. By understanding and implementing these rules, my aspiration is not only to contribute to impacting society through the research UASs do but also to make this impact visible. It is through this visibility that we can learn, adapt, and further enhance our impacts, potentially influencing the future of the world.

APPENDIX A

Perspective	Positivist	Constructivist	Realist	Critical	Performative
Assumption about what [research] knowledge is	Facts (especially statements on relationships between variables,) independent of researchers and transferable to new context	Explanations/ interpretations of a situation or phenomenon, considering the historical, cultural and social context	Studies of how people interpret external reality, producing statements on 'what works for whom in what circumstances'	Studies that reveal society's inherent conflict and injustices and give people the tools to challenge their oppression	Knowledge is brought into being and enacted in practice by actor-networks of people and technology
Assumed purpose of research	Predictive generalisations ('laws')	Meaning: perhaps in a single unique case	Theoretical generalisation (what tends to work and why)	Learning, emancipation, challenge	To map the changing dynamics of actor-networks
Preferred research method	Hypothesis testing; experiments; modelling and measuring	Naturalistic inquiry (i.e. in real- world conditions)	Predominately naturalistic, may combine quantitative and qualitative data	Participatory (action) research	Naturalistic, with a focus on change over time and network [in]stability
Assumed way to achieve quality in research	Hierarchy of preferred study designs; standardised instruments to help eliminate bias	Reflexive theorising; consideration of multiple interpretations; dialogue and debate	Abduction (what kind of reasoning by human actors could explain these findings in this context?)	Measures to address power imbalances (ethos of democracy, conflict management) research capacity building in community partner(s)	Richness of description; plausible account of the network and how it changes over time
Assumed relationship between science and values	Science is inherently value-neutral (though research can be used for benign or malevolent motives)	Science can never be value-neutral; the researcher's perspective must be made explicit	Facts are interpreted and used by people who bring particular values and views	Science must be understood in terms of what gave rise to it and the interests it serves	Controversial; arguably, Actor-Network Theory is consistent with value-laden view of science
Assumed mechanism through which impact is achieved	Direct (new knowledge will influence practice and policy if the principles and methods of implementation science are followed)	Mainly indirect (e.g. via interaction/ enlightenment of policymakers and influencing the 'mindlines' of researchers)	Interaction between reasoning (of policy makers, practitioners, etc.) and resources available for implementing findings	Development is critical consciousness; partnership-building; lobbying; advocacy	'Translations' (stable changes in the actor network), achieved by actors who mobilise other actors into new configurations
Implication for the study of research impact	'Logic models' will track how research findings (transferable research findings about what works) are disseminated, taken up and used for societal benefit	Outcomes of social interventions are unpredictable, impact studies should focus on 'activities and interactions' to build relations with policymakers	Impact studies should address variability in uptake and use of research by exploring context-mechanism-outcome-impact configuration	Impact has a political dimension; research may challenge the status quo; some stakeholders stand to lose power, whereas others may gain	For research to have an impact, a re-alignment of actors (human/ technological) is needed; focus on the changing 'actor-scenario and how this gets stabilised in the network

Table A.1: Philosophical Assumption (Greenhalgh et al. 2016, 3)

Types of evaluation	Examples of methods/approaches	Use	Types of impact typically evaluated
Experimental and statistical methods	Statistical modelling, longitudinal analysis, econometrics, difference-in-difference method, double difference method, propensity score matching, instrumental variable, analysis of distributional effects, experimental economics	Typically used in summative mode, ex ante and/or ex post, to infer the extent to which research is a sufficient cause of impact (often showing sole and/or direct attribution from research to impact)	Economic, environmental, social, health and wellbeing, policy, other forms of decision-making and behaviour change
Systems analysis methods	Contribution analysis, knowledge mapping, Social Network Analysis, Bayesian networks, agent-based models, Dynamic-System Models, influence diagrams, Participatory Systems Mapping	Can be used in formative or summative mode, usually ex-post or during a pathway to impact	Policy, other forms of decision making and behaviour change, capacity building
Textual, oral and arts-based methods	Testimonials, ethnography, participant observation, qualitative comparative analysis, linkanges and exchange model, interviews and focus groups, opinion polls and surveys, other textual analysis, e.g. of focus groups and interview data, participatory monitoring and evaluation, empowerment evaluation, action research and associated methods, aesthetics, oral history, storytelling, digital cultural mapping, (social) media analysis, poetry and fiction, music and dance, theater	used either in formative mode to enable beneficiaries to engage and shape feedback that then enhances impact, or in summative more, ex-post to access the extent to which research contributed to impact	All types
Indicator-based approaches	Theory of Change, Logical Framework Analysis, Payback Framework, SIAMPI, DPSIR	Indicators-based approaches use indicators to assess progress towards anticipated impact. Any method may then be used evaluate each indicator. These frameworks can be used in summative or formative mode, typically ex-ante(but can be used ex-post) to show the extent to which research contributes towards, or was a necessary cause of, impact	All types
Evidence synthesis approaches	Meta-analysis, narrative synthesis, realistic-based synthesis, rapid evidence synthesis, systematic reviews	Used in summative mode, e-post, to infer sole attribution of quantify the extent to which research was a sufficient cause of impact	All types

Table A.2: Types of Research Impact Evaluations and Their Commonly Used Methods/Approaches (Reed et al. 2021, 5)

Tool	Summary
Interview	Interviews are a valuable tool for exploring the conditions that contribute to impactful outcomes. They offer a chance for informants to share insights, allowing interviewers to tailor questions based on responses. Structured interview guides aid in cross-case comparisons and can reveal motivations, enablers, or concerns related to impact creation. While qualitative interviews can be used at various stages of a research project, there are challenges such as informants lacking perfect information, timing affecting reliability, and the potential for overemphasizing non-research impacts. Training interviewers and addressing issues in data transcription and analysis are also important considerations.
Case study (narrative Approaches)	Case studies offer a nuanced exploration of complex scenarios, detailing specific pathways leading to the real-world use, uptake, and impact of research. Particularly favored in social sciences and humanities literature, they encompass a broad range of impact areas like policy, health, business, and culture, often overlooked by data-driven approaches. Despite their strengths in providing coherent narratives, case studies face criticism for their subjective nature, making comparison and ranking challenging. Additionally, they tend to prioritize recent research, potentially neglecting long-term impacts, and may struggle to provide clear evidence for all types of research. Critics argue that the method's focus on tangible impacts may idealize outcomes, overlooking barriers and negative effects. Moreover, the labor-intensive nature of case studies poses challenges for both researchers and assessors.
Surveys	Surveys are effective for collecting data on various variables such as motivations, barriers, enablers, and different types of engagements between researchers and society. They enable comparative analysis of performance over time and throughout the research process. However, surveys have limitations. They primarily rely on self-reported evidence, potentially biased towards mapping involvement rather than observing real-world effects. Surveys assume quantitative measurement of research impact, but the validity of indicators like dissemination efforts and relationships with policymakers is contestable. Direct relationships between research and policy change may be scarce, requiring validation through additional methods like qualitative interviews. Surveys may not adequately capture unforeseen impacts and context-specific factors. Consequently, they often necessitate supplementary methods for validation and may be less responsive to unexpected influences.
Peer/expert review	Peer review, encompassing expertise-based assessments in various contexts like journal manuscripts, funding applications, and hiring, is mentioned in 36% of our review texts. Regarded as a crucial method for quality assessment across scientific domains, it involves experts evaluating quality within the field or external indicators. Quality indicators include output measures and indicators of reputation. Used in assessments of scientific excellence and societal impact, peer review is flexible and highly trusted. It can be implemented at different research stages, aiding in understanding societal impact, allocation of funding, and mid-term/final evaluations. Despite its widespread use, peer review faces criticism for potentially delivering an 'acceptance threshold' rather than measuring impact. Bias towards renowned scholars may lead to positive judgments and funding, creating a "Matthew effect." The method is also criticized for being time-consuming, impractical due to the number of involved experts, and requiring well-informed individuals with in-depth knowledge of the research context.
Statistical databases	Statistical databases are valuable for describing research infrastructures, facilities, income, scientific degrees, and prices across various scientific fields. They enable tracking developments over time and between research units, facilitating data combination for comparative analysis. However, literature points out drawbacks, such as hindrances due to administration and user rights, requiring repetitive agreements for joint dataset utilization. Maintenance, documentation, and validation of registries may pose challenges. Administrative and statistical databases alone may struggle to document and derive impact from specific projects, particularly informal engagement efforts. Nevertheless, some contributions highlight the utility of statistical databases in national evaluation systems, emphasizing the importance of considering the relationship between disciplines, the academic environment, and academic and societal outputs.

Tool	Summary
Commercialization data	Commercialization data, often used alongside bibliometrics, is part of a quantitative assessment approach, particularly focused on economic effects related to technology transfer and the business sector. Indicators like patents, licenses, joint research, and industry funding are commonly used. While this method can identify formal relationships between researchers and society, it faces challenges in comparing commercial impacts across disciplines and contexts. In the social sciences and humanities (SSH), where impact is established through non-economic channels like policy reports and public lectures, the economic transaction model is considered insufficient. Critics argue that a narrow focus on commercial impact neglects the broader socio-technical system and the entanglement of economic and non-economic factors in creating impact. Research on topics like sustainable infrastructures or intercultural understanding, while impactful, may not be accurately reflected through standard economic indicators.
Bibliometrics	Bibliometric methods primarily focus on assessing the academic impact of research through publications, citations, and authorships, rather than societal impact, the main focus of our review. While bibliometrics offer objective statistical tools for evaluating scientific performance, especially in life and natural sciences, they face criticism in the social sciences and humanities (SSH). SSH scholars argue that bibliometrics, historically developed for other disciplines, inadequately capture SSH's non-journal publications, non-English language works, and field-specific notions of 'quality.' Responses to this criticism range from improving metrics for SSH to questioning the use of metrics across research fields. Despite their limitations, bibliometrics are considered useful when applied responsibly, but in the context of SSH, they cover only a fraction of researchers' communication and lack evidence of broader societal engagement. Relying solely on bibliometrics for evaluation is criticized for distorting the view of scientific outputs and overlooking research's broader societal relevance. In impact assessment frameworks reviewed, bibliometrics are exclusively used for academic impact assessment, while other methods like altmetrics are employed to capture evidence of broader societal uptake of research. Onderkant formulier
Impact plans theory of change and logic models	Impact plans play a dual role, either retrospectively describing the context, activities, and outputs of research that influenced society or prospectively outlining how a project aims to achieve desired results. In the Research Excellence Framework (REF), impact plans are used to provide context and evidence for individual case studies, accommodating particular circumstances. Frameworks like ROMA and RCF utilize impact plans in the preparation phase based on a 'theory of change,' guiding project stakeholders and allowing for examination of factors influencing research uptake throughout the project's lifecycle. The 'theory of change' approach, while challenging for highly innovative projects, fosters an open-minded and iterative research process. It requires an explicit understanding of the research mission, external actors' interests, and specific activities linking research to society. Some impact assessment models combine logic models with impact plans, templates, and case studies, aiming to capture the intricate processes and interactions in knowledge production, uptake, and use in society. Logic models help track specific outcomes and break down different types of research-associated outcomes, emphasizing the need for sensitivity towards indirect impacts and links between research and society.
Workshops and focus groups	Workshops and focus groups are organized discussions involving researchers, partners, and stakeholders held at various assessment and research phases. They can be used early on to co-produce ideas, set objectives, and accelerate research impact by mobilizing attention. These methods facilitate collaboration, development of dissemination strategies, and exploration of impact evidence sources. Cost-effective and influential, workshops and focus groups are also employed post-project to capture immediate effects on partner institutions or target groups. However, literature notes risks, including participants potentially downplaying negative impacts and having selective memory, emphasizing positive outcomes.

Tool	Summary
Stakeholder/user evaluation	Stakeholder evaluation involves stakeholders as partners in the research project, collaborating in knowledge co-production and influencing the project's organization, implementation, and assessment. This approach may lead to the co-production of evaluative indicators and broader participation in the research process. Stakeholders serve as valuable informants, offering insight into partner organizations and improving awareness, understanding, and communication between researchers and stakeholders. Involvement of stakeholders can occur in the design phase to align research with specific needs, breaking down barriers and cultural differences. It may also happen during the research process to gather information on preliminary benefits. However, there is a risk of compromising research integrity and academic freedom if partners become overly involved. Stakeholder involvement in indicator evaluation or design is less common, but some frameworks use it to develop shared understanding and guidelines (RAPID) or involve potential end-users throughout the research process (CM). Stakeholder information gathering is common in the literature, though it can be time-consuming, and aligning indicators with stakeholders is not prevalent in all frameworks.
Impact repositories	Impact repositories and databases are integral to the Open Science agenda, promoting collaboration and knowledge sharing in academic and policy spheres. Notably used in the policy literature, initiatives like OpenAIRE and CORDIS support impact measurement, providing data for Horizon2020 projects and serving as a primary repository for EU-funded research information. REF employs an impact database listing submitted case studies, while AHRC builds a portfolio of impact case studies. Databases enable the location of individuals linked to specific research projects and facilitate broader dissemination of research results. They allow for explorative studies of impact data, providing nuanced representations across fields. Despite their advantages, repositories require researchers to invest time in documenting impacts and face ethical considerations related to data sharing and security. Impact assessment frameworks emphasize the importance of impact repositories for broader communication and dissemination, promoting wider interest in research and making data accessible to a broader audience of practitioners.
Altmetrics	Alternative metrics (altmetrics) are gaining attention in assessing scientific impact, particularly in the social sciences and humanities (SSH), where diverse outputs beyond traditional publications are common. Altmetrics track research communication and sharing on platforms like Twitter now X, Facebook, blogs, and digital sharing services, offering a broader perspective. Recent improvements include integrating non-traditional outputs like policy reports or white papers. Altmetrics collect various data types, such as citations, views, downloads, tweets, shares, likes, and comments, providing big data to quantify dissemination efforts and digital scholarly conversations. Altmetrics are advantageous for tracking broader societal outputs, including media presence and attention, serving as supplements to case studies and narratives. However, limitations include difficulty in comparing data across disciplines, bias towards specific users, and uncertainties in interpreting mentions or downloads. Altmetrics require a reflexive and responsible approach, recognizing it as a supplementary rather than universal method for assessing societal impact.
Impact Tracking and activity registration	Process-tracking is a technique for tracing impact pathways either forward from initial research or backward from identified outcomes. Backward-tracking, used by HERG, traces return on investment, uncovering how and why specific outcomes or impacts succeed. It allows measurement against goals set by research institutions but relies on the quality and accessibility of relevant documentation, facing difficulties in attributing outcomes to specific research results. Forward-tracking, employed by SIAMPI and RCF, identifies links and interactions leading to socially relevant applications. SIAMPI emphasizes analysing processes to recognize potential impacts, while RCF uses a theory of change to track relations and pathways. Forward-tracking connects research objectives, processes, outputs, and outcomes, identifying barriers and enablers of impact. Process-tracking utilizes both qualitative (interviews, impact logs) and quantitative approaches (social network analysis, geo-referencing). However, systematically describing ways to achieve impact during or after a project is challenging, with studies finding a lack of systematic data hindering information on productive interactions. Researchers often claim importance for specific interactions without independent data for assessment.

Tool	Summary
Review and analysis of documents	Document analysis involves reviewing and interpreting existing documents like books, policy reports, white papers, and grey literature. This method can be used qualitatively and quantitatively, often combined with computational text analysis or traditional coding strategies. It aids in understanding the content and context of specific outputs but heavily relies on the quality and systematic collection of existing materials, providing limited insights into non-written research outputs. While no single method is universally applicable, various methodological strategies may be needed, complicating study design and requiring extensive expertise and time for adaptation.
Field/site visits	Field visits are utilized in the Netherlands' national evaluation system to assess research at universities and research institutions. The method aims to showcase the quality and societal relevance of research. During field visits, evaluators observe research on-site, engaging with principal investigators and staff to gather insights into their experiences, plans, and strategies. While valuable, the reliability of qualitative data from field visits can vary, presenting challenges similar to other qualitative measures like workshops and interviews.

Table A.3: Tools for Research Impact Evaluation (Budtz Pedersen et al. 2020, 9-14)

Category	Tool	Use
Formative, flexible and able to deal with cross-disciplinary and multidisciplinary assessments	Case studies	Can be used in a variety of ways; flexible enough to capture a wide variety of impacts, including the unexpected, and can provide the full context around a piece of research, researcher or impact.
	Document review	Review of existing documentation and reports on a topic.
	Site visits	Visit by evaluation committee to department and institution; generally consists of a series of meetings over one or more days with a range of stakeholders.
	Peer review	Review by peers, typically other academics in the same or similar field, of outputs of research; rationale that subject experts are uniquely qualified to assess the quality of the work of others.
	Interviews	Used to obtain supplemental information on areas of interest, generally to access personal perspectives on a topic, or more detailed contextual information.
Scalable, quantitative, transparent, comparable, free from judgement and suitable for high frequency, longitudinal use	Bibliometrics	A range of techniques for assessing quantity, dissemination and content of publications and patents; uses quantitative analysis to measure patterns of publications and citation, typically focusing on journal papers; Offers insights principally along the following dimensions: activity measurements, knowledge transfer measurements, linkage measurements, citation analysis.
	Survey	Provide a broad overview of the current status of a particular programme or body of research; widely used in research evaluation to provide comparable data across a range of researchers and/or grants which are easy to analyse
	Economic analysis	Comparative analysis of costs (inputs) and consequences (outputs);aims to assess whether benefits outweigh opportunity costs and whether efficiency is achieved; generally, there are three types of economic analysis: cost-benefit analysis (CBA), cost-effectiveness analysis (CEA) and cost-utility analysis (CUA).
	Data mining	Allows access to and understanding of existing data sets; uses algorithms to find correlations and patterns and present them in a meaningful format, reducing complexity without losing information.
	Data visualisation	Tool for data summarisation, presenting large amounts of data in a visual format for human comprehension and interpretation.
	Logic models	Graphic representation of the essential elements of a programme or process; aims to encourage systematic thinking and guide planning, monitoring and evaluation.

Table A.4: Tools for Research Evaluation (Guthrie et al. 2013, 9)

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ENGLISH SUMMARY

This dissertation seeks to answer the following questions: What are the requirements for evaluating the research impact created by Dutch Universities of Applied Sciences (UASs) research? How can these requirements be applied within the context of the policy goals of Dutch UASs? The goal of this dissertation is to determine recommendations for evaluating the impact made by UAS research, and how we can implement them within the current policy and organisational landscape, uncovering the impact created by UASs and making it visible.

The initial phase of this research aimed to discover the governing principles and criteria essential in assessing the impact of UAS research. An extensive literature analysis was undertaken, however, very little is written about evaluating the research impact of UAS research itself. The results were drawn from diverse sources including transdisciplinary and multidisciplinary evaluations, general impact evaluation literature, and practical applications within UAS.

The analysis provided several recommendations while recognizing the philosophical assumptions that influence these evaluations (Greenhalgh et al 2016). The two recommended philosophical assumptions for evaluating UAS research are realist, which seeks to unveil the context-mechanism-output-impact configuration; or performative, grounded in actor-network theory, advocating for evaluating research impact by scrutinizing the broader consequences of interactions between research and society (Raftery et al 2016, Greenhalgh et al, 2016).

Further, these recommendations underscore the importance of conducting real-time, formative evaluations that foster learning and improvement. Advocating for a flexible evaluation structure that resonates with the dynamic nature of practice-oriented research, these recommendations caution against the constraints of a prefabricated linear logic model linking objectives, input, output, and impacts. The recommendations also emphasize the importance of a co-production approach, involving stakeholders from the outset. Currently, there are no established frameworks that conform to all these recommendations, while ASIRPA (Joly et al 2015), PIPA (van Drooge and Spaapen 2017), and Contribution Mapping (Kok and Schuit 2012) each meet several of the recommendations and could provide a starting point for evaluating the impact of UAS research.

The second part of this investigation was to understand what is currently happening in the field of UAS research practice and compare it to the newly understood recommendations. To do so, our focus first shifted to include examining the roles and functions of research groups within the Knowledge Triangle (KT).

The KT of Education, Research, and Innovation was developed to capture the dynamic interactions among Higher Educational Institutions, the business sector, and society. This framework aims to go beyond a one-way flow of knowledge by promoting continuous and systematic connections across these spheres (Etzkowitz and Leydesdorff 2000). These interactions are essential for maximizing the impact of investments and addressing societal challenges (Sjoer et al. 2012).

Based on the work of Kyvik (2012), we selected primary roles in which (UAS) academics participate: teaching; research; internal organization; and external networking. Demographics such as age, gender, and education level were considered as they could potentially influence how the researcher groups functioned. Principle Component, and Regression Analysis was conducted on questionnaire results.

The analysis revealed two primary dimensions of Connectivity and Content[4]. Respondents were asked to indicate what function they contractually fulfil within the research group; Professor, Associate Professor, and Researcher. They were asked to indicate which function they felt their tasks fulfilled; Professor, Associate Professor, Researcher, and Other. They were also asked to indicate the number of contractual hours, as well as the number of hours they felt they work.

The clear delineations between roles and functions within the research group, and consequent contribution of research to education and practice, can result in the knowledge transfer within the KT being vulnerable. It is important for research teams, and those who support them, to be aware of the various roles and functions in the team as well as each of the projects in which that team participates. Each role and function contribute to the impact created as well as the knowledge transfer that occurs. Ensuring the right person with the right role and function is involved in the right project is necessary to maximize impact.

To prevent the KT from becoming fragile, it may be advisable for institutional policy makers and the NAUAS to consider strengthening policy around the KT. This ensures that responsibilities for the KT are not dependent on single members of the research group. A formal description of how research is coupled with Practice and Education, and the processes it goes through, should also be part of the discourse.

A deeper exploration into the impacts of Universities of Applied Sciences was then carried out. At the beginning, ten themes had been discussed in the Strategic Agenda of 2016-2021: Health Care and Vitality; Education and Talent Development; Resilient Society: In Community, City and Region; Smart Technology and Materials; The Built Environment: Sustainable and Liveable; Sustainable Transport and Intelligent Logistics; Sustainable Agriculture, Water and Food Supply; Energy and Energy Supply; Art and Creative Industries; and Business: Responsible and Innovative. (NAUAS 2015). Both a questionnaire and workshops were utilised to facilitate a comprehensive understanding of the impact's researchers wish to create; the outputs realised to facilitate this impact; and the themes in which they strive to do it. Our study reveals that researchers find it challenging to align their work with a single theme. They often engage in multidisciplinary research with a wide variety of stakeholders which requires flexibility and multiple themes. Project-level evaluations may better capture theme-specific impacts. This is especially true as stakeholders play a crucial role in impact creation, and the choice of theme often depends on project-specific stakeholders.

This part of the study revealed a disconnect between the intended impacts and actual outputs. This was particularly true for educational impact and outputs, and economic impacts and outputs. Echoing the results of our exploration of the research group, this emphasizes the importance of personal engagement in translating research findings into tangible impacts.

The concept of ‘impact’ for Dutch UASs has evolved over time. Currently, the term ‘doorwerking,’ translated as ‘effect’ in English, is widely used in UAS policy discussions. The current definition used by UASs describes ‘effect’ as the influence of the research process, and its results in education, professional practice, and the research domain, encompassing implicit and explicit changes during research and dissemination (NAUAS 2022). According to Brouns et al (2023), this is fostered by ongoing interactions among individuals and their output. Andriessen (2019) suggests that these interactions and outputs facilitate knowledge transfer across the spheres of the KT.

Doorwerking implies an ecosystem where minute developments lead to a succession of adaptive changes, akin to Sivertsen and Meijer’s (2020) concept of ‘Normal impact’—everyday interactions creating scientifically robust and socially relevant impact. Sivertsen and Meijer

[4] ‘Content’ refers to the teaching and research activities in which researchers participate pertaining primarily to the production and conveyance of Content. ‘Connectivity’ refers to activities pertaining to Internal Organization and External Networking. These dichotomies challenge the three potential dimensions of the KT; Education, Research, and Innovation in professional practice, and the four potential dimensions of academic functions.

differentiate ‘Normal’ impact, which stem from daily interactions, while ‘Extraordinary’ impact, though rare, has a widespread effect on society.

Lykke et al (2023) further build on this differentiation by suggesting that Normal impact is made up of micro impacts that occur throughout the research process, contributing to expected and unexpected, planned, and unplanned effects. Budtz Pederson and Hvidtfeldt (2023) suggest that these micro impacts may lead to macro level impacts and require different tools for evaluating the distinct types of impacts. They suggest that the evaluation of macro impacts is better suited to indicators and a narrative while micro impacts are best made visible using a contribution analysis.

The final stage of this study was a case study aimed at applying and evaluating the effectiveness of contribution analysis as a micro impact, or doorwerking, evaluation tool in the context of UASs. Structured around Kok and Schuit's (2012) Contribution Mapping framework, we evaluated a transdisciplinary project, GoNoord Nederland, based in the Netherlands. While many forms of contribution analysis are based on a Realistic perspective, Contribution Mapping was selected because of its Performative assumption. It aligns with other recommendations for evaluating UAS research impact in that it is formative and stresses the importance of stakeholders throughout the evaluation process in co-production.

In line with co-production, semi-structured interviews with each member of the research team including stakeholders were conducted. A focus group with the research team was also held following the completion of the project, making use of the Contribution Mapping framework in its original ex-post form.

Contribution Mapping itself presented challenges, such as; time intensity, the necessity of insider involvement, and results that often-lacked depth and contextual richness. These findings led to recommendations for enriching contextual details in the mapping, and adopting an iterative, non-linear evaluation approach conducted in real time, suggesting that Contribution Mapping's effectiveness in the UAS context depends on addressing its limitations and refining the approach.

CONCLUSION

While there is certainly more to uncover, I hope this work will assist both myself and others in making informed complex decisions about what we mean in the words we use, the policies we write, and the tools we offer. These are impactful decisions about who we involve in our research, the output we generate, and the research process itself. These are weighty decisions about our expectations for researchers, institutions, and the future of Practice Oriented research. By understanding and implementing these rules, my aspiration is not only to contribute to impacting society through the research UASs do but also to make this impact visible.

SAMENVATTING

Dit proefschrift richt zich op twee centrale vragen: wat zijn de vereisten voor het evalueren van de impact van onderzoek uitgevoerd door Nederlandse hogescholen, en hoe kunnen deze vereisten worden toegepast binnen de beleidsdoelstellingen van deze instellingen? Het doel is aanbevelingen te formuleren voor het evalueren van praktijkgericht onderzoek en deze te implementeren binnen het huidige beleids- en organisatielandschap, zodat de impact zichtbaar wordt.

De eerste fase van het onderzoek richtte zich op het identificeren van theoretische principes en criteria voor het beoordelen van de impact van praktijkgericht onderzoek. Hoewel de beschikbare literatuur hierover beperkt is, werd een brede analyse uitgevoerd, waarin onder meer transdisciplinaire en multidisciplinaire evaluaties, algemene literatuur over impactevaluatie en praktijkvoorbeelden binnen hogescholen werden betrokken. Het blijkt dat filosofische benaderingen, zoals de Realistic Assumption en de Performative Assumption, belangrijke inzichten geven en een solide basis vormen. Deze benaderingen richten zich respectievelijk op de context-mechanisme-output-impactconfiguratie en de bredere gevolgen van interacties tussen onderzoek en samenleving. Er wordt bovendien gepleit voor real-time formatieve evaluaties die leren en verbeteren bevorderen, in plaats van lineaire modellen die doelen, input, output en impact direct aan elkaar koppelen. Een coproductiebenadering, waarbij belanghebbenden vanaf de start betrokken worden, is essentieel. Hoewel bestande modellen zoals ASIRPA, PIPA en Contribution Mapping nuttige uitgangspunten bieden, voldoen ze niet volledig aan alle aanbevelingen.

In het tweede deel van de studie werd eerst onderzocht hoe rollen en functies binnen lectoraten worden ingevuld en hoe deze bijdragen aan de impact binnen de Kennisdriehoek (KT), die onderwijs, onderzoek en innovatie met elkaar verbindt. Een duidelijke afbakening van rollen en functies is van cruciaal belang om de kennisoverdracht binnen de KT te versterken. Beleidsmakers moeten ervoor zorgen dat verantwoordelijkheden niet afhankelijk zijn van slechts enkele leden van lectoraten, om kwetsbaarheid te voorkomen. Daarnaast is een formele beschrijving nodig van hoe onderzoek, praktijk en onderwijs met elkaar verbonden zijn. Uit de analyse kwamen twee belangrijke dimensies naar voren: connectiviteit, oftewel de betrokkenheid van lectoren bij netwerken, en inhoud, oftewel de focus van hun werk. Ook demografische factoren zoals leeftijd, geslacht en opleidingsniveau spelen een rol in hoe onderzoeksgroepen functioneren.

Daarna werden de strategische thema's van hogescholen onderzocht, zoals gezondheid, duurzaamheid en creatieve industrieën. Hieruit bleek dat onderzoekers vaak moeite hebben hun werk aan één specifiek thema te koppelen, omdat veel projecten multidisciplinair van aard zijn en flexibiliteit vereisen. Evaluaties op projectniveau bleken effectiever om thema-specifieke impact vast te leggen, omdat belanghebbenden een cruciale rol spelen bij het bepalen van de impact. Tegelijkertijd werd een kloof geconstateerd tussen de beoogde impact en de gerealiseerde output, met name op het gebied van onderwijs en economische resultaten. Dit benadrukt het belang van persoonlijke betrokkenheid bij het vertalen van onderzoeksresultaten naar concrete impact.

Tot slot werd in een casestudy het Contribution Mapping-framework toegepast op een transdisciplinair project, GoNoord Nederland. Deze methode, die sterk leunt op coproductie met belanghebbenden, biedt een formatieve benadering om impact te evalueren. Hoewel effectief in het blootleggen van contextspecifieke details, bracht de methode ook uitdagingen met zich mee, zoals de tijdsinvestering en de noodzaak van insider-betrokkenheid. Om de methode te verbeteren, wordt voorgesteld om meer contextuele details te integreren en een iteratieve, niet-lineaire evaluatieaanpak te gebruiken.

Dit proefschrift biedt een raamwerk voor het evalueren van de impact van praktijkgericht onderzoek. Het benadrukt de noodzaak van weloverwogen beleidsregels, coproductie en flexibele evaluatiemethodes. Door deze principes toe te passen, kunnen Nederlandse hogescholen een grotere maatschappelijke bijdrage leveren en de impact van hun onderzoek zichtbaarder maken. Het werk roept op tot meer bewustwording over de keuzes die onderzoekers en beleidsmakers maken en de gevolgen daarvan voor de toekomst van praktijkgericht onderzoek.

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CURRICULUM VITAE

Sarah Katherine Coombs (Calgary, Alberta, 29 July 1978) graduated from the School of Experiential Education in Toronto in 1996. She studied biblical studies at Caperwray Bible School in Carnforth England before getting an Honour Bachelors degree in Religious Studies in 2002 from Mount Allison University. She received a Master's degree in Library and Information Science from the University of Western Ontario in 2004. During her studies there she worked as a research assistant at the Faculty of Information Science and Media, as well as a reference librarian at Kings College. After moving to the Netherlands in 2004, and completing her integration course in 2005, she began working at Saxion University of Applied Sciences in 2006. She is currently the Open advisor there. In 2018 she started as an external PhD candidate with Leiden University's Centre for Science and Technology Studies. In 2021 Sarah became an Open Science advisor for the Netherlands Association for Universities of Applied Sciences Open Science Support Office. In 2022 Sarah assisted in the creation of the Digital Competency Centre for Practice Oriented Research, an expertise centre for research support and Open Science. In 2024, in addition to her work at Saxion, she became the content coordinator for it. In 2023 she became a member of the Open Science Netherlands steering board. Sarah has been the chair and co-chair of several professional organisations including Network Copyright Informationpoint (2013-2019), LIBER Association of European Research Libraries working group Metrics (2016-2018), Think-Tank PubliNova (2019-2023), and Taskforce Open Science Netherlands Association of Universities of Applied Sciences (2021- present). She is also the recipient of several awards including the HBOAward Annual for Facilitating Open Science 2017, HBOAward monthly for April, June and October 2017, Research Support Champion of the Year for Practice-Oriented Research 2022, and most recently the UKSG Innovation Award 2023.