Visible: discovering the impact of research conducted by universities of applied sciences

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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).

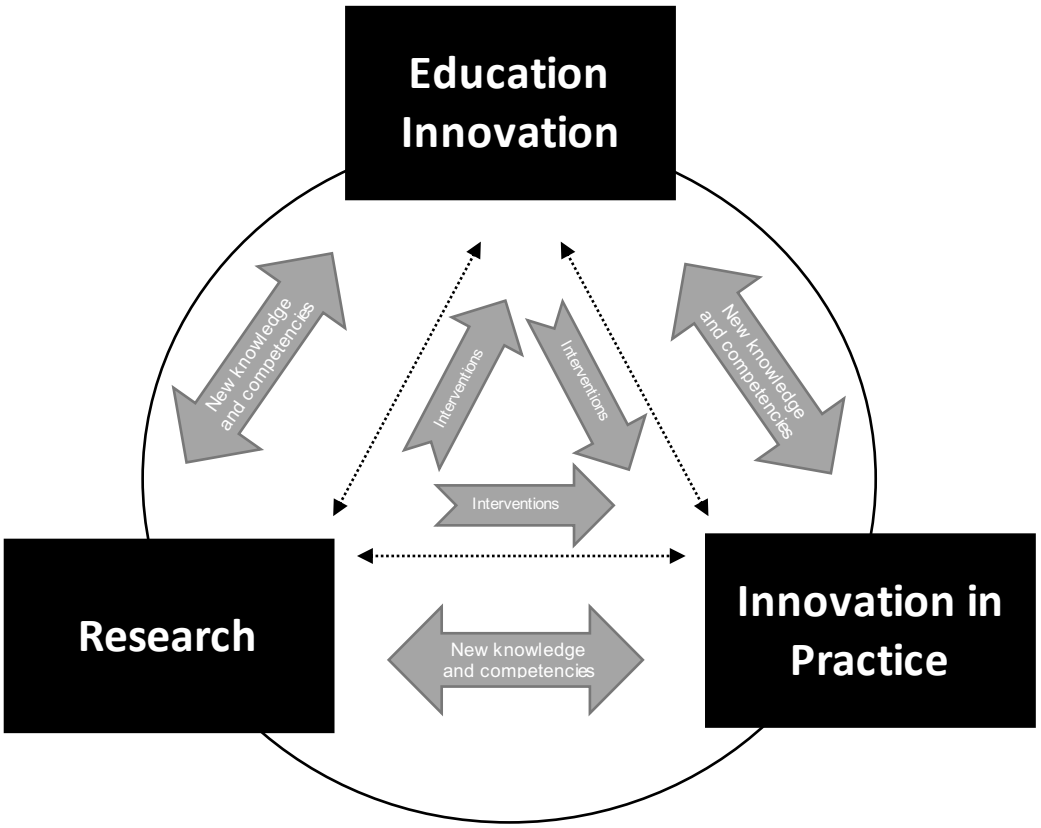

Figure 3.1: Knowledge Triangle of Dutch UASs (Franken et al. 2018, 11)

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.

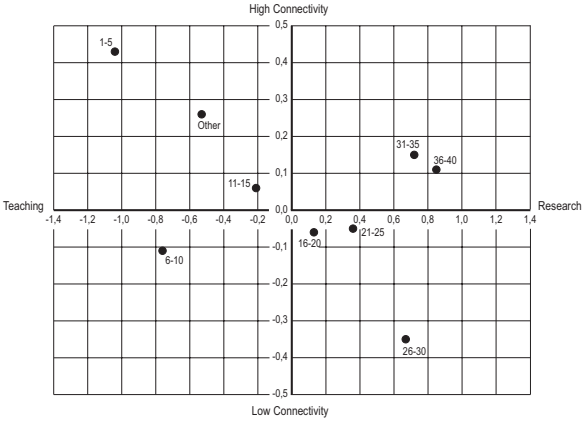

Figure 3.2: How Many Weekly Hours Are Contractually Allocated for Research Related Tasks

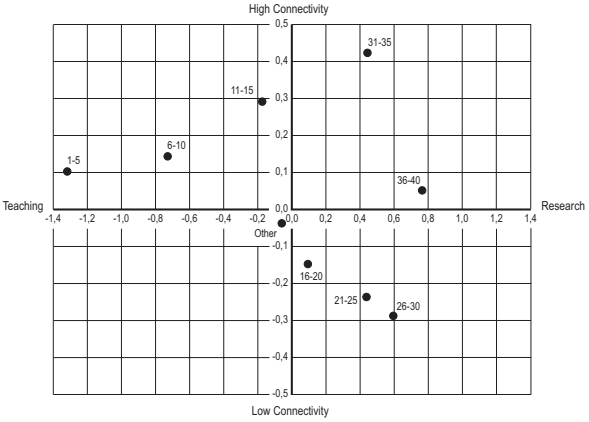

Figure 3.3: How Many Weekly Hours Do You Realistically Spend on Research Related Tasks

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.

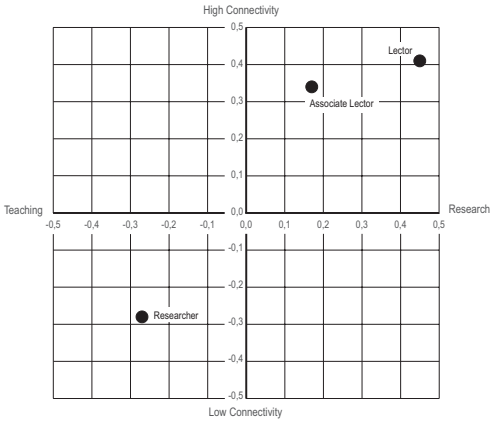

Figure 3.4: Are You a Lector, Associate Lector or Researcher?

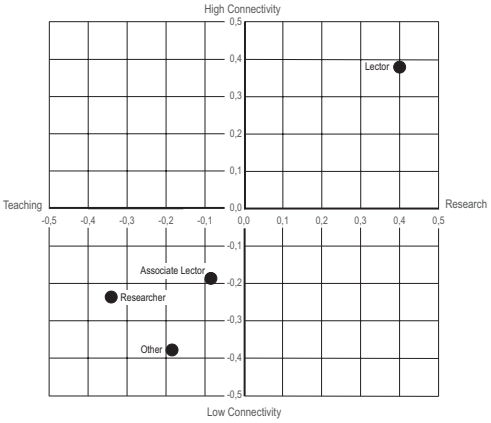

Figure 3.5: How Do You Perceive Yourself According to Your Skills and Expectations of You?

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].

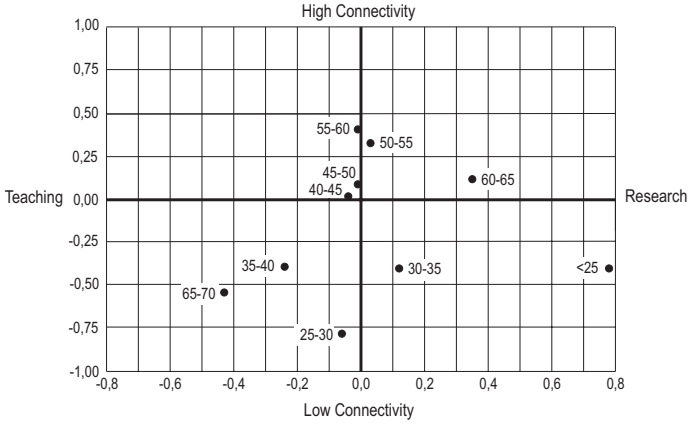

Figure 3.6: Age

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.