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Study Program Innovation in the Triple Helix Context: The Case of Cooperative Study Programs at a German University of Applied Sciences

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Abstract

The purpose of this article is to understand how Triple Helix linkages foster study program innovation at the micro-level and how the entrepreneurial university shapes support structures and processes to foster this innovation at the meso-level. We draw on the case of cooperative study programs from a German university of applied sciences. We selected business administration and nursing as two different disciplinary examples. Cooperative study programs are delivered partly at university and partly in industry and illustrate the hybridity that shapes the knowledge transfer at a university. Our study draws on semi-structured interviews with professors, industry representatives, students and policy makers as well as on pertinent documents. Our data show that Triple-Helix interactions generate program innovations and, depending on the discipline, have a focus on a Double Helix. In addition, the study shows the processes and their limitations by which teaching is transferred in partnership with industry in the entrepreneurial university context.

Keywords

entrepreneurial university – hybrid organization – Multi-campus university – Multi-level analysis – Stakeholder involvement in higher education – Stakeholder involvement in higher education – study program innovation – University-industry-government interactions in teaching

Arabic

دراسة برامج الابتكار في إطار المراوح الثلاثة :حالة الدراسات ضمن برامج تعاونية في جامعة ألمانية للعلوم التطبيقية

يهدف هذا المقال إلى فهم كيف يمكن لنظم الربط البيني في إطار المراوح الثلاثة أن تعزز الابتكار في مناهج الاقتصاد الجزئي وكيف تشكل الجامعة المقاولة دعم على المستوى.المحلى يستند بحثنا أساسا علي دراسة البرامج التعاونية لدراسات بجامعة ألمانية للعلوم .التطبيقية اخترنا في هذا الإطار إدارة الأعمال والتمريض كمثالين مختلفين .للتخصصات تتوجه برامج الدراسات في جزء منها للجامعة وفي جزء أخر للمجال الصناعي معبرة بذلك علي طريقة هجينة لنشر المعرفة في .الجامعة تستند دراستنا إلى مقابلات شبه منظمة مع أساتذة، وممثلين عن الصناعيين، وطلاب وخبراء في مجال السياسات، فضلا عن وثائق ذات .صلة تظهر بياناتنا أن التفاعلات داخل المراوح الثلاثة تولد ابتكارات في البرامج وتركز، حسب التخصص، على اثنين من .المراوح بالإضافة إلى ذلك، تهيئ الجامعة المقاولة أساس التعاون المتعلق بالتسويق للتعليم الجامعي على مستوى هاته المراوح.

الكلمات المفتاح التعاون: مع أصحاب المصلحة ؛ الجامعات والصناعة والمجالات الحكومية؛ الجامعة المقاولة ؛ التفاعلات بين الحكومة والمجال الصناعي والجامعات؛ جامعة متعددة الاختصاصات

Chinese

三螺旋背景下的学习项目创新：以德国应用科学大学的合作学习项目为例

摘要

本文旨在理解三螺旋互连怎样在微观层面促进学习项目创新，以及创业型大学如何在中观层面塑造支持平台。我们以德国应用科学大学的合作学习项目为例。在此，我们选择了工商管理和护理作为两个不同的学科实例。合作学习项目部分在大学中进行，部分在产业中进行，说明了形成发生在大学的知识传播的混合性。我们的研究基于对教授、产业代表、学生和政策专家的半结构化访谈以及相关文献。我们的数据表明:三螺旋相互作用产生项目创新；根据学科的不同，重点放在双螺旋上。此外，创业型大学还为在相应情况下与大学教学商业化相关的合作奠定了基础。

关键词

多方利益相关者的合作；学术、产业和政府机构范畴；创业型大学；大学-产业-政府互动；多校区大学

French

L'innovation dans les programmes d'études dans le contexte de la Triple Hélice: le cas des programmes d'études coopératifs dans une université allemande de sciences appliquées

Résumé

Cet article vise à comprendre comment les interconnexions dans la Triple Hélice favorisent l'innovation dans les programmes d'études au niveau micro et comment l'université entrepreneuriale détermine une plate-forme de soutien au niveau méso. Nous étudions le cas des programmes d'étude coopératifs d'une université allemande de sciences appliquées. Les deux filières « Gestion administrative » et « Soins infirmiers » ont été retenues. Les enseignements sont dispensés en partie à l'université et en partie en entreprise ; ils illustrent le caractère hybride qui façonne la diffusion des connaissances à l'université. Notre étude s'appuie sur des entretiens semi-structurés avec des professeurs, des représentants d'entreprise, des étudiants et des experts en élaboration de politique ainsi que sur des documents pertinents. Nos données montrent que les interactions dans la Triple Hélice génèrent des innovations dans les programmes et, selon la discipline, se focalisent sur une double hélice. En outre, l'Université entrepreneuriale prépare la base de la coopération liée à la commercialisation de l'enseignement universitaire dans un contexte approprié.

Russian

Бенжамин Шиллер, Людвика Лейсите

Инновационные образовательные программы в контексте Тройных спиралей: пример кооперативных образовательных программ в Немецком университете прикладных наук

Аннотация

Целью настоящего исследования является изучение взаимодействий в рамках тройной спирали на микроуровне применительно к инновационным образовательным программам и формам поддержки предпринимательских университетов на мезо-уровне. Мы изучили пример кооперативных образовательных программ в Немецком университете прикладных наук. Здесь мы выделили бизнес-администрирование и сестринское дело в качестве примеров двух различных дисциплин. Кооперативные образовательные программы реализуются частично университетом и частично организациями, иллюстрируя тем самым гибридную модель, при помощи которой распространяется знание в университете. Наше исследование основано на полуструктурированных интервью с профессорами, представителями организаций, студентами и экспертами в области стратегий и политики, а также на релевантных документах. Наши данные показали, что трехспиральные взаимодействия генерируют программные инновации и, в зависимости от дисциплины, фокусируются на двойной спирали. Кроме того, Предпринимательский университет формирует базу для кооперации, способствующей коммерциализации университетских программ в соответствующих случаях.

Ключевые слова

Партнерство нескольких участников – сферы интересов науки, бизнеса и правительства – предпринимательский университет – взаимодействия университет-промышленность-государство – университет с несколькими кампусами.

Spanish

Innovación en el programa de estudio en el contexto de la Triple Hélice: el caso de los programas de estudio cooperativo en una universidad alemana de ciencias aplicadas.

Resumen

El propósito de este documento es comprender cómo las interconexiones de Triple Hélice fomentan la innovación de los programas de estudio a nivel micro y cómo la universidad empresarial forma una plataforma de apoyo a nivel meso. Nos basamos en el caso de los programas de estudio cooperativo de una universidad alemana de ciencias aplicadas. Allí seleccionamos administración de empresas y enfermería como dos ejemplos disciplinarios diferentes. Los programas de estudio cooperativo se imparten en parte en la universidad y en parte en la industria e ilustran la hibridación que da forma a la difusión del conocimiento que tiene lugar en la universidad. Nuestro estudio se basa en entrevistas semiestructuradas con profesores, representantes de la industria, estudiantes y expertos en políticas, así como en documentos pertinentes. Nuestros datos muestran que las interacciones de triple hélice generan innovaciones en el programa y, dependiendo de la disciplina, se centran en una doble hélice. Además, la Universidad Empresarial prepara las bases para la cooperación relacionada con la comercialización de la enseñanza universitaria en el contexto respectivo.

Palabras clave

Colaboración con múltiples partes interesadas – academia, industria y esferas gubernamentales – universidad emprendedora – interacciones universidad-industria-gobierno – universidad de sede multiple

1 Introduction

Within knowledge-based society, Triple Helix has been identified as a catalyst for change and as a tool fostering innovation. In a triadic relationship between

university, industry and state, university has been ascribed a more prominent role in the advancement of socioeconomic progress. In this context it has been argued university becomes a hybrid organization, which creates new forms for the production, transfer and utilization of knowledge (Etzkowitz and Leydesdorff, 2000; Etzkowitz, 2008; Etzkowitz and Zhou, 2017). An example of this hybridization can be found in the entrepreneurial university (Clark, 1998; Etzkowitz, 2013). This type of university has flexible structures and functions as "boundary spanner" in the Triple Helix context. Studies have shown that entrepreneurial universities actively engage in technology transfer and commercialization of knowledge via patenting, spin-off creation and other research commercialization activities (Leišytė and Fochler, 2018). Knowledge transfer between university and industry via university teaching in the Triple Helix context has merited less attention (Roper and Hirth, 2005; Normann and Pinheiro, 2018; Burkhart-Kriesel et al., 2019).

Thus, this article aims to understand the emergence of the new organizational forms in teaching and learning that enhance Triple Helix linkages in an entrepreneurial university. We draw on the example of cooperative study program (CSPs) innovation at a German university of applied sciences. CSPs are a specific type of programs, which are delivered partly at university and partly in industry. They are seen as contributing to socioeconomic development in Germany as they supplement the existing higher education system as a "bridge builder" between vocational training and education system and higher education system (Graf, 2013; Krone et al., 2015). The case of CSPs at a university of applied sciences is highly pertinent to understand the micro and meso levels of hybridity of an entrepreneurial university, as the rationale, design and structure of the cooperative study programs are developed in close cooperation between industry, university and government. In this article we pose two questions: (1) how are cooperative study programs structured and which stakeholders are involved in shaping these structures? (2) how does innovation in cooperative study programs occur and what are the mechanisms that foster it?

We answer these questions by drawing on the Triple Helix literature, especially the notion of an "emerging hybrid organization" (Etzkowitz and Zhou, 2017; Champenois and Etzkowitz, 2018) where we distinguish between two analytical levels in our study: the micro-level as well as the meso-level. At the micro-level we focus on study programs to understand the development and operation of CSPs. To capture the meso-level dynamics we focus on the university as an entity (organization) that interacts with stakeholders with the goal to shape framework conditions for CSPs that respond to industrial needs.

2 Cooperative Study Programs in Germany

Cooperative study programs are defined as a linkage between academic teaching at a university and practical training in an enterprise. These two activities in the form of study programs relate to each other on the content as well as on the organizational levels (Krone et al., 2015: 16). CSPs display a salient phenomenon of the German higher education system: within a decade, student enrollment in these programs rose significantly to more than 100,000 (BIBB, 2017; Mordhorst and Nickel, 2019). In relation to the total student body of three million students in Germany, CSPs make up three percent and still form a niche (Destatis, 2018; Mordhorst and Nickel, 2019). Germany's higher education system is a federalist one where higher education institutions are in the jurisdiction of the sixteen federal states (Wissenschaftsrat, 2010a; Hesser, 2019; Mordhorst and Nickel, 2019). Thus, this also results in a diverse and heterogeneous landscape of CSPs (Wissenschaftsrat, 2013; Krone et al., 2015; Hesser, 2019; Mordhorst and Nickel, 2019). In this article, we build on an example of CSPs from the federal state of Baden-Wuerttemberg as in this state CSPs were institutionalized in the scope of the Baden-Wuerttemberg Cooperative State University (DHBW) (Wissenschaftsrat, 2013; Mordhorst and Nickel, 2019). CSPs at this university are a best practice example within the federal higher education system for two reasons: the size of the university and programs compared to the size of the higher education system in this state (Statistisches Landesamt Baden-Württemberg, 2018) as well as the university being a pioneer of a new institutional type that was from the beginning created by different stakeholders including industry to serve the needs of the regional economy (Minks et al., 2011; Wissenschaftsrat, 2013; Wolter, 2016). The term "dual" is a characteristic feature of CSPs. The German Science Council defines CSPs as an interlinkage and coordination of an academic degree course at no less than two learning venues (Wissenschaftsrat, 2013: 22). We follow this definition and German Science Council's typology of two distinct types of study formats to understand the innovation processes in the CSPs (Wissenschaftsrat, 2013). The first type is referred to as a "practice-integrated model". It combines a structured interlocking of academic teaching phases at the university and practical training in enterprises organized in three-month sequence for a duration of six semesters and a content-related coordination of each phase. The model includes degree courses at two learning venues resulting in the attainment of a bachelor degree (university degree). This model is dominant based on the number of student enrollments (BIBB, 2017: 11). The second model, the so-called 'combination-model' connects vocational education, academic teaching and practical training. In this model study programs are structured through linking academic

teaching periods at university, schooling phases at a vocational school and practical training in an enterprise. Degree courses based on this model combine at least three learning venues and result in two degrees (a bachelor degree and a vocational qualification). Furthermore, the study programs based on the "combination-model" last longer than six semesters due to the requirements of the vocational training act and regulatory framework of the occupations. Dual business administration, engineering, social work and healthcare programs in our case study are offered based on both models.

3 Conceptual Framework

3.1 *Triple Helix Concept and The Entrepreneurial University*

The Triple Helix approach by Etzkowitz and Leydesdorff (Etzkowitz and Leydesdorff, 2000; Etzkowitz, 2008; Etzkowitz and Zhou, 2017) offers a useful model for exploring the case of CSPs and the underlying interactions between university, industry and government with focus on study program innovation. At the outset, the Triple Helix idea can be captured as a kind of "construct" describing interactions between university, industry and government (Etzkowitz and Leydesdorff, 2000; Etzkowitz, 2008). The linkages between the three actors create hybrid organizations that boost innovation in particular regional or local contexts (Etzkowitz, 2008: 8). Furthermore, the Triple Helix linkages provide a platform for institutional formation, which may lead to the emergence of new institutional formats promoting innovation (Etzkowitz, 2008). These linkages transform roles and relationships of and between stakeholders in a Triple Helix construct. Besides, the Triple Helix concept stresses university's more prominent role in innovation to contribute to knowledge-based societies. This idea is closely linked to a third mission of academia, which is the production of relevant output for enhancement of society, entangled with teaching and research (Laredo, 2007; Zomer and Benneworth, 2011; Leišytė and Dee, 2012; Roessler et al., 2015). This may result in universities educating students to address the needs of regional or local economies (Etzkowitz, 2008: 8). An organizational example of the institutionalization of the Triple Helix idea in the university is the so-called entrepreneurial university. This type of university is seen as a vehicle for Triple Helix enhancement (Etzkowitz, 2008: 28) that is an autonomous entity encompassing its "own strategic direction setting" and focusing on relevant output creation, such as producing graduates with the relevant skills for the labor market. In addition, the entrepreneurial university acts "on an equal basis" with "other institutional sectors" and focuses on the regional level (Etzkowitz, 2008: 29). According to Etzkowitz and Leydesdorff

(2000: 112), this arrangement is promoted by government through the "new rules of the game" and provision of funding for emergent hybrid institutions. Thus, entrepreneurial university builds the value through bringing together university, industry and government and we argue, that dual higher education through CSPs are suitable examples to understand how Triple Helix model is embodied in university teaching and innovation. Furthermore, we understand a "hybrid organization" as a mix of elements from different institutional sectors under the roof of an independent organizational form. Or in addition to the argumentation above, Etzkowitz (2008: 41) points out that a hybrid organization in the course of the entrepreneurial university is about combining two elements. On the one hand, an interdependence of the institutional spheres university, industry and government should promote innovation. On the other hand, this should take place in an independent organizational context, namely the emerging hybrid organization.

4 Hybrid Nature of Cooperative Study Programs and their Promoting Institution

On the micro-level, CSPs integrate elements from two separate sectors of education in Germany – vocational education and higher education. Thus, CSPs possess a hybrid organizational character in their design (Graf, 2013; Krone et al., 2015). In addition, CSPs are identified as a bridge between academic education and vocational training – "the best of two worlds in one concept" (Thies, 2015: 11). The image of a bridge has also been used to describe a third type of training distinct from vocational education and higher education (Wissenschaftsrat, 2014: 95). In summary, CSPs are characterized as a hybrid study program format (Wissenschaftsrat, 2014; Krone et al., 2015) with growing importance for national higher education policy (Meyer-Guckel et al., 2015: 14). We argue that gathering these programs under the roof of a single organization exemplifies the emergence of a hybrid organization as stated by Etzkowitz (2008). In turn, this points to the meso-level as mentioned previously, where a hybridization of elements from higher education, industry and government shapes an autonomous institution, which is represented in our case study.

5 Methods and Material

We conducted a single case study in the form of a longitudinal three-year-study (Yin, 2014), emphasizing an example from the German federal state of

Baden-Wuerttemberg, chosen for its highly differentiated landscape of higher education institutions, including the Baden-Wuerttemberg Cooperative State University (DHBW) (MWK, 2019). Furthermore, DHBW is known as a "prime example" of CSPs (Wissenschaftsrat, 2013; Krone et al., 2015; Thies, 2015; Zhang, 2016). Therein, two distinct sub-cases of CSPs were chosen for the analysis: business administration study program and nursing study program. The first represents a well-established discipline at the case study university. Since the early 1970s, economists are trained by the university in close cooperation with industry. Nursing indicates a new field for the university. Since the beginning of the 2010s, an academic drift of nursing has become an issue in the German education policy. Traditionally, nurses were trained in the vocational sector. Due to an altered occupational profile, German policy makers have introduced the higher education nursing programs. Therefore, universities of applied sciences were encouraged to respond and the case study university introduced a new program in nursing. Both sub-cases illustrate two different examples of CSPs at the micro-level and therefore stand for a "representative sample" and "useful variation of the dimension of theoretical interest" (Gerring, 2007; Seawright and Gerring, 2008). In addition, CSPs are directly coupled with economic and societal developments such as digital transformation (Höfer et al., 2016: 18) and academic drift of nursing (Wissenschaftsrat, 2010b, 2012, 2013) both of which stimulate innovation.

Our data consists of 31 semi-structured face-to-face interviews and institutional documents. Interviews were held with professors responsible for the creation of the CSPs, industry representatives engaged in cooperation with the university and policy-makers responsible for CSPs. We completed our sample by interviewing students to provide a 360-degree picture. Thus, our sample reflects a representative cross-section ("revelatory case") of CSPs (Yin, 2014: 52). Our interviews aim to provide a better understanding of the case. Furthermore, they allow us to gain a holistic understanding of the transformation of roles and relations driving innovation of CSPs. All interviews lasted from 25 to 75 minutes, were conducted from August to November 2018, and have been audio recorded, transcribed and analyzed using MAXQDA software, following a qualitative content analysis approach (Mayring, 2015; Kuckartz, 2018). Data were analyzed and categorized systematically (theory guided) aiming to answer our research questions. In addition, we collected pertinent corporate documents, regulations and studied university- and company-websites in the period 2016–2018. Put together, the use of different sources of data is part of the triangulation logic as suggested by Flick (2011), which allows us to tackle our research questions from distinct methodological points of view. The data sets used in this study were collected as part of a larger case study in the context of a dissertation.

6 Results

The findings were categorized and presented based on the two research questions studying the structure of CSPs, the roles stakeholders play in shaping these structures and unraveling study program innovation and underlying mechanisms in the light of Triple Helix model. We analyze our data at two levels. At the meso-level we discuss the main stakeholders and the most important characteristics of the university. At the micro-level we analyze the study programs focusing on operating degree courses, taking into account the interactions of main stakeholders within Triple Helix which drive and shape study program innovations in our two examples, business administration and nursing.

7 Structure of Cooperative Study Programs

The structure of CSPs is multi-level and complex given that the university has multiple campuses. It is necessary to understand the institutional architecture of the university case study, which provides the frame and a platform for Triple Helix interactions at the micro-level.

8 Meso-level Insights

The Baden-Wuerttemberg Cooperative State University (DHBW) was established by the federal state of Baden-Wuerttemberg in 2009 as the successor institution of the former vocational training academies. The government of the federal state of Baden-Wuerttemberg provided a legal mandate for the university (DHBW) to exist through the higher education act and this process was promoted by local industry. The university is funded by the state government to ensure a certain number of study places in CSPs. The following interviewee characterizes the specific nature of the university as responsible institution for CSPs:

> So, it is recognized that the DHBW in this so-called state university model is a politically helpful construct to control this mixed model of vocational education and academic studies, let's say, politically co-dominate, and thus, in the direction of public stakeholders, more precise, political stakeholders within the federal state, but also beyond that this is a helpful construct. It is basically a politically desired management unit. (Interview 12)

Study programs can be characterized based on a determined absolute number of study places, organization of the programs in groups with 30 places in each group (organizational unit), the curriculum design of the courses specific for a group and its performance measurement.

The data analysis has shown that the number of state funded study places is distributed within university's jurisdiction. The distribution of study places within the university follows the needs of industry. Furthermore, industry needs are reflected in a demand for attractive degree courses (curricula) and these are linked to a certain number of required study places (capacity). And this in turn is reflected in the size and structure of the university's twelve campuses. These campuses are distributed across different "economic regions" of the federal state. Each of them maintains a certain number of study places (capacity) and a certain portfolio of degree course offerings (curricula). Therefore, we conclude, the distribution of study places (capacities) and degree courses (curricula) follows a demand-driven approach.

On the other hand, the distribution logic of study places is interwoven with a departmental ways of organizing which is reflected in a university-internal structural order based on academic disciplines. Departments form campus-schools and cross-campus departments (business administration, engineering, social work, healthcare) and they follow a market-oriented logic in developing their study programs.

Our data show that all campuses of the university bear responsibility for provision and maintenance of CSPs as well as for compliance with academic standards. Furthermore, each campus is required to undergo performance measurement. The performance measurement is reflected in the measurement of the utilization of the study places available. Furthermore, performance measurement is also reflected in an evaluation of the quality of the study programs offered. The aim of the university is to attract a high number of first-semester students as well as to run programs at a full study place capacity. Both goals are achieved with the help of attractive degree courses customized to the needs of industry. Hence, one may conclude that this constitutes a kind of "market mechanism" within the university's architecture.

Furthermore, the university encompasses a central administration unit and all campuses of the university are obliged to report to it on their activities. In particular the central administration plays an important role in monitoring capacity utilization and the delivered quality of degree courses.

In general, our data show that a mutually accepted norms and academic standards of CSPs is achieved through a widely ramified and collaborative system of university committees at multiple levels. This also entails decision-making

on amendments to the existing study program portfolio or to new degree courses in order to supplement the study program portfolio of the university. At the meso level we distinguish two types of university committees: the cross-campus committees that deal with all matters concerning the development of study programs (for example, the expert commissions) and the superordinate committees (for example, the senate), which make decisions in all academic and strategic matters of the university.

Expert commissions and the associated sub-commissions operate across all campuses and are concerned with academic matters such as curriculum development, regulation of examination system and maintenance of degree course portfolios. In addition, these refer to "academic disciplines" (such as business administration). Those type of committees prepare decisions from a formal point of view and their aim is to provide a high degree of standardization of curricula. In this context, a specific emphasis should be put on sub-committees of each expert commission that consist of academic departments from campus-schools such as business administration or healthcare. Program coordinators (professors) who are the designers of CSP-curricula participate in the sub-committees. In addition, a quality assurance commission reflects upon and plans the measures of study program evaluations. Secondly, superordinate committees such as senate, supervisory board and executive board constitute the center of formal decision-making on all matters of the university. Membership in the university committees is achieved through election and appointment. In general, committee members are professors, industry-, ministry- and student-representatives. Here the membership of industrial stakeholders is emphasized as an inherent part of the university committee landscape:

> Yes, we formally have the companies in our committees, in our expert commissions, in the sub-commissions, also in the senate and in the supervisory board. (Interview 10)

9 Micro-level Insights

In the following we study the process of innovation of CSPs. We understand the term "innovation" in the same way as the economist Joseph Schumpeter, whose "theory of economic development" describes the nature of business innovation which concerns the enforcement of a new combination of production factors. The new combination of production factors and its economic implementation is understood as innovation (Schumpeter, 2017). Extrapolated

to the area of study program innovation of CSPs, one can say that those abovementioned "production factors" would be the distinction between a curriculum layer and a capacity layer of cooperative study programs. These layers are interrelated and mutually dependent. An enforcement of a new combination of "production factors" of CSPs and its implementation into an amended or new degree course within the study program is understood as "innovation" in our case.

Initially, we investigate the "curriculum layer" of CSPs at three levels of innovation intensity:

(1) Firstly, professors as program coordinators shape "profile modules" (within an existing degree course) and in this way can change the program to a certain extent which results in a "slight innovation". An interviewee in the role of a head of school (professor) illustrates this type of innovation:

> They can use the local profile modules to address their own topics. Or plan in, build in, however. And they do it properly. (Interview 8)

(2) Secondly, program coordinators may also amend or newly develop a new field of study within an existing degree course – which may lead to "significant innovation".

(3) Thirdly, an amendment or new development of a degree course in combination with a "field of study" within a degree course represents a step of "high innovation".

At all three levels of "innovation intensity" the formal decision-making lies in the hands of university committees even though program coordinators take the lead in shaping these programs. Within the committee system, stakeholders from university, industry and government deal with design and innovation of the curricula. This results in formally authorized curricula and statutes on the examination system. At the same time, curriculum innovation can take place only with the prescribed frame of the institutional system accreditation, provided by the Central Evaluation and Accreditation Agency (ZEvA). Furthermore, we observe a high degree of standardization and modularization referring to curricula of CSPs. However, the three levels of structural rooted innovation intensity provide the technical frame for professors as program coordinators to innovation study programs.

In addition, at the capacity layer, a sufficient number of study places should then be available so that an amended or new study program can be offered in a group with up to 30 students. Consequently, the combination of modified or new curricula of a study program and its link with study places capacity constitutes a new offer (study program innovation).

10 Stakeholder Roles

10.1 *The Role of the University*

Our data analysis shows, that the agency of university within the Triple Helix in study program innovation is exercised by professors in the case of CSPs. The analysis of university documents reveals two different roles for professors that are significant for the innovation of study programs: professors in the function of a program coordinator bear responsibility for a degree course and ensure the capacity to deliver it. These professors play an important role as "editors" in curriculum development and "conduct" formally approved degree courses. Furthermore, program coordinators operate as "intermediaries" in dealing with stakeholder expectations. They are in daily contact and personal exchange with industry representatives, students and contract teachers. Our interview data reveal that from this daily contact, ideas for study program innovation emerge. An interviewee characterizes the emergence of study program innovations originating from day-to-day business, relationships and mutual exchange:

> the innovation needs don't emerge from committee meetings. These emerge in daily contact between lecturers and company partners to the program head professors. This is not cemented anywhere, but it is the permanent exposure to real needs that hopefully shapes us. (Interview 28)

Those new ideas are fetched and discussed by program coordinators with their colleagues within their school or within the sub-committee of the expert commission. In addition, program coordinators bear a reporting obligation regarding their activities to their superiors. This reporting obligation refers to the extent of the utilization of student places and the quality evaluation score of delivered degree courses. Thus, the program coordinators are interested to create attractive curricula. They do so through offering popular topics to assure high course attendance. The "superiors" reveal the second role a professor can assume: the office of a "head of school" or of a "head of campus". A professor in the office of a "head of school" is in charge of the academic discipline of his or her represented school, such as business administration or healthcare. Thus, "heads of school" are members of the university's committees where they represent the interests of their assigned school as well as of their academic discipline. Consequently, the school's interests are shaped by its professors, mainly in the function of program coordinators. Furthermore, a professor in the office of a 'head of campus' is in charge for all academic and

organizational matters of his or her campus. This incorporates a stake in keeping up an attractive degree course portfolio on his or her campus for industry and a high capacity utilization rate of the assigned number of study places by the state government. In addition, it is important to mention that program coordinators are appointed by a head of campus. We outline both offices, head of school and head of campus under the term "university management" and identify this role as "facilitator" and "rapporteur". The facilitator role incorporates fostering study program innovations in cooperation with program coordinators in order to provide an attractive degree course portfolio and a high number of first-semester students. In addition, the rapporteur role includes representation (agency) in the committee system of the university as well as in engagement with local government and wider society around the campus (outer orientation). In summary, the role of professors is to take up impulses for program innovations, translate them into suitable curricula and deliver innovative study programs together with a sufficient number of study places.

11 The Role of Industry

Industry plays a role in study program innovation in the case study university in the shape of, for example, HR managers who coordinate CSPs in collaboration with program coordinators from university. Industry representatives provide study places for students in enterprises. The study place in an enterprise is interconnected with a study place capacity on a university campus. To achieve this link, an enterprise has to undergo a specific admission procedure at the university. In this procedure the enterprise has to prove the capability of conducting a CSP on its site. The industry enterprise takes on the student selection process, as students are employed and therefore paid by the industry enterprise during the duration of the degree course. The student employment is regulated through a specific employment contract on CSPs, which is provided by the university. A student can only go through the enrollment procedure into the CSP at the case study university with the proof of a valid employment contract at an enterprise.

Industry enterprises are represented in the university's committee system (through its obtained university membership status by provision and implementation of a study place) and thus takes part in decision-making. Industry representatives are perceived as "clients" by the program coordinators providing valuable feedback regarding the cooperative study program curricula quality. Industry plays a role as a "catalyst" for innovation based on the views of

industrial interviewees. This can be observed in how much degree programs are supported by the industry through co-teaching and practical training as well as through their role in setting the number of study places in CSPs. Finally, it should be mentioned that industry also plays a role of a "practical instructor" during the practical training part of a degree course and the provision of a study place in the enterprise.

12 The Role of Government

Government is represented in the university through the involvement of the Ministry of Science, Research and Arts' representatives in the committee system and therefore influences university decision-making at the strategic level. Government representatives play a "rule maker" role through regulation of CSP framework conditions via the Higher Education Act. They are also important in terms of funding study places of CSPs. Thus, the ministry appears as a responsible body for the university and regards university as a subordinated organizational entity, fulfilling policy goals. Depending on these in a particular year, the ministry acts as "principal" and funds additional study places for example. The following interviewee exemplifies the role of the university within the higher education system and the underlying governmental role:

> We would have a catastrophic junior staff situation in Baden-Wuerttemberg if the Cooperative State University would not exist. And the universities of applied sciences alone cannot do this, and so it is the ideal form in terms of business, student demand and companies, because graduates still have the advantage that they are already in the company before they graduate, so to speak. And the graduates also have the big side advantage that their studies are ultimately financed. (Interview 24)

In the next sections, we present the both sub-cases "business administration" and "nursing" to elucidate how Triple Helix interactions encourage innovations of study programs. Hence, we explore the interplay of actors, their underlying roles and accompanying study program structures. Firstly, we depict the sub-case of "business administration" and explore which actors assume which role in order to shape study program innovation. Secondly, our sub-case "nursing" exemplifies a "contrast case" in terms of academic disciplines and therein we investigate which roles actors take on in order to form study program innovation. Finally, we compare both sub-cases and draw a conclusion and

discuss our findings against the background of Triple Helix and the entrepreneurial university.

13 Case of Business Administration

As mentioned above, business administration represents a well-established disciplinary field within the case study university's course offerings. The program has a broadly diversified portfolio of degree courses of CSPs which are tailored to the needs of certain industry sectors, such as commerce, banking or industrial service management. On the university side, all degree courses of business administration are brought together under the roof of a cross-campus department consisting of a "campus-school of business administration" at each geographic location of the university. In the DHBW case, nine "campus business administration schools" are in charge of study programs and supply local industries of Baden-Wuerttemberg with qualified employees in cooperation with enterprise sites located there. At such a "campus business school", professors as program coordinators carry out their assigned cooperative study programs. Program coordinators do so in collaboration with HR managers originating from the cooperating enterprises.

Innovations of business administration study programs seem to be driven by a decline in the number of freshmen over the past years. Furthermore, inspiration for innovation for program coordinators comes from daily contacts with HR managers from cooperating industry enterprises as the knowledge from industry is transferred to the coordinators regarding current developments in industry and in specific industrial sectors. This provides new ideas for curriculum development and adjustment in qualification requirements in industry and seems to result in amended or new developed degree courses for CSPs. For example, in order to deal with the digital transformation in enterprises, both the curriculum of the study program needs to change while also the industrial partners need to adjust the qualification requirements of graduates.

The initial stage of innovation starts when program coordinators as "intermediaries" gather ideas as well as share ideas with industry partners and transform them to be suitable for curriculum innovation through the above described mechanism of three innovation intensities. In this regard, program coordinators serve as "editors" of the curriculum. In addition, the exchange with industrial partners may inspire and legitimize the creation of a new degree program as seen from the following feedback process description between the study coordinator and a cooperating enterprise:

> Then, in exchange with the company (…), it became clear relatively quickly that this industry 4.0 topic in particular, this strong IT orientation, would be suitable as a business studies degree. Then even the feedback came: if you get this on the way quickly, we'll go along with it. (Interview 19)

These two fundamental steps – idea gathering, and editing an amended or new curriculum – do not take place in isolation. This process is intertwined with industry in the form of exchange with industrial HR managers, who provide valuable feedback on new ideas for curriculum amendments or a new curriculum design. Program coordinators involve HR managers in a consistent and purposeful way. The first level of innovation intensity in this context provides an opportunity to test new ideas for subsequent curriculum amendments or the creation of new curricula. If the study program innovation idea has reached a certain level of maturity, industrial HR managers commit to sending additional students to the university, for the amended or new study programs. Program coordinators see this process as necessary to make their study programs more attractive for freshmen students. Hence, industrial HR managers play an important role as study place providers and sort of informants and catalysts for study program innovation. In sum, one can say industry is a powerful client which through feedback and provision of students is crucial for study program innovation in business administration programs. And thus, in the initial stage study program innovation is shaped in a "primary process" consisting of a set of interactions between program coordinators (university) and HR managers (industry) and results in mutually accepted changes. This innovation is manifested in a proposal for amended or new curriculum developed by program coordinator and a commitment regarding study places dedicated to the amended or new study program (enterprises). A "secondary process" accompanies the aforementioned "primary process." On the university side, program coordinators involve their university management in order to gain support for their study program innovation within the university's committee system. At the end of this "secondary process", a formal resolution on an amended or new curriculum and future use of assigned study place capacities was made (university committee system) and this can be transferred to the daily business within a "campus business school" (program coordinator, HR managers).

In the case of business administration, the innovation process has a stronger focus on the interaction between two actors of Triple Helix university and industry axis. A set of interactions on this axis of the Triple Helix shapes the innovation of CSPs: study program innovations emerge at the micro-level, in the daily contact between program coordinators (university) and HR managers

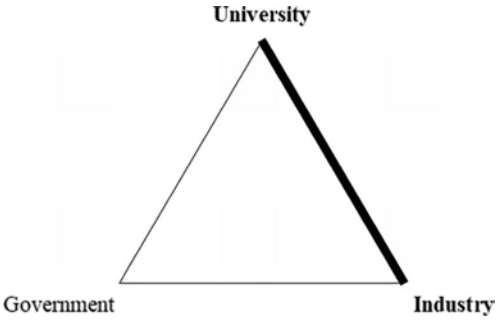

FIGURE 1
Study program innovation in business administration is shaped to a larger extent by interactions on the axis between university and industry.

(industry). This constellation forms a micro-structure or network of relationships with a mutual dependency. Furthermore, our data show that this specific context provides a kind of "incubator" for study program innovations (see Figure 1).

14 Case of Nursing

To prevent an imminent supply shortfall caused by demographic change, the federal government (national level) changed the nursing occupation law. The amendment aims to introduce academic qualification for nursing and suggests CSPs as a suitable concept. An interviewee summarizes the initial situation as follows:

> a new study offer has emerged from a concrete, let's say, health-political or also social need, yes. (Interview 2)

In general, the healthcare sector is strongly regulated and this has a direct effect on qualification and training of nurses. The regulatory environment is granted by the federal government and has to be implemented at the level of the states (provincial level). Thus, government shapes the demand and sets the frame for an academic qualification offer. In the case of Baden-Wuerttemberg, the state government identified DHBW as one major institutional actor to meet the supply for academic qualification of nurses. DHBW is the biggest provider of CSPs. For provincial government, the university appears as a "training facility" for healthcare. For the university, one can say this has been understood as a "call" to provide such a degree course for nursing. Thus, it can also be argued that government acts as "principal" (contracting authority) and university operates as "agent" (contractor). In terms of agency theory in economic science,

this metaphor can be used to capture the set of interactions within the nursing case. Industry is represented on the meso-level by hospitals and other health facilities and on the micro-level by nurses and professional association officers. The latter are closely linked to university and government, and participated in the study program innovation process in two ways: firstly, professional association officers accompanied the process of amendment of the occupational law. This interaction points to importance of the Triple Helix axis between industry and government in the example of the process of amending the occupational law. Secondly, hospital representatives and representatives from nursing colleges were actively involved in the establishment of connections in the direction of the university sector. In our case, they have been actively engaged with the DHBW and their program coordinators in order to design new curricula for CSPs in nursing. It should be noted that the DHBW had already established close relationships to the healthcare sector through courses offered in business administration with focus on health management. New curricula had to take into account the requirements of the occupational law and therefore a "combination model" of CSPs was chosen. The third learning venue alongside practical training at the hospital facility and university campus-school is represented by nursing schools of hospitals. Nursing schools of cooperating hospitals cover a part of the regulatory requirements of the occupational law. The head of nursing schools and the HR managers from hospital HR departments provide the daily contact for professors as program coordinators at the university when it comes to the creation, innovation and operation of CSPs in nursing. This triangular relationship (professors, HR managers, nursing school instructors) provides the source for innovation ideas with regard to implementation of academic training of nurses. In this context, program coordinators appear as editors of a new nursing curriculum and involve nurses from hospitals and instructors of nursing colleges as feedback providers. Thus, program coordinators play out their intermediary role in order to shape a new curriculum in the form of an agent (contractor). Furthermore, program coordinators involve their university managers and the related university committee system in order to exhibit a formally authorized nursing degree course in the direction of provincial government. This process is accompanied by a request for additional funding from the government in order to be able to offer additional study places for nursing academic qualification. Government (national level) appears in the role as "rule maker" for healthcare professions which transpires in the amendment of the occupational law on nursing. Furthermore, government (provincial level) appears as "principal" or "funder" through provision of additional funding of study place capacities at

universities. An access to this was granted through a specially created funding program which was decided by the government and carried out by the Ministry of Science. Universities which met the requirements of the funding program on creating additional study places for academic training of nurses were encouraged to apply. One precondition for the application procedure was evidence of an authorized degree course which finds appeal within healthcare sector. Hence, this set of actions reflects the government's position of a 'principal' (contracting authority) as mentioned above. DHBW applied to the funding program and the application contained a degree course of nursing in accordance with the requirements as well as official commitments by a range of hospitals to provide study places entangled to the application's CSP. Thus, this set of actions mirrors the university's position as an "agent" (contractor) as mentioned above. The DHBW was awarded additional funding in accordance with the funding program and has set up degree courses in nursing. Simultaneously, a healthcare department was established as a new disciplinary field within its jurisdiction the DHBW.

Seemingly, the process of study program innovation in nursing has a stronger focus on the double helix between government and university. A set of interactions on this axis of the Triple Helix shapes the innovation of healthcare CSPs. Industry, represented by entities from the healthcare sector, plays a more subordinate role. The set of interactions heads in the direction of helping to shape regulatory requirements and transfer them into a course offer. However, this set of interactions is coupled to the university which takes the lead and drives the whole process towards the establishment of a new healthcare department. To summarize, one can say the government stimulates demand for qualification supply in the health sector and the university responds to that demand with a suitable study program innovation. In doing so, university program coordinators collaborate with nurses in the aim of shaping a CSP in accordance with the given regulatory framework (see Figure 2).

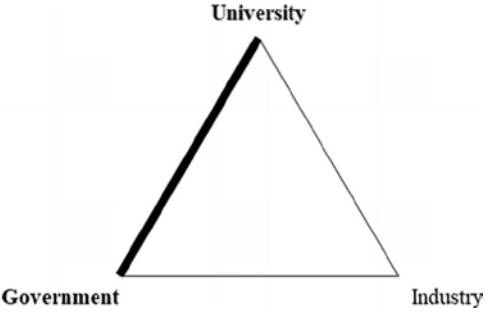

FIGURE 2
Study program innovation in nursing is shaped to a larger extent by interactions on the axis between university and government.

15 Comparison and Summary of the Business Administration and Nursing Cases

Organizational structure and process organization of DHBW are tailored for the creation and operation of CSPs. The organizational design of the university contains structural elements which foster the mission of supplying local economies with labor market relevant graduates.

The sub-case of business administration study program is a well-established disciplinary field of the university (DHBW). Structures and relationships between university and industry have grown over many years in developing the program and both parties operate within the institutional frame which was set by government. This study program innovation is shaped by two main actors in the Triple Helix – university and industry. Program coordinators (professors) and industrial HR managers (enterprises) drive the innovation process and involve their management with the goal to amend or create new courses. The academic discipline of business administration is characterized by a low degree of regulatory requirements which results in a widely differentiated portfolio of degree courses. Furthermore, it is important to mention that the discipline of business administration operates on the basis of long-term funded study place capacities with the requirement to prove a good utilization of those. The interplay of demand for attractive curricula and a preferably high capacity utilization of study places fosters innovation of study programs. Hence, the goal orientation lies in the capability of the system to renew the existing degree course portfolio. Thus, this goal process is shaped and driven by Triple Helix interactions which shape needs-based degree courses.

The case of nursing illustrates study program innovation in a young disciplinary field at the case study university. Structures and relationships between university and hospitals had to be strengthened, although the university had hold strong ties in the direction of the health sector from other disciplinary fields. Study program innovation is shaped by a stronger emphasis on the Triple Helix axis between university and government. The Triple Helix axis between industry and university plays an important but subordinated role. Government shapes and stimulates the need for academic training of nurses through regulation. The healthcare disciplines must comply with a strong regulatory framework in order to shape a study program offer. Furthermore, government addresses the need for highly qualified nurses by funding study places in order to secure a certain supply of qualified nurses educated at an academic level. Funding of study places is closely linked to the offer of suitable degree course that meet regulatory requirements as well as have a positive appeal for the healthcare sector. In the development of a new degree course on nursing

similar processes as in business administration took place: program coordinators involved nurses and experts from hospitals in order to gather feedback and to approve the new curricula. But the goal orientation has been different in this sub-case: program coordinators have brought all actors together with the goal to provide a CSP on nursing in accordance with requirements from government in order to ensure funding for additional study places at the case study university. Thus, Triple Helix interactions foster this goal orientation, wherein university establishes a new disciplinary field and hence industry receives university-qualified trainees and graduates. Table 1 summarizes the different purposes as well as disciplinary differences of our case:

TABLE 1 Summary of different goal orientations as well as disciplinary differences in the two cases of CSPS.

Classification of cooperative study programs sub-cases			
Case	**Purpose**	**Mission**	**Serving**
Business Administration	To meet industrial needs	To create attractive curricula based on labor market requirements	industry/private sector
Nursing	To ensure high-quality nurse provision for the healthcare sector	To create attractive curricula based on professional law	government/ public sector

16 Discussion and Conclusions

Our case study of the innovation of CSPs at a German university of applied sciences indicates an empirical example of the innovation and transfer of study programs in the Triple Helix context. Both studied program innovations show how the "hybrid organization" emerges at an entrepreneurial university and what roles different actors play in this process. In our case study university functions as an "intermediary institution", interacting with industry and government responding to the needs of these at the local and regional level

through study program innovation. In particular, our study demonstrates the importance of institutional formation for an emergent "hybrid organization", adopted and carried out by a university due to a provision of CSPs to industry. Government appears as "rule-maker" by including CSPs in the local Higher Education Act. Furthermore, government provides university funding in order to ensure a basic supply of study places for industry. Industry is involved as "gate keeper" due to student selection and obtains university membership through study place provision. Moreover, university shapes the meso-level as an emerging hybrid institution and bears responsibility for academic and organizational matters concerning CSPs. Thus, the university represents an "intermediary institution" that is central for the Triple Helix. Our results show that Triple Helix interactions influence study program innovation at the university of applied sciences in a positive way. In the case of business administration, it has been observed how Triple Helix interactions are carried out with a stronger focus on the axis between university and industry and they are crucial for this applied discipline. These linkages allow university and industry to renew their ties and relations in order to keep up a relevant degree course portfolio. Further, in this Triple Helix interaction the case study university ensures that the commitment towards government of an efficient use of university funding through high student enrollments is fulfilled. These two factors indicate an "endless transition" as described by Etzkowitz (2008). We outline that university acts as an editor of curricula amendments and involves industry in a client role for feedback provision. In a next step, the university acts as a facilitator for gaining study place capacity entangled with urgency for amended curricula, and industry appears as a catalyst requesting study places aligned with amended degree course offers. Through this mechanism, the government gets a reallocation of funded study places and at the later stage is involved in an indirect manner in study program innovation through performance measurement. The sub-case of business administration highly contributes the innovation of the university. Furthermore, one salient feature lies in the higher degree of freedom to innovate study programs. This is reflected in the stronger emphasis on the interactions between university and industry and results in a very differentiated degree course portfolio.

In the case of nursing, study program innovation is shaped primarily by the axis between university and government in the Triple Helix context. In addition, the axis between university and industry is of subordinate significance. Government shapes the regulatory framework for health professions and thus provides the basis for a demand for academic qualification of nurses. University creates and delivers in a closely coordinated process with industry a

new degree course in order to apply for additional funding of study places. The government responds with a funding program considering those degree courses which are accepted by the health sector. One can say that government stimulates the demand for academic education of nurses through regulation and funding in order to ensure a supply. Furthermore, university and industry respond with a coordinated degree course offer and industry receives its specialists this way in order to secure a supply of highly qualified nurses for the healthcare sector. Since nursing as disciplinary field is characterized by a high degree of regulation, we observe a more salient interactions on the Triple Helix axis between university and government. Thus, we show that the Triple-Helix interaction has been also important in the establishment of a new study program in a new disciplinary field of nursing within the university.

The study of innovation process in our sub-cases confirms that the emergence of CSP offerings represent a "bottom-up project", which is boosted by industry and university on local or regional levels (Krone et al., 2015: 40). The case study university functions as an intermediary institution that is entrepreneurial in bringing together various stakeholders and taking into account of their interests. These findings illustrate the nature of CSPs and we argue this represents a reflection of the transformation of roles and relationships of key stakeholders as an integral part of Triple Helix and the emergent hybrid organization.

Our study functions as a pathfinder for a deeper exploration of the creation process of hybrid organizations in the Triple Helix context exemplified by innovation of CSPs. We show that innovation processes of study programs imply a complex multi-level interaction between different key stakeholders. Thus, further multi-level studies are needed to understand the institutionalization and possibly disruption of innovation of study programs to further comprehend university as a hybrid organization in the Triple Helix context.

Endnote

1. The German higher education system is subject to a "dual obligation". Thus, this comprises the fundamental binary structure and this contains the distinction between traditional research-oriented universities and universities of applied sciences with a focus on teaching with elements of applied-research. In Germany, traditional research-oriented universities shape a "role model" within the higher education system. We therefore argue that a type of university such as the Baden-Wuerttemberg Cooperative State University examined in our case study represents a further development of the type of university "university of applied sciences".

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