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Scientific Research in Universities of Applied Sciences in Various Countries – A Case of Europe

Babangida Maitalata

Federal University of Abeokuta, Nigeria
babangida.maitalata@covenantuniversity.edu.ng

Abstract

This article is based on the information and data of European education technology departments and related higher education industry associations. Through comparative analysis of several cases, this article preliminarily discusses the characteristics and development trends of scientific research in European universities of applied sciences. Through this article, it is economic to carry out applied scientific research. After the society has developed to a certain stage, an important mission of the University of Applied Sciences. European countries have established a scientific research development mechanism for universities of applied sciences, which is composed of national, local governments, enterprises, and applied, for universities. Countries can learn from these experiences and establish. The scientific research management system of the University of Applied Sciences with its characteristics encourages the integration of applied scientific research and talent training and contributes outstanding talents and achievements to the local and national social and economic development.

Keywords: *Talent training, Higher education, Applied science*

1. Introduction

The University of Applied Sciences (UAS) is parallel to the traditional university. It is a new type of higher education institution that is positioned at the training of applied talents and is practice-oriented. Whether it is scale or quality, the development of European universities of applied sciences is eye-catching. The world's earliest university of applied sciences is Fachhochschule (FH) in Germany. To eliminate misunderstandings in the international community, in 1998 Germany unified the English University of Applied Sciences (Hochschule Fürangewandte Wissenschaften in German, abbreviated as HAW) Translation of Fachhochschule. Since then, universities of applied sciences in Austria, the Netherlands, Switzerland, and Finland have successively used this English name. The European universities of applied sciences studied in this article also focus on higher education institutions that originated in Germany and whose English name is UAS.

Applied talent training institutions have a long history in Europe, and the modern sense of UAS was born from 1969 to 1971. To meet the needs of industrial structure transformation, technological progress, and social development after World War II, Germany was established in Mannheim, Munich, Aachen, and Wies. Cities such as Baden and Karlusruhe established the first batch of UAS based on enterprise-led practice teaching models. Since then, Sweden

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(1977), the Netherlands (1987-1993), Norway (1989), and Austria (1994), Switzerland (1994), Belgium (1995), Finland (1996), and other countries have also established the first batch of UAS in their own country. Among them, the first batch of UAS in the Netherlands and Belgium were transformed from the former secondary professional colleges. According to the information currently available, the distribution of universities of applied sciences in the above European countries is as follows:

Table 1. Distribution of universities of applied sciences in selected European countries (as of 2019)

	Germany	Netherlands	Belgium	Sweden	Austria	Switzerland	Finland	Norway
Population	83042200	17282163	11539328	10327589	8902600	8603900	5527573	5367580
Total number ofuniversities	426	57	61	30	57	21	41	41
UAS number	216	36	20	10	22	9	25	24
UAS per million people	2.6	2.08	1.73	0.97	2.47	1.05	4.52	4.47
College students	2868222	750505	259017	306081	376700	252530	295586	293287
UAS students	1001550	455736	40600	28075	58626	99674	142157	61897
Number of UAS students per 10,000 people	121	264	35	27	66	116	257	115

From the perspective of the proportion of colleges and universities and the proportion of college students, UAS has become an important part of higher education in these European countries. Countries have 1-4.5 UAS per million people, and about 30-260 people are studying for every 10,000 people with UAS degree. In the Netherlands, Germany, Switzerland, Finland, Norway, and other countries, UAS occupies almost half of the higher education. From the perspective of professional settings, UAS generally has engineering, technology, agriculture and forestry, economics, finance, business management, design, and so on. Nursing and other majors, including 31 sub-categories such as engineering and technology. Majors are derived from practice, and there are usually no humanities majors. In addition to the necessary basic theories, their curriculum and content are mostly applied, with detailed professional classifications and compact teaching arrangements focuses on cultivating and improving students' independent learning and practical ability. Germany has become the cornerstone of maintaining European economic and social stability. Switzerland's core competitiveness has been ranked first in the world for many consecutive years. Sweden, the Netherlands, Austria, Finland, and Norway have achieved global economic and social development. Taking the lead is inseparable from the supporting role of universities of applied sciences in the country's real economy and the stabilizing role of the entire social order in these countries

Each country has an organization responsible for the management, cooperation, and exchange of all universities of applied sciences. For example, in Germany, the Ministry of Culture and Education of each state is responsible for related education affairs in the state; the All-German Interstate Joint Conference of Ministers of Culture (KMK) represents the state governments Unified guidance and coordination of the basic management rules of German universities; as a non-governmental organization, the German University Presidents' Joint Council (HRK) represents German universities and coordinates the exchanges with the states, the federal government and the society, including the establishment of a new degree after

1998 The Accreditation Committee is responsible for the accreditation rules, standards and implementation of UAS degree courses, as well as encouraging the introduction of some scientific research mechanisms in UAS since the 1990s. In addition, the Federal Ministry of Education and Research provides project-based scientific research funding support to universities across the country, including UAS, and those in need Students provide bursary support, etc.

For another example, the National Education Department of the Netherlands is responsible for the macro development of UAS; the Dutch University of Applied Sciences Association represents all the universities of applied sciences in the Netherlands, responsible for liaising with the government and industry, participating in policy formulation, organization, and exchange; the Netherlands Organization for Scientific Research funds related scientific research to promote basic and applied scientific research in the Netherlands. These institutions perform their duties and jointly integrate relevant resources and management systems to form the basis for the scientific research and other management and security systems of the European University of Applied Sciences with distinctive characteristics.

2. Research support methods of European universities of applied sciences

As a practice-oriented university that is positioned to cultivate applied talents, European universities of applied sciences originally had no scientific research needs. However, after the development into the 21st century, with the need for industrial upgrading, governments at all levels and enterprises from all over the world have gradually become more concerned about UAS. In response to the demand for applied scientific research, European UAS began to receive scientific research support in a variety of ways. These demands and support have prompted them to move from a teaching institution with purely applied knowledge and skills to a development direction that combines teaching and research [1]. Total research and development costs in 2018 are the countries with the highest proportion of GDP, including Sweden (3.31%), Austria (3.18%), and Germany (3.13%), have particularly active UAS research activities.

At the national level of the European Union and Europe, the relevant laws of European universities of applied sciences have gradually increased scientific research regulations and set up corresponding scientific research and innovation functional institutions to coordinate the establishment and management of UAS scientific research projects. The European Union has also adopted its scientific research framework. The agreement directly funds school-enterprise cooperative scientific research projects including UAS. In addition, it is quite common for the governments of many European countries to jointly fund similar scientific research projects (such as the EUREKA project). This article specifically introduces the UAS scientific research support methods in five European countries.

Article 91b of the German Basic Law stipulates that the federal government and the federal states shall jointly support science, technology, and education on issues beyond the scope of the state. Based on this spirit, the Federal Ministry of Education and Science (BMBF) have worked with state governments to formulate many plans to support the Research activities of UAS. For example, the "Innovative Hochschule", "Future of Work" and UAS (Research for Universities of Applied Sciences) of High-Tech Strategy 2025 (High-Tech Strategy 2025). The German Science Foundation (DFG) also encourages UAS participation, such as through its "Project Academies" program, encouraging UAS professors to participate in DFG scientific research projects in the first six years of their professorship. In addition, UAS scientific research activities a large proportion of them are contract scientific research projects

and consulting projects related to the state government, surrounding areas, and small and medium-sized enterprises. At present, most UASs have scientific research support and achievement transformation institutions to assist and meet the scientific research needs of professors.

In addition to direct funding from state governments and companies, the Austrian Research Promotion Agency (FFG) is an important organization that funds UAS scientific research activities. It funds various scientific research institutions, including UAS, cooperates with enterprises in scientific research, and participates in international cooperation. A small number of UAS professors were also funded by the Austrian Science Foundation (FWF) to complete some applied basic projects.

The total R&D expenditure in the Netherlands accounts for a slightly lower GDP than the EU average. Its UAS research is mainly supported by governments at all levels, foundations, and companies in different ways [2]. The Netherlands UAS has been encouraging contract research since 1991 Activities. In 2001, the Netherlands UAS officially introduced applied researchers-especially experienced lecturers (Lector)-support mechanism to solve the technical problems of local small and medium-sized enterprises and cultivate applied talents with strong hands-on ability. After 2014, the Dutch government departments and including the Dutch Science Foundation NWO provided funds to support some research projects to promote the technological innovation, development, and knowledge transfer of UAS and small and medium-sized enterprises. For example, the RAAK plan to promote knowledge sharing between the industry and UAS, The PID plan for the development of specific economic fields, the KIGO plan for agricultural technology innovation and education, etc., sometimes also involve traditional research universities.

In 2009, the Finnish Ministry of Education and Culture issued a document to encourage scientific research activities that contribute to teaching and local development. The University of Applied Sciences Act passed in 2015 states that the government encourages UAS research and innovation, and for the first time it is included in the national scientific research funding system. In recent years, its funding tends to increase year by year. A considerable part of the various scientific research projects set up by the Finnish Ministry of Employment and Economy (including its subordinate Finnish Innovation Agency TEKES) is undertaken by UAS. UAS sometimes participates in the projects of the Ministry of Education and Culture and other ministries and commissions of Finland. In 2017, UAS received an 8% increase in national vertical research funding from the previous year when research funding for other types of institutions fell across the board, reaching 68 million euros [3][4]. In addition to national vertical projects, UAS also participates in some local projects and international exchanges, and cooperation projects. In the internal operation, according to scientific research performance, dynamically improve and reduce the allocation of financial support and related personnel.

Since 2017, the Swiss Innovation Agency has replaced the function of the original Swiss Technology and Innovation Promotion Committee (CTI), supporting scientific research and innovation projects of Swiss start-ups and small and medium-sized enterprises (SMEs). [5][6] Many innovation projects of the Swiss Innovation Agency are composed of SMEs and UAS, etc. A joint application by scientific research institutes. The Swiss Innovation Agency also encourages UAS to apply for some high-risk projects and start new enterprises separately. Some UAS professors also apply for and undertake projects from the Swiss Natural Science Foundation (SNSF).

The University of Applied Sciences in Germany was founded in the early 1970s, the earliest. So far, there are about 220 UAS in Germany, the largest. Therefore, this article uses

UAS in Germany as an example to discuss the characteristics of scientific research in universities of applied sciences. German universities of applied sciences were originally designed for teaching purposes does not include research. As in other European countries, after the 1990s, German UAS gradually had some scientific research requirements, but these requirements were often not for individual professors, but the entire university. According to the scientific research focus map provided to the Federation of University Presidents by various comprehensive universities and applied sciences universities in Germany, the distribution of 242 UAS research clusters in various disciplines is summarized, and they are compared with the distribution of disciplines of comprehensive university research clusters [Table 2], highlighting the scientific research characteristics of the University of Applied Sciences [7][8][9].

From the statistical data point of view, in general, the research clusters of universities of applied sciences are the same as comprehensive universities. At least 3-4 disciplines are required for cooperation and interaction. Even the number of disciplines of UAS engineering research clusters is higher than that of comprehensive universities. 。In the future, the scale of interdisciplinary will become larger and larger. Specifically, the number of UAS engineering research clusters is the largest, about 1.6 times that of comprehensive universities, which fully reflects the application orientation of UAS. Among them, energy and production technology 、Civil engineering is more than twice the latter. In terms of humanities and social sciences, the number of UAS research clusters is generally lower than that of comprehensive universities, only about 55% of the latter. Natural sciences and medicine have the smallest research clusters, and the total number of filings for 102 UAS is only about 40% of that of 76 comprehensive universities.

Table 2. Comparison of discipline distribution of research clusters between comprehensive universities and universities of applied sciences in Germany

Discipline	UAS	Comprehensiveuniversity	Contrast value(%)
Natural Science	151	473	39.24
Mathematics	8	46	17.39
Physical	34	110	30.91
Chemistry	31	107	28.97
Biological	34	132	25.76
Geography and Earth Science	22	54	40.74
Agriculture, Forestry, Veterinary Medicine	22	24	91.67
Engineering	433	318	158.37
Civil Engineering/Construction	44	22	200
Information System and ElectronicEngineering	133	108	123.15
Thermal and Process Engineering	75	35	214.29
Mechanical Industry Engineering	108	62	174.19
Materials Science and Engineering	73	91	80.22
Medicine	44	110	40
Humanities and Social Sciences	143	248	55.49
Humanities	43	106	40.57
Social science	100	142	70.42
Total number of occurrences of the subject	771	1149	67.1
Total number of research clusters	242	361	67.04
The average number of subjects involved in each research cluster	3.186	3.183	

Below is the Hamburg University of Applied Sciences (HAW Hamburg) located in the big city and the Hildesheim-Holzminden-Göttingen University of Applied Sciences (Hochschule für angewandte) located in three regional cities in Lower Saxony. Wissenschaft und Kunst/HAWK Hildesheim/Holzminden/Gttingen) as an example, to introduce the different characteristics of UAS research focus in various regions.

The four research directions of Hamburg University of Applied Sciences are (1) Energy and Sustainability. The research goal is a core issue in the future sustainable society-the principle and application of renewable and high-efficiency energy including smart grid, wind energy, fuel cell technology, and bioenergy, etc. The subject areas involved are (a) Information, System and Electronic Engineering, (b) Mechanical and Industrial Engineering, (c) Physics, (d) Thermal Engineering, and Technology Engineering. (2) Health and Nutrition. The research objectives are social medical care, rehabilitation care, obesity research, large-scale catering management, and food engineering, product development and marketing, sensory science, and recombinant protein and malaria vaccines Research. The subject areas involved are (a) Biology, (b) Medicine, (c) Social Science and Behavioural Science, (d) Thermal Engineering and Process Engineering. (3) Information, Communication and Media (Information, Communication, and Media). The research goal is the research and development of information and communication technology and its integration with the development of modern knowledge-based society, digital media (including support for mobile terminals). The subject areas involved are (a) humanities, (b) information, systems, and Electronic Engineering, (c) Mathematics, (d) Social Science and Behavioural Science. (4) Mobility and Transport. The research objectives are new technologies in the field of aircraft and vehicle transportation, including cabin systems and lightweight structural technologies, acoustics and advanced Driving assistance systems, etc.; in the field of logistics, the focus is on the research of electric vehicle technology and applications for urban freight. The subject areas involved are (a) information, systems, and electronic engineering, (b) materials science and engineering, (c) machinery and Industrial Engineering, (d) Physics.

Hildesheim-Holzminden-Göttingen University of Applied Sciences conducts key research in the following three directions: (1) Laser and Plasma Technology. The research goal is interdisciplinary and ecological efficient innovation field, research-based on atmospheric pressure cold plasma and combined laser technology; develop various application products for the scientific community, industry, and the public. The subject areas involved are: (a) Materials Science and Engineering, (b) Mechanical and Industrial Engineering, (c) Medicine, (d) Physics. (2) Sustainable Production and Use of Biogenic Resources. The research goal is the production of biological resources in agriculture and forestry, to improve the energy efficiency of materials Research and optimization of industrial processes and technologies, and compare the ecological, energy, and economic balances of different process chains. Subjects involved: (a) Agriculture, Forestry, and Veterinary Medicine, (b) Mechanical and Industrial Engineering, (c) Thermal Engineering and Process Engineering. (3) Social, Spatial, and Economic Processes of Integrated Urban and Regional Development in the coordinated development of cities and regions. The research objectives are integrated urban and regional development, sustainable entrepreneurship, and social work Disciplinary research methods, formulating local development strategies to meet the needs of diversified social comprehensive development. The subject areas involved are (a) humanities, (b) social sciences, and behavioural sciences.

Comparing the above two universities of applied sciences, it can be seen that the scientific research characteristics of the German University of Applied Sciences are often closely related to the location. Hamburg University of Applied Sciences is located in a metropolis

with relatively complete infrastructure, high population mobility, and busy logistics, so it makes extensive use of advanced information and communication technology, the development of new energy, smart transportation, smart logistics, digital media, and other new technologies while paying attention to several social issues that have emerged in the city (such as nutrition and health). In contrast, the Hildes Sea in small and medium cities The Holzminden-Göttingen University of Applied Sciences focuses on the study of ecologically sustainable technologies and regional development strategies. This is also based on local characteristics. For example, the Göttingen Surveying and Mapping Valley gathers surveying and mapping materials.

The general cycle of UAS scientific research projects is 2~3 years. After the funder provides the corresponding scientific research funds to UAS teachers, check the financial and project progress every year or after the end of the project, and continue to execute until the end after the expert evaluation is passed. Most of the project funds are Staff costs that are partly used to purchase equipment and software, in addition to about 20% to 30% of management overhead. In addition to the projects directly supported by the company, there are generally strict financial audits.

Except for a few countries such as the Netherlands, UAS has dedicated research professors and research teams. UAS faculty members focus on teaching tasks, and scientific research projects are optional. In most Western European countries, applying for UAS faculty emphasizes the candidate's Industrial experience and teaching experience, but there is no special requirement for scientific research experience. Even in some UASs in some countries, there are no mandatory requirements for applicants for doctoral degrees in teaching positions [Table 3].

Table 3. The minimum entry requirements for some European UAS teachers

	Master Degree	PhD	Years of industrial workexperience	Teaching experience	Researche xperience
Germany	+	+	+	+	+
Austria	+	Section+	+	+	+
Switzerland	+	+	+	+	+
Netherlands	+	Section+	+(4Year)	+	—
Finland	+	—	+	—	—
Sweden	+	Ordinary lecturer - senior lecturer+	+	+	+

UAS faculty with good scientific research backgrounds will generally look for opportunities to apply for scientific research projects. For example, a German UAS professor has received funding from several Federal Ministry of Education and Research (BMBF) projects in recent years and has also received more competitive DFG projects. The European Union One project for each; another young UAS professor received two scientific research projects funded by the state government and one scientific research project funded by a company. They both founded their own companies as sponsors. Especially excellent UAS professors can even pass third-party scientific research funds to maintain a team of more than 10 people. Many universities and professors in other countries also actively participate in Natural Science Foundation projects and EU projects (such as some professors listed in [Table 4] to improve their domestic and foreign reputation and competitiveness.

Once the project application is successful, UAS professors can recruit researchers and purchase corresponding scientific research equipment. The school will also configure corresponding office conditions and administrative support. In some countries, these researchers can be affiliated with comprehensive universities to study for Ph.D. In parallel with the project research, the doctoral degree is generally awarded by a comprehensive university.

It can be seen from [Table 4] that compared with comprehensive universities, the teaching tasks of UAS professors are extremely heavy. Therefore, some UASs have begun to let professors who undertake scientific research projects reduce part of the teaching tasks (some German states stipulate that the maximum is 9 hours, which is comparable to that of comprehensive universities. The teaching requirements are consistent) to facilitate a better balance between scientific research and teaching.

Table 4. Teaching and research workload of some European UAS professors

	Professor's teaching workload	Professor's research workload
Germany Fachhochschule/ Hochschule für Angewandte Wissenschaft	The vast majority (above 95%) requires 18 hours of teaching per week, and very few schools allow the amount of scientific research to be exchanged for up to 9 hours of teaching per week.	Since the 1990s, scientific research has also been one of the goals, but the focus is on applied scientific research
Austria Fachhochschule		
Switzerland Fachhochschule(German area) scuola universitaria professional	The full-time workload of 40 hours per week, of which 16 hours of teaching, another workload is administrative management and guidance of students	Encourage participation in scientific research activities, including the creation of applied research centers
Netherlands Hochschule		
Finland Ammattikorkeakoulu	There are teaching and student guidance requirements, but the data is not yet available	Since 2009, the state has encouraged scientific research activities that contribute to teaching and local development
Sweden Hogskolor		There are scientific research requirements, but the data is temporarily lacking

However, because UAS generally lacks scientific research assistants and administrative assistants equipped by comprehensive universities, UAS professors often need to withdraw these administrative expenses from project funds. In the face of this situation, many UASs have begun to set up scientific research and innovation centers or similar institutions. These professors engaged in scientific research comprehensively allocate some shared resources [Table 5].

Table 5. Research work and supporting support of UAS professors in some European countries

	Horizontal scientific research cooperation projects	Longitudinal research projects	Supporting research activities	Case study
Germany Fachhochschule/ Hochschule für Angewandte Wissenschaft	About 80% of professors have industry-funded projects, including scientific research and consulting projects, as well as undergraduate and master's thesis guidance	About 20% of professors undertake scientific research projects funded by the European Union (EU), the Federal Ministry of Education and Science (BMBF), state governments, and foundations	Normal schools do not provide support for professors with scientific research assistants, but instead provide funding through the projects they apply for; many schools provide knowledge transfer offices	Prof. A, HAW Hamburg (there are DFG, BMBF, and other projects); Prof. B, HS Darmstat (a project directly supported by the state government and enterprises)
Austria Fachhochschule	Many undertake industrial projects	Many professors participate in or lead scientific research projects such as the state government, the Austrian Research Promotion Agency (FFG), and the European Union	Some are equipped with administrative and researchassistants	Prof. C, FH Krems (Participate in FFF, EUprojects)
Switzerland Fachhochschule (German area) scuola universitaria professional	Many are funded by local governments and leadingcompanies,including both service-oriented projects and R&D projects	Some professors undertake scientific research projects funded by Innosusse/KTI, European Union (EU), Swiss Natural Science Foundation (SNSF), etc.	Many schools provide knowledge conversion offices	Prof. D, ZHAW (supported by KTI, EU, and other projects)
Netherlands Hochschule	Many come from corporate funding	Mainly established by the Dutch University of Applied Sciences Knowledge Development Fund (SKO) established in 2001, it provides various project support and research subsidies	Since 2011, the government has encouraged UAS to introduce research professors and a research team system and establish a special R&D center for it	Prof. E, Hanzehogescho l (undertaking EU and corporate projects)
Finland Ammattikorkeak oulu	Many come from corporate funding	Some local projects and international exchange/cooperation projects	A small number of teachers participate in scientific research activities	Dr. F, Metropolia (undertaking EU and other projects)
Sweden Hogskolor	Many come from corporate funding	Some government projects, European Union projects	Some senior lecturers and teachers participate in scientific research activities	Prof. G, BTH (undertaking EU and other projects

3. Cultivation of European UAS scientific research personnel

After the establishment of the first batch of UAS in the early 1870s, European countries positioned UAS as practice-oriented higher vocational training based on actual needs in the first 30 years. Students were directly awarded a Diplom (FH) degree upon graduation to distinguish them from comprehensive Diplom (Univ) of a sex university is equivalent to a

master's degree. At this time, the European UAS does not award bachelors or doctorate degrees, nor is it involved in scientific research.

On June 19, 1999, at the University of Bologna, Italy, 29 European countries signed a "Bologna Agreement". The agreement aims to ensure the compatibility of higher education standards and quality in various countries. The core is the European Credit Recognition System (ECTS) In particular; the old school system is replaced by a bachelor-master degree. For example, the old German school system is the Magister school system for liberal arts, and the Diplom school system for science, engineering, agriculture, and business. With the advancement of the Bologna process, most European countries have UASs with bachelors. In other words, Europe positions universities of applied sciences on the same level as comprehensive (or called academic/research) universities, "different types but equivalent" higher education institutions. In addition to bachelor and master's training, in Ph.D. in terms of training, there are two training modes for European UAS.

The first is to conduct doctoral training jointly with comprehensive universities, and the comprehensive universities will issue doctoral degrees. With the improvement of some UAS research levels, in recent years, Germany, the Netherlands, Austria, and other countries have been co-training doctoral students with comprehensive universities. A doctorate is awarded through a comprehensive university. For example, from 2007 to 2017, the Fulda University of Applied Sciences (Hochschule Fulda) in Hessen, Germany, and a comprehensive university jointly trained 38 doctors and graduated with 50 doctors on December 1, 2017, Joint training of doctoral students; in 2014, there were 500 joint training doctoral students in UAS in Bavaria, Germany, of which 114 are currently studying joint training doctoral students at the Munich University of Applied Sciences; in early 2015, North Rhine-Westphalia, Germany There are a total of 650 co-trained doctoral students in 16 UASs in the state [10], of which the Cologne University of Applied Sciences currently has 150 co-trained doctoral students.

The second is a UAS independent training or multiple UAS cooperation for doctoral training, and the UAS will directly issue a doctorate. Sen-Anhalt revised its respective state higher education laws in 2016, 2019, and 2020, and several UASs with mature conditions after review It is allowed to grant doctoral degrees in a few advantageous disciplines and regularly evaluate them. The Fulda University of Applied Sciences in Hessen (Hochschule Fulda) is the first UAS in Germany to be granted doctoral degrees. It has two independent PhDs in social sciences and public health Point. The school and the other three UASs in the state-Frankfurt University of Applied Sciences, Rhein-Main University of Applied Sciences (Hochschule Rhein-Main), and Darmstadt University of Applied Sciences (Hochschule Darmstadt)-Jointly established a doctoral program in applied computer science, which is managed by the Darmstadt University of Applied Sciences, and each degree will be awarded after graduation. In addition, the school is also jointly established with the Frankfurt University of Applied Sciences and the RheinMain University of Applied Sciences According to the data of the school's website, from December 1, 2017, to December 1, 2018, the school's various majors added up, and there are a total of 8 and 22 doctoral programs in the direction of UAS (independent or multiple UAS). Cooperative) Ph.D. students cultivated.

North Rhine-Westphalia Dortmund University of Applied Sciences (Fachhochschule Dortmund), Bochum University of Applied Sciences (Hochschule Bochum), Cologne University of Applied Sciences (Technische HochschuleKln), and other UAS established doctoral students (Promotionskolleg), let outstanding master's graduates continue to study for doctoral degrees under the guidance of supervisors with scientific research capabilities. In May 2020, Saxony-Anhalt passed a new university law, which also allows several UASs in the state to jointly establish the field of engineering and sociology Doctor training center.

4. Conclusion

Through this article, the development of applied scientific research is an important mission of universities of applied sciences after the economic and social development reaches a certain stage. European countries have established scientific researches composed of national, local governments, enterprises, and applied universities for universities of applied sciences. Countries can learn from these experiences, establish a scientific research management system for universities of applied sciences with their characteristics, encourage the integration of applied scientific research and talent training, and contribute outstanding talents and achievements to local and national social and economic development.

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