A Practitioner's Perspective on Profession Oriented Engineering Education

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Abstract

In 2020 Malaysia will be a highly developed industrialized country. This aim is described in the Vision 2020 program. And Malaysia acts accordingly and founded five application oriented universities in the recent 2 1/2 years.

How to set up application oriented universities and how to educate highly qualified application oriented engineers were the main topics of the 1st National Convention on Engineering Education: Profession Oriented Approach in Putrajaya, Malaysia, July 7-9, 2003.

The author has been invited by the conference organisors to give a keynote speech on the economic relevance of Fachhochschulen to the German economy because Germany's professional and application oriented education system is a preferred reference model.

This paper presents statistical evidence that Fachhochschulen are indispensable to the German higher education and economy.

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1 Introduction

Universities of Applied Sciences (UAS, German: Fachhochschule (FH)) are an important part of the modern German university system[i]. Within the German system, the educational mission and profile of UAS are especially adapted to the requirements and needs of professional life. An increasing number of young people, interested in receiving higher education, choose this type of university. UAS are gaining in popularity. This is why the federal government and the federal states of Germany – supported by recommendations of the Science Council – decided to gradually increase the admission capacity of the UAS from currently 28% to 35% and later 40% of all first-year students [iv]. In addition to practice-oriented instruction, other hallmarks of the UAS are applied research and development, the quality and quantity of which have risen perceptibly since the mid 1980s. UAS have established partnerships with universities around the world. European degree programs in which universities from various EU member countries cooperate were first developed at UAS. Young people need forms of education which consistently and purposefully provide both academic qualifications and professional qualifications needed by the economy. The UAS have made great progress toward this goal.

2 General Survey

2.1 Origin and Development of UAS

The system of higher education in the Federal Republic of Germany currently includes some 350 universities, UAS, teacher training colleges and universities of fine arts. UAS and the Univ.[1] are the largest groups among them. The establishment of UAS was a reaction to the increasing demands of industry and professional life, caused by scientific and technical advances, and the corresponding new qualitative and quantitative requirements placed on education. UAS, most of which were established between 1969 and 1971, grew from former engineering schools, academies and higher professional schools for design, social work or economy. Engineering studies oriented to these new requirements, for example, needed to provide considerably greater methodological and scientific depth than existing educational facilities were able to offer at that time. The growing demand for education and the increasing number of those who were interested in receiving a higher education which offers direct professional qualifications was an important factor, too.

2.2 UAS Mission and Profile

Just like all other types of institutions of higher learning, UAS have the following mission:

- Support the maintenance and development of sciences and the arts through research, instruction, studies and continuing education.
- Prepare students for professions which require the application of basic as well as the latest scientific knowledge and methods or artistic design abilities.
- Promote the international cooperation within the higher educational system, as well as exchanges between German institutions of higher learning and those in other countries.
- Encourage the mutual exchange of knowledge and technology.
- In addition UAS have their own special educational mission within the German system of higher education:
- Studies at UAS are strongly oriented to meeting the requirements and needs of professional occupations.
- UAS carry out applied research and development.

UAS do not have a standardized profile. They vary greatly in number of students (100 .. 17,000) and degree programs offered[ii]. The causes are the different regional backgrounds of the individual UAS and the respective areas the students come from. UAS are especially attentive to the needs of the regional economy. Special emphasis is placed on technology and knowledge transfer. This commitment makes UAS all the more important for regional economies. For example, seven new regional UAS were established in Bavaria in the past decade in order to boost the economy in their respective home regions.
UAS rapidly became committed to European and worldwide cooperation in higher education. They achieved a marked internationalization of the courses offered through expansion and intensification of their international

ties. In summary, the educational mission and profile of the UAS in the German system of higher education can be characterized as:

- close link between science and practice in classroom instruction and studies;
- efficient organization of studies and examinations;
- briefer overall periods of study.

2.3 Number of Students

Approximately 0.43 million students were enrolled in UAS in the winter semester 2000/01. The number of available UAS study places is far lower than the number of applicants. Approximately 89.000 first-year students enrolled at UAS in the winter semester 2000/01[III].

2.4 UAS Staff

In 2000 the UAS in Germany had 16,600 job positions for academic personnel and 15,600 job positions for non-academic personnel[IV]. The UAS personnel structure differs from other types of universities. Teaching at UAS is carried out by professors and visiting lecturers with regular jobs in industry, commerce and administration. Professors at UAS must normally have an outstanding scientific record and at least a five years professional experience. During a minimum of three years industrial occupation they must have demonstrated their ability to turn scientific findings into industrial or economic applications and to tackle industrial and economic problems using scientific methods. Professors at UAS are normally required to teach 18 hours a week.

2.5 Admission Requirements

A high school diploma (German: Fachhochschulreife = 12 years of schooling) or a general high school diploma (German: Abitur = 13 years of schooling) are prerequisites for enrollment in a UAS. In addition, a several weeks practical training is a prerequisite, too.

2.6 UAS Degree Programs

The degree programs offered at UAS are based on the “Agreement of the Conference of Ministers of Education and Cultural Affairs of the Federal States Concerning Branches of Study and Diplom Degrees at UAS”. Three complementary objectives are observed in these degree programs:

- The theoretical part of teaching is in line with the scientific and technological progress, which means, that the graduates are able to apply scientific methods and knowledge on their own and, thus, are able to make an independent contribution to technological and economic development;
- The application-oriented side of teaching and its close link with practical requirements of industry, commerce and administration ensures that theoretical knowledge can be effectively translated into practice in the respective occupation;
- The breadth of teaching provided permits graduates to familiarize themselves quickly with new fields. The theoretical and practical sides of training are so closely connected that UAS graduates are particularly well suited for translating basic innovations and technical developments into practice.

Particular emphasis is placed on engineering sciences. There are traditional degree programs for civil engineering, electrical engineering and mechanical engineering, but also for business sciences, computer science, social affairs and design (for more see Table 1). The very extensive and varied range of subjects offered by the UAS can not be presented in this overview.

2.7 The Basic Structure of UAS Studies

The UAS predecessors, a number of which had a long and successful tradition, influenced the range of subjects and the basic structure of teaching and development at UAS. This is especially evident in the seminar-like style of teaching, the streamlined and efficient organization of the studies, briefer overall periods of study and

the emphasis placed on practical application. In contrast to Univ., the UAS educational style is more interdisciplinary and it also focuses more closely on problem solving. Communication of a broad knowledge of the contents and work methods relevant to practical occupational work takes precedence of the theoretical - analytical style of Univ. education. Including the time spent acquiring practical experience and preparing for and taking examinations, the nominal study duration for all subjects is eight semesters. The actual time spent studying at UAS depends on individual aspects. Studies at UAS are divided into semesters of up to 19 weeks; the non-lecture period totals three months each year and is thus shorter than that found in other types of institutions of higher education.

Stage I studies (basic studies; German: Grundstudium) take between two and four semesters, followed by an intermediate examination (German: Vordiplom). Examinations at UAS usually take place during the regular course of studies at the end of each semester. In the stage II of studies (main studies; German: Hauptstudium), students may normally choose between various areas of specialization and electives. UAS courses are organized in the form of lectures, seminars, labs, project work and practical training. The preferred form of classes is small groups of 15 to 30 participants each. This encourages and maintains a direct personal contact between teaching professors and students. Integrated practical semesters in companies (internships) under the supervision of a UAS are recognized as time spent in the higher education system. They fulfill all criteria stipulated by the European Union directive for the mutual recognition of degrees issued by institutions of higher education.
Internships are an extremely important element of the practice oriented UAS education. Normally an internship takes 20 weeks. Four days a week the student works on projects in a company jointly supervised by a professor and a person in charge on site. One day a week the students attend accompanying seminars and lectures at the UAS. In the 1st internship the students go through several stages in the industrial organization and gain hands-on experience. In the 2nd internship the students normally work on one or two “real world” development projects and, thus, test the applicability what they learned so far at the UAS for the first time. After this 2nd internship students are especially motivated for the last phase of their studies. Students are well accepted by enterprises for internships because they normally do absolutely useful and highly qualified work for them. Usually enterprises pay a monthly compensation. In most German regions, e.g. in Bavaria, enterprises offer many more internship opportunities than there are students needing one. Companies around the world may be chosen for internships after approval.

2.8 The Diplom Degree from a UAS

A student has to pass all exams and to write a Diplom thesis with a nominal full-time effort of three months. More time is often spent because the students are so ambitious and able to tackle very complex tasks successfully. The Diplom thesis usually focuses on a practical research or development problem in the student’s area of interest. Especially in engineering sciences, the share of Diplom theses carried out in or in cooperation with a company far exceeds 70%. Successful graduates receive the official state-recognized academic Diplom degree.

2.9 Bachelor’s and Master’s Degrees

The 1998 amendments to the Framework Act for Higher Education give German institutions of higher education the opportunity to award a Bachelor’s degree for the completion of first-level higher education studies and a Master’s degree for completion of post-graduate degree programs. The standard period of study in the Bachelor’s degree programs is at least three and at most four years; Master’s degree programs require at least one year and at most two. UAS have established numerous Bachelor- and Master- degree programs by now[7].
Doctoral Degree for UAS Graduates
UAS have no institutional right to confer doctoral degrees. However, especially well qualified graduates of UAS may enroll in a doctoral degree program of a Univ. without having to spend additional time attaining a Diplom degree from such a university first. UAS professors may supervise doctoral work and take part in the examination.

3 Economic and Industrial Relevance

3.1 Higher Education and the Job Market

With currently 0.43 Mio. students UAS educate 1/4 of all students enrolled in German institutions of higher education. However, Univ. and UAS show a very different distribution of students vs. subject groups (see Figure 1 and Figure 2). Students of engineering sciences make up 35% in UAS and only 9% in Univ.. The corre

sponding figures are 47% vs. 27% in law, business and social sciences. Considering selected subjects in detail, the differences in UAS – Univ. profiles are even more striking. 33,508 UAS students are enrolled in electrical / electronic engineering but only 26,771 Univ. students (Figure 3). Normalizing the figures of Univ. to 8 semesters of UAS programs the difference is even bigger: 33,508 (UAS) vs. 21,471 (Univ.) (see Figure 4). In mechanical engineering 2/3 of all students are enrolled in a UAS. In total 2/3 of all engineering science graduates come from UAS as is shown clearly in Figure 5 and Figure 6.
Additionally, UAS currently graduate nearly all social workers / social educators as well as half of all business and computer scientists.
Based on the data just mentioned, it is easy to see that the UAS hold an eminent position within the higher education and employment system in Germany. The technical and scientific areas of specialization offered by UAS are more strongly geared toward occupations in private sector companies. Therefore, the special qualifications UAS graduates offer correspond to the economy's need for academically graduated specialists. They have received a practice-oriented education and, thus, have the skills required for mastering the ever more complex tasks demanded by the industrial and service society.
In keeping with this trend, the economy has in the past repeatedly advocated a more differentiated system of higher education with a strong UAS sector. The demand for employees with a degree from a UAS has continued to remain strong. A 2001 study of 21,000 enterprises concerning the qualifications required for open positions clearly supports this conclusion (see Figure 7 and Figure 8)[vi]. UAS qualification is demanded much more often than Univ. qualification. Consequently UAS graduates show the lowest level of unemployment of all educational groups (2.6% in 1998)[vii].The respective figures for selected groups are Univ. graduates: 3.9%, skilled worker: 7.6%, unskilled: 25.8%.
Many companies make no distinction between degrees from a UAS or a Univ. when hiring. Top and highest level executive positions are open to graduates of UAS. Jurgen Schrempp for example, DaimlerChrysler's chief executive, is a UAS graduate.
In trade and industry, the starting salaries of UAS and Univ. graduates have become largely compatible. Civil service positions are still an exception. The - not admitted - reason is the fiscal consequences feared by the ministries of finance.

3.2 UAS and Univ. Education Mirrored in Manufacturing Industry Needs

Figure 8 depicts the demands made on staff groups and the required relation between theoretical / scientific and practical / application abilities[viii] in manufacturing industries. The lowest demand in both aspects is with the semi-skilled workforce. Nevertheless, they are needed if products have to be manufactured. Skilled workers and technicians require more theoretical and much more application oriented abilities. Diplom – engineers (UAS or Univ. graduates) must cover a broad range of theoretical / scientific and practice / application oriented abilities in order to innovate according to market needs.Figure 9 shows in detail how UAS and Univ. education profiles map into this very broad area. Basic research tasks demand a maximum of theoretical and scientific abilities and are hardly oriented toward practical application. Assembly and service, i.e. deployment at the customer side, requires a maximum of application and practical ability based on a sound theoretical background not available with technicians (see Figure 8). The arrows shown depict equal overall competence of the Diplom engineers (equal length) but different focus (different orientation of the arrows) of their Univ. respective UAS educational profile. The UAS profiles cover the broad range from research and development, product development, project planning, manufacturing to assembly & service. Basic research is not covered by UAS education. This is unique to the Univ. profile.

3.3 Cost of Education

There are no tuition fees in German state-run higher education. Therefore the public sector is interested in cost efficiency.
As Figure 7 shows there are considerable differences in the basic annual cost per student[iii]. With approximately 8,000 € per year and student, engineering sciences education at Univ. is twice as expensive than at UAS. Because studies at Univ. last longer than at UAS, the cost per graduate differ considerably. UAS are much more cost effective.

3.4 Cooperation with Enterprises

"UAS are especially important for the cooperation between science, research and enterprises. The applied research – a UAS trademark – allows for the fast conversion of innovations into new products and processes. Not in the least, this safeguards employment in Germany."[ix]

Cooperation between universities and research institutes on the one hand and enterprises on the other hand is of great importance for a high-tech country like Germany. Figure 12 and Figure 13 show the results of a recent satisfaction poll of 5,200 enterprises[x]. 50% to 73% of all enterprises, depending on size, cultivate contacts and cooperate with UAS. Obviously, UAS are accepted and appreciated.

3.5 UAS as Technology and Enterprise Incubators

Many economies are undergoing a tremendous structural change. Transformation of scientific findings into economic use by spin-off creation out of academia is of increasing importance during this process. Figure 14, Figure 15 and Figure 16 show the results of a recent survey of spin-offs generated by academia[xi]. 24% of the commercialization spin-offs[1] and 31% of all competence spin-offs[1] have UAS as incubators, i.e. UAS are ranked 2nd after Univ.. UAS, however, hold the top rank according to the parameter "number of spin-offs per year per 100 scientists".

4 Perspectives

4.1 Local aspects

The German system of higher education is unique in terms of structure, breadth and differentiation of its subject areas. This should prove to be a location advantage within the European economic region. Problems do not arise because UAS might be allegedly obsolete. UAS continue to play an important role in this system of higher education. Their relevance to the industry continues to grow. Problems arise because of fiscal bottlenecks which must be removed.

- UAS currently take in less than 30 % of first-year students. The common goal of the German federal government and the German states is to increase this figure to 40% in the long term. This expansion must be linked with a broadening of the range of subjects offered, to include innovative and future oriented degree programs[ii]. In this context, degree programs previously reserved for Univ. should also be offered at UAS, a consequence touching the cooperation – competition relations of UAS and Univ.. Because both, UAS and Univ., are state financed this requires budget shifts from Univ. towards UAS. This proposition may intensify competition but may also reinforce cooperation[xii].

- Previously, curricula had to observe the principle of comparability and exchangeability between universities of the same type as defined by federal framework regulations. Nowadays universities have to develop a clear profile and to enter a competition with each other. Formerly, new or modified curricula had to be approved by the responsible ministry of science before becoming effective. This quality assurance instrument currently is being replaced by accreditation though accredited accreditation agencies and by evaluation. An increasing variety of programs is following upon the standardization process of the past. However, the ministries of science basic approval of the introduction of a new degree program still is required. This will eventually lead to a controlled competition amongst universities.

- In their early years UAS were blamed for an - unproven - tendency to become a "real university". This is partly understandable, because in these early years there was no applied R&D in UAS because their predecessors had no R&D activities. However, R&D activities soon turned out to be a prerequisite for up to date UAS teaching and consequently has been introduced as a UAS duty. Contrarily, the proven and well accepted practice oriented UAS studies meanwhile led Univ. to introduce application and practice oriented degree programs by adopting the shining UAS example. This may blur UAS – Univ. specifics and, because of the better Univ. funding, be disadvantageous for UAS.[xii]

- UAS and Univ. are poorly supplied with staff and money. As a consequence more and more universities prepare to earn their own money by introducing continuing education programs subject to tuition fees and by intensifying contract R&D. In addition, there is a big discussion going on with the aim to reintroduce tuition fees for all programs and to change the university control and finance system. At the moment, nobody knows anything for sure. However there will be big changes in the future.

[1] Commercialization spin-offs put new scientific findings on the market; competence spin-offs primarily base on the special competence of the founder(s) acquired in the incubator.

- A teaching load of 18 hours per week for UAS professors (8 for Univ. professors) is no longer appropriate. It must be lowered to reach the 12 hours per week originally defined when UAS were established. 18 hours were introduced "temporarily" to cope with a phase of extremely high enrolments in the late 1970s and 1980s. So far financial restrictions prevented to get rid of the "magic 18".

4.2 Developments in Europe

Within Europe, UAS and similar institutions can be found primarily in the Netherlands, Flanders, (Belgium), Austria, Finland and Switzerland. Reform in the higher education systems of other Central and Eastern European countries has led to institutions similar to UAS, e.g. in Hungary and Poland. A total of 150 UAS degree programs have been approved in Austria since 1994, e.g. in the fields of tourism, economics, technology, information technology and multimedia. Two-thirds of all Dutch students are enrolled at the UAS type "Hogescholen", 26% of them as part-time students. The "Hogescholen" are in the process of becoming an independent part of the higher education sector with clear-cut differences to the Univ.. Switzerland introduced the first UAS degree programs in the fields of technology, economics and design in 1997. The Polish UAS, established in 1997, offer interdisciplinary subject areas oriented to the needs of the local employment market.

4.3 Recognition of German UAS Degrees throughout the entire EU

The basis for international recognition of the Diplom degrees awarded by German UAS are the directives issued by the European Community as the "General Directive on the Recognition of Degrees from Institutions of Higher Education for Admission to Professions". The recognition of "Diplom degrees, test certificates or other certificates of qualification" attained after a minimum three-year educational program at an institution of higher education and intended for entry into a profession or occupational training within the EU is carried out according to the stipulations of this general regulation. The basic principle behind the directive is that a member of a profession who has acquired the necessary education for entry into the profession in his or her native country or country of origin is also capable of satisfactorily practicing this profession in other EU member states. The regulation also applies to Bachelor and Master degrees.

4.4 Foreign Ties at the UAS

UAS maintain bi- and multi-national cooperation and exchange relationships with institutions of higher education in countries around the world. These relationships have revealed that it is precisely the practice-oriented degree programs and emphasis on applied research and development of the UAS which are of special interest for students and institutions of higher education from foreign countries. There are more than 3.500 cooperation's between UAS and foreign partner institutions of higher education in around 100 countries[IV]. Again budget restrictions are the only real problem.

4.5 International Degree Programs

Approximately 1/3 of German UAS offer international degree programs requiring that some portions of the studies are to be spent at an institution of higher education or company in a foreign country. It is becoming increasingly possible to simultaneously attain degrees from the participating institutions of higher education in these degree programs.

5 Summary

UAS are indispensable in the German higher education system and in the German economy. They play a dominating role especially in engineering sciences in terms of number of students, number of graduates, with their practice oriented up to date degree programs and teaching methods, tight relations and cooperation with industry. UAS are cost effective, responsive to market needs, flexible and innovative and well positioned. "Success story" is a label often attached to UAS.

No.	Name
1.	**Engineering**
1.1.	Architecture
1.2	Civil engineering
1.3	Interior design
1.4	Mechanical engineering
1.5	Process engineering/Chemical engineering
1.6	Supply engineering
1.7	Media engineering
1.8	Printing technology
1.9	Operations engineering
1.10	Materials technology
1.11	Physical engineering
1.12	Precision technology and microtechnology
1.13	Electrical engineering
1.14	Biotechnology
1.15	Surveying, transport and traffic technology and navigation
1.16	Agriculture/forest management/horticulture/wine growing
1.17	Landscape planning
1.18	Food technology
2.	**Business Sciences**
2.1	Business administration
3.	**Administration and administration of justice**
3.1	Administration
3.2	Police
3.3	Finances
3.4	Administration of justice
4.	**Social affairs**
4.1	Social work/Social education
5.	**Health and therapy**
5.1	Therapeutical education
5.2	Music therapy
5.3	Art therapy
5.4	Care management
6.	**Religious education**
7.	**Mathematics**
8.	**Computer science**
9.	**Information and communication science**
9.1	Archive management
9.2	Library administration
9.3	Documentation
9.4	Translation
9.5	Interpreting
9.6	Museum studies
10.	**Nutritional and domestic sciences**
10.1	Oecotrophology
11.	**Art, design and restoration**
11.1	Fine arts (painting, graphic arts, sculpture)
11.2	Design
11.3	Restoration
11.4	Multimedia

Table 1 A selection of UAS degree programs in various fields.

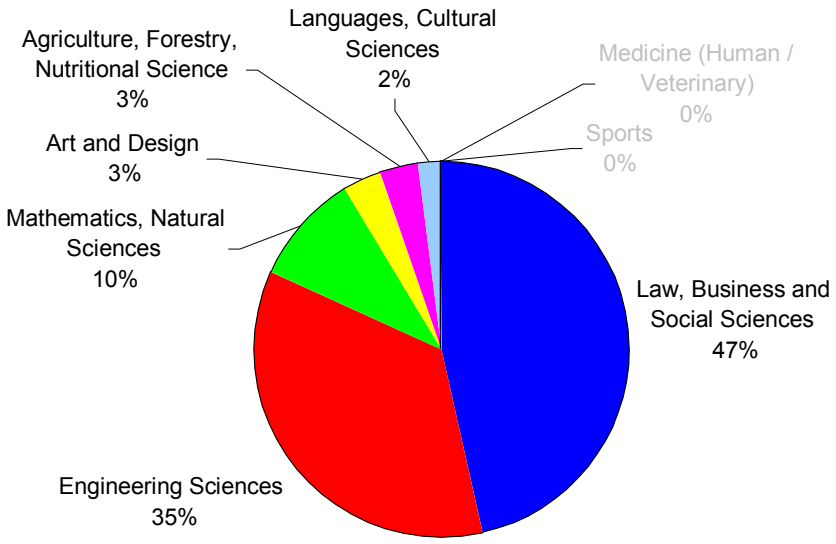

Figure 1 Distribution of student population versus subject groups in UAS with a grand total of 0.43 Mio. students (raw data: [iii]).

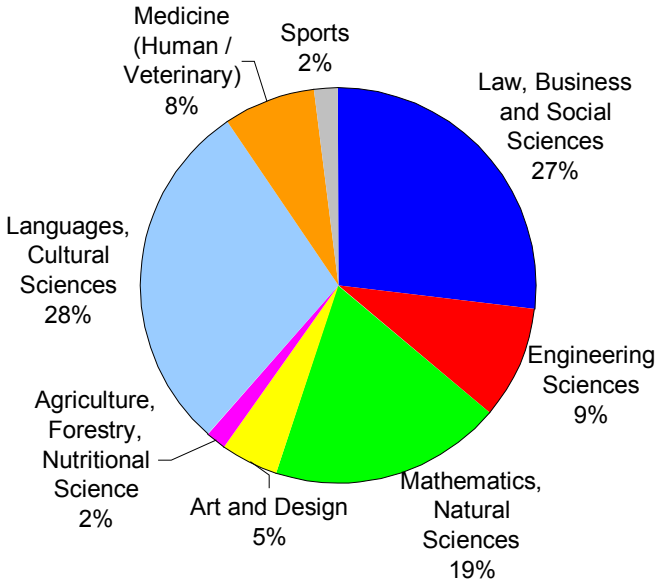

Figure 2 Distribution of student population versus subject groups in Univ. with a grand total of 1.34 Mio. students (raw data: [iii]).

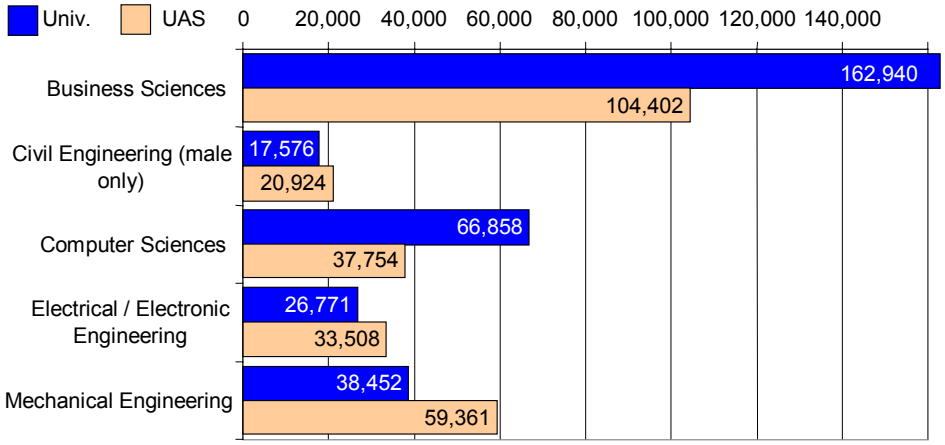

Figure 3 Number of students in selected subjects in Univ. and UAS (raw data: [iii]).

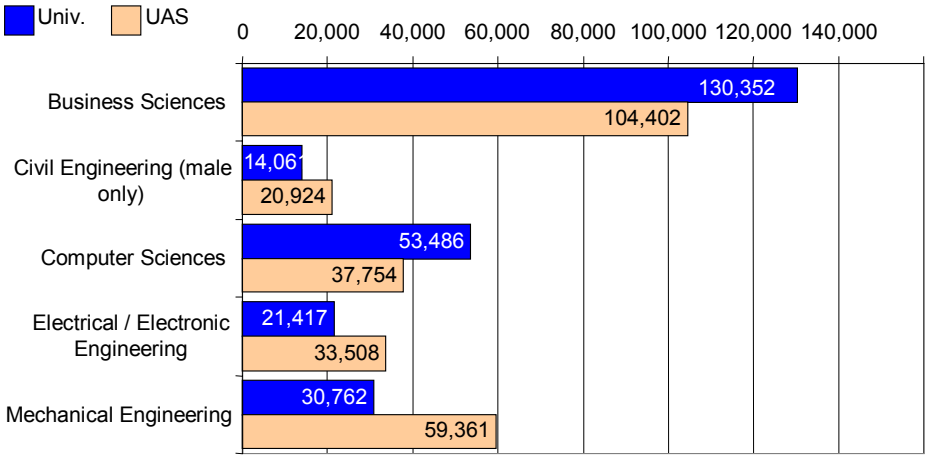

Figure 4 Like Figure 3 number of students in selected subjects in Univ. and AUS, but Univ. data normalized to the nominal study duration in AUS for better comparison (raw data:[iii])

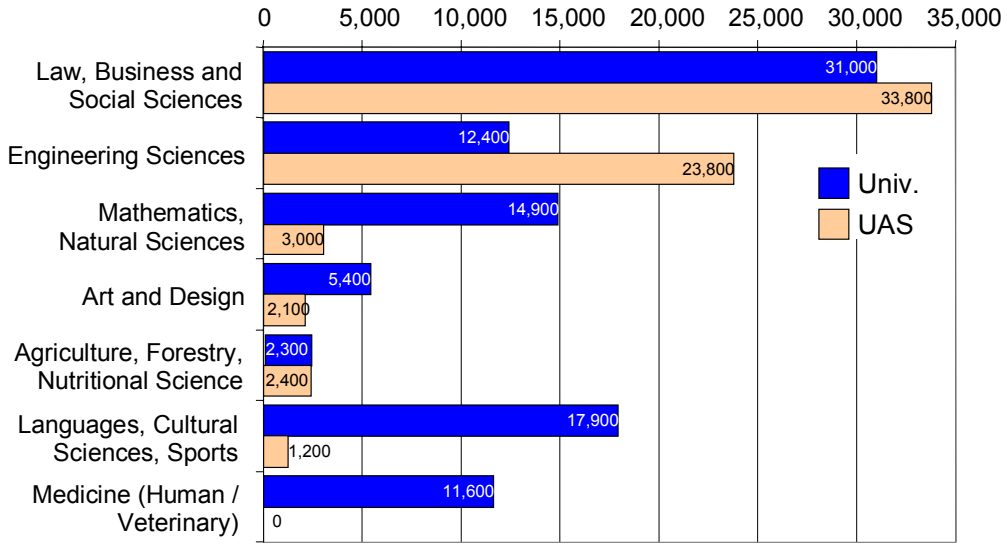

Figure 5 Number of final Diplom - examinations (graduations) completed in 2000 versus subject groups in Univ. and UAS (raw data: [iii])

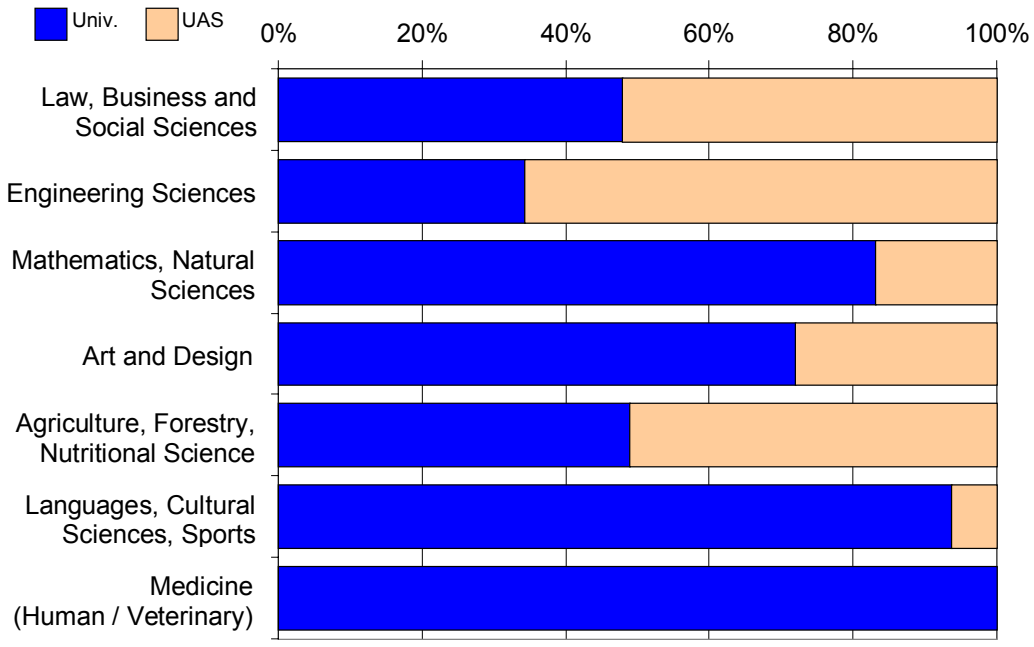

Figure 6 Contribution of Univ. and UAS to the total number of final Diplom – examinations (graduations) in 2000 (raw data: [iii])

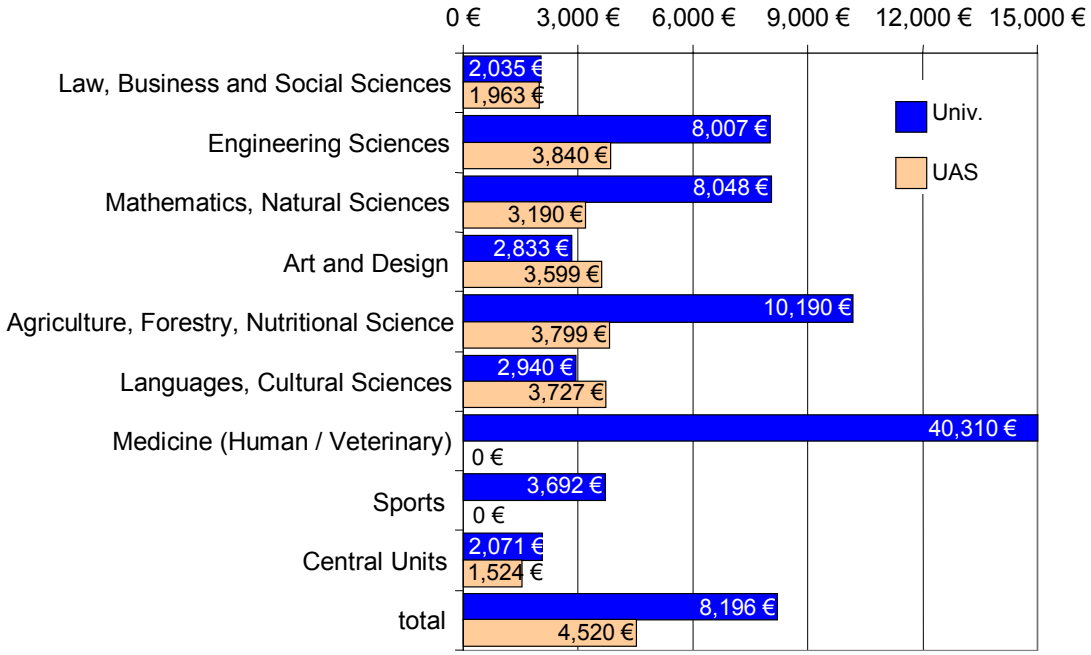

Figure 7 Basic annual cost per student versus group of subjects in Univ. and UAS studies[iii].

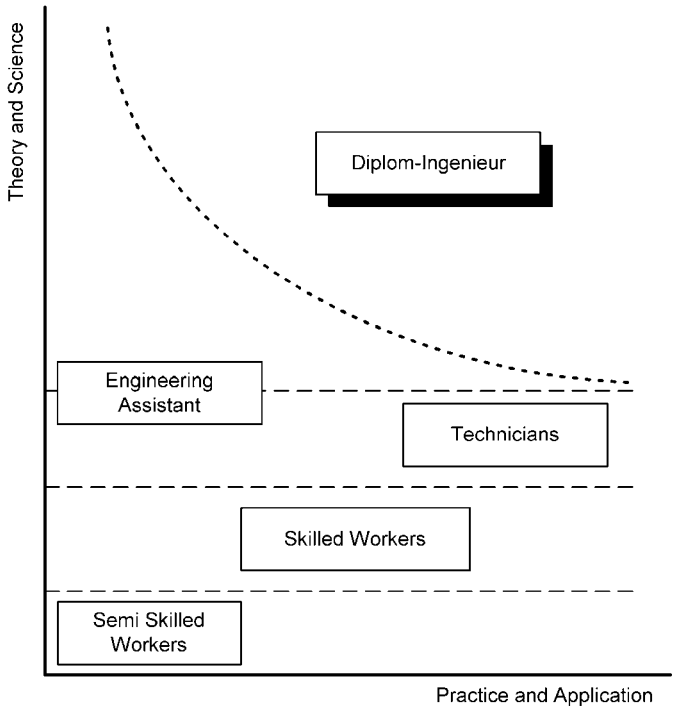

Figure 8 Demand on staff groups and required theory – practice relation in manufacturing industry (see 3.2)

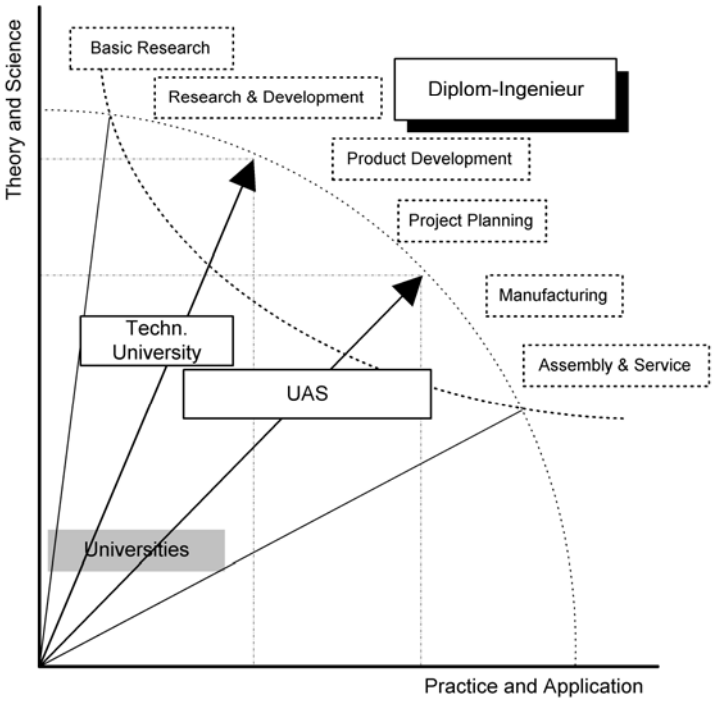

Figure 9 Education Profiles for Diplom - engineer at German universities compared to industrial needs. The UAS profile covers the broad range from R&D to assembly & service. The equal length of arrows denotes equal overall competence of UAS and Univ. graduates. Their different orientation denotes a different educational focus (see 3.2).

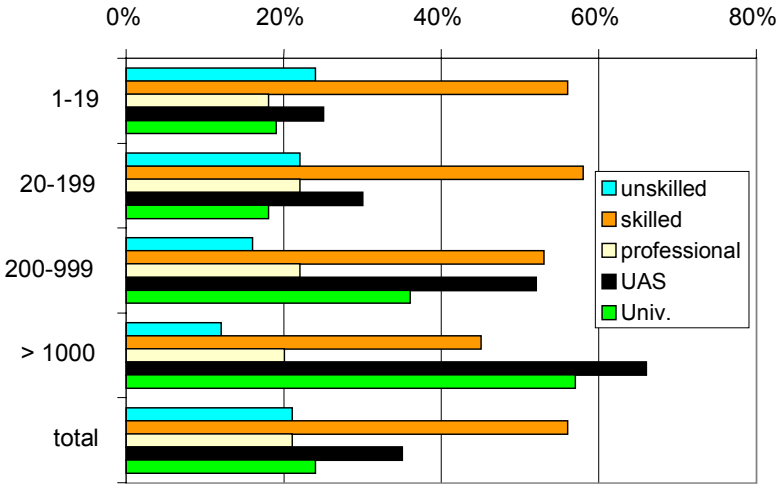

Figure 10 Staff qualification demanded for vacant job versus number of employees ('2001 study of 21,000 enterprises[vi]; multiple selections possible).

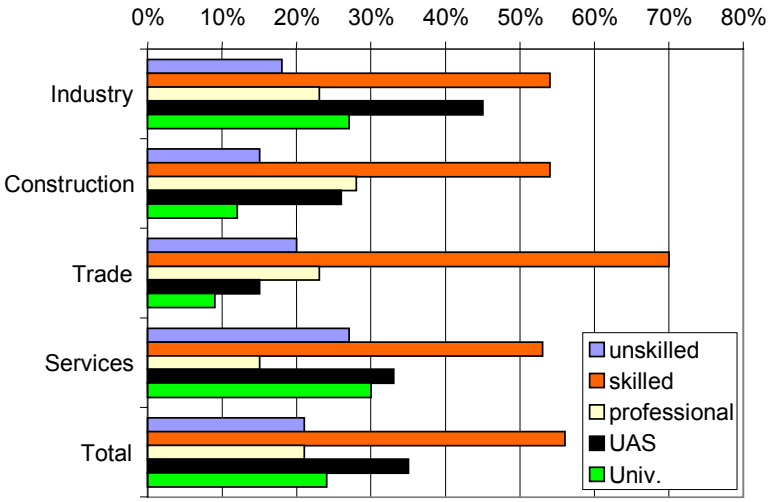

Figure 11 Staff qualification demanded for vacant job versus type of business ('2001 study of 21,000 enterprises[vi]; multiple selections possible).

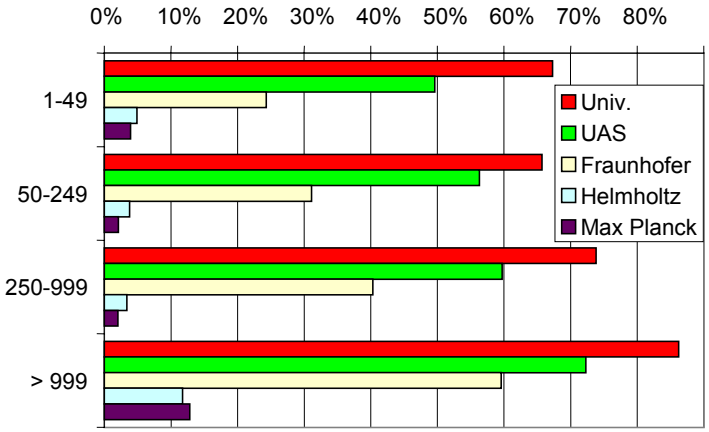

Figure 12 Percentage of interviewed enterprises having contact and cooperation with the named research institutions versus number of employees[xi] ('2000 satisfaction poll of 5,200 enterprises; multiple selections possible). "Fraunhofer", "Helmholtz" and "Max Planck" are fully or partly (Fraunhofer) state financed.

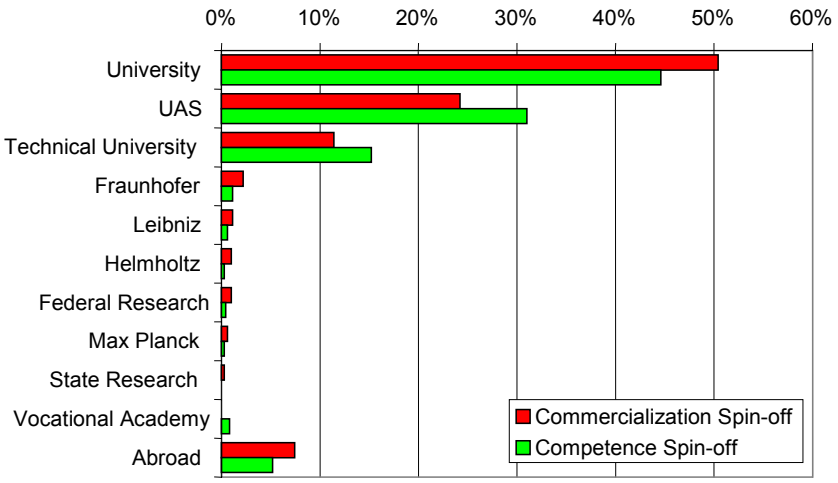

Figure 13 Types of contacts between enterprises and research institutions versus number of employees[xi] ('2000 satisfaction poll of 5,200 enterprises; multiple selections possible).

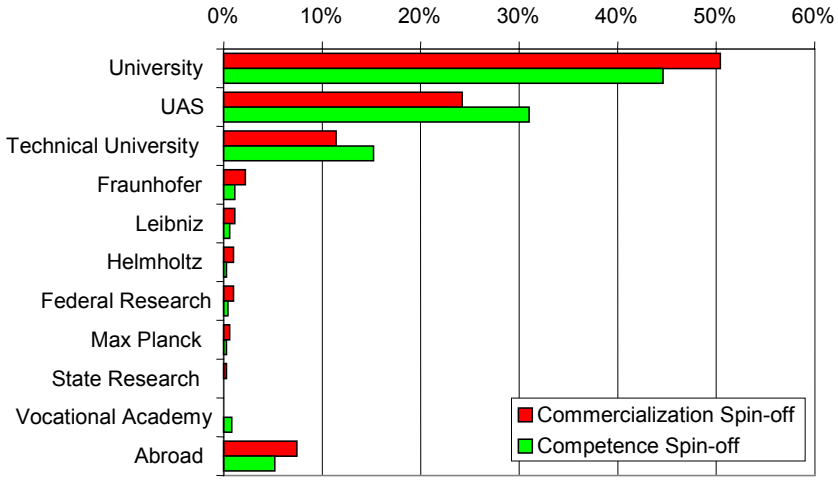

Figure14 Contribution of incubating institutions to spin-off creation in Germany in the period 1996-2000[xi]. "Fraunhofer", "Leibniz", "Helmholtz" and "Max Planck" are fully or partly (Fraunhofer) state financed research institutes and societies.

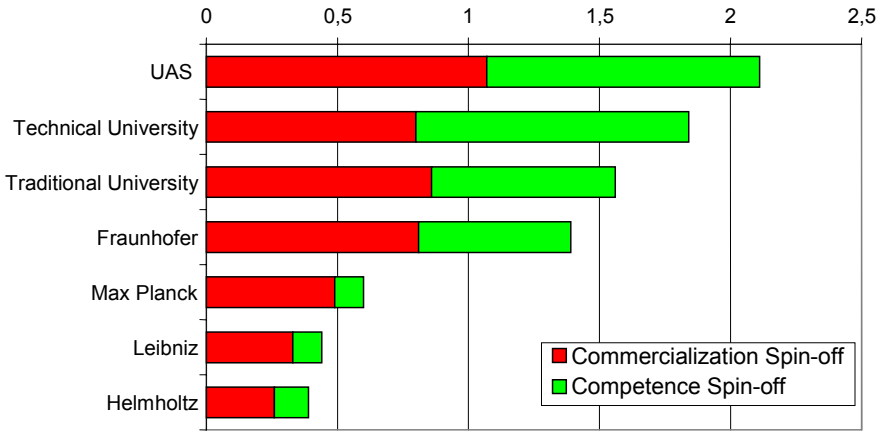

Figure 15 Number of spin-offs per year per 100 scientists versus research institution in the period 1996-2000 acting as incubator[xi]. “Fraunhofer”, “Leibniz”, “Helmholtz” and “Max Planck” are fully or partly (Fraunhofer) state financed research institutes and societies.

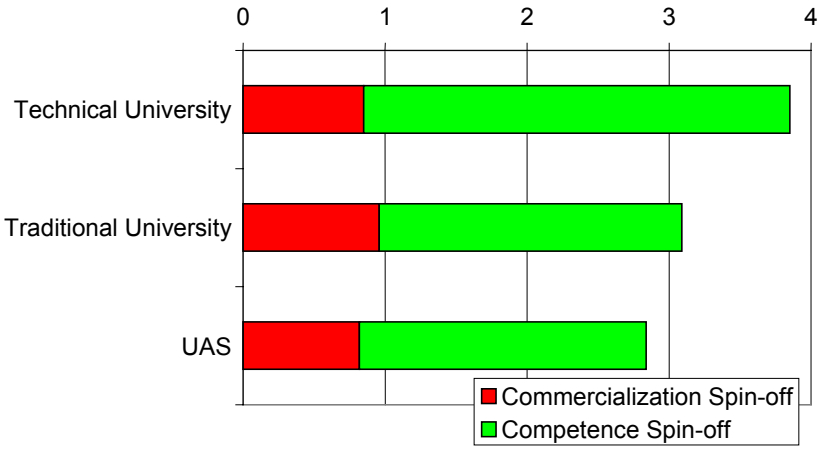

Figure 16 Spin-offs created per year by 100 students / graduates versus incubator in the period 1996-2000[xi].

References and Remarks

I Throughout this paper, “UAS” stands for “University of Applied Sciences” and “Univ.” for a collective noun referring all traditional and technical universities. “universities” denotes all institutions of higher education.

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XII “In the next 10-15 years, according to the Science Council’s opinion, it is necessary to change things and to redefine the share of all students and graduates Univ. and UAS shall have. Emphasis must be put quantitatively in the area of practice-oriented, science based professional education. Load shifts must be combined with a shift of resources.” In “Thesen zur kunftigen Entwicklung des Wissenschaftssystems in Deutschland”, Wissenschaftsrat Juli 2000 Seite 18 (“Theses concerning the Future Development of the Science System in Germany”, Science Council July 2000 page 18), www.wissenschaftsrat.de