Doctoral Education in Europe: New Structures and Models

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1. Introduction: What Makes Doctoral Education a "Hot Topic"?

Doctoral education has become a "hot topic" in Europe. Two political events triggered these discussions.

It is common knowledge that the European Commission never had any competences in the field of education, including higher education. Education was and still is considered to be an area of national importance because it is closely related to national culture and identity but also to economic competitiveness. The Treaty of Maastricht, signed in 1992, changed this to some degree because for the first time the European Commission was allowed to establish incentive programmes supporting exchange of people, cooperation of institutions and mutual recognition on the basis of trust in the field of education. This was partly due to the success of the ERASMUS Programme which supported networks of departments among which students and staff were exchanged, recognition of study abroad took place and joint curriculum development was undertaken. Still, the actual interference of the European level in any kind of curriculum development and the contents of education continued to be a taboo.

In May 1998, the ministers of education of four European countries (Germany, France, Italy and Great Britain) during a meeting to celebrate the 800th anniversary of the University Sorbonne-Paris adopted a declaration entitled "Joint Declaration on Harmonisation of the Architecture of the European Higher Education System" (Sorbonne Declaration 1998). The declaration was a first step towards creating a unified struc-

ture of studies to further reduce barriers for mobility and exchange. It was not intended to interfere into the content of studies, learning and teaching styles. One year later another meeting, including many more European ministers of education, took place at Bologna the result of which was to become the famous Bologna Declaration (Bologna Declaration 1999). It has by now been signed by 45 European countries. The most important part was the intention to create a "European Higher Education Area" until 2010 and introduce the two-tiered structure of studies consisting of a Bachelor degree of about three years' duration as the first degree providing students with an education that enabled transition into the labour market (employability is the key word here) and – for a clearly smaller proportion of students – the offer to continue with a Master degree of approximately two years' duration.

The European Commission was totally surprised by this undertaking. This was what the Commission had always wanted but was never allowed to do because education was deemed to be a national responsibility. The European Commission began to support the Bologna process which started after 1999, meaning the actual implementation on the national level of what had been decided by the ministers. At the same time the Bologna Process triggered considerable reform dynamics in almost all European higher education systems. The ministers also agreed to meet every two years until 2010 to do a stock-taking of the implementation process. They have met in Prague (Czech Republic) in 2001, in Berlin (Germany) in 2003, and in Bergen (Norway) in 2005. They will meet again in 2007 in London (UK). Each of these high level meetings is prepared by a so-called "Trends Report"[1] analysing the implementation process in the countries involved in the process. The Bergen meeting was additionally prepared by a small group responsible for a more general stock-taking after half of the period until 2010 had elapsed. In many countries smaller and larger studies are commissioned by the governments to look into the national implementation processes. A further important step was the Berlin Communiqué in 2003 informing about the intention of the European ministers to include doctoral education into the new tiered structure, i.e. Bachelor degree (3 years), Master degree (2 years), and doctoral degree (another 3 years).

The European Commission reacted to this surprising development not only by actively supporting the Bologna Process but by coming up with a similar goal in the field of research and technological development. At the Lisbon Summit (Lisbon Summit 2000) in 2000, a communication from the European Commission to the Council, the Parliament

1 For the most recent Trends IV Report cf. Reichert and Tauch (2005)

and the relevant Committees was issued proposing to create a "European Research Area". In his Lisbon speech, the Commissioner for Research, Philippe Busquin, declared to make Europe the most dynamic and competitive knowledge economy in the world until the year 2010 and in order to achieve this, it was decided to raise the proportion of the national GDP spent on research in all member states to 3 percent, thus envisaging to also raise the number of qualified researchers in Europe and to trigger further innovation.

The two processes have begun to merge: Creating a European area of higher education and a European research area in order to become a dynamic and competitive knowledge society on a global scale has not only created a renewed importance of the role of universities in terms of their task of research and research training, it has also led to a closer scrutiny of the ways in which research is currently organised.

Suddenly, money was available to study the issue of research education and training, to analyse existing problems and arrive at possible solutions. Several larger scale studies have been carried out recently, for example, the "Doctoral Programmes Project" carried out by EUA (EUA 2005), or the UNESCO-CEPES study (Sadlak 2004).

Furthermore, two networks for doctoral students have been created on a European level. One is a self-organised network called EURODOCS, in which doctoral students from a variety of member states have associated to represent their interests vis-à-vis the various policy-making bodies. The other one, with a very similar name, called EUREDOCS, is a network organised by researchers in the field higher education for doctoral students working on comparative European topics.

Overall, it has become more important to look into the issues of research training for a variety of reasons. First, there is widespread dissatisfaction with the quality and the duration of research training. Second, there is the ambitious goal to invest into research to make Europe more competitive. This has at least two consequences: (a) not all researchers will take up a career in academia and therefore might need different skills and competences than previously; (b) further barriers towards mobility within Europe must be removed but are difficult to remove due to problems of intra-European brain drain (from East to West, from South to North) and also due to increased competition within Europe, be it for tuition fees or be it for the danger to give away knowledge that can be turned into a profit through licenses and patents.

The debates and reform initiatives targeting doctoral education in recent years are clearly driven by a more utilitarian and economically oriented outlook on the production of knowledge which has a competitive edge attached to it. The question which is asked is whether current forms

and practices of doctoral education are appropriate to prepare scholars and researchers to meet the demands of society and the global world (Nerad 2004, Nerad/Heggel 2005). Relevance and employability are now also on the agenda for doctoral education.

2. What are the Problems with Doctoral Education?

UNESCO's European Centre for Higher Education (CEPES), located in Bucarest (Romania), has as its mission to promote cooperation in higher education among the states of the European region but also to provide bridges for active cooperation on a more global scale. After publishing the results of a study on the doctorate in the European region in 1994 (Kouptsov 1994) which included 31 countries and provided a description of the requirements and conditions in the process of getting a docotoral degree, UNESCO-CEPES and the Elias Foundation of the Romanian Academy of Sciences initiated another project which looked into the issue of doctoral degrees and qualifications in the context of the European Higher Education Area and the European Research Area. Thirteen national case studies were commissioned in 2003 including the following countries: Austria, France, Germany, Italy, the Netherlands, Norway, Poland, Romania, the Russian Federation, Spain, Sweden, the United Kingdom, and the United States of America. The United States were intentionally included because their model of doctoral education, i.e. basically organised within the framework of graduate schools, is often referred to as a model for Europe (Sadlak 2004).

The synthesis of these country studies (Kehm 2004) identifies the main challenges and trends in the development of doctoral studies from the perspective of the Bologna process requirements. Altogether eleven main concerns and issues were identified.

2.1 Institutional Structures and the Shape of Doctoral Education

There is a clear trend to establish a more formal structure for doctoral education including course work and research education and training within disciplinary or interdisciplinary programmes or graduate schools.

Programmes or schools are intended to reduce the length of doctoral education, to prevent or reduce drop-out and to provide a more targeted research training. Following the course work they also include a detailed

work plan for carrying out the research for the thesis which often takes place under shared supervision. Currently, in those countries following the traditional "master – apprentice – model" the old and the new system of doctoral education exist parallel (e.g. in Germany, Austria, Russia, Poland, Italy, Norway). While the traditional apprenticeship model relies on a personal relationship between doctoral student and supervisor, the structured programme model has a more regulated and standardized approach.

As the European countries which have signed the Bologna Declaration are currently re-designing their degree structures as well, the shape of doctoral programmes is also dependent to some extent on the question whether the new Master degrees should include a research option which may at the same time represent the taught part (or some of it) of doctoral studies. This is the model of the Anglo-American graduate school and an option under debate in France and Spain. In contrast to this, the German regulations require a distinction between research oriented and professionally oriented Master programmes and a successful completion of a Master degree before there is an opportunity to start the phase of getting a doctorate.

In some countries (e.g. Sweden, Spain, but also in the USA) we find two distinct phases in doctoral education, the first phase mostly including the course work and finishing with a candidate degree or a certificate in advanced studies while the second phase more or less consists of research work and writing the thesis.

Quite a few countries have detailed regulations concerning the institutions being allowed to offer doctoral education or set up graduate schools and have defined requirements which institutions and doctoral candidates have to fulfill in order to start doctoral education. These regulations are most pronounced in Russia, Sweden, Norway, and the UK, though in each country for different reasons. In particular the Netherlands, Norway and Sweden but also Italy, have some kind of contractual relationship between the doctoral student and the institution, regulating the rights and obligations of both sides. As a rule, institutions offering doctoral education and awarding doctoral degrees must either be accredited by the state to do so or be a certain type of institution (i.e. a university). Private institutions and the non-university sector institutions can not award doctoral degrees. However, exceptions to this rule exist as well. Often selected extra-university research institutes and/or academies of science have been granted either the right to confer doctoral degrees or the right to train doctoral students in cooperation with a university which then confers the degree. In several countries (e.g. the Netherlands, Spain, Sweden) also higher education institutions without university

status can cooperate with universities in the framework of graduate schools or, as is the case for Sweden and Norway, may even award doctoral degrees in specified subjects. Only in Russia the doctoral degree is awarded by a governmental body rather than by the institutions. In Romania doctoral degrees have to be validated by a national body.

In the UK, in Austria and also in the USA we find an emerging distinction between research doctorates and professional doctorates. This distinction also shapes some elements of the programmes for doctoral education and training. There is still a problem of definition and distinction in these countries in terms of doctoral education versus research training. Closely related to this issue is the status of doctoral candidates ranging from fully salaried employee via hybrid states in between employee and student to grant holder and to fee paying student (for more details on this issue cf. Section 3.3 and 3.10).

2.2 Admission into Doctoral Education and Training

Admission again ranges from highly regulated and highly competitive to rather informal and unregulated. The apprenticeship model is very informal and unregulated – i.e. a student does not have to do any course work and can choose his or her own topic for the thesis but has to find a professor who accepts the task of supervision and the chosen topic – while the programme or school model tends to be highly regulated and contractual in a variety of aspects. Some of the European countries (e.g. Italy, Sweden, Romania, the UK) only allow a fixed number of doctoral candidates which makes admission highly selective as there are usually more applicants than places. Reasons to restrict the number of doctoral candidates are typically the requirement to guarantee adequate resources and support or, in the case of Italy, the number of available tenured positions for postdoctoral academic staff. In Sweden there was a sharp decline in number of applications when admission into doctoral programmes was restricted in 1998. At that time admission was made dependent on available funding for the entire period it took to complete a doctoral degree which the university had to guarantee. In disciplines with less access to external funds (e.g. humanities and social sciences) this led to a considerable decrease in the number of doctoral candidates.

As a rule, all doctoral programmes have admission procedures. Entrance examinations, however, are only carried out in Russia, Italy, and Romania. Sweden, Norway and the Netherlands have introduced or are currently introducing official admission procedures, i.e. establishing rules for application, eligibility, selection and decision about candidates applying for participation in a doctoral programme. In the UK a code of

ethics and minimum threshold standards including good practice guidelines for doctoral programmes and regulations concerning a critical mass of available researchers and supervisors have been introduced which also guide selection, admission, enrolment and induction of doctoral students.

It is also noteworthy that admission into doctoral programmes or acceptance as doctoral student is possible in some countries without a previous degree, in other countries after a Bachelor degree (or equivalent), and in again other countries after a Master degree (or equivalent). If we take into account that not all European countries have established the tiered pattern of 3 plus 2 plus 3 in all subjects and all institutions, denoting the number of years to attain a Bachelor, a Master and a doctoral degree which has been proposed in the framework of the debates to create a European Higher Education and Research Area, the requirements for access in terms of number of years of previous study and previous formal qualifications vary considerably. In addition, there are efforts in several European countries to open access into doctoral programmes for professionals with practical experiences (for more details on this issue cf. Section 3.10), so that diversification in terms of access and admission requirements increases even more.

2.3 Status of Doctoral Students and Requirements

In many countries, the status of doctoral students is that of a student being enrolled at a university and affiliated to a department, a research institute, a research team or a laboratory in his or her field of specialization. In addition, a doctoral student might also be a member of a graduate school or participate in a cross-disciplinary doctoral programme. Such schools and programmes frequently ask for tuition fees. However, there are a number of exceptions.

In Poland, many doctoral students have the status of junior scholars being employed by the university as assistant teachers. This provides them with faculty privileges but no regular salaries. Currently a new draft law envisages giving doctoral students a student status rather than continuing with the status of being a member of the faculty. In France, doctoral students enter into a contractual relationship with their university by signing a “Charter of Thesis” which defines the responsibility of both sides. They a have student status and must be enrolled so that they are eligible for social security benefits. In the Netherlands, a new system of doctoral training was introduced in 1986 giving the doctoral student a status of doctoral trainee being employed and salaried by the university on a temporary basis. For training and supervision fees are deducted

from that salary. Dutch doctoral students also have a contractual relationship with their university establishing a plan for training and supervision. These arrangements have been characterized hybrid because in the Netherlands doctoral trainees are neither fully salaried nor do they have a proper student status. This has led to an emerging shift away from research training towards doctoral education but within the framework of regular employment (de Weert 2004). Romania as well has a somewhat hybrid status for doctoral students who can have a teaching or laboratory position for up to half of the regular workload of a university assistant. Sweden and Norway are probably the most advanced of all countries in Europe concerning the contractual relationship and guaranteed funding of doctoral students during their entire period of getting a doctoral degree. Usually they are appointed to a postgraduate studentship which includes course work as well as some teaching or research obligations which may not exceed 20 or 25 percent of a regular workload. They do their work on the basis of a general and an individual study plan which is approved by a faculty board. Annual follow-up of the plan is part of the agreement.

2.4 Funding Doctoral Education and Training

The funding of doctoral education and training is another issue of great diversity. In some countries doctoral programmes ask for tuition fees, others pay their doctoral candidates. Often doctoral students are offered a position as paid teaching or research assistants. Such positions constitute an additional workload and usually lengthen the time-to-degree. Many countries provide a range of state grants or scholarships which usually have no social security benefits included. Frequently, there is also a possibility for part-time doctoral studies so that funding can be secured through an outside job or through a university job. The mostly rather insecure financial situation of doctoral students has led to a number of concerns in terms of status, time-to-degree, and drop-out rates. A number of countries (e.g. the UK, Norway, Sweden, the Netherlands) have tried to remedy this by establishing rules and regulations for doctoral training and supervision, restricting doctoral training and education to certain institutional frameworks and availability of resources and by entering into a contractual relationship which defines the rights and obligations of both sides.

2.5 Increase in the Numbers of Doctoral Students

Since the 1990s, most European countries have experienced an increase in the number of doctoral students. In Spain the number of students enrolled in doctoral studies as well as the number of students awarded a doctoral degree doubled between 1990 and 2000. Numbers in Sweden increased by 35 percent during the 1990s and then stagnated between 1998 and 2000. A similar development is noted in Austria: a tenfold increase in number of doctoral students between 1980 and 2000 and then a sharp decline reducing the number to the level of 1990 due to new state regulations. Since the 1980s the number of doctoral degrees awarded in Germany has more than doubled and with about 24,000 doctoral degrees awarded annually Germany belongs to those countries worldwide in which the highest number of doctorates are awarded. To provide a context for this figure: In the UK about 14,000 doctoral degrees are awarded annually and in France about 11,000. In the USA approximately 1.2 percent of all citizens above the age of 25 have a Ph.D. degree, while the same figure for Germany is 1.8 percent and the average proportion across all OECD member states is 1.0 percent (OECD 2002, Enders 2005b).

Between five and nine or ten percent of all students having successfully completed a first phase of studies and received a degree go into doctoral training (in the UK 5 %, in Italy 6 %, in Germany 8.9 %, in the Netherlands 9 %). An exception in this respect is Spain where 30 percent of all graduates go into doctoral studies.

In the majority of European countries medicine and sciences continue to have the highest number of doctoral candidates. However, the increases over the last decade have often been due to an increase in the proportion of women going into doctoral training – e.g. in Italy 53.1 percent of doctoral students in 1999/2000 were women, in Spain the percentage of female doctoral students is currently 51 percent, in France 40 percent of doctorates were awarded to women in 1998 – but also to an increase in the proportion of part-time doctoral students and to a higher number of persons returning to university for doctoral studies after a period of employment. Looking at the subject distribution the picture is more varied again. In some European countries the increase in the number of doctoral students has been in the humanities and social sciences as well as in what has been called “professional subjects”, e.g. management and education, while in others these fields experienced a decline in favor of natural and medical sciences.

Most European countries, with the exception of the Central and Eastern European countries also experience an increase in the number of

doctoral students from abroad. France, for example, awarded 25 percent of its doctorates to foreign students in 1998, in Germany the proportion was 7.5 percent in 2000. The UK boosts a proportion of 44 percent international students in doctoral education, 13 percent of whom coming from the EU member states and 31 percent from other countries.

2.6 Duration of Doctoral Programmes and Attrition

The majority of European countries have some kind of proxy in terms of the length of doctoral programmes. As a rule, duration is between two and four years. But in many countries it has been increasing and thus also the average age at the award of the doctoral degree. In recent years many reforms and further regulations have been introduced because of concerns about the actual time-to-degree and high drop-out rates. Mean age at the time of defense of thesis varies according to subject. For example, in Germany the mean age at defense of thesis was 31.9 years in 1990, in 1995 it was 32.0 years, and in 2000 it was 32.7 years. In Norway and Sweden the mean age at defense of thesis is even higher (around 37.7 in Norway in 1995 and 37.9 in Sweden in the same year) and has not been much reduced in the recent years (37.4 years in Norway in 2000 and 37.2 years in Sweden in 2001). In both of the latter countries, however, the average age when beginning a doctoral thesis is considerably higher than in the other European countries. With the exception of Norway and Sweden, the reasons for the increasing age at completion and high drop-out rates are basically insecure funding and the need to earn money, lack of supervision, additional research and teaching duties, and last but not least insufficient structuring of doctoral programmes.

Those countries having two phases in doctoral training – be it two degree levels or course work followed by writing the thesis – tend to complain about the fact that the second phase is often not completed. “ABD”, or “all but dissertation” is the American expression for this. The Netherlands have introduced a type of honorary title (doctorandus) denoting the fact that a person has been part of a doctoral programme at one stage in his or her life. In the USA a doctoral candidate having successfully completed the course work for a PhD but not written a dissertation receives a Certificate of Advanced Studies. A few other countries (e.g. Spain, Sweden, and Russia) have an intermediary degree as well (Diploma of Advanced Studies, licentiate, candidate) indicating that some part of doctoral training has been followed. The actual availability of statistics on this aspect varies from country to country, but it typically takes between three and up to five or six years on average for writing the

thesis after having completed the first part, i.e. either a degree or required course work. Even in the USA course work takes two years on average but completion of degree between six and nine years with high drop-out rates.

Those countries which have introduced relatively structured programmes for doctoral education including an official part-time status, and have opportunities available for getting funds are usually more successful in reducing duration and preventing drop-out. Typically drop-out rates are higher in the humanities and social sciences than they are in the natural sciences and in engineering. Many European countries do not have statistics about drop-out rates. There are some exception, like France for example, where drop-out rates vary on average between 12 percent in science subjects and 51 percent in humanities and social sciences. Other exceptions are the Netherlands which have a drop-out rate of about eight percent and Russia where the drop-out rate is estimated at about 10 percent.

2.7 Supervision and Quality Control

In most European countries it is assumed that the long duration until completion of the doctoral degree is directly related to a lack of proper supervision and insufficient quality assurance mechanisms. In Austria 'overcrowding' in some undergraduate programmes (e.g. a staff-student-ratio of 1:355 at the Vienna University Institute for Political Sciences) seriously threatens the quality of doctoral education due to a lack of supervision since professors are overburdened with undergraduate work (Pechar/Thomas 2004). But even in those countries which have a more structured doctoral education in a framework of proper programmes or graduate schools or colleges, insufficient supervision has been a continuous concern. Only in the Netherlands, Sweden, Norway, and Russia a regular, i.e. at least annual, follow-up of agreed study and supervision plans takes place. However, only those countries requiring a contractual relationship between the institution and the doctoral candidate or having a code of ethics which includes the rights and obligations of both sides and have some kind of appeal mechanism (UK, Netherlands, and Sweden) seem to be able to achieve better results in terms of time-to-degree and attrition.

Quality assurance mechanisms for doctoral education and training seem to be most pronounced and highly regulated in the UK. The establishment of these mechanisms was due to concern about poor completion rates. Since January 2001, the British Quality Assurance Agency (QAA) has established a framework for all degrees, including the doc-

torate, which defines the required skills and competences which must be demonstrated in order to be awarded the respective degree. It has also put a new emphasis on minimum standards, facilities and support structures which must be in place before an institution is granted the right to award doctoral degrees. At the same time, the British case in comparison to other countries tends towards over-regulation.

In Sweden postgraduate education is evaluated every six years by the National Agency for Higher Education. In the Netherlands the research schools are subject to quality assessment as well. However, there is an additional financial incentive as universities get extra funding for each doctorate that is awarded. In Spain doctoral programmes are evaluated annually by a University Commission. In addition, external evaluation of doctoral programmes is required to obtain state funding. In France postgraduate or doctoral schools are only recognized for four years, which is the length of the contract between the individual institution and the state. After four years there is an evaluation and – depending on the outcome – the contract can be renewed or not. Italy has only recently introduced some quality mechanisms for doctoral education and Germany and Austria are still rather dependent on the traditional model of individual acceptance of a doctoral candidate and his or her topic by a professor who agrees to supervise the research and thesis. In both of these latter countries, however, the establishment of doctoral programmes and graduate schools is very much on the policy and reform agenda. With the support of the German Research Council, more than 280 graduate schools for doctoral students have been set up over the last 15 years and other bodies are funding similar models as well. Also Austria has started to set up graduate programmes. But the majority of doctorates in both these countries is still awarded on the basis of the master-apprentice-model.

Russia, Romania, and Poland tend to rely on state regulations and governmental bodies. In Romania and Russia in particular, over-regulation seems to be the case including extensive accreditation and validation measures as well as process control. In Romania all doctoral degrees have to be validated by a national council, in Russia all procedures of accreditation, licensing and certification are carried out by federal bodies.

Despite that fact that all European countries have either ex ante or ex post quality assurance mechanisms in place, there is great variation and no optimal model is emerging as yet.

2.8 Mobility and International Exchange

Although mobility of young researchers is high on the European policy agenda, quite a number of European countries have relatively low mobility rates among doctoral students. Mobility tends to take place when enrolling in a particular doctoral programme and there is clearly competition among the countries for best talent. Central and Eastern European countries continue to suffer from brain drain although they often want to give their students, including their doctoral students, the opportunity of experiences abroad. The Netherlands and the UK, in particular, are making efforts to scout for talent and guarding it, often trying to provide a variety of incentives for doctoral students from within as well as from outside the country to complete a whole programme at one university. This is related to funding and income generation on the side of the institutions as well as competition for best talent. The USA are rather successful in attracting doctoral students from all over the world. Almost half of all American doctorates in engineering, mathematics and computer sciences are awarded to international students many of whom intend to stay in the country. Also in the Netherlands some technical sciences recruit up to 50 percent of doctoral students from abroad, in particular from Asia and Eastern Europe. In the UK the proportion of British doctoral students has fallen from 64 percent in 1994/95 to 56 percent in 2001/02. Accordingly, the proportion of doctoral students from other EU countries ranges between 8 and 13 percent depending on the field of study and the proportion of other, i.e. non-EU, international students in doctoral programmes ranges from 28 to 31 percent. The proportion of foreign doctoral students in Spain is also quite considerable with 16 percent in 2000. The percentage of doctoral degrees awarded to foreigners in Germany was about 7.5 percent in 2000. In addition, 26 (9 %) of the 286 graduate colleges funded by the German Research Council in 2001 were international ones. All European countries have mechanisms in place to receive doctoral students from abroad and recognize their previous qualifications. In most countries, with the exception of Spain, the thesis may be submitted in another than the host country language (basically French, English, or German). However, Spain has a number of joint doctoral programmes with institutions abroad in place which include a research period abroad and finish with a double degree or joint degree.

In general, exchanges of doctoral students for a limited period of study, research, or training abroad tend to be more problematic in engineering and in the natural sciences as doctoral students in these fields are more often integrated into groups of researchers doing applied research

or working on a topic with a competitive aspect. As European patenting, licensing and intellectual property rights are not wholly regulated as yet some research groups feel that they might lose their competitive edge if they send their doctoral students abroad.

2.9 Award of Titles and Degrees

The main part of getting a doctoral degree is writing the thesis or dissertation and defend it publicly in front of a commission. This procedure is basically the same in all European countries. Other aspects of getting the doctoral degree vary to a considerable extent. Quite a number of countries require successfully completed course work as part of getting the degree, other countries require additional written or oral examinations. Finally, many rules and regulations can be found in terms of the composition of the commission and in terms of the process to defend the thesis. As a rule, the doctoral degree continues to be considered as a degree qualifying for independent research. Accordingly, the thesis must consist of a piece of original research on a chosen and approved topic in a particular field or discipline. However, the traditional perception of the doctoral thesis as a 'masterpiece' is changing in some countries to a perception of writing an 'apprenticeship piece', thus taking into account that the completion of a phase of research training should not be equaled to the work of a researcher with many years of experience.

Russia has probably the most complex set of regulations concerning the doctoral thesis. It consists of altogether four steps. The first is a preliminary defense of the thesis in the responsible department. The department evaluates and recommends the work for the final defense. The candidate then submits his/her dissertation to the university dissertation council. The dissertation council again undertakes a preliminary evaluation and assigns a so-called "leading organization", i.e. a second university, for refereeing the thesis as well as two opponents for the defense. The final defense of the thesis is carried out in front of a public audience and consists of a debate between the candidate and the members of the dissertation council and the opponents. This is followed by a secret ballot to vote on the success or the failure. In case of success the dissertation and all documents are submitted to the Higher Certification Commission of the Ministry. This Commission will evaluate all documents and after final consideration award the degree. It must be pointed out that it is rather unusual that the result of the defense is achieved by a secret ballot rather than by open acknowledgement whether a candidate has shown sufficient research capabilities or not.

Poland, Romania, Spain, and Sweden include external examiners for the process of defending a thesis. These can be from another university within the same country but also from universities abroad. In most European countries there is a trend to include more examiners or referees from abroad or to cooperate with universities abroad in doctoral programmes including the award of a joint degree. This indicates a move towards increased international cooperation and validation of doctoral degrees.

With the exception of Germany and Austria, most other European countries have implemented regulations to make sure that the examinations and the defense of the thesis are refereed by juries or examination boards that have no direct or personal relationship with the respective candidate for the doctoral degree. Typically the supervisor of the thesis evaluates the work before it is officially submitted but after that the supervisor has little or no influence on the process and the decision to award the degree. Despite attempts to de-personalize the process of getting the doctoral degree by setting up doctoral programmes and schools, Germany and Austria still follow the tradition that the doctoral student chooses his or her supervisor who has often been already the main examiner for the first degree. This supervisor also acts as the main referee of the doctoral thesis, selects a second referee, and is the main examiner in the oral defense of the thesis. This configuration can become very personal and shaped by dependency of the candidate on the supervisor. However, it is also possible for the doctoral candidate to change his or her supervisor.

2.10 Professional Doctorates as a New Trend

A number of countries (e.g. USA, the Netherlands, UK, Austria with one pilot project) have started to introduce what is being called a "professional doctorate" which is distinct from the traditional research oriented doctorate. Professional doctorates (e.g. in management studies, education, applied sciences, public services) tend to be somewhat less demanding as regards the requirement of producing an "original piece of research". They are often related to projects carried out within an enterprise or in another future field of employment and jointly supervised by the home university and the respective enterprise. The course work emphasises more generic skills and interdisciplinary approaches. The inception of such professional doctorates is closely linked to a growing concern about the employability of doctoral degree holders in the labour market outside academia (also Bourner/Bowden/Laing 2000).

But there are still a few countries, for example Poland and Italy, in which employment of doctoral degree holders outside research institutes and academia is rather untypical. Generally, potential employers in the private and public sector criticise that doctoral degree holders are too narrowly specialized and lack generic and transferable skills. The new development of professional doctorates is intended to redress this problem by paying more attention to the issue of employability of doctoral students outside academia. In several fields of study and scholarship (e.g. medicine, chemistry, business administration or law) this is not new and has been practiced for quite some time, but there are new aspects to the issue of professional doctorates. In the Netherlands, the UK and also in the USA the emerging knowledge economy more and more often requires a workforce having research skills. In the UK and the USA this development has led to the construction of "professional doctorates" (e.g. in fields such as economics and business studies or in education) preparing the respective students not only with research skills but other generic skills and competences as well, like managing research groups and large projects, communication competences and the ability to work in teams. Usually the requirements for a thesis in such programmes are somewhat less demanding than for a research doctorate.

The basic concepts in the development of "professional doctorates" include the definition of quality, standards, and skills and entail more regulation in terms of necessary support structures and supervision. First pilot projects are on their way to achieve a stronger cooperation with industry and business (e.g. through project work in industry or joint supervision of research) and establish research schools in applied sciences (e.g. chemistry, physics, biology, public services). It is as yet unclear whether this development will eventually lead to a training status or to an employment status of the doctoral students. Overall, the number of programmes for professional doctorates is growing (cf. also Bourner/Bowden/Laing 2000, Scott 2004).

2.11 Transition into an Academic Career

Basically the majority of doctoral degrees continue to be considered research degrees preparing for a career in universities or research institutes. However, in most European countries there is a certain openness of the non-academic labour markets in the public and private sectors to recruit doctoral degree holders for particular positions and job tasks. Only in Poland, Italy and Spain employers outside academia are not or not yet very interested in hiring such highly qualified persons. In Germany and Austria, in particular, there have always been possibilities for

doctoral degree holders to find appropriate employment outside academia without there being a pronounced distinction between research doctorates and professional doctorates. The example of chemistry in Germany might illustrate this. A doctorate in chemistry is practically required to find employment in this field at all. A similar case is medicine. Most medical students get a doctorate because it belongs to the prestige and social status of this professional group. In Germany as well as Austria, quite a few teachers at upper secondary schools preparing for access into higher education have doctorates as well and many positions in the departments of the ministries of state and federal government have doctoral degrees.

A contrasting example is Italy where the number of doctoral students is basically limited to the number of available positions within universities and research institutes. However, in most other European countries the number of doctoral students has increased over the last ten to fifteen years and in some countries efforts to raise their numbers still continue. In several countries the number of staff positions in research and academia has not increased to such an extent that all doctoral degree holders will immediately find adequate employment. Therefore, postdoctoral fellowships provide a possibility to extend the period of transition into an academic career after having achieved a doctoral degree. As the transition period has become markedly more difficult and/or prolonged, the postdoctoral period has become an issue of concern and scrutiny in several European countries as well. The "overproduction" of doctoral degree holders has basically led to various types of post-doctoral fellowships, which can be characterized as "holding positions" until proper employment is being found. But this also prolongs the time until the beginning of a proper career and introduces an additional layer of uncertainty. Seen from a perspective of return on investment and productivity this situation is economically not very viable.

3. Conclusions

If we try to summarise the eleven issues or problems being visible in terms of doctoral education today we can arrive at two large complexes, the first one having to do with the structure of programmes, funding and quality of supervision in the process of getting a doctoral degree, the second one having to do with transition into employment and adequate employment. There is a basic agreement in Europe that high quality research training as well as a higher supply of qualified researchers are important elements to realise the vision of a Europe of knowledge. To

achieve these goals doctoral education and research training is supposed to be given more structure and to improve its quality and relevance. In identifying the goals of the reform and analysing the instruments and models used to implement it, we can observe two underlying trends.

The first trend is that doctoral education and research training is no longer regarded exclusively as curiosity driven and as the disinterested pursuit of knowledge. Instead the generation of new knowledge has become an important strategic resource and economic factor. It thus becomes a commodity and its shape acquires a more utilitarian approach. Policy makers have begun to scrutinize research training and universities have been requested to develop institutional strategies to improve it. In addition, it is deemed so important a resource that it is no longer left in the hands of professors and departments but has become an object of policy making and has moved to the institutional and national, even supra-national level.

The second trend is that in most highly developed countries across the globe there has been a considerable increase in the number of doctoral students and doctoral degrees awarded over the last ten to 15 years. A further considerable increase is expected as a result of the implementation of the Bologna Process and the Lisbon Agenda. This means that an increasing number of doctoral degree holders will not remain in academia but seek employment on the labour market outside universities and research institutes or academies of science. Actually, this development is expected to trigger economic growth and innovation. However, for these jobs a research training within disciplinary boundaries and the acquisition of skills geared towards teaching and research in higher education institutions are deemed to be insufficient. Thus, reforms of doctoral education and research training are a must, even if we don't agree to the trend towards commodification of knowledge production.

The impact of globalisation with its increased emphasis on competition on the one hand and strategic alliances on the other has been identified as one of the main factors triggering change in doctoral education and research training. Globalisation is linked to the faster dissemination of information and knowledge through new information and communication technologies. This has not only led to the fact that information and new knowledge become outdated much faster than before but also to a higher relevance of knowledge generation. In the emerging knowledge societies or knowledge based economies knowledge production becomes commodified and a strategic national resource. These developments have started to have an impact on the ways in which knowledge is generated in universities and finally how education and training for the future knowledge producers is organised. It is no longer almost exclu-

sively geared towards self-recruitment of the teaching and research staff within academia but towards a much broader range of careers in society and the economy.

Emerging models for research organisation and research training for the knowledge society differ from traditional models in several respects. Paavo Uronen (Uronen 2005) has summarised them as follows:

- from national to international,
- from basic, curiosity driven research to results oriented research (i.e. relevance, impact),
- from individual research to team research,
- from narrow, disciplinary oriented research to multidisciplinary research,
- from small laboratories to larger research institutes, programmes and centres of excellence (i.e. critical mass),
- from fragments to big science,
- from public or university funded to multiple funding sources,
- from unbound research to research within programmes and projects
- from purely academic to also professional,
- from national security to competitiveness and job creation
- from utilisation of resources to sustainable development.

I would like to emphasize in particular four of these dimensions:

- There is a trend to approach doctoral education and training in a more systematic way by providing structured programmes and more transparency, including codes of ethics and regulation or even contracts to define the rights and responsibilities of students, supervisors and institutions. Critical mass and concentration in centres of excellence or strategic networks are issues here as well.
- There is a stronger trend towards internationalisation of research training through mobility and in the substance of what is taught studied and learned.
- There is an increase in governmental and institutional steering of research training emphasizing institutional, societal and economic relevance as well as competitive advantages.
- There is a growing amount of interdisciplinary approaches in doctoral programmes and schools to provide key skills and qualifications for careers in mixed research settings outside academia.

As all applied research needs basic research to build on and as research and research training is becoming more important, these two core tasks of the university will make its role probably more important instead of less important for society and economy. However, the higher education institutions, in particular universities, need to change as well in order to

face the challenges and requirements. They will have to serve a number of additional purposes and thus become multi- rather than uni-versities.

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