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## **Editorial: Structuring Doctoral Education**

The number of doctoral candidates is increasing worldwide. There has been an increase of more than 60 % in the number of new doctoral graduates in the EU alone over the period 2000 to 2011) (EC, 2014). Students come from a broader mix of entry pathways, educational, occupational, cultural and ethnic backgrounds, creating a more diverse doctoral student body. The doctorate is also evolving and diversifying. Just as research is increasingly inter-connected – crossing discipline, sector, institutional and national boundaries – we see increasing numbers of joint and group supervision, either where individual universities or faculties are seeking multiple bilateral strategic partnerships with other universities nationally and internationally at the level of doctoral education, or in multi-institutional consortia. We also see a trend towards growth in professional doctorates<sup>2</sup> or doctorates which are

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<sup>2</sup> The professional doctorate saw a rapid increase in programmes between 1990 and 2010 in the UK and in Australia. MELLORS-BOURNE (2016) infers that this pattern of growth has continued at a steady rate from 2010 to 2015 (although the data is not directly comparable). Professional doctorates are not widespread in Europe. With the exception of a small number of publications 2006-7 that call for further exploration of the PD in the European context (HUISMAN & NAIDOO, 2006; KEHM, 2006; EC, 2007) there is little published (in research or policy) that specifically addresses professional doctorates. In practice, variations on industrial PhDs are in evidence across Europe. The Marie Curie European Industrial Doctorate Programme offers pan-European funding for collaborative doctorates between industry and universities. The industrial doctorate is defined in legislation or in government-led programmes in Denmark and in France. The Netherlands offers a distinct PDEng which was developed in response to demand from the Dutch high-



embedded from the start in business, industry or third sector organisations. These stretch university administrators and Faculty to work in new and innovative ways in partnership with research end users and with new types of researchers who bring decades of industry experience to their doctoral journey. This also necessitates a greater flexibility in thesis format, which is opening up discussions across some institutions around alternative modes of presenting a final thesis. In some cases this involves the introduction of new modes that have been common in some parts of the world for a number of years to countries where the practice is relatively unknown. This may include performance, artefact, intellectual property or a collection of pre-published papers – “thesis by published work”.

This diversity enriches the university culture but also brings challenges that include greater requirements for flexibility from supervisors and institutions in supporting doctoral candidates (e.g., BOURKE, HOLBROOK, LOVAT & FARLEY, 2004; ALLUM, 2014; BITZER et al., 2014; HEFCE, 2016; LARKINS, 2012).

In policy and in practice it is clear that the needs of current and future doctoral candidates extend beyond disciplinary expertise and skills; the PhD student now requires and seeks more from the host institution than just the opportunity to become an expert in a specific disciplinary domain. The policy discourse in Europe, as in Australia, has positioned employability skills for PhD students at the heart of business, innovation and global competitiveness. Employers likewise expect from doctoral graduates more than scholarly expertise in a specific disciplinary area (JACKSON & MICHELSON, 2014). They look for doctoral graduates with “soft” skills in addition to their disciplinary expertise, skills such as teamwork, project management, and advanced communication skills (BORRELL-DAMI, 2009; CIHE, 2010; DBIS 2010, 2013, 2015; RCUK, 2014).

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tech industries. In Germany, there is no separate professional doctorate however company-based PhDs are available.

The outcome of the doctorate must include both a record of a completed original research presented within a doctoral thesis, and the formation of a well-trained, independent researcher (PARK, 2007). While the thesis offers the most concrete evidence of project completion, it does not encompass the full doctoral experience; the emphasis is shifting toward greater consideration of the process rather than the product and the person – the independent researcher – at the heart of this process. Institutions must ensure the provision of opportunity for this development and its articulation for graduates. This has been the focus of an extensive portfolio of policy and practical initiatives at an institutional, national and international level since the beginning of the new century. The Carnegie Initiative on the Doctorate in the US investigated quality and fit of professional skills and inter-disciplinarity across a number of US institutions. It promoted flexibility to support the individual and discipline-specific needs of doctoral candidates. This work was synchronous with the development of the Bologna Process in Europe (2003) and in the UK, the introduction of Roberts funding (ROBERTS, 2003). More recently, Principles for Innovative Doctoral Training (EC, 2011). Funding mechanisms such as Marie Skłodowska-Curie actions and Erasmus Mundus have also set standards for structure and content of research training that are focused on individual capabilities and broader skills development, and have facilitated training networks.

In addition to disciplinary expertise, the award of the PhD degree identifies the individual as having a range of critical thinking and flexible problem solving skills. Success in recruiting, retaining and graduating doctoral candidates increasingly requires institutions to provide suitable opportunities for fostering transferable skills: “The PhD has also changed over time so that, irrespective of their degree, research students now experience and expect structured research training as part of their programme” (QAA, 2012). This becomes vital as doctoral graduates increasingly seek professional employment outside academia. Only a minority of doctoral students now enter academic careers (ROYAL SOCIETY, 2010; OECD, 2010; NEUMANN & KHIM TAN, 2011; VITAE, 2013).

A greater emphasis has been placed also on collaborative and inter-disciplinary or ‘Grand Challenge’ approaches to global problems. Various national and international funding bodies encourage universities to establish structures such as Doctoral Training Partnerships or centres in UK, Research Training Groups in Germany or Initial Training Networks (ITNs) funded by the EU, to provide a framework for inter-disciplinary and inter-institutional collaboration. In Australia and in the UK, University Mission Groups such as the Australia Technology Network and University Alliance (groups of business-facing universities with broadly similar origins, ethos and ambitions) have created national doctoral training networks to address the research challenges of specific industries or sectors (bioscience, energy) working in partnership with knowledge transfer networks or similar and major firms and organisations.

In calling<sup>3</sup> for submissions to this special edition of *Zeitschrift für Hochschulentwicklung* we highlighted three areas of doctoral development: Governance of doctoral education; Doctoral program level; and Supervisor – supervisee relationship. The aim of this issue is to contribute to the research discourse on the impact of structuring and thus professionalizing doctoral education at all levels. Having seen these changes occurring in doctoral programs and school across the world, it is important to document, review, reflect and evaluate these changes in a scholarly forum.

Somewhat surprisingly, the number of submissions was low, and none addressed the issue of governance of doctoral education. This raises some concern about the limited research and evaluation that is being carried out in the area of doctoral education. Particularly in the context of the significant changes in policy and practice in this space we would encourage further work at institutional, national and international level to ensure a strong evidence base for further evolution.

After a rigorous peer review the Editorial Board proposed four of originally eleven submitted papers to be published in this special issue. The articles included provide

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<sup>3</sup> <http://www.zfhe.at/index.php/zfhe/announcement/view/52>

a provocative discourse on a number of key issues around diversity within doctoral education.

The first article by *Susan Smith* considers differences in the doctoral pathway, focusing on the PhD by Published Work in the UK. In contrast to previous literature in this domain, however, Smith focuses on a specific pathway within the PhD by publication route, looking at bringing together previously published articles into a PhD thesis by researchers who have published over years, but who have not been enrolled to a traditional PhD program. This alternative route provides an opportunity to *reflect back on their coherent body of existing work to enhance their education, professional development and career prospects through the acquisition of a PhD* and accordingly supervisors are far less involved in the research process. Actually, they often start their supervisory activities stage when support for the drafting and designing of the synthesis and preparation for the final exam is needed. Opportunities and challenges of such an approach within a context of diversity of PhD programs are considered and questions raised for researchers and practitioners alike.

The second article, by *Eva Kolbeck and Annette Marohn*, focuses on the provision of skills training to doctoral candidates. This is an area that has received much attention over recent years given the diversity of career pathways for PhD graduates and the need for them to be able to demonstrate a broad set of critical thinking and analytical skills in addition to their disciplinary expertise. In this article the authors provide a report about a project which focuses on the training of skills needed by PhD students in Chemistry. The initiative is indicative of broader skills development in doctoral education across many countries. In particular it addresses the centrality of advanced communication skills to the professional development of doctoral candidates and how these skills can become embedded in the discipline context of the researchers. The authors report how *a model of the teaching skills*

*needed by scientists was developed and then adapted specifically to chemistry. This then served as a basis for embedded accreditation.*

The third contribution, by *Elena Martins, Birgit Szczyrba, Petra Liedtke and Klaus Becker*, as well as the fourth, by *Ulrike Herzog, Alette Winter and Christian Kautz*, address the issue of collaboration across institutions (Martins et al.) and across disciplines (Herzog et al.). These are again key challenges and opportunities within the changing landscape of doctoral education. In addition, Martins et al. focus specifically on support for female doctoral candidates, raising the additional issue of gender equity within doctoral programs. They discuss the challenges related to cooperative doctorates specific to universities of applied sciences (UAS), Fachhochschule, in Germany. Being a UAS, the TH Köln cannot award a PhD and is thus facing the challenge of supporting their graduates who pursue their doctoral education in partner universities in Germany, Europe, and beyond. Herzog et al. gives an example of practice relating to an interdisciplinary approach to doctoral education aimed at fostering enhanced collaboration between chemists, physical and materials scientists in the framework of a Collaborative Research Centre funded by the German Research Foundation (DFG). The authors argue that while providing teaching opportunities for PhD students to other students in the Centre, they can enhance their interdisciplinary understanding of methods and subject matter.

The papers submitted showcase a limited number of specific initiatives in their early stages. They are case-study examples of new approaches to doctoral education. As such they make a small contribution to our understanding of a complex and changing picture which is shaped and re-shaped at an institutional, national and international level by changing policy imperatives, goals, objectives, stakeholders and players.

In order to better understand opportunities, challenges and innovations in doctoral education, we argue for further work and greater focus on the impact of the reform over the last two decades on the quality and characteristics of research training. In particular we call for a focus on policy, governance and management, the impact of the changes at program level and how the structuring and professionalization of doctoral education affects the supervisor – supervisee relationship. Many of these questions currently remain unanswered and some are not even widely posed. So we invite the reader to also have a look at the questions we have proposed to answer in Call for Papers for this special issue, see <http://www.zfhe.at/index.php/zfhe/announcement/view/52>.

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