# The Employer's Perspective of Practice-Based Doctorates: A Paradigm Change

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*This article will focus on the epistemological, cultural, normative problems as well as the design principles related to the so-called practice-based doctorates. Given the extreme complexity of the topic, the author will deal with it by using the "Five Ws' and One H", allowing for an expedient exposition. In the conclusions, guidelines and a future orientation for the full development and implementation of practice-based doctorates will be provided*.

## 1. Who?

I must immediately say that, for a variety of reasons, I do not know whether I am the right person to deal with this subject. First of all, I'm a lawyer, not a pedagogist. More precisely, I am a labour lawyer and researcher of industrial relations systems. I think as a lawyer. Indeed, the culture of civil and administrative law informing the European-continental, and Italian legal system in particular, has strongly influenced in the way we conceive the so-called practice-based doctorates, their structural features and their goals. This becomes particularly true if we put ourselves in the employer's shoes. The Italian experience of practice-based doctorates is to situate them near the so-called industrial doctorates, unlike the tradition of the Anglo-Saxon area countries where the so-called professional doctorate prevails. The differences between the two experiences are many, and the risk of terminological misunderstanding is very high. It is also true, however, that it is above all, the comparison with cultures and distant socio-economic contexts that helps to grasp the essential and characterizing traits of the "models" and therefore also to better understand one's own national experience. The hope is to place myself in this perspective bringing a distinctive outlook to the study of practice-based doctorates and the anglo-saxon model of the professional doctorate.

Secondly, I do not think I am entitled to bring the perspective of the business system on the so-called practice-based doctorates here. I am merely a scholar and a teacher and it is from this point of view that I have always analysed and evaluated practice-based PhD experiences. I'm not an entrepreneur. I am not even a legal consultant for companies that use this channel to recruit researchers. What I can share and offer to the debate is, rather, a narrative of my experience and, also, some curious and fortunate coincidences.

I draw on the experience of the doctorate in "Human capital formation and labour relations" co-promoted by the Italian Ministry of Education, University and Research, the University of Bergamo and ADAPT, the School of Higher Education in Industrial and Labour Relations founded by Professor Marco Biagi in Modena in 2000 (the experience has been extensively described in its pedagogical and institutional aspects by Lilli Casano

in the 2015 edition of the *E-Journal of International and Comparative Labour Studies*. As its normative and institutional context (see Tiraboschi 2014).

*The program* was established with the aim of experimenting with innovative forms of doctorates in collaboration with companies in Italy, in a cultural and regulatory environment strongly influenced by a longstanding tradition of classical academic PhD. A, not easy experimentation initially took place in Modena in the 2006/2007 academic year., when I was teaching Employment Law at the Economics Department. At that time, the new formula was experiencing strong cultural, administrative and organizational oppositions.

The experience took off successfully only three years later when it eventually moved to Bergamo and a partnership between ADAPT and the local Faculty of Educational Sciences started. The latter better matched the goals and principles informing the project of setting up an innovative doctoral path in the field of industrial and labour relations where industries would be closely involved.

To date, the program has involved many young researchers involved over 250 students and over 10 million euro have been fundraised over a 12 years life cycle. The amount of turnover and the private source of the funding is a peculiar trait compared to the Italian standards where the vast majority of doctoral scholarships are fully funded by the state. Since the inception of the program, the Italian Ministry of Education, University and Research has encouraged the implementation of the program by matching funding for PhD grants, notably doubling the total amount of private funding fundraised (and this way doubling the number of grants available for students).

However, this public support stopped in 2016 and the program is currently relying exclusively on private scholarships for doctoral programs fully funded by companies, without relying on public funding (conversely to what happened with the so-called professional doctorates).

Beyond the numbers, which are certainly significant but not exhaustive, I think it is important to point out some curious and fortunate coincidences that have facilitated the inception and further development for the experience and its consolidation over the years. After the first three difficult years experienced at the Faculty of Economics of the University of Modena and Reggio Emilia, where in any case a distinctive number of more than 90 enrolled PhD students had been reached, the upgrade of the program, both in quantitative as well as qualitative terms, took place with the transition to Bergamo in a more favorable cultural environment: this was mainly due to the research fields carried out there and mostly focusing on industry-university linkages, knowledge transfer between the two through mobility programs, ‘’brain’’ circulations and school-to-work transitions. As a matter of fact, teachers in the Faculty of Education of the University of Bergamo were investigating a new methodology of learning, notably the method of alternation between school and work conceived as a milestone to promote the modernization of training paths. Some of them even served the Ministry as consultants on this research.

At the same time, at institutional level, several labour law reforms were taking place and the increasingly worrying conditions of the Italian labour market (with a youth unemployment rate of around 40%), urged the ADAPT group of researchers (of which I am scientific coordinator) to engage with and provide a policy response to the growing social instability. The answer happened to be at the crossroad between, on the one hand, the transformations underway affecting companies' organization of production and workplace; and on the other hand, the need to bridge the gap between higher education and research systems, and production.

The shared response provided by the two research groups made up by pedagogists and jurists of the work resulted in an innovative doctoral pathway: innovative not only in content and learning methodologies, but also in the contractual arrangements. Apart from awarding PhD students with the traditional grant scheme, the PhD program is currently hiring most of its researchers with a *research and higher education apprenticeship scheme*, an arrangement introduced by Italian legislation in 2008 and specifically issued to be utilised in the field of higher education and doctoral programs involving an alternation of study and work. The program and its distinctive traits have allowed the research group to both develop a sound understanding of the legal aspects and specificities related to the recruiting and career development management of the non-academic researchers conducting research activities within private companies and more in general in the private sector.

The added value of this contribution does not lay in the perspective through which companies conceive innovative doctoral path, as the experience I have mentioned; rather it is to be seen and tied to the recent trends underway in labour markets and production processes which today require the emergence of a new strategic professional profiles, notably a non-academic researcher, steering innovation within enterprises to help them successfully compete on a global platform.

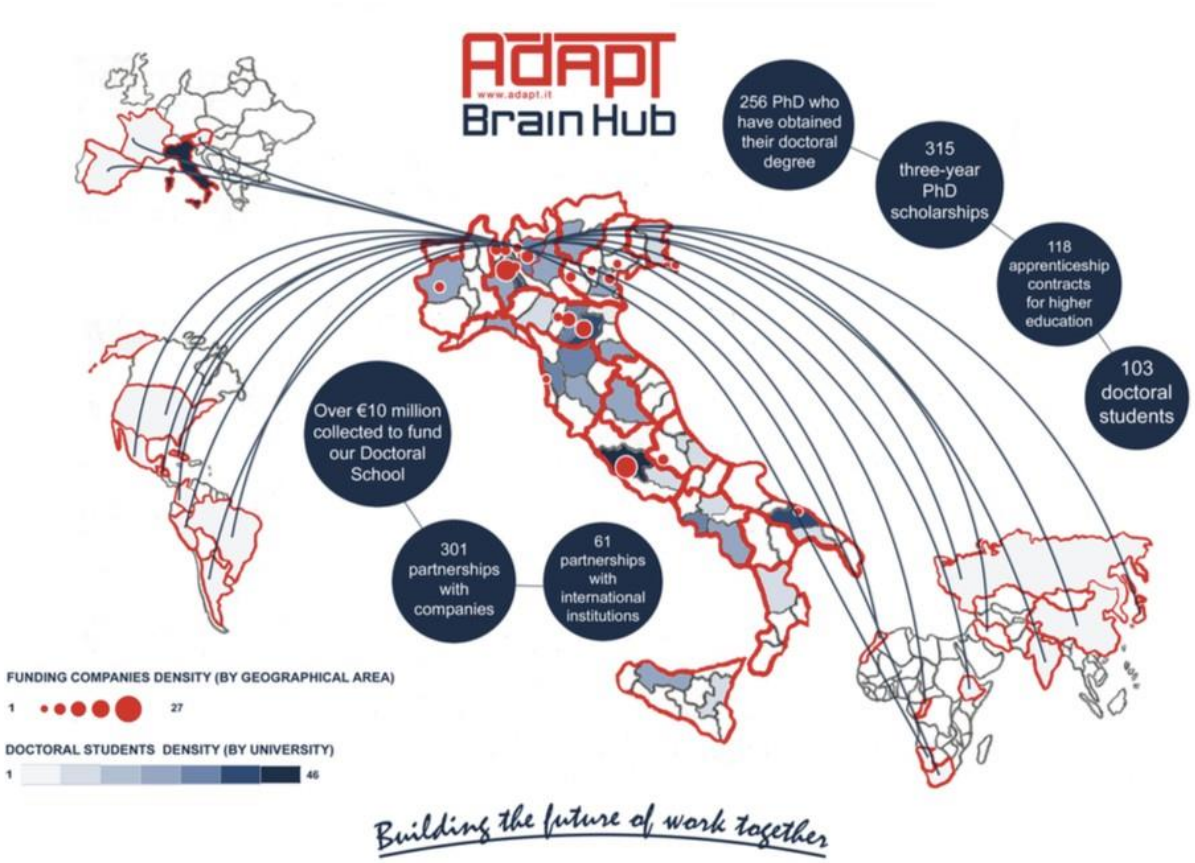


Table 1: Adapt, fact and fugures

As a professor of labour law (and in particular as a continental jurist) I am aware of the inevitable conceptual, methodological, disciplinary, terminological and even linguistic barriers that can raise misunderstanding. To avoid this risk, the epistemological and conceptual framework I will refer to are the one presented in two contributions that complement and integrate the reasoning developed here. For the conceptual and terminological aspects I'll refer to the Allan David study from 2015 on *Conceptualizing work learning: exploring the educational discourse on work- based, work related, and workplace learning.* For the cultural profiles and the vision on how to understand the evolution of doctorates and their importance in modern societies and economies I'll refer instead to Tim Blackman's paper on *The Professional Doctorate and the 21st Century University*, according to which 'far from being the poor cousin of the PhD, the professional doctorate epitomises a model of higher education that is for the 21st century, based on professional formation and design thinking' (2017:1). After having clarified my point of view, my previous experience and vision, now the object under analysis will be framed in detail.

## 2) What?

The expression "practice-based doctorates" is by itself certainly indicative, as a first approximation, of the phenomenon we intend to put under analysis. However, to a more careful observer, it is profoundly misleading both on the conceptual and on the normative point of view and, above all, it can be a source of dangerous interpretative and reconstructive misunderstandings of the phenomenon for a series of

epistemological reasons, which concern both the juridical and the pedagogical disciplines, and also for cultural and planning reasons.

First of all it is appropriate to distinguish, within the wide and indistinct category of the so-called practice-based doctorates, the industrial doctorates from the professional doctorates. In both cases, undoubtedly, we are in the presence of innovative forms of doctorates, open to the labour market and the world of professions, which challenge the traditional paradigm of the academic selection / training of researchers, as if the research was a prerogative of the university. And yet, on the conceptual as well as on the normative level, the distinction between the two types of doctorates seems to me, profound and not only related to cultural and geographical features: indeed, professional doctorates are historically present in the experience of Anglo-Saxon countries (USA, UK, Ireland, Australia), while the industrial doctorates have been widespread, for over forty years, in Northern Europe (Denmark, Norway, Sweden) and, more recently, also in Italy.

The plurality of experiences and paths of professional and industrial doctorates, in the world and in the different disciplinary sectors of doctoral training, undoubtedly makes it extremely difficult to attempt any definitions. Additionally, there are numerous definitions proposed by the related scientific literature both on an international and comparative level. Having ascertained that both paths intend to develop, as a rule, skills and research trajectories for purposes that are not strictly or directly related to the academic career, a first distinction may lie in the literal meaning of "professional" and "industrial", respectively. The professional doctorates might therefore be referred to professional practice and target professionals (as a rule, practitioners and people who are already employed) who wish to deepen their work experience and upgrade their professional career. The industrial doctorates might instead refer to research paths developed in the company or, in any case, in collaboration with one or more companies, thus developing not a simple bilateral relationship (tutor and doctoral student) but a triangular relationship linking university, company, doctoral students.

This conceptual distinction would entail practical implication: as an example, it would be also important to distinguish between, on the one hand, training and research paths offered to liberal professions and self-employed professionals (professional doctorates) aimed at equipping one with valuable skills thereby further developing and upgrading one’s professional perspectives; and on the other hand, non-academic research training and work carried out at the premises of the companies where researchers themselves work. The latter embodied a work arrangement whereby the goal of the research activities are set and agreed from the very beginning of the project between the employer that funds the research and the PhD students/researcher.

Though, the conceptual distinction between the two typologies of doctorates, rooted in the literal meaning of the words "practice" and "industrial", is not a satisfying one if we look at them through the lens of the European Commission report on “mapping of doctoral training in Europe: towards a common approach” (European Commission, 2011a) and its related “Principles for an innovation in the PhD programs” (European Commission, 2011b). The goal of both documents is to provide Member States with a

conceptual framework and operational tools aimed at laying the foundation for a common understanding and shared approach towards doctoral education and the development of research career paths across Europe. This represents a major concern and a precondition for building a European research area (ERA) based on the mobility of researchers not only from country to country but also at sectorial level, i.e. from the public to the private sector and vice versa (European Commission, 2011c).
Based on the outcomes of a benchmarking exercise aimed at identifying innovative doctoral paths across Member States, the Commission Report specifies clearly that the expression 'industrial doctorate' should be understood in a broader and a-technical sense 'including all sectors of the private and public labour market, from profit companies, to public institutions, to NGOs and charitable or cultural institutions'. As for collaboration with the production system and the activation of industrial-type doctorates, the European Commission itself does not follow a rigid and formalistic pattern, since it may include from time to time

> internship periods during the research period, forms of funding, involvement of non- academic staff in the tutoring and supervision of doctoral students, fundraising activities and financial support for doctoral courses, structuring of alumni networks to support candidates for the PhD and other forms of collaboration based on the transfer of skills, technologies and personnel.

The value of this flexible approach is also confirmed by the results of a comparative study reporting the experiences of industrial doctorates in Europe. These include, first of all, the Danish experience where the first structured forms of industrial doctorates were born, as formalized in legislative and contractual terms (The Danish Agency for Science, Technology and Innovation, 2011). This confirmed that the industrial doctorate can also be developed in public institutions and non-profit organizations (The Danish Agency for Science, 2013), and that what most characterizes the Danish model is the contractual relationship of employment that, in parallel with the registration at the academic path, binds the PhD student with the external subject involved in the training and research path. Although the PhD student's commitment is exclusively aimed at the development of the research project assigned to him, the typical arrangement foresees, thanks to the presence of generous public subsidies and to guarantee real integration and the link between the productive system and the university, a 50% subdivision between working time in the company and working time in universities (Kolmos et al, 2008). This seems to be the main success factor of the Danish model - and of the Nordic model in general (Thune et al, 2012; Wallgren & Dahlgren 2007). The French model, which likewise provides, thanks also to generous public subsidies, for the doctoral candidate to represent the partner company, and that also helps to define the research project (CIFRE 2012).

Similar experiences seen in other countries are, on the other hand, less impactful and effective in the presence of a legal qualification of the PhD student in terms of "simple student". In these cases, which are still the majority (European Commission, 2011a), collaboration between the university and the business system facilitates the employment transition of the research doctorate in the labour market at the end of the training and research path (Garcia-Quevedo et al, 2012), but does not evolve into the full dimension of the industrial doctorate, assuming forms in some ways similar to those of the professional doctorate.

From this point of view, and in view of my disciplinary skills as a professor of labour law, I believe I can make a definitive and interpretative proposal aimed at distinguishing (or at least suggesting distinction of) the professional doctorates from industrial doctorates in the strict sense. I then refer to the first as simply individual paths that are activated, depending on the legal regimes in force in the various jurisdictions, with the participation (by professionals who are already working or young people who wish to develop a more rapid professional and / or career path) to the announcement selection process opened by a university or PhD School as students (as a rule without scholarship) initiated into research on topics directly or indirectly related to their professional experience. The industrial doctorate, on the other hand, represents the result of the interplay between a university and a public or private entities (such as public administrations, companies, not for profit organizations, trade unions, employer's associations etc.) funding a PhD grant or contract tied to a specific research project. This path is of a non-academic type, which means that PhD researchers enrolled at the university will conduct research at the premises of the funding body that has contracted the research project. A PhD salary/scholarship is fully covered by the hosting organization which host the doctoral student for the whole time-span of the doctorate or for shorter internship periods, as appropriate and at the discretion of each funding body.

Put in these terms, the difference entails important consequences for the funding bodies. The professional doctorate is usually developed in the interest of the single doctoral candidate who could indeed create to their employer problems such as a lower concentration and / or presence at work or even economic or career advancement requests at the end of the doctoral course. The industrial doctorate, on the other hand, is a path of great interest for the companies who agree to carry out their own research project for industrial and / or productive purposes, or to increase professional skills within the company to initiate processes of innovation and functional changes to business as usual.

The proposed distinction has, indeed, its impact and interest also for the universities that offer professional or industrial doctoral programs. In the first case, in fact, the economic income for the universities would be relatively modest (the enrollment fee from the single participant) while within the framework of the industrial doctorates the donors transfer far more substantial amounts of funding for the benefit of the research groups of the universities and the doctoral tutors, such as scholarship funding or the payment of a sum to carry out or guide or monitor a specific research project. Without neglecting the fact that, through the industrial doctorates, universities can develop important and fruitful networks of relationships with the productive system that can facilitate the purchase of machinery and / or technologies or even the participation in national and international financing lines (think, for example, of the Horizon calls or of the lines of financing for the establishment of competence centers promoted within the national initiatives to support the processes referred to in the IV industrial revolution, in Italy the so-called Industry 4.0 plan).

Having clarified the conceptual distinction between the professional doctorate and the industrial doctorate, still there still remains a second consideration to be understood concerning the expression "practice-based doctorates". The latter, both in the literature as well as in the daily experiences carried out at the universities, which indiscriminately couples these two types of training and research paths. I consider this expression not only misleading but also dangerous and negative, on the cultural level, for the enhancement and fully-fledged development (at least in terms of normative regulation) of professional and industrial doctorates. If we really believe that “far from being the poor cousin of the PhD, the professional doctorate epitomises a model of higher education that is for the 21st century” (Blackman T., 2016), then we cannot be the first ones supporting the idea that professional doctorates and industrial doctorates differ from traditional doctorates on the basis of a purely practical criteria. In short, conceiving the world of praxis, of practical knowledge, as a parallel path and or even a second-rate career compared to theoretical knowledge and academic research would be a great mistake, entailing dramatic consequences.

We will deal later with the issue of training and research education to be developed within the company or, in any case, in work contexts. Still, I want to draw to attention once more the fact that ‘learning by doing through practical knowledge does not necessarily mean or entail, to put it in the words of Plato and Aristotle, being "praticoni", i.e. people who do not ask the question of why and how’ (Bertagna, 2011: 120). In the same way, a research project focusing on concrete and practical cases, with the aim of investigating a real and measurable impact on socio-economic dynamics or on the organization of production within industries, is not scientifically to be ranked lower than theoretical research for the purposes of publishing and pursuing the academic career. It is true, if anything, that only a real experience and real world situations make innovation possible and the consequent development of both tacit and codified knowledge.

The professional doctorates and the industrial doctorates can therefore distinguish themselves from the traditional doctorate paths by the (private) nature of the funding, the environment where the learning experience take place, the way research is conducted for the general and specific objectives of the thesis pursued. Nevertheless, they remain perfectly identical to traditional PhDs in their purpose, that is to provide an original contribution to the advancement of knowledge in a given subject or in a specific field.

In this perspective, the full deployment and diffusion of professional and industrial doctorates can represent a valuable opportunity to modernize all PhD programs, provided the overcoming of traditional pedagogical methodologies of human capital formation which are an expression of an outdated regulatory and organizational paradigm which fits the economic models and social institutions of the twentieth century (the Industrial society), but that is highly inappropriate to the transformations the world of work and production are currently undergoing.

Indeed, the challenges posed by innovative doctorates call into questions, and not from today (see the proposals of the National Advisory Committee on Creative and Cultural

Education, 1999), the whole system of education and training, starting from primary schools, on which the attention of pedagogists is greater today, to of high-level university education that are also called to deal with increasingly different needs, not only economic but also emanating from the whole society we are part of (Pillay et al, 2004).

**3) When?**

In order to understand what they really are and, consequently, which practical functions and needs they respond to, it seems useful at this point to reflect on when the scientific thinking and even the business system have begun to have a stake and show interest in professional doctorates as well as industrial doctorates.

Over the past two decades the emergence of innovative educational paths within university and in particular new doctoral pathways has attracted significant attention because of their collaboration with industries and the efforts to match professional needs expressed by the labour market. A growing body of literature points out the high heterogeneity of experiences undertaken across countries: besides detailing the analysis by providing theoretical-reconstructive evaluations, they trace the parallel evolution of the normative and institutional framework of reference (for bibliographical references see Tiraboschi, 2014).

The question to be asked here refers to why have we only recently started to discuss these innovative forms of doctorates. In Italy, for instance, the debate is still stuck mainly at a theoretical level and at the margins of the academic debate.

Indeed, the interest of the academic debate towards professional and industrial doctorates seems, in fact, driven by the heavy cuts on public research funding and is not spurred on by the idea that today's world of work require stronger connections between the academic world and the business system (see the analysis of Salimi et al, 2013).

I especially refer to the low number of doctoral scholarships granted every year as well as to the ever more difficult opportunities for individuals to pursue an academic career. To provide just one example, in Italy more than ten thousand graduates enroll to PhD courses each year. The main goal of these applicants is to pursue an academic career. This same goal is also shared by their supervisors and professors who act in a world which apparently hold the monopoly of research knowledge and the exclusive right to award doctoral degrees and, as a direct consequence, the ability to train them. However, what statistics and reality shows is rather far from PhD students expectations. Indeed, no more than two thousand out of ten thousand will really succeed in their purpose and only after a long transition period, spanning many years, during which they experience volunteer work, post doctorate scholarships, research grants and precarious contracts, they become tenured professors.

The occupational perspective through which the academic debate looks at the idea of a research PhD in collaboration with companies has dramatic implications on a practical

level: firstly, it seems to entail that both industrial as well as professional PhDs are conceived as second rate choice compared to the academic career; secondly, it is perceived as an alternative track to place PhDs at the end of the doctoral path and not to lose the capital of knowledge and skills that these young researchers have acquired over the years of their doctoral path.

Given the experience I have acquired in the Doctoral School I am the head of, both perspectives clash with the interests of companies and of the private sector more in general. Companies are not particularly interested in massively hiring researchers that have been selected and trained over a (at least) three-year long period and equipped with skills which are barely useful outside the self-referential academic labour market ([1]). Researchers who, as such, often don't meet the skills requirement and proper attitudes of the research work carried out within the private sector, and, as a direct consequence, are not appreciated by the business system.

Put it briefly, as for the 'research profession' the European Commission's group of experts has specified in the report *Excellence, Equality and Entrepreneurialism. Building Sustainable Research Careers in the European Research Area* (European Commission, 2012, spec. 28) that 'many researchers are trained in a traditional academic environment, which does not equip them for the needs of the modern knowledge economy where connections with society's needs and the private sector are increasingly important'.

With reference to the business point of view, on the other hand, the growing interest in true innovative forms of doctorates lies in the profound changes in the ways of doing business. Today, firms need to adapt to an unprecedented higher degree of segmentation of the market-demand. This makes a strong case for fostering the emergence and institutionalization, from and economic, normative and even collective bargaining perspective, of a real labour market for researchers in the private sector, who are currently neither fairly recognized from a legal perspective, nor even properly trained by the educational institutions. In this scenario, professional doctorates and doctoral candidates represent the first fundamental step to pave the ground for the set-up, organization and regulation of the so-called 'intermediate labour markets', perhaps also better known as 'brain hubs' or even 'competence centers'. They refer to a collective space in which education and work interplay is made possible by collaboration ties linking university, research centers and companies, setting the right conditions for the development, and consequent placement, of modern professional profiles, such as researchers, creative talents, project designers, equipped with the right skills matching the needs of the twenty-first century economy (among the first to provide a definition of intermediate labour markets, see Lanciano-Morandat & Nohara 2006).

**4) Why?**

At this point in the reasoning, the real question to ask is not, therefore, when did we begin to question these innovative doctorate paths. The real point is, why business - and not only a small circle of academic visionaries and scientists - has recently become interested in professional doctorate and industrial doctorate programs? This to the

point of mobilizing (with the pressure of the companies and their associations of representation) the attention of Governments and legislators who are increasingly working, but not always with due knowledge of the topic, to stimulate financially and to facilitate on the regulatory level these collaborative projects between universities, the productive system, and the professions market.

We are currently on the verge of a new industrial revolution that deeply calls into question the concepts of business, work, training, and research as we have always known them during the twentieth century and the industrial age. Industry 4.0, the 3D printer, robotics and artificial intelligence, big data, digital platforms, the Internet of Things, biotechnology, nanotechnology and genetics are bringing our economies to the heart of a new revolution that lives and it is nourished by research and continuous innovation both in processes and in products (Schwab, 2016). On the other hand, standardized tasks and executive work typical of the production and organization methods of the Fordist and Taylorist work, now largely replaced by machines and robots, are less evident. In the same way, the mechanical processes of imitative or reproductive processes on a large scale and in a serial form that have characterized the economic system of the twentieth century are less applied. As a consequence, the professional skills and attitudes necessary to support production and work models characterized by short, if not very short, cycles that must continually be reinvented or redesigned become crucial.

It is in response to this 'great transformation' (to use the words of Karl Polanyi) that we understand, moreover, the real reason for the growing attention of the business system towards the model of dual German education. This goes far beyond the prospects of the mere insertion of young people in jobs, as well as the repeated attempts to relaunch and enhance the apprenticeship also along the paths of high-level university education and for the inclusion of young people in the company in the context of research activities and projects. An apprenticeship understood not only as a work contract supported by on-the-job training paths but, first of all, as an emerging learning space because it is characterized by training moments in real and task situations and, as such, more functional to the construction of professional skills required by the new labour markets, first of all the ability to deal with complex situations and problems.

Even international as well as national institutions are currently stressing the interplay between education, productivity and innovation underlying a well performing economy and, as a consequence, the need to invest more in human capital formation and skilled workers. The quality of human capital is a pivotal factor for economies approaching the Fourth industrial revolution which, though still far from being conceptualized, is conceived among scholars as a phenomenon that can still be shaped and potentially bring benefits to companies and workers in terms of increasing network and platform interaction, reduced transaction costs, phasing out of routine tasks and (introduce?) higher requirements of cognitive skills.

Furthermore, the ecoomic theory defending the idea that 'the places where they physically make things will continue to lose importance, while the cities populated by

interconnected and creative workers will become the new factories of the future' (Moretti, 2012: 215) is currently receiving unprecedented attention and support.

No one can deny the evolution of businesses – not only research institutions – which are undertaking major structural and organizational changes along with the workforce. They are moving from being top-down economic organisations managed through 'command and control' models and focused on the production and exchange of goods and services to being full-fledged cooperation platforms giving rise to networks establishing partnerships and innovation districts which are difficult to classify from a legal point of view. With production involving hybrid professionals, whose work is a halfway house between researching and managing changes in organizational and production processes, work itself is performed as a sort of circular process involving training and research aimed at 'learning to learn' according to a sequence of productive tasks based on studying, learning, innovation, planning and developing.

Research is key to the transformation of the way business is performed because it is concerned with what has been termed "intermediate labour markets" in international literature. In other words, research has to do with international hubs in those productive processes built on the open and circular interconnection of intelligent systems. These systems are such not because of the massive use of highly-developed technologies, but because of the involvement of people and modern researchers that create and implement them, fueling ongoing development which in turn adds high value.

The above is evident in those areas that are home to so-called 'brain hubs' – to use the fortunate and catchy terminology employed by Enrico Moretti in his book on the geography of jobs. Brain hubs can be seen as an evolution of industrial districts. For this reason, they have also been dubbed 'knowledge districts', or 'local innovation platforms' by Bellandi. The latter definition can be explained by the fact that innovation is a local process triggered by 'a relation and interaction system favoured by proximity' (Garofoli, 2011: 2) – also in terms of culture and language – and by critical thinking.

This is the 'agglomeration' of ideas, projects, resources and qualified staff which is being increasingly discussed by economists (Carlino & Kerr, 2014; Rosenthal & Strange, 2001) and that – beyond a certain threshold – helps to boost innovation, productivity and growth in new markets in times of globalisation. The sharing economy itself can be viewed as an exemplar of proximity relations and agglomeration (Davidson & Infranca, 2016).

Therefore, while industrial relations in the past featured the construction of streets, bridges, railways, harbours and airports, the 4th Industrial Revolution is marked by the fact that research and planning activities, be they private or public ones, are key elements of the intangible infrastructure known as 'knowledge infrastructure', which concerns also broadband connection and new generation technologies and should set the basis for a modern economy.

Against this backdrop, innovative doctoral paths are to be regarded as enablers for new organizational models of production whereby economies in the Fourth industrial

revolution prosper. From a policy perspective, there are good reasons for lobbying Governments to support – both in terms of funding and the regulatory level – these collaborative projects tying universities, higher education bodies, and companies for the benefit of the labour market for skilled workers and professionals.

**5) Where and How?**

How should we respond to the need for spurring innovation in both economic and social processes? How can we build modern doctoral paths that might tackle socio-economic challenges by providing innovative and integrated approach? How can we bridge university and business and engage them in the joint offer of new educational paths equipping researchers with skills matching global market needs (without lowering educational quality standards)? How do we prevent professional doctorates and industrial doctorates from the rethoric of the 'poor cousin of the academic doctorates'?

A first response certainly deals with cultural elements and the traditional mindset, which especially in Italy has always conceived training and work as separate worlds, as well as distinguished production activities from research activities, disentangled theory from practice, and what is academic and what is not related to the university dynamics. Today, there is an increasing need to integrate school, university and work in a coherent and interdisciplinary fashion, triggering a process aimed at overcoming the self-referentiality of academic teaching which, in the midst of the 4$^{th}$ Industrial revolution, doesn't fit any longer within the organization of society and the new production models. The latter requires skills tied to higher quality standards expressed by a global market which today is highly segmented and shifting from the taylor-fordist production system to one in which mass production is diversified in tailored goods to satisfy individual needs.

To equip researchers with technical, but also cognitive/transversal skills, academic research should closely interact with business and outcomes should exercise a direct or indirect impact on the economy, society, people. The other way round should be also nurtured: this means that societal challenges and practical problems should be the main topics or issues providing insights for conducting goal-oriented research activities. For these reasons, doctorates must be assessed and evaluated by their quality standards and research outcomes, not only on the basis of where they physically takes place, the methodologies used for learning or by the number of publications.

To overcome these cultural barriers, it seems therefore, essential to avoid the typification of professional and industrial doctorates in order to prevent the risks of having the two of them as a distinct paths (often encouraged to be undertaken across countries via tax cuts for enterprises) from the traditional PhDs (confining the former in a sort of so called 'golden ghetto'). Research is research, regardless of it being conducted in collaboration with the private sector or for the purpose of pursuing an academic career. Furthermore, beyond the labels, achieving a doctorate through the standardization of the recruitment, enrollment, training and an evaluation processes is highly recommended. Planning and implementing industrial or traditional PhDs require a different approach and specific tools as well as new routines, notwithstanding the fact

that both go under the umbrella of 'research path' with equal dignity, though their missions are different. I am familiar with the Italian reality, but on this front, I believe that the delay of this across countries is evident.

A second element worthy to be considered as a potential answer to the questions posed above, is represented by the idea of setting up doctoral schools in which PhDs and research activities are not distinguished by disciplines. Rather, they are gathered around societal challenges or fields requiring an interdisciplinary approach, engagement and constant dialogue with actors directly involved in the main topic the school deals with.

This is thought to have positive externalities for the educational body setting up the school in terms of aggregating the adequate critical mass of resources to tackle the issue from different perspectives and angles, triggering fruitful as well as original forms of collaboration across the heterogeneous group of PhD students, and attracting funding from private organizations or companies. Some of them might be more involved both theoretical/basic research while others might be more engaged in application/ business oriented research paths. To the best of my knowledge and experience, this represents the distinctive and successful factor of the doctoral school promoted by ADAPT which is in constant dialogue and carefully pays attention to the needs and new trends crossing the production system and its social-economic organization.

The doctoral school promoted by ADAPT has been made possible by a staff devoted to the selection and recruitment and training of candidates willing to undertake a research career in the business sector. Each candidate is appointed both an academic as well as a workplace supervisor:

> the latter is not solely related to the student's development as an effective practitioner, but an essential part of the provision of doctoral supervision to help ensure coherence between the assignment within the company and the research and training activities offered at the School (on the case of ADAPT see Maguire et al, 2018).

Only the reaching of an adequate 'critical mass' of students, supervisors and staff can provide the doctoral school with the strength to overcome 'regulations, systems and mindsets designed for PhDs' (on the point see Costley. 2013) and pave the path for setting up a research group/organization tied together around the same mission. This approach allows one to keep at arm's length distance the risk of younger researchers going through PhDs without supervision and scientific guidance which they often experience in traditional PhDs. Sometimes even with dramatic consequences in terms of mental health and disease due to the loneliness of the research path in which they have embarked on for three or even more years. The point here is trying to engage doctoral candidates and get them to act as a conduit between the two worlds of business and university, ultimately sharing among them their experience, knowledge and research insights even during lessons with their peers.

However, proactive engagement doesn't come up spontaneously very often and, it is when it comes to the coordination mechanism that business, university and researchers get stuck, as it entails the pooling of resources and the convergence of interests (on the topic see Torka, 2018). Successful collaboration and outcomes presume a coordination

mechanism which in the case of the Doctoral school promoted by Adapt, and is played by Adapt itself, acting as an independent intermediate organization cultivating cooperative efforts among the relevant parties (business, university and doctoral candidates) and mobilizing them to overcome bureaucratic and cultural barriers towards shared goals.

In the case of the Industrial Doctorate School promoted by ADAPT, for example, the student does not choose the research project; it is instead a result of the triangulation and a convergence of interests. While students have little say at the time of deciding the contents of the research project funded and proposed by a private company, they have much leeway in terms of methodology and results achieved. The close link with the academic supervisor and the University ensures scientific rigour in research, impartiality of both research and its results (i.e. not affected by the business' interests) and the achievement of valuable knowledge advancement on the topic selected for the research project.

Obviously, a working system such as the one sketched above should be equipped with additional elements, such as a mechanism that checks and balances university and business interest and build trustful relationships between the public and the private sectors, which are necessary to nurture effective collaboration especially in the field of modern doctorates. The rise of 'trustful relationships' might be encouraged by starting, as an example, by allowing employers and representatives from the world of work to be part of the teaching faculty on PhD courses and Schools, creating a real hybrid community of peers. This is not an option yet, at least in Italy, since the Ministerial Decree of 8 February 2013 establishes that the teaching 'faculty should be composed of tenured university professors for the accreditation of PhD courses and schools'. In fact, this could be helpful for framing new evaluation methods in the context of modern PhDs and/or enriching the research agenda with insights provided by practitioners.

In Italy, the absence of supportive policy measures and a regulatory framework within primary legal sources represents a major constraint hindering the emergence of structured and formal ties between universities and the world of work. This reflects a longstanding tradition of reciprocal indifference and the lack of trustful relationships between the public and the private sectors, which would be in fact necessary to nurture effective collaboration especially in the field of modern doctorates. However, it is difficult to conceive and plan innovative doctoral paths without rethinking organizational, management and teaching models that better fit the mission and the goals of modern doctorates.

However, this is not something particularly new considering that the organizational model of doctoral programs I am referring to recalls the idea of 'action research' put forward more than half a century ago, in 1951, by Kurt Lewin. The latter supported the methodology of the 'field theory' in Doctoral programs, which is based on the full interaction and integration between knowledge and action - and therefore on the fusion between practice and theory (Davies et al, 2016) - in the context of real world, experience and situations. Innovation and learning are nurtured in wide and open contexts through constant stimuli interaction and further reproduced when the

opportunity to confront different points of view is given, spurring the PhDs attitude to problem solving and triggering positive divergent thinking and co-thinking phenomena (Blackman, 2016).

A practical example of what I am referring to is to be found in the German model of the Fraunhofer – Gesellshafts and in its almost 70 indipendent institutes scattered across Germany. Their research efforts, geared towards the development of technologies for health, security, communication, mobility use and for environmental and energy sustainability, have paved the ground to help the German industrial structure prepare for the Fourth Industrial Revolution. Their success lies in a complex infrastructure of interrelated 'centers of competence' which are operational units at the forefront of research and technology, carrying out research of practical utility for industrial application in close cooperation with its customers from industry and the public sector. Trustful relationships with business, even personal sometimes, are made possible by their former PhDs or researchers now employed in their contracting enterprises, which constantly nurture Fraunhofer's staff with new research inputs and insights to be further developed, tested and validated (see Comin, et al, 2016). Moreover, researchers at Fraunhofers also maintain constant relations with universities not only because of their physical location, which is often placed closed to a university campus; but also the head of the Fraunhofer's institutes are Professors and member of teaching faculties. Undergraduate students are allowed to engage with FhG's institutes as research assistants, and keep on working during their Masters degree and PhDs. In the latter case, PhD students usually work on projects initiated by industries and it is not uncommon that long term research and development projects become the topics of their PhD thesis and they are able to develop further knowledge on the specific issue to be tackled.

A third element that needs to be addressed concerns the legal and contractual status of modern PhDs in terms of recognition of their professional skills, role within the society and attitude that doesn't fit any longer the identity of the mere 'student'. An idea which is still dominant these days, except in those countries where industrial doctorates first appeared such as in Denmark. An important point in this regard is addressed by the Commission's Recommendation of 11 March 2005 on the 'European Charter for Researchers' and 'A code of conduct for the recruitment of researchers'(under the heading 'General Principles and Requirements for Employers and Funders'), recommending that

> all researchers who have embraced a research career must be recognized as professionals and be treated accordingly. It should start in the initial phase of careers, that is, immediately after graduation, regardless of the national classification (for example, clerk, post-graduate student, doctoral student, doctoral scholarship holder, public official).

Of particular interest, in this perspective, the Italian legislation since 2008 has allowed for the possibility of PhD candidates to be contracted under an 'apprenticeships of research and higher education' contract instead of being entitled a research grant. This contractual arrangement draws from the well- known higher education German model (for a detailed analysis reference to Tiraboschi 2014; 2017). It embodies a modern forms of dual training bridging university and company gaps with the spirit of human capital

formation, accumulation and knowledge circulation for the benefit of the whole local system and its development.

Moreover, it is a contractual scheme which, by legal definition, allows one to strike the balance between the time devoted to research work and to the training activities. It also emphasizes the strategic role of two supervisors, both formally appointed by the organizations offering the PhD program: one representing the university awarding the PhD title while the other the public or private institution funding the research projects and hosting at its venue the researcher (see Maguire et al, 2018).

The gap to be filled for the full development of innovative doctorates and the modernization of traditional doctorates is the full recognition and the emergence of an open and transparent labour market for researchers, without distinctions between public or private sectors. A labour market in which intersectoral mobility and contamination are ecouraged and professional careers are not confined within the borders of the university but they extend to the private sectors in which should be adequately valued by employers. Building a free labour market for researchers, the so-called 'European area of research' represent a shared goal at European level, officially formalized in the 'European Charter for Researchers' and the related 'Code of Conduct for the recruitment of researchers'.
Ultimately, I want to stress once more and point out the need for a formal recognition of the activities carried out by PhDs (whatever the doctoral path undertaken) in terms of real work deserving a professional status as well as and adequate remuneration and training programs.

Administrative boundaries and cultural barriers which still separates the public / academic research from the private / corporate no longer fit the transformation that the economy and, as a consequence, society are undergoing (Tiraboschi, 2017). The issue I want to draw the attention to is not one concerning pedagogical protocols, or the construction of the related curricular paths and the monitoring of their quality (certainly not a secondary issue, but on which there is now a sufficient literature and attention (see Costley, 2013). Rather, it is a matter of the current lack of emphasis and attention on the outcomes of research, their value for society and practical application, and on the contents of the training for modern researchers. The latter should be aimed at, from the early stages of the research career, developing knowledge, skills and abilities necessary not only for applying and successfully obtain a teaching position at the University, but rather to be employed in jobs requiring problem-solving skills, flexible mindsets, creativity and sound judgement, which is the case of most of the jobs that will ensure the Fourth industrial revolution.

In conclusion, the labour market for researchers is changing, spilling over the mere boundaries of the university to embrace the world of work and the private sector whose products and goods need to be more quality-driven and incorporate a higher degree of research and development if they want to stay competitive in global markets. As a consequence, education and training for the next generation of researcher must be rethought. Doctoral programs themselves need to be conceived differently from the past and seen as a conduit for technology and knowledge transfer between

organizations, going beyond the traditional dichotomy of university and business and also including public administration, not for profit organizations, trade unions and representatives of the employers. As already highlighted a few years ago in the Final report for the European Commission Directorate General for Research and Innovation, 'The complexity of research careers today demands a new type of researcher, which we would like to describe as an entrepreneurial researcher.' This implies that a researcher should be innovative, a risk-taker, multitasking and develop leadership (Expert Group on the Research Profession, Final report drafted for the European Commission Directorate General for Research and Innovation, Brussels, 2012: 29). The fourth industrial revolution and the ensuing ground-breaking challenges will affect both developed and developing economies. Society might benefit from these changes in production only if the transformation is properly steered and education fully integrated with research system and the new emerging models of production. If research work is considered against this backdrop, rethinking doctoral programs and acknowledging the research work in the private sector (making an end to the longstanding tradition of reciprocal indifference and lack of trustful relationships between the public and the private sectors) represents the reference framework for building the intangible and supporting infrastructure of the new economic system: a transparent labour market for researchers.

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([1]) The literature speaks, in this regard, of overeducation (so GAETA GL, LAVADERA GL, PASTORE F., 2016) even if the real problem seems to be that of the marked misalignment between the traditional training of research doctors and the needs expressed by the labour market research in general which can not be limited to academic careers only.On the other side, from the business point of view the growing interest in true innovative doctoral path is rooted in the profound changes that firms are currently undergoing in their approach to the market. In particular, Industry 4.0 entails dramatic changes in business models, greater flexibility, cooperation and constant interaction with customers, new recruiting and HRM methods. To stay competitive in a global market requiring higher quality standards than ever before, firms need to constantly improve and update their products and process whose added value is grounded in significant component of research and development carried out by enterprises by themselves or in collaboration with research centers.