

The Skills Mismatch: What Doctoral Candidates and Employers Consider Important

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INTRODUCTION

The mobility of doctorate holders towards the non-academic labor market became of growing interest to policy-makers in and outside academia over the last decade. European as well as national and regional policy agendas (crystallized among others in the Bologna Process, the Lisbon Strategy and the EU 2020 Strategy) stress the importance of a greater supply of highly educated researchers for a competitive knowledge economy.

Despite the considerable demand for a highly skilled workforce in industry (Jackson, 2007; VRWB, 2008), this process proves not as straightforward as expected. First, doctorate holders compete for senior research jobs in industry with experienced master-level graduates, who may have less specialist expertise than doctorate holders, but often have more relevant work experience in industry. Second, many employers still hold quite stereotypical views of doctorate holders, inspired by the myth of the doctoral candidate in his/her ivory tower, isolated from other fields and people. They therefore doubt whether doctorate holders have the necessary competences to perform well in a business environment (Usher, 2002; Morgavi, McCarthy & Metcalfe, 2007). Third, many doctoral candidates still hope for an academic career and consider employment in another sector merely as a second choice (Béret, Giret & Recotillet, 2003, Fox & Stephan, 2001). This focus on an future academic career may also prevent doctoral researchers from investing in the specific skills needed in industry, resulting in a skills mismatch.

DATA

SOURCES

For the information on doctoral candidates we make use of the *Survey of Junior Researchers (SJR)* (ECOOM-UGent, 2008). For this survey 4878 junior researchers, who were defined as 'non-doctorate holding research staff', at Flemish universities were asked to participate in a web-survey. The overall response rate was 40.9% ($N = 1994$). In this brief we included only respondents from the natural sciences, engineering and medical and health sciences, as respondents from these disciplines have the highest probability of ending up in an R&D environment. Of these, 835 doctoral candidates provided data on what skills they valued.

The information on the employers was obtained from the 2008 *Research & Development Survey*, (ECOOM-KULeuven 2009). 2597 Flemish companies involved in R&D were asked about their personnel, company structure, R&D activities and initiatives, innovation and collaboration with others. Almost half (1164 or 45%) of these companies participated in this survey. 217 employers in companies with an active R&D division answered the question on the skills they look for in a researcher.

PERCEIVED IMPORTANCE OF SKILLS

The respondents were asked to pick the 7 items out of a list of 27 skills/competencies which they considered the most important for their further careers or which they

considered important for researchers they might hire. To compose the list of skills we combined the framework of two studies. Firstly, the joint statement on the skills doctoral researchers need to develop during their research training, published by the UK Research Councils (UK Grad Programme, 2001). Second, Rudd, Nerad, Morrison & Picciano (2008) differentiate between Ph.D.-completion skills, which are on the one hand skills and habits needed to complete a Ph.D., and on the other professional skills, including training which prepares Ph.D.-students for non-academic environments. We have grouped these detailed items into five general sets of skills: research skills and techniques (5 items), communication skills (5), general management skills (6), working with others (3) and personal effectiveness (8), see Figure 1.

RESULTS

DOCTORAL CANDIDATES

The left column of Table 1 shows the top five of skills items that are considered important for their future careers by doctoral candidates in natural sciences, engineering and medical and health sciences. The top three consists of items from the cluster 'research skills and techniques', illustrating the importance that these doctoral candidates give to their academic qualities. But even in this set there is substantial variation (see Figure 1). Technical skills (23.9%) are considered substantially less important than research skills (69.9%), scientific knowledge (67.4%) and analytical thinking (48.5%). Within the set 'working with others', social skills and teamwork are considered important by four out of ten doctoral candidates. Within 'personal effectiveness', independence (45.9%) is rated highest and within 'communication skills', presenting to an audience (38.2%). Skills of 'general management' are only considered important by a minority of the respondents.

Table 1: Top 5 of valued skills for doctoral candidates and employers

Doctoral candidates		Employers	
Research skills	69.9%	Technical skills	71.0%
Scientific knowledge	67.4%	Teamwork	64.5%
Analytical thinking	48.4%	Analytical thinking	58.1%
Independence	45.0%	Taking initiative	56.7%
Social skills	38.8%	Scientific knowledge	56.2%

EMPLOYERS

As shown in the right-hand column of Table 1, employers seem to value researchers also mainly for their research and technical skills: technical skills, analytical thinking, and scientific knowledge feature in their top 5. The other skills sets are less homogeneously valued. Within the 'personal effectiveness' set, taking initiative (56.7%) is by far considered the most important competence, and in terms of 'general management skills' project management (46.1%) and business skills (40.1%) are highly valued in a researcher. Being able to work as part of a team (64.5%) is stated more often as an important skill than research skills (51.6%). In general, the 'communication' set covers only skills that are mentioned by less than one fifth of the employers. We could argue that these are additional skills which are appreciated but will not make the difference in the selection of candidates.

MISMATCH

Table 1 already demonstrates clear differences between the skills doctoral candidates value and those that employers value. Although in both top fives, three skills from the research and technical skills set appeared, the top valued skill of either group is remarkably absent from the other's top five list. The group of doctoral students in particular value their technical skills little as they rank merely 14th out of 27. Among employers, technical skills rank first and the more abstract research skills still rank 6th.

Figure 1 gives a more detailed picture of the discrepancies between the ways in which the various skills are valued by doctoral candidates in the natural sciences, engineering and medical sciences on the one hand, and employers of R&D intensive firms on the other. For most of the skills significant differences were found ($|t| > 2$). Only the most important ones are discussed here. The results indicate that doctoral candidates overvalue their more academic and specialized research skills and scientific knowledge, while employers consider their more general research skills (analytic thinking and technical skills) more important. Regarding skills concerning working with others, employers tend to value teamwork much more than doctoral candidates do. Regarding personal effectiveness the major difference is that employers much more than doctoral candidates, give importance to taking initiative, while the latter tend to value their independence more. It is also worth noticing that employers consider communication skills considerably less important than the doctoral candidates. General business skills and project management skills, however, are considered quite important by employers while most doctoral candidates do not consider these important.

CONCLUSION

In this analysis we shed light on the mismatch between the skills that doctorate holders perceive as necessary for future employment in industry and the expectations from industry, by contrasting the views of doctoral candidates in natural sciences, engineering and medical sciences with those of employers in industry and with an active R&D department.

Our research results indicate on the one hand that what doctoral candidates expect of industry in terms of employability skills, differs significantly from what industry expects. This mismatch can constitute a problem. Employers expect researchers to have a mix of technical skills and a broader set of transferable competencies like being able to work with others, and having some general management skills, such as project management and business skills. Technical skills and managerial skills are also highlighted by other studies (Morris & Cushlow, 2000; Borrell-Damian et al., 2010) as skills needed in industry.

At least three types of stakeholders can be involved when addressing this skills mismatch: first, universities, as they provide the required skills training; second, doctoral candidates, as they need to become aware of which skills are required; and third, companies that absorb a large number of doctorate holders as employees. Universities have started taking on responsibility in this debate, by broadening the scope of doctoral training to the development of transferable skills, in addition to scientific knowledge and skills (Roberts, 2002; EUA, 2007; Jackson, 2007). Some universities even go further and adopt a more 'entrepreneurial academic model' (Etzkowitz et al., 2000; Enders, 2005; Hakala, 2009), in which the application of knowledge is considered more important and crosses disciplinary and organizational borders. Strategic research can possibly bridge the gap between fundamental and applied research fields (Enders, 2005), with the result that the training provided for doctoral candidates also incorporates a mix of specialist and transferable skills. There is, however, much debate on whether this trend should be followed or not, since some academics fear that their freedom is at stake (Kleinman & Vallas, 2001) and that the growing attention for applied research could leave less room for fundamental research.

The Flemish industrial sector as a whole does not yet have a joint set of general skills they look for in a researcher. This expectation depends to some extent on the size of the company and on whether they already employ doctorate holders - two factors which often intertwine. In the UK sector skills councils (SSC) do represent employers' views on skills issues. Employers' federations in Flanders could for example consider

starting up similar programmes specific to the skills set problem, in order to design competency profiles per subsector for doctorate holders. Individual companies obviously also have responsibilities for training their employees, and might, just as universities have done, take on a more active role in bridging the gap by training researchers in the skills they might be lacking for a particular job.

The format and content of the preparation of doctoral candidates for future careers (a.o. in doctoral training) is an important issue in higher education which affects all mentioned stakeholders. First, even though career planning is not regarded as a priority by many doctoral candidates, nor by employers in our survey, it is actually important for doctoral candidates to know what the options are after obtaining their degree, as universities can only absorb a small number of them. Career services where they can discuss future perspectives can be a valuable option (Jackson, 2007), preferably in cooperation with doctoral programs or with recruitment agencies. Career fairs are another option as they provide a direct link to possible future employers and raise doctoral candidates' awareness of what is expected in other sectors. Last but not least, skills like teamwork and project management are also gaining importance in an academic environment, as more doctorates are nowadays funded through larger projects (rather than the traditional individual path) or through partnerships with other institutions or companies.

In this way, a wider set of skills can benefit not only those who move to other sectors (e.g. industry), but also those who stay in a postdoc position or become faculty: they will have to supervise more (Ph.D.) students than before and could also benefit from better managerial skills (Thompson et al, 2001). Moving towards different types of doctorates, as is the case in for example the UK (UK Council, 2002), can also be an option, where the specific learning outcomes for the professional doctorate can be adjusted to skills sets that are needed in the corresponding labour market. As such, doctoral candidates are also stimulated to think about their future ambitions at the start and during the doctoral research process. The interviews with employers however informed us that not the amount of skills training, but the type of training is important. Some skills cannot be acquired by following courses, but need to be learned on the job and/or through collaboration with other companies.

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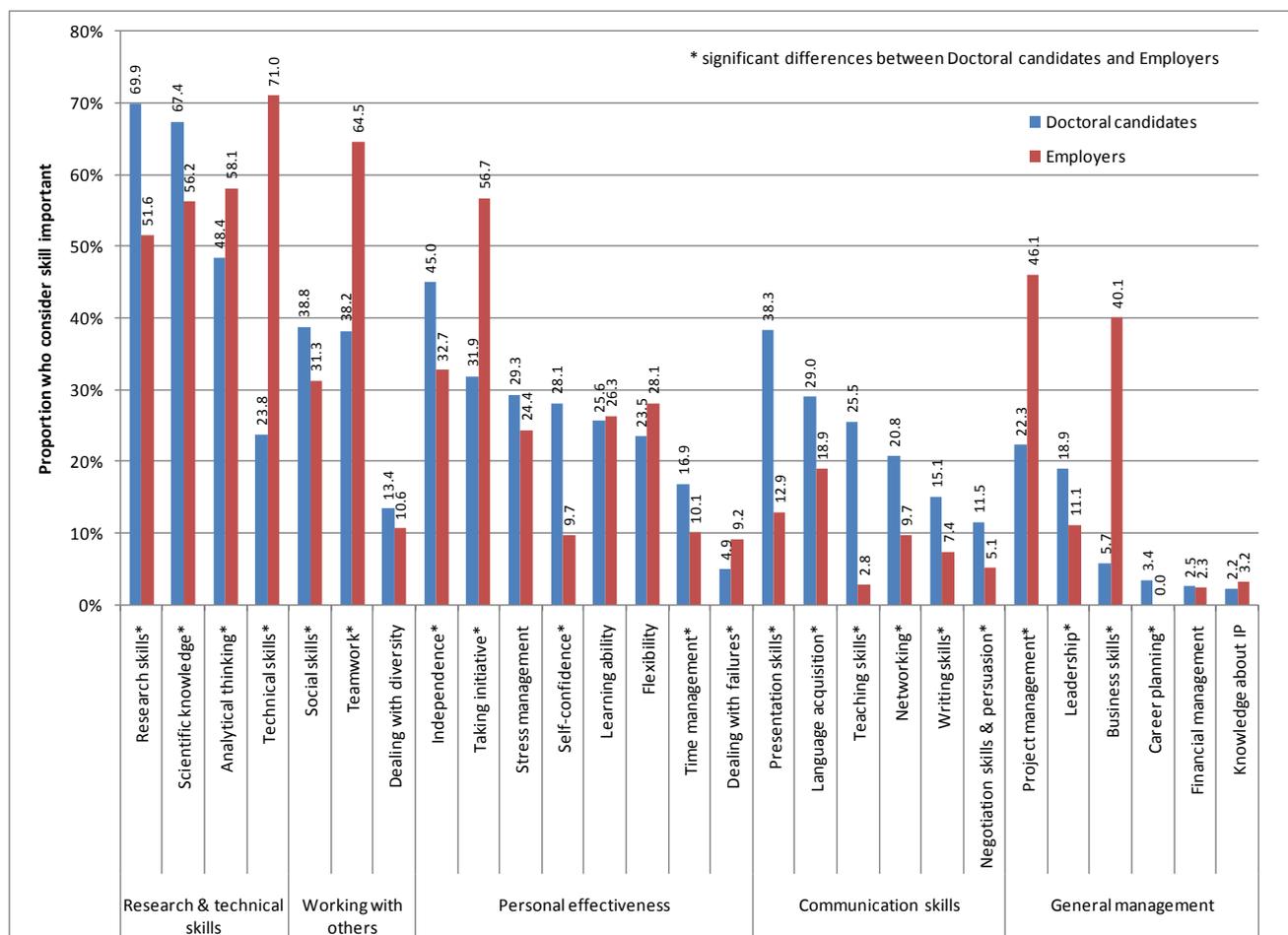


Figure 1: Comparison of perceived importance of various skills by doctoral candidates and employers