Supporting Computing professionals on part-time research degrees

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19 January, 2011

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Abstract The development of competent researchers is a key aspect of academic practice, and the only way
to ensure continuity of our profession. It is also a key enabler of the knowledge society, with research skills in ever greater demand both in industry and academia. In the UK and elsewhere, the traditional way of developing future researchers through research degrees is under scrutiny with pressure on institutions to look beyond the needs of academia and to cater more fully for those of the working professional. In this paper we analyse the challenges raised with reference to our experience of supporting Computing professionals enrolled on part-time research degrees, contextualised in current and emergent institutional and national practices. We also propose a model of supervision we have refined over the years, in the hope that our experience can be of benefit to other academics who find themselves facing similar challenges.

1 Introduction

The last two decades have seen significant changes in the UK research degree landscape. Historically, the first
UK research degree (a DPhil) was introduced in Oxford in 1917 (and awarded in 1920) (Park, 2005; Bourner et al., 2001; Manathunga, 2005), inspired by the German doctoral model in existence since the 19th century. That model, substantially unchanged until very recently, revolves around a form of apprenticeship between supervisor(s) and (usually resident) student, and is regarded as a means to educate the next generation of researchers: the degree is awarded for demonstrated ability to conduct academic research independently and for the generation of new knowledge. While remaining the prevailing research degree in the UK, this doctoral model has attracted some criticism in recent years, particularly from students and employers (Park, 2005), who have questioned its fitness for purpose in meeting their expectations and requirements in today’s rapidly changing knowledge society, criticisms also echoed in a number of a national reports (Harris, 1996; Dearing, 1996-1997; Roberts, 2002). As a consequence, UK universities are under pressure to rethink their research degrees, trying to strike a balance between educating researchers who will carry discipline-based research agendas into the future, and catering for the needs of an increasing number of practising professionals looking at research degrees as a means of developing a range of skills which may help them improve their professional profile1. As well as a greater emphasis on skills and training, addressing both research and transferrable skills (Vit, a,c,b), other drivers for change have been the benchmarking of the various degrees (QAA, 2001), and a greater scrutiny of supervision quality and completion rates (Pearson and Brew, 2002; Manathunga, 2005; Lee, 2008). It goes without saying that some of the changes remain controversial, particularly those that directly affect supervisors’ role, practice and explicit training (Manathunga, 2005).

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1. This is also true in other countries that have adopted the UK model, notably among them Australia, as witnessed by some of the literature cited in this paper.
Our own institution, The Open University (OU), UK, is a major provider of adult higher education, with currently 250 thousand students\(^2\), most of whom are enrolled in undergraduate degrees entirely at a distance. The OU research student population is made of just over 1300 students, half enrolled on part-time research degrees at a distance. Computing is one of the disciplines exhibiting a high number of part-time research students, some conducting their research while employed in the IT industry. Like most UK institutions, the OU has been affected by recent national trends and drivers for change, with many of its research degree processes being tightened up and subjected to a higher level of scrutiny, and with extra infrastructures put in place for research skills development, formative assessment of research projects, and supervisors’ training.

As senior academics in Computing at the OU, the authors together we have over 20 years’ experience in research supervision both at Masters and PhD levels. Also, we have worked together within a common programme of research since 2001, hence we jointly supervise most of our current research students, many of whom are part-timers, and our supervisory practice has been affected by and has evolved alongside institutional changes.

Despite a growing literature on research supervision, the supervision of part-time students, particularly professionals remains largely unexplored and we have been unable to locate any articles at all which look specifically at Computing professionals. In this paper we share our experience of supervising Computing professionals on part-time research degrees, and discuss the model of supervision which we have developed over the years, contextualised within current institutional and national practices. We are hoping our insights will be of benefit to other academics who find themselves facing similar challenges in this key aspect of our profession.

2 Research degrees and the working professional

The need to cater for both future academics and students seeking other kinds of employment has resulted in the rise of new research degrees as well as the repurposing of existing ones. Since the 90s, professional doctorates have appeared in the UK (Bourner et al., 2001), with Doctorates in Education (EdD) and in Engineering (EngD) leading the way. Many other professional doctorates exist today, particular in Business and Medicine. These are usually part-time degrees offered to practising professionals who are expected to make a contribution to knowledge in their professional practice. In fact, professional doctorates aim to integrate a student’s professional practice within their research work, something which is not required in traditional doctoral studies. Another important distinction between the two doctorates concerns their aim and starting point (Bourner et al., 2001): while a traditional doctorate will aim to make a contribution to knowledge which addresses a gap identified in the literature, a professional doctorate will aim at investigating and resolving a significant problem perceived in practice. It should be stressed that such new degrees are not meant to replace the traditional model of doctoral studies, which remains the most common and favoured means to train the next generation of academics in the UK. Instead, the intention is to provide additional choices for professionals seeking to carry out research outside academia and develop valuable skills for their professional life.

Currently, The Open University offers only one professional doctorate, an EdD. However, since 2008, the Computing department has been offering a new flavour of MPhil degree, the Virtual MPhil in Computing\(^3\), designed to cater for the needs of the working IT practitioner, alongside its more traditional version. The

\(^2\) Based on recently published 2008/2009 facts and figures. See http://www.open.ac.uk/foi/p4_2.shtml. All URLs cited in this article were accessed last on January, 5th, 2011.

\(^3\) http://www.virtualmphil.open.ac.uk/
second author has led the development of the new programme, and both authors lead research themes and supervise students under this programme. It is a flexible part-time programme, with no residential requirement. As a Masters level research degree, it allows for more focused, practice-oriented research investigations, as well as emphasising the development of a range of research and transferable skills. It also allows supervisors to offer projects applying their own research to problems identified or perceived in today’s IT practice, resulting in a two-way knowledge exchange which is of particular value to certain types of Computing research.

This is the case for the authors’ own research programme, called Problem Oriented Engineering (POE)\(^4\), which has developed since 2001 into a collection of thought tools for problem solving underpinning design and engineering, including of software-intensive systems. As such POE research encompasses both theory and application, hence spanning the continuum from speculative thinking to experimentation and empirical work (Génova, 2010). The application of POE in the area of IT Governance (Weill and Ross, 2004; ISO, 2008; Calder and Moir, 2009) has proved particularly popular among recent IT professional applicants.

It should be noted that, while remaining the dominant model of supporting students on research degrees, supervision is also key to some components of our taught Masters programme, particularly our Masters research projects, and we have been supervising students on that programme too. There are in fact strong similarity between the Masters research project and MPhil work. Of course, Masters research projects are briefer and the depth and breath of the expected contribution more limited. Yet, they too: involve part-timers who are also practitioners (often sponsored by their employers) and who bring their rich professional context into their study; require students to complete a substantial dissertation, as their main means of assessment; and require students to master similar skills as to those expected from our research students. As a consequence, we have developed a model of supervision and student engagement (discussed in Section 7) which applies to all our students within our common programme of research, and can be tailored to their needs, independently on the particular degree they are registered on.

3 Skill sets

One of the drivers for change for UK research degrees is a greater emphasis on explicit recognition of skills (Park, 2005), arising from pressure from funding bodies and employers for more structured programmes for training and skills development. Vitae (previously known as ‘UK Grad’) is a UK national organisation championing the personal, professional and career development of doctoral researchers and research staff in higher education institutions and research institutes. In 2001, in collaboration with the UK Research Councils, Vitae published the Joint Skills Statement\(^5\) (JSS) (Vit, a) to provide a common view of the skills that doctoral students funded by UK Research Councils are expected to develop as part of their doctoral studies.

JSS has now been integrated with and superseded by the more comprehensive Research Development Statement\(^6\) (RDS) (Vit, c), a document specifying knowledge, behaviours and attributes expected of effective, highly skilled researchers: it provides a reference model in which knowledge, behaviours and attributes are organised according to a number of domains (and sub-domains). Note that RDS is meant to characterise skills for a wide range of research careers, not just doctoral level skills. RDS is accompanied by the Research Development Framework\(^7\) (RDF) (Vit, b), an operational framework to guide the implementation of research training and career development programmes by individual institutions. RDF is very comprehensive.

\(^4\) http://problemoriented.wikispaces.com/
\(^5\) http://www.vitae.ac.uk/policy-practice/1690/Joint-Skills-Statement.html
\(^6\) http://vitae.ac.uk/researchers/1272-274761/Researcher-Development-Statement-RDS.html
\(^7\) http://www.vitae.ac.uk/policy-practice/234301/Researcher-Development-Framework.html
and specifies five levels of research maturity (called ‘phases’ in the document) for each identified domain (and sub-domain). It is meant to embody the requirements set by the Concordat to Support the Career Development of Researchers, the QAA Code of practice of research degree programmes (QAA, 2004) and the Roberts Report’s recommendations for postgraduate researchers and research staff (Roberts, 2002).

Some could argue that skills development has always been an integral part of the apprenticeship of research students, and this type of approach is simply a way to metricise current practices, sometimes to the detriment of actually carrying out original research. However, for better or worse, this type of thinking is having an impact on the way UK universities engage with research students and has a knock-on effect on the supervisory relationship. Moreover the UK is not unique in this trend: see, for instance, the Australian Research Skills Development Framework (RSD), devised to underpin curriculum design at undergraduate and graduate levels for the development of research skills of value in the workplace.

Since 2001, The Open University has adopted the JSS as the reference model for research students’ training and skills development, and an explicit skills audit and tracking of research skills is required to be carried out by all research students throughout their programme of study and research. Given this track record, it is very likely the OU will soon adopt the new RDS and supporting RDF. Currently, the OU is not prescriptive of the way skills audit and tracking is carried out for individual students, devolving such operational matters to supervisors and their academic units, and only requiring that a summary should be provided as part of the regular monitoring of the student’s progress, which happens every six months. Online resources and training workshops are available to students and supervisors, which they use/attend at their discretion. From personal observation, we notice is a great variability across the university (even within the same department) and we, too, have developed our own specific practices to address the skills development of our students.

Given the generally mature nature of our students, our approach is quite light-touch: we expect them to develop their research and transferable skills as an integral part of conducting research, interacting with us and their wider research community. For us, reflective practice (Schön, 1983) is the key, rather than requiring them to take part in a wide range of add-on generic training activities: this is particularly true for our professional part-time students, who are already equipped with a range of valuable skills and for whom generic activities of uncertain value would simply complicate their already very busy lives. With a baseline in basic research skills, for our students we focus on specific skill sets which are particularly meaningful for their development needs and the nature of their research projects, taking into consideration that the initial skills profile of a working practitioner can be very different from that of a research student who has never been in professional employment.

We also strive to match deliverables with skills development. For instance, all our students at some point through their programme of study will: give oral presentations in question-and-answer sessions (to us, other students or at workshops and conferences), in order to develop their presentation skills and the ability to think on their feet; write academic papers (for doctoral symposia, workshops, conferences or journals) in order to develop their writing skills above writing their own dissertation and to gain feedback and validation from their academic peers; lead and participate in group discussions around specific readings from the literature, to develop their ability to conduct a discourse with peers and more experienced researchers; review academic articles on specific technical subjects, above the literature survey which is part of their dissertation, to develop their ability to critically appraise other authors’ work, and provide appropriate feedback and constructive

criticism; engage with a variety of media to present and discuss their work at a distance, to improve their online literacy. These are all examples of activities that both contribute to their own research and to their development as effective and independent researchers, with tangible outputs and evidence that can be collated as part of their monitoring process.

4 Part-time research students

Despite the growing number of students taking research degrees part-time, very little has been written about them. According to (Neumann and Rodwell, 2009), part-time students are often overlooked in policies or government initiatives, where often an underlying assumption transpires that research students be young and study full-time. Others (Evans, 2002) have suggested that universities often only make minor adjustments to their programmes to account for part-time students. Some of the particular challenges encountered by part-time students have been recognised (Butterfield, 1997) for some time:

“The isolation that affects all research students is likely to be the greater, at least in academic terms, for part-timers, and they are less likely than full-time students to be able to attend conferences and day-time seminars. They are likely to experience some of the difficulties of spasmodic rather than continuous periods of writing, and they will usually have to manage their time between the various professional demands upon them and the need to focus their research project. [...] the context of challenge is important in contextualising the kinds of sacrifices and difficulties that part-time practitioner/students face.”

Moreover, not much seems to have changed in the intervening years as witnessed by an ongoing study funded by JISC and the British Library (Carpenter et al., 2010) aimed at profiling so-called ‘Generation Y’ doctoral students against older students. Early results seem to indicate that time pressure remains the most severe constraints for both groups (both for part-timer and full-timer, it must be added). Also, when looking at their technology-mediated information enquiry skills (the main focus of that study), the results seem to indicate, perhaps surprisingly, that there are no significant differences between the two groups: both exhibit similar patterns of technology use, and also appear rather conservatives in their adoption of new technology.

Yet another factor to consider, perhaps unique to our own institution, is that OU degrees, including our research degrees, have been designed to meet the needs of those whose capabilities equip them for study, but have not previously obtained formal academic qualifications. Hence each applicant’s entry capabilities need to be evaluated on an individual basis.

(Evans, 1995) summarises some of the challenges and opportunities for supervisors of part-time professional students: on the one hand, care is needed to understand better the student’s personal and professional context, the skills they bring to the degree and their development needs, and the professional issues they are in a position to investigate as part of their research; on the other hand there are clear synergies to be exploited in combining theory and practice, with much potential for fruitful partnerships between industry and academia. This is certainly the case in our experience of supervising part-time research students who are also IT professionals: we find that the complexity of their working context and of the problems they face help in challenging research assumptions, in validating or disproving theoretical results, and provide valuable insights for further theory development. We will expand on these in Section 7.

12. Not digitally native, but been exposed extensively to internet technology after their formal education.
5 Communities and communication technology

The standard OU model assumes that part-time students be UK residents and visit their supervisors on campus on a regular basis (at least 4 times per year); part-timers are also offered participation in on-campus activities (like seminars, lectures or workshops), but generally there is no obligation for them to do so, and those in full-time employment rarely can afford to. As a consequence, part-timers often miss out on opportunities to interact with academics and their peers and, generally, their level of engagement with the community can be low. In Computing, in recent years, particularly thanks to the rise of widespread communication technology, a number of new practices have be introduced in order to engage with part-timers more fully, both by individual supervisors and at departmental level (e.g., the Virtual MPhil project).

As supervisors, we have now reached a point in our practice in which we supervise part-time students primarily online, with only very sporadic co-located face-to-face sessions (as little as once per year). We use a variety of technologies to help us fulfil our role and have developed our own set of practices for online supervision and to engage our students with our community. Note that the literature on online supervision is currently very thin: outside the Virtual MPhil project, only a few Australian authors seem to have published on the subject so far (Stacey and Fountain, 2001; McKavanagh et al., 2004; Sussex, 2008).

We meet online with our students at very regular intervals, usually weekly. This has the advantage of breaking isolation, of creating a continuous dialogue and a flow of ideas, and providing a rhythm to the students’ weekly routine which helps them ring-fence their research time from competing requirements and pressures from work and family.

Figure 1 gives few illustrative snapshots from online sessions we have run in the past 18 months. These are all examples of synchronous sessions using mainstream internet technology such as Skype, Elluminate Live! and Second Life. The range of activities we run include the online equivalent of traditional supervisory sessions (e.g., discussing and developing ideas, reviewing progress and providing guidance), but also working with groups of students, or running workshops with a mixed economy of residential and remote participants: one of the examples in the figure is from an international workshop we have co-chaired, affiliated to a major software engineering conference and with participation from three continents. We have also started to engage with ‘cohorts’ of part-time research students, by which we mean small groups of students enrolling on the same research degree at the same time, contributing research to the same research area, albeit pursuing distinct lines of enquiry, but having common goals and milestones.

In between synchronous sessions with us, we encourage our students to keep in touch in a variety of ways, including running their own peer sessions, or participating in our wiki and social network. Importantly, these are open to our students and collaborators, independently from their particular course of study (MSc, MPhil or PhD), mode of study (part-time or full-time), stage of research (enrolled or completed) or sector (academia or industry). Their topic focus complements other resources made available by the department and the university: for instance, currently enrolled students have access to further resources through the Virtual MPhil infrastructure, including other research students’ wikis and fora (see Figure 2).

The cross-fertilisation of past and present students and academic and industrial collaborators is particularly fruitful both for continuity and impact of our programme of research. Among the advantages, the more experienced students can play a mentoring role for the newer ones, and academic and industrial collaborators can bring complementary views to our research programme, feeding into its theoretical development.

14. Students’ images have been anonymised intentionally.
17. http://secondlife.com
6 Student Stories

In this section we outline three students’ stories from our supervisory practice with IT professionals which are representative of the benefits and difficulties of our chosen supervisory model. These are based on data collected through a questionnaire we recently distributed to all our students, present and past, and they have been chosen to provide snapshots at different times during a research degree/project. The aim of the questionnaire was to elicit some information as to what motivates IT professionals to engage in academic research, their expectations, barriers and success factors, and their view on the cross-fertilisation between academic research and professional practice. The three snapshots below were taken after completion of a PhD degree, during a PhD degree and after completion of a Masters research project.

6.1 Student X

Student X completed his part-time PhD in 2009, after 7 years of part-time doctoral studies. He has been a Computing professional for 30 years. His main motivations for starting a PhD were a desire to develop new skills and a long-standing personal ambition. He thinks employer support, relation with supervisors and the use of communication technology were the three factors with the greatest influence on the successful completion of his degree. What he found particularly challenging was the mismatch between professional practice and academic research, in particular: switching from writing in a commercial style to an academic style; forming an adequate research question; and acquiring the confidence that both his research question and results were appropriate.

He acknowledges the synergy between practice and research: on the one hand, his professional practice provided both motivation and substantial case studies for his research; on the other hand, he is currently
Figure 2: Online fora for our research students and wider research community. Clockwise from top-left: POE Ning; POE wiki; POE under the Virtual MPhil Moodle portal; POE under the Virtual MPhil Moodle public site.

trying to integrate Problem Oriented ideas into the development process used by his company, which he sees advantageous in bringing clarity and analysis capabilities.

He sees his PhD experience as “life-changing”:

“Even at this “late” stage in my career I am amazed at how much my approach to problem solving has been improved by my going through my research work.”

6.2 Student Y

Student Y has just started the 4th year of his part-time PhD. He has been a Computing professional for 11 years. His main motivations for starting a PhD were a desire to progress his career, acquire a new range of skills and engage in an intellectual challenge. He thinks the relation with his supervisors and the use of communication technology have been, so far, the two factors with the greatest influence on the successful progress of his degree. He sees isolation and a mismatch between professional practice and academic research the greatest challenges to successful completion. Things he has struggled with in particular include academic writing, lack of confidence, identifying a clear research direction, and focussing on a very narrow area of research.

Student Y reflects on the relation between his practice and research. A motivator for his research was the frustration he felt in his profession due to a perceived lack of appropriate engineering practices. He sees his research as starting to address some of those issues. In particular, he feels his research has influenced the way he now perceives his industrial context, and found particularly useful the Problem Oriented notion of risk transfer between stakeholders. He thinks his professional practice has allowed him to see the opportunities for making useful tools based on his research in Problem Orientation.

He observes that his initial assumption that all research tasks are somehow beneficial to industry and
professional practice has been challenged over the years in that he has observed that the extent in which academic research is appreciated or valued in industry is dependent on organisational culture: while his current organisation is appreciative of academic research, his previous organisation was not, with people often thinking that academic research should be confined to academia, and not having a place in the industry.

He sees increased understanding as the long-lasting value of his research:

“I would say that academic research, while being extremely demanding in terms of time and resources, has had an immense impact on my understanding of the areas I am interested in.”

6.3 Student Z

Student Z has been a Computing professional for 22 years and has just completed his part-time MSc research project. Acquiring a new range of skills and engaging in an intellectual challenge were his main motivations for choosing the project, although a desire to progress his career also had some influence on his choice. The timeliness of the project was also a factor.

He thinks support from his supervisors and the use of communication technology were the two factors with the greatest positive influence on the successful completion of his project. Isolation was sometimes an issue, but he felt that it would have been far worse without communication technology to keep in regular contact with his supervisors. He feels that his whole project was about the challenges of matching professional practice to academic research and noted that:

“Employing an academic research focus highlights the ineptitude of what passes for professional practice in much of IT — and practitioners tend not to like that.”

He found Problem Orientation very useful in providing an academic framework to something he felt intuitively from his professional practice, that is the necessity of problem and solution validation, and thinks that his project would have been far less rigorous without it. On the other hand, he took him quite a while to properly understand how to deploy it in terms of academic notation and its roots in logic, and, while considering such an effort worthwhile, he had probably spent quite a long time developing such an understanding compared to carrying out his primary research.

He feels that the research project has given him an opportunity to consolidate and revise a body of knowledge that is of great practical benefit to his professional practice, while the latter has provided him with plenty of primary research material. He sees academic research as:

“Hard work but worthwhile — especially with good supervision. Not something to be committed to lightly, though.”

7 An emerging model for supervision and student engagement

Through reflection on our practice, a model of research supervision and student engagement is starting to emerge, which is proving particularly fruitful to us. Although developed in the context of our specific research programme and our work with IT practitioners, we think it exhibits some general transferrable characteristics, which we will attempt to explicate in this section. These relate to the nature of the enquiry we conduct, rather than its specifics, the general qualities that practitioners can bring to academic research, and its fit with emergent generic research skills development frameworks and recognised supervisory practices. Essential facets of our model are discussed below.
7.1 A scalable research model: Quine’s island

Our research is principle and theory-based. As a contribution to knowledge it has practical applications in the engineering disciplines. As Quine (1951) (Quine, 1961) wrote\textsuperscript{18}:

‘Total science, mathematical and natural and human, is [...] underdetermined by experience. The edge of the system must be kept squared with experience; the rest [...] has as its objective the simplicity of the laws.’

Our research is neither pure theory nor pure empiricism, and Quine’s observation is very pertinent, as we must be able to simultaneously, as researchers, combine theoretical reasoning and observation to:

– exercise the analytic and predictive abilities of the theory as they apply to practical matters – this is a validation role for empirical studies conducted within a theoretical viewpoint;
– to determine scope and/or identify infelicities and/or deficiencies in the theory through the paucity or non-existence of analysis or through incorrect or deficient prediction – this is a verification role for empirical studies.

In short (and to paraphrase Boehm (Boehm, 1981)) in our applied theory, we must both ‘think about the right thing’ and ‘think about the thing right’.

Quine’s observation suggests ways in which research that spans both theory and practice might be fruitfully conducted. That Quine’s scientific system model mentions no scale or point of reference means that it applies both to the smallest, most focussed theory and to the largest, most expansive theory; that it provides an objective measure of increasing simplicity means that it comments on theory development. It does not, however, describe, in practical terms, the relationship nor does it provide a mechanism that benefits theory and practice when used together.

To this end, we have developed a research model that allows the expert practitioner to enter and contribute their expertise to the research world. In essence, the practitioner’s contribution to knowledge stems from their understanding of both the working and deficiencies of something within their professional context, which they then (at least):

– model within the theory,
– analyse their model within the theory,
– re-express/refactor their model with a view to applying the principles of the theory,
– identify whether the theory adequately explicates the artefact’s behaviour/predicts the deficiencies that they experienced,
– critique the theory in terms of its analytic and predictive performance.

The motivated researcher/professional can then reflect on their experience, construct a dialogue on the presentation or on the detail and development of the theory, when it has been shown deficient, over complex, or just plain wrong.

In terms of Quine’s observation, our research model provides a number of different points on the edge between theory and experience by which the theory can be tested for alignment with experience whilst allowing many to make simultaneous contributions from their own rich context and at their own pace. It is also scalable from a few to a great number of researchers. A helpful metaphor is that practitioners battling a

\textsuperscript{18} Text available from http://www.ditext.com/quine/quine.html
sea of experience can take respite in their exploration of an island of theory, which we call “Quine’s island”. Whether they choose to reside there, or whether they will continue their battle refreshed and with stocks replenished, is a choice for later.

7.2 Life-long partnership

The completion of a part-time research degree can take a very long time: as long as 7 years for a doctorate. It represents therefore a considerable investment of time, effort and resources both for supervisors and students, and provides both parties with an opportunity to develop long-term relationships, which can be beneficial to a research programme well beyond the (more or less) limited scope of a degree. In the case of practitioners, there is an added bonus that they are already located within the industry while conducting their research, with extra benefits for a research programme in terms of relevance and impact. As a consequence, we view our relationship with research students as long-term and beyond the expected interaction which characterises their course of degree study.

We pay particular attention to their initial engagement: this is the period which spans from the initial approach of a potential applicant to the point of registration for a degree. We make a significant investment in this phase, well beyond the normal practice of checking a candidate’s credentials and qualifications and agreeing a generic topic of research. For our students this phase can span from several weeks to several months, during which we expect candidates to engage with the literature and write a significant research proposal. This is our means to test their real commitment to the degree, gain a deep understanding of their professional context and make a thorough assessment of their potential as researchers (see also the Section 7.3 below).

Post-degree we see our students as research collaborators and continue to engage with them in a variety of ways. For those who choose an academic career, collaboration is relatively straightforward, these being a normal mode of academic interaction. In the case of practitioners, a particular challenge is how to maintain regular contact, and enable them to continue to contribute to the research community, exchange research ideas and generate research outputs. The seeds for long-life engagement are planted during their course of study, and include the use online technology as a key enabler for regular exchange, but also regular interaction though professional networks, such as those under the patronage of professional bodies like the British Computing Society\textsuperscript{19} or the Institution of Engineering and Technology\textsuperscript{20}, to which many of our present and past students belong to.

7.3 Skills assessment

As already mentioned, the skill set that an experienced practitioner brings to academic research can be very different from that of a newly graduated student. An initial assessment is beneficial, both to establish a candidate’s potential to research and their development needs.

One use of the recently published RDF (\textsuperscript{Vit, b}) is as a model to benchmark the skill set of applicants for research degrees and to plan for their development needs (other frameworks can be used in a similar manner, of course). The main skill domains from that framework are: Domain A: knowledge and intellectual abilities required to do research; Domain B: personal effectiveness in carrying out their own research; Domain C: research governance and organisation for professionalism; and Domain D: engagement, influence and impact when working with others and in contributing to the wider environment.

\textsuperscript{19} http://www.bcs.org/
\textsuperscript{20} http://www.theiet.org/
Without intending to oversimplify, we have observed that IT professionals bring to a research degree already well-developed skills in Domains B and D, and also developed Domain C skills, although some contextualisation is required to differentiate professional issues in industry vs those in academia (in particular, ethics in generating and collecting data, acknowledging and attributing IP or co-authorship of academic articles). As a consequence, a great proportion of the development effort during the degree can be devoted to Domain A skills, i.e., those more traditionally associated with conducting academic research, including the development of subject knowledge and knowledge on research methods, analytical and synthetic skills, and academic writing and discourse.

7.4 Becoming a researcher

With the shift towards the explicit recognition and monitoring of skills and their development as part of a research degree, a question arises as to how this can be achieved effectively and balanced with the need for the development of the essential qualities and values which characterise a well-rounded researcher, and for new knowledge generation which, we believe, should remain a main goal of a research degree.

With time pressure being a critical factor for the success of part-time study, especially for working professionals, our preferred approach is to use reflection as the main tool for our students’ development as researchers (and for us to be better supervisors). Indeed, the role of reflection in learning is widely acknowledged, and also meshes well with the traditional apprenticeship model of research supervision that our generation of academics is accustomed to: students develop through direct experience and interaction with supervisors, peers and their wider research community, gaining awareness and deepening their understanding by reflecting on such experiences. Its particular fit with professional practice is also widely acknowledged (Schön, 1983).

It is important to remember that there are several dimensions along which students must develop to become professional researchers. Those identified in a study of supervisory practice by Lee (Lee, 2008) have a particular resonance in our practice. They can be summarised as: function, i.e., what needs to be done; enculturation, i.e., the ethos and the unwritten rules of being part of an academic community; critical thinking, i.e., the core quality of a professional researcher; and emancipation, i.e., the professional growth towards independent thinking. Alongside them, and perhaps the key enabler for their development, sits the student-supervisor relationship with all its delicate balance (e.g., between professional and personal) and tensions (e.g., between authority and independence) (Delamont et al., 1998; Grant, 2003).

7.5 eLiteracy

With technology playing a significant role in mediating the interaction with our students, serious considerations are also given to developing their online literacy. It should be noted that being an IT practitioner does not equate to having a high level of online literacy: our students may well be sophisticated software architects, able to deliver complex organisational software, but they may not have much experience of using online technology for communication or team work.

With reference to Sharpe et al.’s pyramid for developing learners’ digital literacy (Sharpe et al., 2009), we have developed significant technical expertise and practices to support functional access (the bottom of the pyramid): tried and tested tools and induction practices are used to help new students get over the initial hurdles in a relatively short period of time, overcoming any anxiety they may have and allowing technology to soon vanish in the background. Their online skills and custom practices (next two layers of the pyramid) develop over time as we regularly engage them through technology in a variety of research-related activities.
Confident experienced students appropriate technology creatively (top of the pyramid) feeding their expertise and insight back into the community, often leading to new practices.

8 Conclusion

Traditionally, the UK academia/industry relationship has been based on the validation of intellectual study skills – of knowledge and understanding – of students by universities, who then enter industry. Increasingly, however, the cusp of change is being approached by creative individuals in industry who wish to study for research degrees. Today, therefore, academics at the interface with industry see many professionals who wish to distinguish themselves by gaining validation of an independent research capability, e.g., as is gained through an MPhil or a PhD.

Thus, academia faces a new challenge, those of welcoming a practitioner’s deep understanding of the problems that exist within their own rich professional contexts and of delivering research models that can accept those contributions, that are focussed and deliver value back to the individual and to the context, that deliver value to academia in terms of its setting of sound expectations of what a research degree is and to whom it is suited, and, consequently, that instil an appreciation of the ways in which academia and industry can and should sustain each other.

In this paper, we have discussed many facets of this relationship in the context of our practice of supporting Computing professionals on research degrees and projects, from underpinning principles to the mechanics of research at a distance, in the hope of providing a jumping off point for a new sustainable academia/industry symbiosis, based on the teaching of research and not only the teaching of knowledge and understanding. The challenges of building such a sustainable academic/industry joint venture are those of any symbiotic relationship and, we feel, could be met based on the willingness of individuals to come together to learn from each other and to share their rich context.

Acknowledgments

We would like to thanks our students, present and past, for their continuing contribution to our research and for helping us be better researchers and supervisors.

References


