Research supervision: the research management matrix

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Abstract We briefly make a case for re-conceptualising research project supervision/ advising as the consideration of three inter-related areas: the learning and teaching process; developing the student; and producing the research project/outcome as a social practice. We use this as our theoretical base for an heuristic tool, 'the research management matrix' and this is the major focus of this paper. The matrix facilitates the work of supervision. In the matrix we privilege the research questions. The research management matrix can be easily used to focus on key research features and the relationships amongst them. The timing of different parts of research is introduced so that practical goals are identified. This facilitates project and research student learning management and timely completions. For these reasons the research management matrix is a useful tool for supervisors/advisors

Introduction

We think of supervising/advising[1] of higher degree research (HDR) students as a teaching and learning practice but it is more than this. Alongside teaching/learning, supervision needs to be thought of as research student development together with research project knowledge production. By 'supervising' we mean here the process(es) that the academic(s) uses to support HDR students' learning. Such an approach is necessary to side step the

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[1] Generally, 'advisor' is the term used in North America whereas it is 'supervisor' in those countries with a British higher education tradition. Henceforth we use the terms supervisor/supervising.

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present thrust of much supervision literature which focuses upon improvement rather than re-working some basic ideas about supervision itself. We thus make our position clear: supervision is centrally a teaching/learning process but never-the-less a practice that has parallel processes, namely, student development and the research itself (see Maxwell and Smyth 2009).

In this paper, we advocate a new tool to assist the supervisory process: the research management matrix (RMM or 'the matrix') that is consistent with our conception of supervision. We base our claims on the ways that we have used it as a support for research student learning leading to student development and a quality research product. Thus the paper has a main purpose to introduce the RMM as an heuristic tool in higher education. However to support this major purpose we first make a brief case for supervisors focussing upon research as student learning. In so doing less attention is given to project management using the RMM. The latter is a future project.

Context

Much of the international literature in doctoral education, to which we refer below, has in fact so far concentrated upon the improvement of supervising.[2] Ongoing criticisms of supervisory practice include those exemplified by Ingrid Moses in her early publication for the Higher Education Research and Development Society of Australasia:

> We believe that not all but many of (higher degree) student complaints can be overcome if two basic principles are observed in the advisory relationship: clear and open communication on all aspects of the project (is maintained); structure without a straightjacket, i.e., a framework for supervision and studies which facilitates rather than hinders students' development and creativity (is needed) (Moses 1985, p. 5, our parenthesis).

These remarks clearly point to needed improvements. Other issues for supervisors have been identified elsewhere. Burns, Lam and Lewis (Holbrook and Johnston 1999, pp. 66–70), for example, note of the supervisory process that there is:

- a lack of the interchange of ideas which, in turn, can reduce feelings of isolation and stimulate appreciation of the benefits of being acculturated into academic thinking;
- insufficient attention to a process whereby a supervisor, or supervisory team, can negotiate each student's needs for structure and direction; and
- a lack of clear communication about project design, milestones, timing, expectations and responsibilities, as well as the relationships amongst these.

Zuber-Skerritt and Ryan (1994) point to "a lack in both students' and supervisors' confidence in the quality of higher degree research outputs".

More recently the debate in doctoral education has broadened. The way has been lead by Kamler and Thompson (2006), Nightingale (2005) and Wisker (2005) who have built upon on the work of others (Delamont et al. 2004; McWilliam and Singh 2002; Punch 2000, 2003; Zuber-Skerritt 1992). These authors encourage improvement by unwrapping issues of pedagogy, relationships, and institutional responsibilities, the tasks of the research

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[2] There was the general agreement on this issue amongst 29 doctoral educators representing six countries (including the US) in a plenary session of the "Challenging Research Pedagogies" conference in doctoral education held at McGill University, 15–18 April 2007.

process, managing the outcomes and on to launching successful research careers. Encouraged by this scholarship we have built a theory of supervision to support our HDR work including that of the research management matrix.

When supervision[3] is conceived as a simple learning/teaching dichotomy, this is insufficient to express the complex nature of supervision. Similarly, discussions solely focussing upon the project as the product of the research endeavour miss opportunities to highlight learning and teaching. A focus upon process *and* product is needed that can be facilitated by functional leadership leading to greater student learning. Here we are building upon the seminal work of Biggs (1999) supported by Ramsden (2003) where learning is central to the adult conception of undertaking a course. This is broadly consistent with Mezirow and Associates (2000) and others' work on guiding and facilitating rather than teaching adults leading to deep learning and even transformation. In doctoral study knowledge transformation is the context and the focus is upon knowledge production, as well as transformation of the person, that is, student development is also central. From our theorising and experience, what has not been addressed previously is the central difference in doctoral education to other forms of learning, namely, the "creation of new knowledge".

New knowledge results from student development bound up in the research process. The new knowledge results from an interaction between what has been taught/learned over and above experience, and the gap that has been found in the substantive area of knowledge. Development of student understanding means that attention to learning rather than teaching is essential. It is the doctoral student who is certificated as the producer of a dissertation or portfolio constituted as "his or her own work". It is also a representation of what has been learned and so the student's development. Thus, the research project itself is central. But it has to be remembered that its production is a social practice (Fairclough 1992, in Kamler and Thompson 2006, pp. 19–21). Especially in the case of professional doctorates, the various texts are constructed amongst, and for, a range of different people for different purposes. Kamler and Thomson use Fairclough to point out that dissertation production and interpretation is a particular kind of discourse that is thrust into a level of review (examination) which has its own parameters. Success of the product at this level is dependent upon the parallel development of the student's knowledge, skills and attitudes via a teaching/learning process resulting in new knowledge. So, supervision has three foci:

- the learning and teaching process;
- developing the student; and
- producing the research project/outcome as a social practice.

These three elements are always present in supervising. The focus will vary according to the needs or stages of the research project, the needs of student and with different supervisors and their view of the process. Thus, there is overlap between these foci and the actions prompted within each one. Which of these three foci comes to the fore in any supervisory instant is a product of the developing student/supervisor relationship and the supervisor's and the student's reading of the specific situation faced by the student or in the project at any point in time. It is for these reasons that we prefer a functional leadership view (Maxwell and Smyth 2009) of the teaching/learning relationship since in this way the needs of both can be addressed. Never-the-less attention to all three elements is required in an interactive manner and here the experience of the supervisor comes to the fore as the adult student usually has less experience of what is required in terms of process and

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[3] This section, and to a lesser extent other sections, mirrors our discussion in Smyth and Maxwell (2008).

product in doctoral study. These change as the student's learning stimulates growth over the course of the work.

However, the complexity of the process might best be conceptualised in the notion of shared zones or relational spaces (Green 2005). We have used the idea of the shared zone to emphasize the overlap between any two of the foci identified above and we have used a three circle Venn diagram to assist in articulating our position (Maxwell and Smyth 2009). It is in shared zones that the practices of supervision occur. Of critical importance is the zone wherein all three circles overlap which we have called the transformational zone. It is essentially a zone of change where the foci and the shared zones coalesce. Here the complexity of the interactions amongst the people involved, teaching/learning styles, expectations, life context and perceptions of the task/s to be done influence the outcomes of the research project. We believe that this is the realm where new knowledge is generated from the supervisory process (Maxwell and Smyth 2009; Smyth and Maxwell 2008).

Thus we present our tripartite view of supervision as the intellectual side of our approach. The practical side is the tool we use: the matrix. As a concrete overview the matrix has its strongest pedagogical role since it explicitly demonstrates both the *what* (substantive content) and the *how* (process) of the learning that is taking place (Biggs 1999; Ramsden 2003). Furthermore it points to the complex process of creating new knowledge and inscribing this in a dissertation or portfolio. Functionally, the matrix becomes an aid to revealing the hidden nature of the learning processes, improving effective learning in an area where underpinning pedagogy has been fuzzy at best (Green and Lee 1998/1999; McWilliam and Taylor 2001; Wisker 2005). We now introduce our research management matrix that is based upon our tripartite model of teaching and learning in higher education, specifically in the process of knowledge production.

Development of the research management matrix

The matrix is a new tool to facilitate research student learning within a HDR project. The matrix is a spreadsheet that links essential research elements, in the design and the methodology, in one view aligned to the research questions. The research questions, being *the* key elements, form the first column(s) of the matrix in our use of it. In our field of Education sometimes there is a need to further specify the questions as sub questions in which case the sub-questions make up the second column. Each of the essential elements, related to each research question, is considered and noted in the corresponding cell. In doing so the matrix grows as each cell is developed. The point here is that using the matrix explicates issues which the research student needs to consider and sometimes need to be brought to their attention. The matrix development over time facilitates discussion. We start with the research questions but in practice thereafter we have come to a position of encouraging the student to take the lead in which elements of the matrix are considered when so long as a complete set of research design questions are addressed. This approach is consistent with our view that functional leadership is essential in doctoral education. Importantly for us, gaps in the matrix become points for discussion.

Table 1 is an illustration of the matrix. It shows how the matrix could be based on the research question "what potential does the matrix have for me?" In this example we have not positioned the central research question in column one. It makes little sense in this case to do so. The key elements are identified in the first row (bold) and 'ruling off' is illustrated. Ruling off maintains the coherence of the matrix. Relationships are easy to see this

Table 1 The research management matrix illustrated

Sub questions	Data needed to answer questions	Source of data/who to contact	Method of data collection	Timeframe of data collection	Method of data analysis	Timeframe of data analysis
1. Is the matrix a useful heuristic tool?	Other structures/mechanisms available	Internet/library search	Search engine	As convenient	Reflective/comparative analysis	Reflective/comparative analysis
	The matrix benefits to supervisors in teaching	Experienced researchers supervisory/research team using the matrix	Video use of matrix in action	The weekly/fortnightly meetings of five supervisors/students	Critical video analysis	Next day following meeting
			Interview with supervisor(s)	Immediately after videoed meetings	Create themes using nVivo	Next day following meeting interview
	The matrix benefits to students in learning	Students of supervisor(s) using the matrix	Video use of matrix in action	Weekly/fortnightly meetings of five supervisor(s)/students	Critical video analysis	Next day following meeting
			Interview with student	Immediately after videoed meetings	Create themes using nVivo	Next day following meeting interview
2. Does the matrix assist timely completion?	Etc.					
3. Etc.						

way (see Smyth and Maxwell 2008, pp. 10–12). We illustrate here a completed matrix with respect to one question constructed for our purposes here.

The matrix came out of a desire to capture the key features of a research process on one page. It was the addition of the literature column and, later and more importantly, the addition of the timing column(s) more than anything else that made the matrix practical. Our students are almost exclusively part-time and completing their research in the distance education mode. A tool which could assist with focus and at the same time provide a project overview would be useful. Breaks that often accompany research at a distance mean that there are constant catch ups required both by the student and the supervisor(s). The matrix in its one page[4] view could assist in minimising the time spent in "catching up".

As we gained experience in using the matrix with students three things happened. First, we started to use the matrix in our own research. Second, and more important for this article, we realised how useful the matrix was in assisting other supervisors as we formed different supervisory teams. Third, our students began to acknowledge that it assisted them to learn and to keep on track. We discovered that discussions around the cell content raised issues of research design and methodology. Considering gaps added to understanding of the need for quality and issues concerning the research questions themselves. Specific cell details could be seen in relation to the overall picture. Project management could be discussed via a consideration of the timings, for example, time requirements for questionnaire construction, trailing and preliminary analysis and the administration and analysis. The whole project was there, or developing, on the student's matrix or seen over a series of matrices built up over time. Discussions considered what needed to be done next. Students also used iterations of their matrix to identify lack of understanding of concepts, relationships or both. Here again the matrix was an heuristic device that could catalyse learning by either the student or supervisor.

Several caveats are needed. Columns can be added, that is, matrices can be individually customised and personalised to meet student's/project needs. For example, in Table 1 'literature' might be placed after the sub-questions column. Research is a learning process not an event. In fact matrix development tracks the learning process of the research student and as such identifies a quality assurance pathway.

What about the various types of paradigms or approaches? We have laid our constructivist principles squarely on the table but we believe from our past experiences and from scanning relevant literature that the matrix can be useful for scientific, critical and even didactic approaches where the significant questions need to be answered. We also believe that it can be applied to various research paradigms (Babbie 2001; Creswell et al. 2003; Gergen and Gergen 2000; Guba 1990; Johnson and Onwuegbuzie 2004; Punch 2003) or across broad fields of study (Parry and Hayden 1994).

Supervisors use of the matrix

In her study into the environment of doctoral 'training' in the US Lovitts (2008) identified, as have many others, the centrality of the supervisor in doctoral education. She found, from the perceptions of faculty/staff, that "the advisor [is the] single most important microenvironmental factor in success or failure" (Lovitts 2008, p. 316) in the successful transition to independent researcher. Now we turn to a consideration of how the matrix might be used

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[4] More often than not the 'page' actually is several physically stuck together.

to assist supervisors. We do this from the standpoint of the supervisor or supervisory team since it is likely that it will be the supervisor not the research student who will be reading our article. We base our arguments in our own experience totalling more than 20 years in using the matrix. We note that its use will vary for different research students and different projects. Thus the matrix needs to be flexible. However, the matrix cannot take the place of quality interactions in the supervisory relationship. At all times the student has to be given the confidence that the project is worthwhile and the student can do it well. "Effective [supervisors] were praised for their enthusiasm, the time they give to students, their technical skills and their willingness to give students appropriate independence" (Harman 2002, p. 183). The matrix assists in these endeavours by facilitating work on the process and the product.

We always commence from the point of view that the research questions are *the* starting point for research. More than that, clear articulation of the research questions is an essential process. This forms a critical entry for the research student into the research process. Research questions, since they guide the design/methodology and not the other way around, are carefully considered word by word from the disciplinary point of view. More than 20 years ago the senior author learned that changing one word ("students" became "girls") effectively halved and simultaneously focussed the research question.

Process and product

We try to keep an eye on process *and* product when we are facilitating learning through our developing relationship with the student. The importance of quality teaching/learning relationships is well known, though such relationships are not essential for all learners. We have found this relationship changes over time leading to, or as a result of, increasing student growth towards autonomy (cf. Lovitts 2008). The matrix is a tool to facilitate the journey of the research student toward autonomy over the process and the product.

Early in the project

Often a student (in education at least) wants to do research that is too broad or otherwise not able to be completed in the time available. This is where the focus upon the research questions comes into its own and the supervisor's experience and disciplinary knowledge come to the fore. The articulation of the research questions and then setting them out in the matrix focuses the researcher's attention on what will be researched. This is usually the key conceptualisation period and is heavily informed by reading and discussion.

A focus upon the research questions also highlights a number of issues that need to be learned if not already known (they are usually not known). The focus brings into the foreground the idea that the student is doing *research*, that is, finding out answers to questions which *they can show are significant,* hence the rationale column. Within their first 6–12 months, institutions often require students to justify their research proposals (confirmation of candidature) and so the matrix enables the focus on answering and investigating specific research questions to be demonstrated. Although the identification of the research questions delays deeper consideration of the design and methodology, these issues remain a part of the early discussion but usually they are in the background. There may be occasions where a student wants to learn about a particular methodology and this can be accommodated.

We usually bring the idea of the matrix in relatively early to assist with the focussing. Part of the focussing includes wide reading. Some caution is necessary because it is not

desirable to focus/limit reading early on. At the point when the questions need to be set against the growing body of literature is often a good time to introduce the idea of the literature column in the matrix. This is an early exercise that the student can complete. In doing so the matrix visually displays the relative strengths of the literature review against the tentative research questions. It also should force the student to be evaluative. Some advice may be needed on how to do this. Again, the one page visual display can easily show any gaps. Gaps in the matrix are windows for diagnosis. They can show what the student does not know yet. Gap identification is an important process which is clearly facilitated by analysis of the student's matrix.

Later

The matrix does not take the place of early writing but works alongside it. The student's matrices are built up over time but have other uses. We have mentioned that the matrix is used as a point of discussion. It helps the research student to clarify because it is written and, prior to and in supervision sessions, it forces the student to articulate the project. It represents the project. So for discussing different aspects, separately, it is very useful.

However, it is particularly useful as a tool that enables relationships amongst different aspects of the project to be pointed to and discussed. As a concrete overview it has its strongest pedagogical role since it explicitly demonstrates both the what (content) and the how (process) of the learning that is taking place (Biggs 1999; Ramsden 2003). As one of our students commented:

> In the beginning I found it useful as it gave me direction, but later when I started writing, I quite forgot about it but now that I am working on the methodology, it has once again become useful.

The matrix also acts as a planner. Reviewing the stage of project development can assist in what needs to be done next. This is something that the student can also do. A next column to add might be the kinds of data needed. This then can be taken away by the student to complete and considered later. The matrix can also be used, where necessary, to bring a conversation back to the issues at hand, that is, to retain focus. This is not to say that the research questions are cast in stone. Sometimes these need to be modified, even added to, words, even questions, deleted as the project develops. The matrix also allows the student to see the whole project in one view, a decided advantage for busy supervisors too.

Perhaps the most important use of the matrix is that it is a working document. Any version is always in draft. A matrix is created and so it can be re-created. As life chances come into play, which they invariably do, alternations can be made. Timelines can be adjusted. Anything can be adjusted but a good job should have been done on the research questions since these are the foundation of a satisfactory outcome. Particularly when students are part time and/or studying at a distance, the time span between sessions is often extended so concrete record keeping is essential to minimise repetition and unwarranted diversions, roadblocks and dead ends.

The matrix assists the supervisor to help students make decisions about the boundaries of the research project so that it does not become unmanageable in size and, therefore, unmanageable in time. In this process of defining boundaries flexibility without rigidity is essential (Wisker 2005). What do we mean here? Well, we do not want students to see the research task artificially constrained by the matrix nor do we want it used to segregate ideas so that the synergy between them is artificially constrained. It is our responsibility as

supervisors to ensure that students use their personalised matrix as a record of an organic journey in constructing new knowledge rather than a rigid device of constraint.

In many ways, the matrix can become a surrogate adult learning curriculum structure. It assists the research student to pinpoint strengths and weaknesses and even to negotiate access to expertise beyond a supervisor's knowledge. Thus, it also becomes a means of plotting requirements of candidature such as key consultations, presentations, symposia, methodological and writing milestones, all of which contribute to the development of the student (Brien 2005) and the quality of the output.

The research student and the matrix

We believed that the matrix could add to research quality. We were interested in our students' views of the matrix. Accordingly we obtained UNE Higher Education Research Committee approval to ask our students' reactions to their use of the matrix. We asked present and past students ($N = 8$), with whom we retained contact, to respond electronically to eight questions such as "What do you find useful about the framework?" Five students responded positively representing different stages of progress. One student did not use the matrix and two chose not to respond. Below we comment upon students' use making use of our students' comments to illustrate our points.

Providing structure

Our focus, here, is upon the pragmatics of learning about project development in the form of a dissertation or portfolio largely from the point of view of the research student. We work on the assumption that a major piece of work needs to be well thought out. It has to be planned at least two levels: the conceptual and the practical. The matrix brings these together: "Research should be planned, but should throw up some surprises, extending thoughts in the field in critical ways" (Wisker 2005, pp. 17–18). Support has to be practical as well as conceptual because practical and conceptual demands have to be met.

Lovitts (2008, p. 316), in the study mentioned above, identified the lack of early structure as a definite problem for students in her study. For us, the matrix documents essentials of the research so that the *what*, *when*, *how*, *how well* and w*hy* can easily be identified, tracked and communicated. For those students who need technical reassurance as they journey into the unknown, some means of charting progress is particularly useful. This is how one student was assisted in this way:

> I found it particularly useful when decisions were being made (on the basis of reading / discussion / practical issues) that altered the research plan in some way. Reworking the matrix was useful because the implications of change in one part on another part were more easily identified through reference to the matrix. I like the way the matrix presents a 'whole picture'. …it shows how interdependent components hold together. It helps in keeping an eye on goals and sequencing of tasks.

Another commented:

> It becomes an outward and visible "road-map" (excuse the use of a well worn analogy), a scaffold in which the vicarious and somewhat elusive ideas become more tangible. I am then more able to see a way ahead that appears practical and perhaps even achievable.

Finally, this is how a full-time PhD student commented on the utility of the matrix structure:

> It helps me to keep on track with the topic being investigated. As a novice researcher, it is easy to get interested in subjects related to your area, but not necessarily linked with the main topic. I find that it is very important to always go back to the matrix in order to keep me focused on my topic and within its boundaries provided by the framework.

Added pressures, notably work constraints, need to be balanced with postgraduate demands and again here the matrix should assist. Part-time distance education students may also be researching in their own institution and grappling with the demands of workplace knowledge production (Gibbons et al. 1994). "It is really hard, when working on your own as a novice researcher, to grasp what it is you actually have to do" is the way that one part-time PhD student put it.

Identifying gaps and compactions

Identifying gaps are important to the supervisor (and student). Gaps in the literature contribute to research significance. Gaps in data for answering questions can easily be identified using the matrix and the ruling off convention.

> It is not much use to me when I work on it alone, as 'I don't know what I don't know' and this means I fail to recognise how complex and detailed the whole process of research and thesis writing can be.
> An updated version of the matrix is usually discussed during our meetings. Then, normally, new ideas, reflections and recommendations are included for further discussions, as well as directions being given for the next steps.

At the same time researchers and supervisors can use the matrix to identify where relatively too much is present or too much is expected in the time available. Such compactions can be teased out and priorities identified.

Clarifying the research questions

The journey through the research process is not for the fainthearted so we strongly suggest that the topic must arise from (or at least be compatible with) the professional or disciplinary or even personal interests. This is not essential but makes common sense particularly in the social sciences and/or when the research is undertaken part-time. It is the task of the researcher, to position the research in the field through asking questions. In the matrix this is done through a rationale column. Here the significance of the research is established.

Locating the question(s) within a suitable conceptual framework becomes part of the process of communicating the research. In our view, a conceptual framework is a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation in this case the research outcome (Smyth 2004). It is also called an analytical framework. Here is a comment from a student who subsequently had a sole-authored article published based upon her conceptual framework. She thought that the matrix was useful for:

Conceptualising, whilst reading the literature and reflecting on the concepts that: 1) are being integrated in one's mind, and 2) which raise one's awareness that there is a genuine issue to research, comes more readily to me that working out the logistics of how to get started and keep on track.

However, the conceptual framework may take some time to develop so the matrix can be used to link emerging questions to relevant literature and to document this journey. For example, *keywords* can be used in the matrix to connect them within bibliographic software (eg *EndNote*) to classify literature.

An approach to process

It is the research questions that form the backbone of the matrix with each leading separate rows of the matrix. They also form a basis for our process of supervision. The text that is generated in each of the cells will initially be quite tentative in the earlier phases of the research as supervisor and student consider what is appropriate as well as what is practical.

We make use of the matrix in a variety of ways. To illustrate this several comments are taken from students' feedback beginning with a long quote from one student:

My supervisor presented me with the background article on the matrix and an exemplar. I also borrowed Robyn Smythe's PhD and attempted to get an elementary framework of my initial research project together. I took the Matrix to a number of supervision sessions where I was able to draft ideas straight onto the document and together,

She continued pointing to a process that we use form time to time:

Recently we sat together with the Matrix on the computer in front of us and in dialogue, tussled with the demands of each column and row task. We referred back to the key Research questions and then the sub-questions, to logically articulate what the actual task might look like, at every step.

For her the outcomes of the process were important:

In socially constructing the matrix, I was able to untangle the 'basket of tangled strands' that exist in my mind. It is in the process of meeting the demands of the Matrix, with an experienced mentor that I start to find a way through. When I work without this support, it seems that I pull out one strand and try to unravel that e.g. EndNote, and the associated summarising of key points in an article, that I lose track of other strands and how each strand must fits in answering the big question/s.

Another student indicates another habitual practice:

I forward the matrix to my supervisors in advance of meetings. They seem to use it to check progress and to make suggestions. I think it is useful in this way.

Here is a comment from a student that one of us "took over" sometime after her research had begun:

My supervisors and I worked painstakingly at the beginning to get the matrix to a point where everyone was happy. This involved the supervisors needing to (rightly) hold me to the task and I am very glad that they did.

Our students mentioned more than once how important the discussions over the matrix were.

Keeping track of process

At crucial stages throughout the research, the matrix is an organiser. It records details within a design conceptualisation. The question to ask is, "Why am I doing this part?" The decision-making, recorded very briefly as changes in iterations of the matrix, provides data which can be audited. This contributes to dependability and enhances the quality of the research outcome. As an audit trail it can assist in establishing student intellectual property rights.

Also, supervisory discussions can assist in monitoring. It is possible to use the matrix to identify emerging research training and information needs so that resources can be strategically focussed for timely completion. The setting of milestones and the close monitoring of progress will become essential for most students and supervisors. Here are some of our students comments associated with the milestone and monitoring ideas:

> (Usefulness comes from) the focus you get while thinking and filling it up. It's quite flexible - we can change as we proceed. … it provides direction.
> For checking on progress and when a new line of inquiry comes into focus. This is then added into the matrix so it is not overlooked.
> It is a flexible tool because it allows users to add or remove columns and rows according to each researcher's style and their way of conceptualising information. It encourages users to think deeper about the stages of their research and what data is needed to fulfil each one.

The feeling of overall control that it gave and the ability to tick off bits and fill in boxes so that there was a firm sense of moving forward ñ extremely satisfying!

Engaging in the process

Currently, the pressure to complete within minimum time frames is significant in Australia (McWilliam and Taylor 2001, p. 235) and in the US particularly with respect to research in the social sciences (Nerad 2004). As the 'How' questions are discussed, the 'When' must be determined. So relevant questions could be: When will the data be collected and then analysed; and How can these tasks be realistically spaced in the time I have available?

The inclusion of the *Timeframe/Timing* column is a simple means of estimating and recording when actions should and subsequently do occur. Here is a typical comment to illustrate this from the student perspective:

> I would say it is a useful tool. I would say that it helps you to 'stay on track' and focus on one thing at a time.

In fact from the supervisors' perspective having these time goals identified in detail enables checking of goals against student reality and measuring these against university demands for timely completion. One unexpected benefit of the matrix is that it can be used to quickly compile a progress report for institutional accountability or summarising what has been achieved so far.

The dissertation/portfolio writing

Along with Kamler and Thompson (2006) and many others, we support beginning writing early. Often the first task can be a paragraph, half page at most, that encapsulates the project itself. The matrix can be used as the main reference point for writing. For example, 'Persuading the literature octopus into the glass' (Kamler and Thompson 2006) can be

greatly assisted using the literature column of the matrix because here the key literature is identified against the research questions. Two EdD students, both completed, comment quite differently about writing and the matrix:

> The matrix was useful in the planning phase but I found it less useful as I reached the final stages of the writing phase.
> (The RMM was useful) at all times, but particularly during the writing process. In fact the writing process was able to continue steadily throughout times when the mind was immersed in other parts of the research because the RMM allowed me to pragmatically dip in and out of the writing without losing concentration on the other parts or vice-versa.

She went on to say

> My doctoral study was presented in the form of a portfolio. In my mind the portfolio and the RMM were inseparable. I think I probably used the RMM as a structuring device far more than a writer of a standard thesis would because the freedom from traditional structural conventions allowed this and the RMM was able to be stretched to meet this purpose.

We support the idea of having the researcher write to the research questions not by data type and this is again facilitated by the matrix since there is set out what data load onto each question. It can also act as a set of reference points for presenting the research because it is a snapshot of the whole research. In that sense it can serve as an integrating device.

Beyond the dissertation/portfolio

One way to add to final outcome quality is to submit pieces of the work for peer review in reputable journals. These can be identified in the matrix, as one of our students did, and, timelines can be added for article submission. Feedback from such submissions can be extremely useful for the project as a whole.

The benefits of the matrix

We believe that the marriage of the substantive research question(s) and the methodological issues together *in one view* is the basis for the power of the matrix as a learning tool. It is a means for establishing the alignment of research context, questions and methods that is at the heart of the learning about research conceptualisations and the research process (Punch 2000; Sheehan 1994). During the project, the matrix provides snapshot in time of all research essentials.

Using the lived experience of the research itself the student learns the intellectual demands of the project. This is exemplified by the way the matrix will change iteratively as thinking is refined about the research questions and the methodological implications. The matrix also connects the intellectual work with the reality that the researcher predicts. Sometimes the predictions are wrong. No matter, the matrix is a tool always expressed in *draft* form. It can cope with change. A focus on time goals also leads to timely completions or at least makes them more likely. Hours of discussion may be therapeutic, and even useful, but in writing the matrix the student has made concrete decisions.

We asked our students what they would tell other students. All recommended it. Here is a selection of their comments:

> Begin the process of developing the matrix in the very early stages of your research, don't leave it to 18 months down the track. By spending the time developing the matrix as you are discovering the literature and formulating your research question, you will be most efficiently and more effectively placed to clarify your own schema and the pragmatics of your research and thesis development.
> It provides direction, helps to focus, and narrow down your ideas to what is actually required.
> I have already advocated the approach to several friends and colleagues.
> I would say that the matrix is an essential planning tool which assists in clarifying thoughts and provides direction to the study in hand

From the point of view of the supervisor, the matrix can assist research supervision since it:

1. Requires the student to document the key elements of the research project directly, and especially requires the identification of gaps and compactions of various kinds leading to facilitation of significant knowledge production;
2. Facilitates learning and teaching about the substantive and procedural (macro and micro) knowledge identified in the questions as well as in the research process(es) required to answer them; and
3. Supports the student's development towards autonomy.

Furthermore, the use of the timing column keeps the researcher honest, that is, a busy worker can plainly see time goals that need to be met leading to timely completions that Adkins (2009, p. 175) correctly identifies is now part of the university scene.

Concerns

We have found that the matrix did not suit all students. Depending on the learning style, a one-page overview may suit big picture people or visual thinkers best. Put another way, the process of researching and writing a dissertation is an idiosyncratic one, so it ought not to be assumed that the supervisor's matrix strategy will be totally suitable for all (Sternberg 1994). We do believe that it is worthwhile to discuss its potential in the initial stage with a view to assisting students to make informed choices about their way forward.

Sometimes too students did not see the advantage of the matrix at the outset. As one student said, however, it proves worthwhile. "The time that it took to get it right in the first place. This was frustrating at the time, but in hindsight very, very worthwhile." It *is* time consuming to develop and it is a text that does not materially contribute to the dissertation/portfolio itself except as a quality assurance device. These are issues that can be debated inside the relationship.

The students, too, contributed other concerns:

> You have to get into small details like timing of data collection, analysis etc but on the flip side these help you to get organised.
> I think that it is important for novice researchers to have some guidance in handling the matrix during their first research enterprise, due to the considerable volume of information we need to manage.

It is already physically large and I am concerned that over future years the physical size will 'get out of hand'. Early days for me so maybe other issues will arise.

In relation to this last point, our experience is that it first expands and then contracts. This is especially the case for the literature as the students comes to identify key papers. The latter is also important since these are the ones that can be emphasised as required.

With the matrix, we are offering our ideas for achieving these conceptual and theoretical tasks for both students and supervisors. If a student reading this paper thinks that the matrix could be of assistance, discuss it with the supervisor or, indeed, use it as a personal tracking device!

Conclusions

In this paper, we have made a case for the supervisory process in doctoral education as facilitating student learning. Thus, improvements in doctoral education extend beyond a focus on improving supervising to improvements in the research students' learning environment broadly conceived. We noted that there are few tools available for facilitating doctoral education and research project learning so we have proposed that the Research Management Matrix can act as a generative tool to assist with the learning of research practices by doctoral students.

One of the key benefits to the student is the process of iterative refinement where supervisor-researcher dialogue contributes intellectually and practically. Gaps in the information portrayed by the matrix provide opportunities for student diagnosis. Ultimately, this adds to the robustness of the outcomes and, most especially to the research student's learning. Ironically we have focussed upon a tool that privileges the student supervisor relationship. It illustrates our contention that the focus should be on student learning and on student control of learning. It makes no comment upon the range of other learning approaches that are necessary for doctoral student success.

Our work contributes to higher education scholarship in the form of doctoral education practice. From our experience there are very few tools to assist in doctoral supervision and when used with our tripartite model the matrix becomes very powerful.

References

Adkins, B. (2009). PhD pedagogy and the changing knowledge landscapes of universities. *Higher Education Research and Development, 28*(2), 165–177.

Babbie, E. (2001). *The practice of social research* (9th ed.). Belmont, CA: Wadsworth/Thompson Learning.

Biggs, J. (1999). *Teaching for quality learning at university: What the student does*. Buckingham: Society for Research into Higher Education and Open University Press.

Brien, D. L. (2005). *Integrity in planning postgraduate curriculum: Developing research degrees in writing that work*. Paper presented at the APEIC, December.

Creswell, J. W., Tashakkori, A., Jensen, K. D., & Shapley, K. D. (2003). Teaching mixed methods research: Practices, dilemmas and challenges. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioural research* (pp. 241–272). Thousand Oaks: Sage.

Delamont, S., Atkinson, P., & Parry, O. (2004). *Supervising the doctorate: A guide to success* (2nd ed.). New York: Society for Research into Higher Education and Oxford University Press.

Gergen, M. M., & Gergen, K. J. (2000). Qualitative inquiry: Tensions and transformations. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 1025–1046). Thousand Oaks: Sage.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies*. London: Sage.

Green, P. (2005). Complex contexts, relations and practices: The space for research supervision. In P. Green (Ed.), *Supervising postgraduate research: Contexts and processes, theories and practices* (pp. 3–10). Melbourne: RMIT University Press.

Green, B., & Lee, A. (1998/1999). Theorising postgraduate pedagogy. In A. Lee & B. Green (Eds.), *Postgraduate studies: Postgraduate pedagogy* (pp. 129–146). Sydney: University of Technology.

Guba, E. (1990). The alternative paradigm dialogue. In E. Guba (Ed.), *The paradigm dialogue* (pp. 17–27). Newbury Park, CA: Sage.

Harman, G. (2002). Producing PhD graduates in Australia for the knowledge economy. *Higher Education Research and Development, 21*(2), 179–190.

Holbrook, A., & Johnston, S. (Eds.). (1999). *Supervision of postgraduate research in education* (Vol. 5). Coldstream, Victoria: Australian Association for Research in Education.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14–26.

Kamler, B., & Thompson, P. (2006). *Helping doctoral students write: Pedagogies for supervision*. Abington: Routledge.

Lovitts, B. E. (2008). The transition to independent research: Who makes it, who doesn't, and why. *Journal of Higher Education, 79*(3), 296–325.

Maxwell, T. W., & Smyth, R. (2009). Theorising about higher degree research supervision: A tripartite view. *Higher Education Research and Development* (submitted).

McWilliam, E., & Singh, P. (2002). Towards a research training curriculum: What, why, how, who? *The Australian Educational Researcher, 29*(3), 3–18.

McWilliam, E., & Taylor, P. G. (2001). Rigorous, rapid and relevant: Doctoral training in new times. In B. Green, T. Maxwell, & P. Shanahan (Eds.), *Doctoral education and professional practice: The next generation?* (pp. 229–246). Armidale: Kardoorair.

Mezirow, J., & Associates. (2000). *Learning as transformation: Critical perspectives on a theory in progress*. San Francisco: Jossey-Bass.

Moses, I. (1985). *Supervising postgraduates* (Vol. 3). Canberra: Higher Education Research and Development Society of Australia Inc.

Nerad, M. (2004). The PhD in the US: Criticisms, facts and remedies. *Higher Education Policy, 17*, 183–197.

Nightingale, P. (2005). *Advising PhD candidates*. Sydney: Higher Education Research and Development Society of Australasia.

Parry, S., & Hayden, M. (1994). *Supervising higher degree research students: An investigation of practices across a range of academic departments*. Canberra: Australian Govt. Pub. Service.

Punch, K. F. (2000). *Developing effective research proposals*. London: Sage.

Punch, K. F. (2003). *Survey research: The basics*. London: Sage.

Ramsden, P. (2003). *Learning to teach in higher education* (2nd ed.). London: Routledge Falmer.

Sheehan, P. (1994). From thesis writing to research application: Learning the research culture. In O. Zuber-Skerritt & Y. Ryan (Eds.), *Quality in postgraduate supervision* (p. 14). London: Kogan Page.

Smyth, R. (2004). Exploring the usefulness of a conceptual framework as a research tool: A researcher's reflections. *Issues in Educational Research, 14*(2), 167–180.

Smyth, R., & Maxwell, T. W. (2008). *The research matrix: An approach to supervising higher degree research*. Sydney: Higher Education Research and Development Society of Australasia.

Sternberg, R. J. (1994). Allowing for thinking styles. *Educational Leadership, 52*(3), 36–40.

Wisker, G. (2005). *The good supervisor: Supervising postgraduate and undergraduate research for doctoral theses and dissertations*. London: Palgrave Macmillan.

Zuber-Skerritt, O. (Ed.). (1992). *Starting research: Supervision and training*. Brisbane: The Tertiary Education Institute, University of Queensland.

Zuber-Skerritt, O., & Ryan, Y. (Eds.). (1994). *Quality in postgraduate supervision*. London: Kogan Page.