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The Agile Approach with Doctoral Dissertation Supervision

Lars Göran Wallgren Tengberg[1]

[1] Department of Psychology, University of Gothenburg, Sweden

Correspondence: Lars Göran Wallgren Tengberg, Department of Psychology, University of Gothenburg, Box 500, SE 405 30 Göteborg, Sweden. Tel: 46-031-786-1000. E-mail: larsgoran.wallgren@psy.gu.se

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Abstract

Several research findings conclude that many doctoral students fail to complete their studies within the allowable time frame, in part because of problems related to the research and supervision process. Surveys show that most doctoral students are generally satisfied with their dissertation supervision. However, these surveys also reveal some students think their supervisors meet with them too infrequently, lack interest in their dissertation topics, and provide insufficient practical assistance. Furthermore, many countries will soon witness a large turnover in the labour market as people near retirement. Because this is also the case at many universities and colleges, the expectation is that there will be many teaching and research vacancies. Therefore, many new doctoral students who plan to enter academia after earning their doctoral degrees are needed. In responding to these complaints, this conceptual paper examines the use of the agile approach–which has achieved recognition and approval in software development–in the doctoral dissertation process. In the teaching/learning sphere, the agile approach can be used in iterative meetings between doctoral student and supervisor for dissertation planning, direction, and evaluation. The focus of the iterations, the so-called Sprints, is on communication and feedback throughout the entire process. The paper is based in theories on teaching/learning and on the author's personal experience with the agile approach. Use of the agile approach, which can decrease the time required for doctoral studies, may thus increase the number of graduates with doctoral degrees. The paper makes suggestions for practical implementation of the agile approach.

Keywords: agile approach, dissertation process, PhD student, supervision

1. Introduction

Many countries will soon witness a large turnover in the labour market as people near retirement. Because this is also the case at many universities and colleges, the expectation is many teaching and research vacancies will open up. In Sweden, for instance, by 2025 approximately 1.6 million people will retire and leave the labour (Arbetsförmedlingen, 2010). Many of these people, in Sweden and elsewhere, are teachers and researchers at universities and colleges.

It is well known, and accepted, that a doctoral degree requires a number of years of study and research. Doctoral students and their supervisors commit to this extended period of work that concludes with a doctoral degree (Appel, 2003). According to Ismail, Abiddin, and Hassan (2011), the research shows that many doctoral students fail to complete their studies within the allowable time, in part because of problems related to the research and supervision process. Furthermore, many universities overestimate the completion rates of their doctoral students as well as the time-to-completion for doctoral dissertations, although without taking corrective action (Elgar 2003).

The various factors that influence doctoral students' education and study environment have become increasingly important. One factor is dissertation supervision by senior researchers. A survey of 1,130 doctoral students at the University of Gothenburg in Sweden revealed a majority of them think they receive too little advisory supervision. The survey also revealed that 23% of the students stated they ended their studies because of little or poor supervision. The survey concluded that a positive correlation exists between the number of hours of supervision students receive and their satisfaction with their supervision (Göteborgs universitet, 2010).

Björnermark, Kettis-Lindblad, and Wolters (2010) reached a similar conclusion in a survey of doctoral students about their graduate studies at the University of Uppsala in Sweden. These researchers found that 29% of the students think poor advisory supervision, to a fairly high or high degree, is an obstacle to their research. They

also found that only 20% of the students said they had contact with their supervisors at least once a month. The study recommends making improvements in the student-supervisor relationship.

It is not only Swedish doctoral students who are dissatisfied with the guidance they receive from senior researchers. A survey of 686 Norwegian graduate students revealed the following: more than 50% said they received the supervision they needed; 33% said they received somewhat less supervision than they needed; and 10% said they received significantly less supervision than they needed (Norges forskningsråd, 2002). About 60% of the students said they received satisfactory dissertation supervision on the most important aspects, but they also said the frequency of the supervisory meetings varied greatly. In some research areas, almost 50% of the students received dissertation supervision at least fortnightly. However, in other research areas, the figure was only 10%, with many students reporting the supervision was very sporadic. When asked if they could meet their supervisors as needed, the students responded as follows: 43% said "Yes, always," 47% said "Yes, for the most part", and 10% said there was often a problem.

Frischer and Larsson (2000) conducted a survey of 19 doctoral students who had left their research programmes at a Swedish university after completing at least 50% of the requirements. The students reported that the irregularity and randomness of their advisory meetings, in addition to lack of guidance on their dissertation goals, were the main reasons for leaving their programmes. Frischer and Larsson concluded that the supervisors, with their laissez-faire attitude, although willing to share research materials, gave the students rather too much freedom in their work. Because of this attitude, the supervisors did not involve the students in research collaboration and did not oversee or provide feedback on students' research unless specifically requested.

These studies indicate that generally doctoral students in Sweden and Norway are satisfied with their supervision and their supervisors. However, the studies also reveal there is room for improvement. According to Handal and Lauvås (2008), doctoral students made the same criticism of doctoral studies that Brown and Atkins (1988, p. 123) identified in their workshops in the UK and elsewhere. The complaints were too few supervision meetings, lack of supervisor interest in research topics, insufficient research guidance, and inadequate practical assistance.

To increase the quality of dissertation supervision, it may be worthwhile to experiment with other supervisory approaches. Perhaps a different approach would benefit both doctoral students and their supervisors.

In recent decades, software development has changed. Where once it was a rigid and lengthy process (the "traditional" approach) with pre-defined goals and the use of documents or repositories, today software development is a less rules-driven process (the "agile" approach) in which the work is performed incrementally (a step by step process of some kind) and iteratively (with repeated actions) with fewer rigid deliverables and more communication and collaboration. Dyba and Dingsøyr (2008) describe this new approach as "agile software development". In the agile approach, the work is continually evaluated and altered when new demands are made and new situations arise. Furthermore, people solve problems innovatively instead of following inflexible rules set out in manuals and documents. In a study in which they compare traditional methods with agile methods as a way to achieve knowledge sharing, Chau, Maurer, and Melnik (2003) equate traditional methods with Tayloristic methods (Taylor, 1911). They think Tayloristic methods differ from agile methods, among other things, in that Tayloristic methods define all requirements and prerequisites in advance. Grossman, Tappert, Bergin, and Merritt (2011, p. 139) state: "Typically the dissertation process is "waterfall like" with heavy upfront planning and doing with very little writing".

The use of agile methodologies in software development (e.g., Gustavsson, 2010; Palmquist, Lapham, Miller, Chick, & Ozkaya, 2013; Williams & Cockburn, 2003) was one inspiration for the idea that an agile approach can improve doctoral dissertation supervision. Another inspiration was Marshall's (2009) discussion of how to achieve the fine balance between too much and too little supervision of research students. She concludes that both projects and dissertations require the use of project management skills: planning, monitoring, meeting deadlines, and evaluating results.

The creation of a framework for the agile approach began with a search, for journal articles only on the topic of the agile approach in doctoral dissertation supervision. Several databases (ACM Digital Library, Eric Proquest, Eric EBSCO, EdITLib, and HEDBIB) were used in this search. The following search strings were used: "Dissertation process AND agile"; "Doctoral student AND agile"; "PhD student AND agile"; "Doctor of Professional Studies AND agile". Table 1 presents the results of this literature search. Publications not relevant to this paper are labeled N/A (non-applicable).

Table 1. Search string and number of publications

Search string/Source	ACM Digital library	Eric Proquest	Eric EBSCO	EdITLib
"Dissertation process" AND agile	9 (N/A)	0	0	1 (N/A)
"Doctoral student" AND agile	2 (N/A)	0	0	2 (N/A)
"PhD student" AND agile	8 (N/A)	0	0	2 (N/A)
"Doctor of Professional Studies" AND agile	0	0	0	3 (N/A)

Based in theory and empirical evidence, this paper analyses the use of the agile approach in the supervision of doctoral students' dissertations with the intent of offering practical suggestions for its implementation. Use of the agile approach, which can decrease the time required for doctoral studies, may thus increase the number of graduates leaving universities and colleges with doctoral degrees. As Grossman et al. (2011) found, and as my search confirms, very few studies have explored the agile approach in teaching, learning, and advising.

2. Supervision in the Dissertation Process

No prescribed pattern exists for the supervision of doctoral dissertations. Each student-supervisor pair must work out procedures that both find productive and harmonious. As Ives and Rowley (2005) write, the relationship between the supervisor and the doctoral student will have significant influence on the student's willingness and ability to complete his/her theses. Handal and Lauvås (2008), in emphasizing the importance of the collaboration, recommend that the supervisor have a repertoire of flexible strategies and methods. Although it seems self-evident that all student-supervisor pairs should plan their collaboration before the dissertation research begins, this is not always the case. According to Handal and Lauvås, of the various choices and decisions in researching and writing a doctoral dissertation, many are made somewhat casually without a great deal of thought about consequences.

It is important that student-supervisor pairs choose a supervision form satisfactory to both. Handal and Lauvås (2008) identify three forms of supervision in dissertation meetings: product, process, and ad hoc. These forms of supervision, in one way or another, appear in all meetings, although with different emphasis. In product supervision, the various aspects of the dissertation product are in focus. In process supervision, the student guides the dissertation discussion and analysis. Ad hoc supervision takes place spontaneously when the student requires dissertation assistance. According to Handal and Lauvås, process supervision is traditionally least evident in the natural sciences. However, process supervision is appropriate for dissertations in the social sciences.

New technologies, especially the Internet, mean that dissertation supervisors can communicate more easily and more rapidly with students, and vice versa. Handal and Lauvås (2008), who analyse the pros and cons of web-based communication, find such communication is quite useful for reviewing back-and-forth draft versions of dissertations. They caution, however, that supervisors should be wary of becoming dissertation co-authors as they revise dissertation text.

Doctoral students should discuss these different forms of dissertation supervision with their supervisors in order to decide which form is most suitable given their programme and research area. At the first meeting, the doctoral student and the supervisor should establish mutually agreed on expectations – this is, using Schein's (1965) term, they should create a psychological contract. The student-supervisor must agree on expectations, aspirations, and requirements, all of which are subject to future revision. In a book chapter on the student-supervisor relationship, Lindén (2008), who underscores the importance of clarity on these factors, recommends that the pair take adequate time to reach a satisfactory work arrangement.

Furthermore, it is important that supervisors encourage students to begin writing early in their dissertation research without worrying too much about grammar, punctuation, and style. With practice, students' writing will improve if they get in the habit of writing regularly. As Handal and Lauvås (2008) state, the act of writing, by clarifying one's ideas, produces text that can be revised after discussion with one's supervisor. Postponing the act of writing only makes writing more difficult later. Of course, this advice, as in all individualized instruction, should be adapted to the differences among students. However, most students who delay writing their dissertation find they are overwhelmed by the writing tasks remaining as the completion date approaches. A plan for writing the dissertation, step by step, with clearly stated deadlines, is useful in moving the work forward and in monitoring its progress.

3. The Agile Approach in Software Development

According to Gustavsson (2010), traditionally managers in software engineering are praised for their competence in follow-ups but dammed for their incompetence in change management. A main criticism is that software projects fail to meet delivery dates. Therefore, for decades, much of the discussion on software development has centred on how to produce not only cheaper and better results but also faster results. In this discussion, traditionalists argue that software development approaches are plan-based and their results are predictable. Other commentators, who lack such faith in predictability, support the greater importance of the use of innovative and adaptive approaches.

A survey of 365 IT managers in the USA revealed that only 16% of their software development projects were completed within budget and on time. Such data are behind the movement to find new software development approaches (The Standish Group, 1995). New approaches – the so-called agile methodologies – that are less rules-driven, more incremental, more iterative, and less focused on deliverables have replaced the former, traditional approaches that are more rigid and more outcome-defined with longer development schedules.

Although many variations of the agile methodologies evolved in the 1990s, it was not until 2001 that 17 software developers agreed on and published common principles intended to create better software development methods. The result of their work is "The Agile Manifesto" that specifies, among other things, that guidelines for individuals and interactions should take priority over processes, tools, and the static, planned responses to change (Fowler & Highsmith, 2001).

A major difference between the rigid, traditional software development approaches and the agile software development approaches is that the latter rely on short iterations of work in which analysis and development are performed at each iteration (Palmquist et al., 2013). According to Williams and Cockburn (2003), agile software development responds to constant feedback aimed at adaptation and change. They contrast software development with automobile manufacturing that predictably produces high-quality cars if predetermined steps are strictly followed. Software development does not follow predetermined steps because the process is subject to constant corrections, adaptations, and adjustments. In such an environment, it is very unlikely that a series of predetermined steps can lead to desired results

Agile software development consists mainly of the following five components (paraphrased from Palmquist et al., 2013):

- Overall Requirements–the "Backlog"
- Purpose and Goals of the project
- A Comprehensive Plan: the "Roadmap"
- Defined Products
- One or more iterations per product: the "Sprint"

The *Overall Requirements* are specified in the *Backlog* as a prioritized list that may be re-prioritized and revised during projects. The *Purpose and Goals* reflect the agreement between the developer and the user. The *Roadmap* specifies how the requirements will be met within budget and on schedule. When the prioritized list in the *Backlog* is followed in accordance with the *Roadmap*, the *Products* are defined and then appear as *Sprints* (or iterations) in a pre-defined, recurring period of time (e.g., two or three weeks).

4. The Agile Approach in Other Areas

However, the agile approach has relevancy in areas other than software development. One area is education. According to Chun (2004), many similarities are found between software development and teaching and learning. In each sphere, several parties with different goals are involved, resources are limited, deadlines are tight and often fixed, and plans/schedules are characterized by unpredictability and frequent change. Chun also claims that the agile teaching/learning approach places a high value on the communication between teacher and student, prioritizes real knowledge sharing over content acquired by rote memorization, and responds actively to schedule/content change.

Use of the agile teaching/learning approach has also been promoted in organizational management. In an article on organizational learning, Miles (2013) advocates that HR leaders use "agile learning" to prepare their workforces for the rapid pace of change. In response to employees' claim that HR departments provide little or no learning, Miles recommends that HR leaders should adopt more agile tools and approaches that reduce the gap between employers' needs and employees' skills.

5. The Agile Approach in Doctoral Dissertation Supervision: A Model

Figure 1 is an eight-step model of the agile approach used in doctoral dissertation supervision.

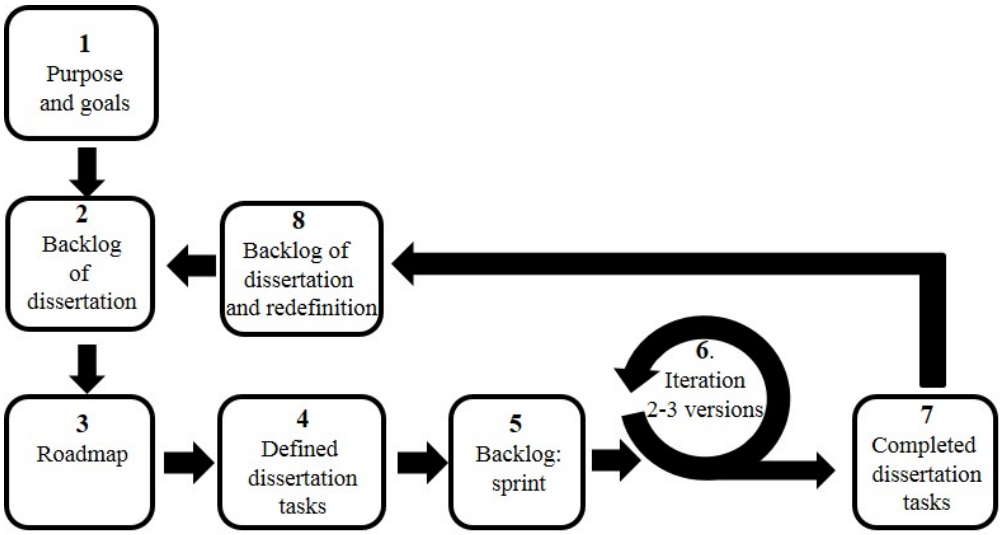

Figure 1. The agile approach in the doctoral dissertation supervision

1) Purpose and goals of the dissertation: In the first step, the student's dissertation supervisor becomes acquainted with the student and determines the student's level of ambition as well as the student's ability to work independently. Students differ in the amount of support they need, particularly at the beginning of their dissertation research. Students who think their surroundings mainly influence their dissertation research have an external "locus of control" (Rotter, 1966) while students who take greater dissertation responsibility have an internal "locus of control". A supervisor will gain a better understanding of a student's locus of control as the research continues.

2) Backlog of the dissertation: In the second step, the supervisor and the student, working together, define, prioritize, and list the overall dissertation requirements. Some students are rather uncertain at this point about these requirements. Therefore, it is important that the supervisor explain the list can, and likely will be, revised and reprioritized as the research continues. Therefore, Handal and Lauvås (2008) caution against setting fixed ambition levels at the beginning of research. Rather, supervisors should explain to students that they may revise their ambitions many times during their research.

3) Roadmap of the dissertation: In the third step, the student creates a Roadmap based on the prioritized requirements. In its broad outlines, the Roadmap describes the planned dissertation timeframe and progression. In the Department of Psychology, where I am a dissertation supervisor, it is the tradition that doctoral students prepare articles for publication based on their research; these articles become dissertation sections. The plan for these articles is in the Roadmap with step-by-step goals that assist student and supervisor with monitoring, as well as motivating, the progress of the dissertation (see Locke & Latham, 1990).

However, Ordóñez, Schweitzer, Galinsky, and Bazerman (2009) argue that such control of goals may reduce motivation. Therefore, the best Roadmap likely creates a balance between students' independence and their need for guidance and instruction. As Appel (2003) notes in his report on dissertation supervision, each student's study plan (i.e., Roadmap) should allow for flexibility and change.

4) Defined dissertation tasks: In the fourth step, specific dissertation tasks in the Roadmap are defined based on the prioritized list in the Backlog. At this point, these tasks are then reduced to smaller tasks such as dissertation design, data collection, etc. This specification of individual tasks is useful for establishing student-supervisor mutual expectations and for tracking and following-up on the progress of the dissertation.

5) Backlog: Sprints*:* In the fifth step, the dissertation tasks become Sprints – the continual iterations at two-three week intervals. In each Sprint, the student works with some dissertation task. At the end of each Sprint, the student meets with his/her supervisor to review the work. The Backlog for a Sprint is, in principle, the same

as the Backlog for the dissertation but with more detailed specifications about what is to be accomplished. The tasks in a Sprint are detailed and have deadlines.

6) Iteration: multi-versions: In the sixth step, the student submits versions of the dissertation to the supervisor per a schedule. The supervisor monitors the student's progress and provides feedback on the dissertation versions. This iterative step can prevent the unfortunate situation (which I have observed) in which a student falls behind in his/her work and dares not report this lack of progress to his/her supervisor.

Dissertation supervisors typically have to modify their advisory role depending on the stages of the student's work. In the initial stages, a doctoral student often requires considerable assistance and direction; as the research progresses and less assistance is required, the student can work more independently. With recurrent iterations of review and feedback, the dissertation quality improves. After each Sprint, the student is encouraged to reflect on the progress of his/her research: What problems have arisen? What have I learned? What is left to do? Reflection on such questions provokes ideas on how to make changes in the dissertation design, direction, and content so that the student avoids roadblocks as he/she follows the Roadmap.

A doctoral student usually has a primary supervisory and an assistant supervisor. Sometimes only one supervisor participates in an iterative step; at other times, both supervisors participate. Moreover, other experts (from the university or the professional community) may also participate in the Sprints.

7) Completed dissertation tasks: In the seventh step, following one or more iterations of a dissertation task, the results are evaluated and compared to the Backlog of Sprints. In addition, the completed tasks are compared to the Backlog of the dissertation. The student may encounter unforeseen issues or unexpected events that influence the dissertation findings. Or the student may have discovered new data and reached new insights that require adjustments in the dissertation findings. In some cases, this knowledge may alter the Roadmap and the various dissertation tasks.

8) Backlog of dissertation and redefinition: In the eighth step**,** if a redefinition of the dissertation is required, the process repeats, beginning at the second step.

6. Discussion

Because universities and colleges foresee that a considerable number of researchers and teachers will retire in the next decade or so, it is expected that academia may soon face a labour shortage. To prepare for this situation, more doctoral students who can replace these retirees are now needed. However, research shows that doctoral students often fail to complete their degrees within the allowable time or, worse, simply leave their programs. One explanation is the lack of support in the research and supervision process (Ismail et al., 2011). This paper analyses how the agile approach, when used in the supervision of doctoral students, can decrease the time it takes such students to earn their degrees. Theory and experience are used in this analysis. The paper also offers suggestions for practical application of the agile approach in this context.

The paper is motivated by doctoral students' dissatisfaction with certain aspects of the student-supervisor collaboration. Their concerns include too few student-supervisor meetings, lack of supervisor interest in dissertation topics, and insufficient practical, supervisory assistance (Brown & Atkins, 1988).

The paper links the agile approach in software development to dissertation supervision through the use of Sprints (a term from software development). In the student-supervisor context, Sprints are the iterative occasions when student and supervisor meet to review and evaluate dissertation planning, direction, and progress. This is an approach consistent with the conclusion by Chau et al. (2003, p. 5) that learning–the internalization of knowledge – is a situation in which tacit knowledge is shared; "One does not learn alone but learns mainly through tacit knowledge gained from interactions with others". Similarly, Vekkaila (2014) states that the supervision of a doctoral student is a long-term process with a very distant goal. Therefore doctoral students may require short-time goals that other pathways may provide.

The frequency of dissertation iterations promotes constructivist learning where learning occurs on both the individual and the collective levels (Pettersen, 2005). In constructivist learning, people construct knowledge from experiences and from encounters with content, concepts, theories, and examples. For doctoral students, such an approach to learning motivates them to actively embrace and understand their dissertation topics in a way that relates their learning to past experiences and prior knowledge (Savery & Duffy, 1995). The outcome is depth-oriented learning.

From the vast literature on teaching/learning, I call attention to several researchers whose work relates to this paper. According to Hussey and Smith (2002), teachers should be able to point to the products of learning. Norton (2009) calls for different assessment methods that can help students achieve desired learning goals. Such

methods involve the frequent feedback opportunities that this paper identifies as iterations. Norton also describes two types of assessment: formative and summative. In formative assessment, teachers give students feedback on what they have learned; in summative assessment, teachers give students feedback on their achievements in relation to learning goals.

Sadler (1989) writes that in formative assessment, students use feedback to fill the gap between current knowledge and desired knowledge. According to Black and William (2009), this feedback should support the next learning step. The preferable perspective of feedback is forward (feeding forward) rather than backward (backward feeding). Forward feedback helps students reduce the knowledge gap and become more reflective. Sadler (1989, p. 119) maintains that effective feedback allows students "to monitor the quality of their own work during production". This is the premise behind the iterations this paper describes in which student and supervisor meet to review and evaluate the research and dissertation at various stages.

All development approaches, whether software, organizational, or teaching/learning, have their critics. The agile approach is no exception. In writing about the agile software development approach, Pathak and Saha (2013) charge that not everyone has the adequate communication ability to benefit from the many iterations of knowledge exchange. Such people require extensive communications instruction and practice. Amlani (2012) is concerned with the rigidity of the iterations in the agile software development approach, their possible overlap with other iterations, and the persistence of changes throughout the process. Sharma, Sarkar, and Gupta (2012) criticize the flawed documentation and constant changes in agile software development process models as a waste of time and other resources. It may be that some of these criticisms are also relevant to the agile approach when used with doctoral dissertations.

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