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Where Agile Research Goes: Starting from a 7-year Retrospective (Report on Agile Research Workshop at XP2009)

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Abstract

This report summarizes the key findings from a workshop at the 10th International Conference on Agile Processes and eXtreme Programming in Software Engineering (XP2009) called “Agile Research – A 7-Year Retrospective”, held in Sardinia in May 2009. The workshop was based on an open discussion around past papers presented at the conference, identifying current gaps and areas for future research. A research topic map has been drawn and several future research directions have been highlighted as the results of running the workshop.

Keywords: Agile research, Literature analysis, Research gaps, Future research directions

Introduction

While agile software development was originally driven largely by practitioners and academics, research on agile methods has grown rapidly in recent years, with a continual flow of new papers from both researchers and industry. At the 10th edition of XP conference, it might be a good time to reflect on what topics have been investigated in agile research so far, what are left unexplored, and what are the emerging trends and directions that are worth research efforts in the future. Several previous studies have reviewed agile research at various stage of its evolution, some with specific focuses. Erickson and Lyytinen evaluated the state of the research on XP and agile modelling [1]. Dybå and Dingsøy carried out a systematic review of empirical studies of agile software development up to and including 2005 [2]. In [3] Dingsøy et al. summarized the focus areas for agile research while drawing a preliminary roadmap for empirical research on agile software development. What seems missing is a more comprehensive topic map that can describe what agile research has covered and what deserves further effort. This observation inspired the agile research workshop run at XP2009.

Preparation for the workshop

In order to elicit interesting discussion and meaningful contribution from the workshop participants, we conducted a small scale literature survey prior to the workshop. The intention was to build an initial research topic map that served as a starting point for meaningful conversations at the workshop and a baseline on which the future research topics could be drawn. To this end, we reviewed 161 research papers published in XP conference proceedings from 2003 to 2009. Six main research themes emerged through this exercise, which are explained briefly as below.

- **Methodology:** studies of agile methods as a whole;
- **Practice:** studies of the use and potential application of agile (XP) practices;
- **Testing:** studies of work related to the activity of testing software;
- **People Management:** studies in areas of organizational

behaviour and motivational theory;

- **Planning Management:** studies into the planning and management of agile development initiatives;
- **Business:** studies of how agile methods contribute to addressing analysis and management of both customers and business value;
- **Development activities:** studies related to software development tasks (other than ‘Testing’ which is afforded a separate analysis).

We have roughly classified the 161 papers under these six main themes based on their keywords and our reading of them. Table 1 shows the distribution of the 161 papers across the topics. It can be seen that the studies on agile methods as a whole dominated the research papers presented at XP conferences, followed by the studies of individual practices. In terms of development activities, testing was the primary focus compared with the studies of other activities which were a small amount. Social and organizational aspects of agile software development, represented by the themes like people management, planning management and business, although small in number, were constant angles taken by the studies surveyed.

Table 1. The main themes and distribution of the research paper in XP conference proceedings from 2003 to 2009

Theme	2003	2004	2005	2006	2007	2008	2009	Total
Methodology	16	8	7	5	8	11	11	66
Practice	9	2	4	4	2	1	3	25
Testing	7	4	4	0	4	1	1	21
People Management	2	4	1	4	2	2	3	18
Planning Management	5	1	1	1	2	4	1	15
Business	3	0	0	0	2	1	4	10
Development Activities	1	0	1	2	2	0	0	6

We have further classified the 161 research papers under sub-themes (see Table 2). Together with the main themes, they constituted an agile research topic map which we brought along to the workshop at XP2009.

Running the workshop

The agile research workshop was run with a mixture of academic and industrial participants. The workshop started with the presentation of the pre-built research topic map. Slides showing each of the themes and their associated sub-themes were supported by posters pinned to the walls around the room. Graphs illustrating patterns of research on the various themes published in the proceedings throughout the years 2003-2009 were also presented. A general discussion was emerged based on the presentation on the topic map. After the discussion post-it notes were given to each of the

participants so that they could add any additional themes that they felt are missing or would be interesting to cover as a part of the future research. During the break, the additional themes were placed against existing posters around the wall. An additional poster was added that captured new themes that had been identified. After the break all the results were presented and further discussed together with the workshop participants.

An extended agile research topic map

Table 2 outlines the additional sub-themes presented in the workshop that can be classified under the existing main themes. Table 3 presents the emerging new themes and related sub-themes. Any sub-themes presented by industry participants are further highlighted by darker background.

Table 2. The main themes from the survey and sub-themes from both the survey and the workshop

Theme	Sub-themes
Methodology	<i>Emerged from the literature survey:</i> <ul style="list-style-type: none"> - Agile adoption - Education & Training - Extending methods - Method combination - Novel Concepts - Quality/Assessment - Reuse - Regulatory environments - Test-driven development
	<i>Emerged from the workshop:</i> <ul style="list-style-type: none"> - Software process improvement - Agile software product line - Challenges of agile in distributed context - Just-in-time methodology - Integration of other techniques from other fields into Agile processes
Practices	<i>Emerged from the literature survey:</i> <ul style="list-style-type: none"> - Continuous Integration - Pair programming - Metaphor - Refactoring - User Stories - Social Aspects
	<i>Emerged from the workshop:</i> <ul style="list-style-type: none"> - How agile practices are actually tailored - New agile practices - What practices are used in open source, to what extent
Testing	<i>Emerged from the literature survey:</i> <ul style="list-style-type: none"> - Acceptance testing - Regression testing - Unit tests - Automation
	<i>Emerged from the workshop:</i> <ul style="list-style-type: none"> - Integration / system-level testing
People Management	<i>Emerged from the literature survey:</i> <ul style="list-style-type: none"> - Motivation - Team issues
	<i>Emerged from the workshop:</i> <ul style="list-style-type: none"> - Techniques to facilitate learning in agile teams - Challenges of self-organizing and its impacts - Social analysis of large agile (and non-agile) teams - Cooperative and human aspects of development - Agile work organizing and its implications - Handling cross-cutting concerns in agile teams

	<ul style="list-style-type: none"> - Rewards (team/individual) - Recognition, assessment methods for teams - Generational differences (members age) - Career progression in agile context
Planning Management	<i>Emerged from the literature survey:</i> <ul style="list-style-type: none"> - Decision-making - Project management - Estimation - Risk management
	<i>Emerged from the workshop:</i> <ul style="list-style-type: none"> - Quality vs. features - Agile as enabler of continuous improvement
Business	<i>Emerged from the literature survey:</i> <ul style="list-style-type: none"> - Value concepts - Governance - Customer relations
	<i>Emerged from the workshop:</i> <ul style="list-style-type: none"> - Customer side of agile software development
Development Activities	<i>Emerged from the literature survey:</i> <ul style="list-style-type: none"> - Requirements - Design - Coding
	<i>Emerged from the workshop:</i> <ul style="list-style-type: none"> - Software architecture - Maintenance and support issues in agile development

A set of key points related to both exiting and emergent themes discussed at the workshop are briefly summarized as below.

Agile organizations. Adoption of agile is considered key by the Agile Alliance and they have started an initiative to determine the key practices in this area. From an academic perspective, agile adoption appears to be bottom-up whereas lean transformation programs tend to be top-down. Reacting to this, industry views highlight that it would be very useful to see comparisons of the values of various fields of agility. A statement is made that agile is considered anti-management whereas lean transformations are considered to be management oriented and that this viewpoint could block the evolution and growth of agile.

Table 3. The emerging new themes and sub-themes from the workshop

Theme	Sub-themes
Agile Organization	<ul style="list-style-type: none"> - The agile corporation - looking at agile from a holistic business/corporate perspective - Innovation/roadmapping in agile organizations - Mainstream productization
Agile and Finance	<ul style="list-style-type: none"> - Beyond budgeting + agile - Agile contracting (customer, internal, support, etc.)
Measuring Agile	<ul style="list-style-type: none"> - Measuring agile / agility (frameworks) - Success of agile software development - Comparisons - evidences, hard facts - with waterfall
Agile Concepts	<ul style="list-style-type: none"> - Theoretical foundation of agile software development - Concept of agility - Theory of emerging agile usage of practices/values/principles across specific methods - Where is agile headed?
Research Methodology	<ul style="list-style-type: none"> - Study of research methods and theories that can be used in agile research - Longitudinal studies
Other	<ul style="list-style-type: none"> - Implications on society of the agile movement

Agile contracting. It is believed that this area could result in very

valuable research. An academic viewpoint is that currently the field is wide open with very few publications. An industry viewpoint is that consultancies who work out how to manage contracting consider it to be a competitive advantage, so it is not widely reported. It is highlighted that the creation of agile project contracts is a major problem.

Global agile software development. From an industry perspective, it would be very interesting to research such issues as travel considerations in distributed agile projects, and investigate questions such as “who does the travel and how much is needed for various types of projects”.

People management. It is believed that research is needed in other disciplines that complement knowledge in the agile field (e.g., sociology, health). From an industry perspective, issues such as what human resources rewards are applied to support teams are worth exploring.

Measuring agility. The major questions discussed are how to study agility and what to measure. Given that projects are unique, it may be difficult to make comparisons. However, it is argued that it may be sufficient for certain quantitative studies to just review one project. The key is to determine the correct research questions.

Research methodology. An academic perspective is that there are a lot qualitative cases in the area of agile research but little replication. It was suggested that journals don't tend to accept these studies due to the lack of novel contributions. In addition, ethnographic studies where individual immerse themselves in agile teams would be useful but it must be acknowledged that this would be very costly.

Conclusion

The amount of research on agile software development is growing rapidly in recent years. This report on the agile research workshop conducted at XP2009 depicted an extended research topic map which may provide agile researchers with an overview of the agile research field and to position their work, as well as guide their future research. Agile organisation, finance and agile, more in-depth people management issues, among various themes, are identified as significant and interesting areas to explore and directions that can yield relevant and valuable insights.

References

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