The review and research on agile oriented method n the pilot industry system

Hong Wang*

School of Art and Design, Wuhan University of Technology, Wuhan, Hubei, 430070, China

School of Art, Hubei University, Wuhan, Hubei, 430062, China

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Abstract

Agile methodology has getting wide recognition within the software industry due to its flexibility and ability to cope with rapid changes in the software development environments. It is however comes with a number of demands that must be complied with. This paper presents a pilot systematic literature review (SLR) study on the limitations of Agile methods in the industry based on primary research. In this study, conference and journal papers in the IEEE, published between 2007 and 2012 were investigated. 29 papers were found as the most relevant. While the SLR findings have brought to both limitations in the implementation and in the Agile methods, the former becomes the most addressed issues. The result revealed that high dependency on people/personnel, organizational dependency, as well as high impact on organizational structure and culture as the three most repeatedly addressed factors. While these three factors are mutually related, people factor especially upper level management strong involvement and support can be regarded as a primary necessity in the Agile implementation. In spite of apparent emphasis on people critical function stated in the Agile principles, plus the excellent rules in the gist of the principles, the problem still arose when it comes to the implementation part. This indicates the need for future work on proper guidelines for management, given that existing guidelines for Agile adoptions and implementations are general and less focus given to upper level managers.

Keywords: Agile, limitation, human factor, pilot management, systematic review

1 Introduction

Agile methods are now becoming the mainstream and extensively being adopted outside of its initial intended scope of small and collocated project teams. They are now being implemented in all project sizes (small, medium and large), in both distributed (locally and globally) and non-distributed project environments, as well as in various project domains such as engineering, manufacturing, banking and medical. As a result, new versions of Agile methodology have been developed, Agile methods have been enhanced or being integrated with other models to support the increasing demands of different project environments. The initial intention was to integrate Agile method (AM) with an existing framework originated from non-software industry to enhance the AM adoption coverage. To further explore the limitations of Agile practices before deciding their suitability for integration, a pilot systematic literature review (SLR) study has been conducted.

While the limitations of AM in the industry have been aimed at, the limitations in adopting and implementing the AM were identified more during the reviewing. The Agile Manifesto that was addressed as too informal [5] and embraced "abstract principles" [1] raised a lot of issues in the implementation and adaptation of the Agile practices. Regardless of abundance suggestions and recommendations from existing experiences, the flexibility and generality of AM open for various interpretations and therefore, inviting issues in the way to effectively perform AM in practice notably for early adopters.

Agile methodology is an iterative and evolutionary approach for software project development. Initiated by seventeen experts of organizational anarchists in February 2001, it operates under four core values and twelve principles, namely Agile Manifesto [7]. This widely known people-centric process model is inspired among which by sentiments, working with people who shared compatible goals and values based on mutual trust and respect, promoting collaborative, people-focused organizational models and building the types of professional communities in which we would want to work [7]. There are different types of AM. For example, Dynamic Systems Development Method.

(DSDM), Extreme programming (XP), Scrum, Crystal Clear, Feature-Driven Development and Lean Software Development. Each of the different types of Agile methods such as Scrum and XP have their own practices which are based on different concentrations. While XP concentrates on the project level activities of software deployment, Scrum "concentrates on the management aspects of software development" [8].

In this paper, we firstly highlight the background of this pilot SLR study which encompasses a brief introduction on Agile methodology, previous related studies as well as motivation behind the study. Then, the

* ***Corresponding author's*** e-mail: 408569488@qq.com

review method or the steps taken in performing the SLR is elucidated. Subsequently, the result consisting of the overview of the study and the compiled limitations is presented. Last but not least, we conclude our SLR study together with our future work.

2 Background

Agile methods are getting wider attention and widely used at present. However, early investigation (end of 2011) finds their usage are limited (i.e. more suitable for experienced and skilled software engineers, and less appropriate for large and complex projects) despite of their ambitious purpose. AM is regarded as an ambitious practice because it allows for changes within rapid software development environment but the anticipated outcome is yet to be stably attained. At the same time, no paper is found to discuss the drawbacks of AM inclusively.

As a result, pilot SLR was conducted to dig out the limitations of Agile practices and prioritized them based on frequencies. The SLR review process was very helpful as the reviewer could clearly understand the situations and issues surrounded the AM practice. This study also brings the reviewer to see different angles in the research area and help her to firmly decide on what direction that should be focused.

First systematic review study on AM done by Dingsøyr and Dyba [6] intends to tackle the issue of anecdotal evidence in the agile adoption success story. The SLR specifically reviews empirical studies of agile software development since beginning up to 2005 with earlier search result of 1996 papers. The benefits and limitations of AM from their finalized 36 empirical studies as well as the strength of evidences were discussed. Their inclusive analysis provides guidance and comparison for industrial readership based on situational applicability. To conclude, the study mainly advocated for further similar study with better quality in the similar area.

This next systematic review of Agile methodology was specific for global software engineering (GSE) environment [9]. The SLR includes papers from five electronic databases between the year 1999 and 2009 where 77 most relevant papers were analysed. The study found that Agile practices in most cases were customized to fit the project environments and requirements. Thus, future work in incorporating existing experiences was pointed as required to aid agile adopters in distributed project settings.

Subsequently, Causevic et al. [4] have conducted a systematic review on factors limiting industrial adoption of test-driven development (TDD), one of the Agile practices. This SLR study examines both mainly focus and non-specific TDD empirical studies covering papers of industrial and academic studies from 2005 to 2009. The study was based on earlier research findings that the TDD practice "is not followed to the extent preferred by industry". Based on the result, the paper addressed the need for guidelines "to overcome these limiting factors for successful industrial adoption of TDD" [4]. While papers from seven electronic databases were investigated, the SLR merely focuses on one basic agile software development practice.

The only paper of similar focus with this SLR study was by Livermore [12]. Nevertheless, it was a worldwide online survey of general focus involving various industrial areas. With a low response rate of 5.76% or 112 survey responses, factors that were found to significantly impact the Agile implementation include; training, management involvement, access to external resources, as well as corporate size. Through this smaller scope of findings (compared to this SLR study), the management was identified as having main influence over most of the other factors.

Lastly, Neves et al. [14] have presented a paper on a thorough analysis and evaluation (empirically) of the benefits and limitations of Agile practices in relation to knowledge formation and transition experienced by Agile teams. In the last phase of evaluation, a SWOT (Strength Weakness Opportunity Threat) analysis was utilized to evaluate Agile contributions toward the productivity of the software development teams. Our SLR findings show a number of similar limitation items with this paper results of weaknesses and threats of Agile processes in knowledge management.

3 Review Method

First and foremost, an informal review is conducted to gain some understanding on the issues surrounded the AM. In the process, the author review articles, journals and conference papers by searching through the "google" and several well-known electronic databases such as ACM portal, IEEE Xplore, ScienceDirect and SpringerLink that pointed out the limitations or constraints of AM. The information obtained from this preliminary search and review is used as a basis to plan the systematic review.

To form an appropriate systematic review, separate search on papers discussing systematic review method is performed. There are two combination of search strings used; "systematic review AND software" and "systematic review AND Agile". In the process, several papers are retrieved based on title where final selection is made based on abstract and recent published date. Here, two systematic review papers on different AM research focus are chosen and referred; Empirical studies in Agile software development [6] and Agile practices in Global Software Engineering [9]. Their review techniques are carefully assessed and combined in building this systematic review plan. In actual, their SLR methods which focus to the AM study based on several SLR guidelines (i.e. [10]) provide a very helpful and clear-cut guidance for the reviewer to work on the SLR.

Basically, the design of this SLR review protocol was closely influenced by the review method presented by Dingsøyr and Dyba [6] and Jalali and Wohlin [9]. The combination of their review techniques resulted to the following construct. In a systematic literature review, research question that is required to be initially built defines the scope of the review study for the paper. In this

review study, the following research question has been formulated with the objective of finding and gathering the limitations of AM.

A lot of previous research reports pointed out the issue of the validity of Agile methods (AM) study, saying most of the reported results were anecdotal. Based on the situation, research community asks for more concrete study on AM where more and more AM study focusing on tangible results were published afterwards. Therefore this SLR study started with searching AM related papers that were based on strong foundation such as empirical or case study as well as survey and industrial experience report with concrete evidences or strong justifications. In the process, a reviewer went through the research method used in each paper to identify their validity.

Since this review study is about finding the limitations of Agile practices, the primary keyword used in the searching process is "agile" meanwhile "limitation" becomes the secondary keyword. For the first keyword, there are different types of AM such as extreme programming (XP), scrum, crystal clear, dynamic systems development method (DSDM), feature-driven development and lean software development. Separate search is conducted to identify the limitations of each of these AM types. Since the second keyword "limitation" is a common noun, similar meaning words are listed. The words are spotted from papers in the earlier informal review process. The formulation of several search strings from the keywords ensures that only related papers are extracted. The searching activity is conducted using IEEE Advanced Search, the sole electronic database used in this pilot SLR. IEEE is one of the general sponsors for Agile Conference annual events since 2003 and the main publisher for papers in the conferences.

Altogether, there were 7 search strings formed and used in the searching process. This is to ensure that all the related papers, according to the research question could be extracted. Basically, there were 2 types of search string as indicated below:

First search string: to extract all Agile practices in software project related papers that having Agile keyword in their abstract. Second to seventh search string: to extract papers that discuss specific Agile practices such as Scrum which is not included in the first searching, where these papers having no Agile keyword in their abstract.

The reviewer went through four stages of searching and filtering to identify relevant papers In the first stage, a total of 306 search results were returned after 7 individual searches in the IEEE Advanced Search. Next stages were a three phase filtering process. While the first filter is mostly quite straightforward (scanning the titles or abstract), there were cases where the reviewer need to go beyond the abstract to further understand and decide. During the last two phases, the reviewer carefully went through each paper where in most of the cases, need to go through the whole paper or study the full-text to identify its relevancy. In all the three phases, intended data as well as potential points were extracted and stored in an excel file. At the final stage, 29 papers are found to be most relevant to the SLR topic. Subsequent process, the data extraction was not straightforward as the process was delayed by the way of the studies/experiences were reported. The limitation elements are most of the time generally pointed or non-transparent (not in the surface). Thus, the intended points could not be easily extracted and require critical reading and understanding. Furthermore, the points to be extracted are not fix or unique whereby keyword search is not possible. To put in a nutshell, the limitations data are extracted based on the reviewer's analysis and conclusion by reading the whole paper normally more than once to understand the cases/experiences reported.

4 Results and Discussions

4.1 OVERVIEW OF THE RESULT

29 studies that addressed limitations in the Agile method implementations have been identified. The constraints of AM are constantly addressed through the year 2007 to 2012 (until 8th of August 2012), though the papers were extracted merely from an electronic database.

14 of them were case studies of either single or multiple case studies, 11 of them were experience reports, 3 were empirical studies, and the remaining 1 paper is a survey. 38% or 11 papers were affirmed as having large projects or large scale Agile adoptions.

Out of the 29 relevant papers, majority of them or 90% were published in conferences while only three papers (10%) were journals. In this review study, Scrum is found as the most adopted Agile techniques (38%), followed by Agile practices in general (28%). The rest are extreme programming (XP) (2 studies), Lean (1 study), Lean and Agile (1 study), Evo (1 study) and a mixture of several AM (1 study). Having single Scrum adoption as the majority, there are also hybrid implementation of Scrum and XP (1 study), Scrum and User Stories as well as Scrum and Lean (1 study). A new approach in practicing Scrum namely Enterprise Scrum was also developed and exercised (1 study). Our result aligns with several earlier reported studies where at present, Scrum is noted as the most favoured approach among other AM [2,3,17,S2,].

More than half or 55% of the reviewed papers implement Agile in collocated or non-distributed project setting, 21% applied Agile in distributed project environment, 14% of the papers discussed globally distributed Agile projects and the remaining three studies (10%) reported Agile implementation in both environments.

There are five Agile transition cases reported where four of them involve large projects and/or large scale Agile adoptions and four of the five cases as well adopted Scrum [S11,S16,S22,S25]. Besides, an experience report also discussed how the Scrum method has been extended to the executive level to effectively handle large scale Scrum implementation [S10]. The final result of this review compilation exhibits a variety of industry have involved in the Agile adoption other than software such as medical, system engineering, and embedded systems.

4.2 LIMITATION FACTORS

The limitations in the Agile implementation are compiled into several categories. High dependency on people/personnel, organizational dependency, as well as high impact on organizational structure and culture are found as the three factors with highest priority that limiting the Agile implementations in the industry. Here, we are going to highlight the issues identified from the related papers on these three elements.

The most addressed element, people or personnel dependency is divided into four groups. The first one that is found to enforce most barriers to the AM implementation is strong reliance on management. Without management support or having no full support, the agile implementations were either reported as facing greater pain and challenges [S1,S1s] or less effective due to so many problems and difficulties arose [S23], and in the worst case, the implementation was terminated [S11]. In one case, the developers felt insecure and threatened with their Agile adoption status due to suspiciousness after there was a change in key management personnel, lead to work impairment [S9]. While a case study reported successful in the Scrum implementation, strong management support has been gained from the beginning and above that, the company has been practicing Scrum for five years [S13].

On the other hand, a company was clearly reported as failed with lacking in management support as the main cause [S11]. In the case, management approval was raised as fundamental towards AM realization. Developer's with experienced and highly skilled was the second most concentrated factor within the people dependency constraint. Adopting AM, using merely product backlog in place of traditional requirements engineering (RE) practices requires for vast expertise to handle huge gap between the user requirements and coding [S22]. Besides, the lack of documentation [S29], the emphasis on working autonomously (both individually and as a team) through the self-organizing approach [S19], having no design work prior to applying user stories technique for requirements elicitation [S3] and doing things in a speedy way without adequate experience lead to technical debt. Technical debt is a term utilized by Kaiser and Royse [S14] that made use of financial debt as parable to refer to code issues where "when a developer cuts a corner (whether they are implicitly asked to do so or not) it is potentially something that the company will pay for down the road. That is because it will generally cost more (sometimes much more) to resolve it later". All of these conditions were addressed as factors contributing to the favorable of highly skilled and experienced developers or project team in exercising AM. The fact that Agile approaches favors skillful personnel has been acknowledged based on Smith and King [S24] experience report on a project adopted XP method stated that, "a clear benefit was the high level of expertise of candidates that applied for positions throughout the project" [S24].

Subsequent dependency concern was on other personnel such as agile/scrum master and product owner (PO). To start, clear specification of each and everyone's role and tasks for Agile project team is a must according to Jakobsen and Poppendieck [S13] based on their multiple case study findings. In one case, clear blueprint of PO's roles to the extent "how the team collaborated with the PO" has been recognized as a key factor for successful project sprints. Nevertheless, no proper guidelines available for either PO's role and job description, agile/scrum master or other main roles in an Agile project until to-date. At the same time few literatures discussed about PO's role regardless of its clear need [S16]. To conclude, the applications of PO or Agile and Scrum master position in the studied literatures are inconsistent and reported in disappointed ways [S11, S14, S16, S20, S26]. They were either inexperienced, inactive, rarely available, unavailable, or inefficient. So to say, those who want to adopt Agile needs to place extra initiative and effort to carefully design main roles job description based on their project requirements and environment.

Last but not least, Agile practices depend highly on intensive communication with customer as customer collaboration is one of the four core values of Agile methodologies. As a result, when there is a lack of trust on the customer side or the customer is unavailable, relevant information and feedback will be in scarce [S7]. The information shortage issue has been identified also in Korkala and Abrahamsson [S15] report that had caused serious problems due to lack of well-defined customer. In their case of distributed agile project, the customer became intermediate between two remotely located teams but inactively held the responsibility and failed to deliver important information between the two teams. While according to Jakobsen and Poppendieck [S13], "many projects struggling with clarifying features in collaboration with the customer. Clarifications from the customer were late, leading to a decrease in flow, which we know causes schedule and cost overrun". In the case, too much expectation was placed on the customer that exceeds the customer's ability and readiness.

Srinivasan and Lundqvist [S26] reported that inappropriate tool has been used to support Agile processes as it was mandated by the company, given a lot of investment has been made on the tool. Meanwhile organizational restructures have obstructed the communication and collaboration between developers and testers as well as with the QA team (the team felt the lack of support from the QA organization) when they are placed separately from each other [S27]. According to Thomas [S27], organizational boundaries such as enterprise policies that exercise separate team for testing and release activity from the development team made agile technique like Test-Driven Development (TDD) inapplicable [S4]. This kind of policies disallow the adoption of testing process like TDD besides impractical to be incorporated in a short release cycle due to longer time taken for testing activity. "Organizational resistance may be the main barrier to other organizations trying it, because top executives and engineers must be willing to give it a serious try" [S10]. It refers to a Scrum practice extension initiative at the executive level. To truly gain the commitment from the people on the changes brought about by the Agile through its values, the effort must come from the highest organi-

zational level [S1]. It has been concluded by Lalsing et al. [11] where it is imperative that before any organization decides to adopt an AM, it needs to assess whether the company culture, operating structure, business processes and projects are suited for the use of an Agile Project Management Methodology.

To adopt AM, there will be a need for changes not only in the working style but also in the organizational structure and culture whenever necessary. For example, Thomas and Baker [S28] stated that there was "an inherent conflict" between the AM and organization operated under legacy processes, mindsets and cultures. While Middleton and Joyce [S17] pointed out the drawback of Lean methods as might be conflicting with current corporate standards. Among the obstacles specified; "Lean does not work well with targets, milestones, Gantt charts and traffic light reporting methods" (the artifacts/requirements demanded in organization with heavy plan driven process), besides the need for changes in the job roles and responsibility such as the manager being a facilitator [S17] instead of a planner and controller [13]. To conclude, organizational changes are necessary in the Agile adoption process [S11,S20], especially for traditional corporate governance [S28]. Nevertheless, culture and mindset among the people within organization were recognized as the most difficult aspects to change [S25].

4.3 SUMMARY

Firstly, recognized AM limitations from the final 29 relevant papers are compiled and grouped through profound analysis made throughout the SLR study. Meanwhile discoveries and inputs from other literature readings (e.g. [14]) contribute to the refinement of the limitation items. Nonetheless, instead of classifying the limitations based on project sizes (small, medium and big) and/or project types (non-distributed and distributed), they are generally itemized.

Secondly, the two factors; organizational dependency as well as high impact on organizational structure and culture are separated from each other. While organizational dependency refers to constraints posed by the decision at the organizational level, the latter factor signifies the required organizational changes that had imposed strong opposition and challenges. To conclude, these two factors are mutually related and can be associated back to the people factor.

To compare, this pilot SLR finding aligns with several earlier research results on the importance of upper level management high commitment and support for better implementations of AM. For instance, Young and Jordan [18] result on multiple case studies on projects "ranged from complete failure to complete success" shows that top management support (TMS) is the most critical determinant for project success or failure. While Livermore [12] through his worldwide online survey found that, "a number of the factors that impact the implementation of an agile development methodology are completely under the control of management". Lastly, recent study on agile deployment in three companies [15] identified management clear vision and support as very significant and thus provided recommendations for management on effective agile deployment plan.

4.4 LIMITATIONS OF THIS REVIEW

The limitation in the SLR is on the electronic database (e-database) used where only papers in IEEE is reviewed (one e-database only). Therefore, this review study can be regarded as pilot SLR to identify and prioritize the factors limiting Agile implementations in the industry. Since the SLR inclusion criteria is broad; includes case study, empirical study, experience report, survey, and expert opinion of all project types (small, medium and large) in both distributed and non-distributed Agile project management and development, using only one e-database has taken considerable time. This is because the whole SLR process is done by a single reviewer through a profound analysis.

This SLR study as well does not specifically include the obstacles of implementing AM in the distributed projects. The reviewer found that other than technology restrictions, the relevant papers do not distinctly stress the limitations concerning distributed environments. In spite of that, the shortcoming of implementing AM in such project setting is an important and a huge area to be focused on its own.

The equation shown below was used to calculate the error rate. It was required to calculate two measures; the number of error patterns and the total number of patterns, which was used to find the error rate in the improved K-means clustering algorithm and the K-means clustering algorithm in all data sets of this study. In next section, it will be seen that the RER-K-means algorithm reduced the error rate and iteration. In this algorithm, additional operations that have a negative effect on the calculation must be avoided. In all the data sets, the K-means clustering and the RER-K-means algorithms implementation were similar and only the data set name and data set coordinates were changed by the algorithms.

6 Conclusion

From 29 most relevant papers identified in the IEEE database, high dependency on people/personnel was found as the most mentioned factor imposing barriers to the Agile implementations in the industry. People dependency encompasses management, developers, customers, and others such as agile master and product owner. This is followed by organizational dependency as well as high impact on the organizational structure and culture as the second and third limitation factor. The SLR demonstrates that the first three limitations with highest frequencies are mainly originated from the people factor where management plays the most important role. While the rest of the limitations exhibit that most of them can be strongly associated back to the people factor (management), they are not highlighted in this paper.

If compared to the Agile principles illustrated in the Agile Manifesto [7], elements such as people dependency and heavy reliance on communication are clearly mentio-

ned and therefore should be mostly expected. To conclude, clear relations between the SLR findings and the Agile principles stated in the Agile Manifesto could be identified. High dependency on people that is supposed to be vastly anticipated during the Agile adoption became the most addressed factor that bring limitations to the Agile adoption and implementation in the industry.

In spite of apparent emphasis on people critical function stated in the Agile principles, plus the excellent rules in the gist of the principles, the problem still arose when it comes to the implementation part. Therefore, future research is to construct a set of guidelines to tackle the identified issue of "lacking in specific guidelines in the practical application of AM" as an approach in preparing the top/senior management with proper direction (on their actual role) in managing people in the practical implementation of AM (aligns with Agile principles).

Appendix

The 29 relevant papers:

[S1] Asnawi A L, Gravell A M, Wills G B 2012 Emergence of Agile Methods: Perceptions from Software Practitioners in Malaysia Agile India IEEE Computer Society 30-9

[S2] Azizyan G M, Magarian K Kajko-Matsson 2 2011 Survey of Agile Tool Usage and Needs Proceedings of the 2011 Agile Conference IEEE Computer Society 29-38

[S3] Babar M A 2009 An exploratory study of architectural practices and challenges in using agile software development approaches. Proceedings of the Joint Working IEEE/IFIP Conference on Software Architecture 81-90

[S4] Bass J M 2012 Influences on Agile Practice Tailoring in Enterprise Software Development AGILE India IEEE Computer Society 1-9

[S5] Beckhaus A, Karg L M, Hanselmann G 2009 Applicability of Software Reliability Growth Modeling in the Quality Assurance Phase of a Large Business Software Vendor The 33rd Annual IEEE International Computer Software and Applications Conference 2009 209-15

[S6] Cagle R 2012 Enterprise Architecture facilitates adopting Agile development methodologies into a DoD acquisition IEEE International Systems Conference 2012 1-5

[S7] Cao L, Ramesh B 2008. Agile Requirements Engineering Practices: An Empirical Study IEEE Software 25(1) 60-7

[S8] Chookittikul W, Kourik J L, Maher P E 2011 Reducing the Gap between Academia and Industry: The Case for Agile Methods in Thailand The Eighth International Conference on Information Technology New Generations 239-44

[S9] Evans M 2008 The FrAgile Organisation Agile Conference 181-5

[S10] Greening D R 2010 Enterprise Scrum: Scaling Scrum to the Executive Level *The 43rd Hawaii International Conference on System Sciences* 1-10

[S11] Hajjdiab H, Taleb A S 2011 Agile adoption experience: A case study in the UAE IEEE 2nd International Conference on Software Engineering and Service Science 31-4

[S12] Hanssen G K, Yamashita A F, Conradi R, Moonen L 2009 Maintenance and agile development: Challenges, opportunities and future directions IEEE International Conference on Software Maintenance 487-90

[S13] Jakobsen C R, Poppendieck T 2011 Lean as a Scrum Troubleshooter Agile Conference 168-74

[S14] Kaiser M, Royse G 2011 Selling the Investment to Pay Down Technical Debt The Code Christmas Tree Agile Conference 175-80

[S15] Korkala M, Abrahamsson P 2007 Communication in Distributed Agile Development: A Case Study The 33rd EUROMICRO Conference on Software Engineering and Advanced Applications 203-10

[S16] Lehto I, Rautiainen K 2009 Software development governance challenges of a middle-sized company in agile transition ICSE Workshop on Software Development Governance 36-9

[S17] Middleton P, Joyce D 2012 IEEE Transactions on Engineering Management 59(1) 20-32

[S18] Miller J R, Haddad H M 2012 Challenges Faced While Simultaneously Implementing CMMI and Scrum A Case Study in the Tax Preparation Software Industry The Ninth International Conference on Information Technology 314-8

[S19] Moe N B, Dingsoyr T, Kvangardsnes O 2009 Understanding Shared Leadership in Agile Development A Case Study The 42nd Hawaii International Conference on System Sciences 1-10

[S20] Moe N B, Dingsoyr T, Dyba T 2008 Understanding Self-Organizing Teams in Agile Software Development The 19th Australian Conference on Software Engineering 76-85

[S21] Rottier P A, Rodrigues V 2008 Agile Development in a Medical Device Company Agile Conference 218-23

[S22] Savolainen J, Kuusela J, Vilavaara A 2010 Transition to Agile Development – Rediscovery of Important Requirements Engineering Practices The 18th IEEE International Requirements Engineering Conference 289-94

[S23] Shatil A, Hazzan O, Dubinsky Y 2010 Agility in a Large-Scale System Engineering Project: A Case-Study of an Advanced Communication System Project IEEE International Conference on Software Science 47-54

[S24] Smith C, King P 2008 Agile Project Experiences The Story of Three Little Pigs Agile Conference 378-83

[S25] Smits H, Rilliet H 2011 Agile Experience Report: Transition and Complexity at Cisco Voice Technology Group Agile Conference 274-8

[S26] Srinivasan J, Lundqvist K 2009 Using Agile Methods in Software Product Development: A Case Study The Sixth International Conference on Information Technology: New Generations 1415-20

[S27] Thomas J 2008 Introducing Agile Development Practices from the Middle The 15th Annual IEEE International Conference and Workshop on the Engineering of Computer Based Systems 401-7

[S28] Thomas J C, Baker S W 2008 Establishing an Agile Portfolio to Align IT Investments with Business Needs Agile Conference 252-8

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Authors

Hong Wang, born in February 1977, Wuhan, Hubei Province, China.

Current position, grades: PhD candidate at Wuhan University of Technology. Lecturer at Hubei University.
Scientific interests: include information interactive visual design and computer simulations.
Publications: 10 papers.