IDEA GROUP PUBLISHING
701 E. Chocolate Avenue, Suite 200, Hershey PA 17033-1240, USA **ITB12583**
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.idea-group.com

This paper appears in the book, *Emerging Trends and Challenges in Information Technology Management, Volume 1 and Volume 2* edited by Mehdi Khosrow-Pour © 2006, Idea Group Inc.

Agile Practices, Promises of Rigor, and Information Systems Quality

Sue Kong, PhD Program, #79, Rutgers Business School, Newark and New Brunswick, Rutgers University, Newark, NJ 07102, T: (973) 946-3680, F: (973) 833-0429, sukong@pegasus.rutgers.edu

Kenneth E. Kendall & Julie E. Kendall
School of Business Camden, Rutgers UniversityCamden, NJ 08102, T: (856) 225-6586, F: (856) 424-6157, {ken, julie}@thekendalls.org

INTRODUCTION

It has been widely recognized that the plan-based, process-centric and formal systems development methodologies (e.g. Systems Development Life Cycle) are well suited for predictable environments, but lacking in environments with substantial uncertainty (Boehm, 2002, 2003a, 2003b, 2004a, 2004b). In order to cope with uncertainty, practitioners (Beck, 1999; Beck and Fowler, 2001; Cockburn, 2002 and 2004; Schwaber and Beedle, 2002) introduced agile approaches, which are people-centric, less formal, iterative and adaptive.

Debates have been raised around agile approaches, especially on the quality effects of agile approaches. Specifically, some researchers believe that agile approaches cannot achieve persistent high systems quality because the constant adaptation will introduce design flaws and coding errors (Paulk, 2001 and 2002). Conversely, other researchers argue that agile methodology increases quality of information systems due to its customer centric and adaptive approach (Armitage, 2004, Huo, Verner, Zhu and Ali Babar, 2004; Opperthauser, 2003). The inconclusive debates around the quality effect of agile approaches have caused great confusion and misunderstanding. The scrutiny of this issue, the impact of agile approaches on quality of the information systems, thus becomes emergent to the research community. However, to our best knowledge, the contemporary literature has largely neglected systematic study of this research question.

This paper will examine the impact of agile approaches on the quality of information systems theoretically and empirically. Specifically, we will employ a survey study among information systems personnel to verify our hypothesis drawn from theoretical study. This research will expand our knowledge and inform practitioners.

DEFINITION AND MEASUREMENT OF QUALITY OF INFORMATION SYSTEMS

Quality definition originated from the manufacturing industry. The classic quality definitions include "fitness for use" and "customer satisfaction" (Juran, 1999). Similarly, the Institute of Electrical and Electronics Engineers (1987) defines software quality as "the totality of features and characteristics of a software product that bear on its ability to satisfy given needs." Because information systems are one type of software, we believe that this software quality definition also applies to information systems.

DeLone and McLean (1992 and 2002) presented a well known model, D&M Information Systems Success Model (the "D&M Model"), for measuring the effectiveness of information systems. This model consists of six important systems success measures, they are: Systems Quality, Information Quality, Service, Use, User Satisfaction and Net Benefits (DeLone and McLean, 2002). While the D&M Model organizes and resolves the seemingly conflicting arguments regarding the measurement of information systems success, it only addresses the dependent variables (the output of the development process) and leaves the independent factors that lead to systems success outside the scope. We believe the inclusion of the independent factors, such as the system development methodology, will provide an insightful way to evaluate the various software development methodologies and practices.

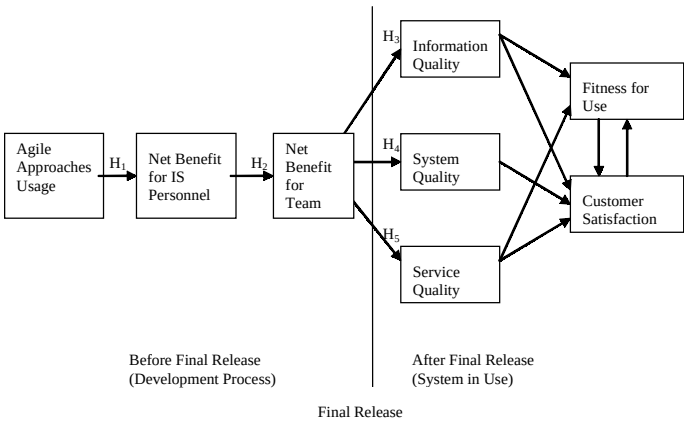
RESEARCH MODEL AND SURVEY DESIGN

Kendall, Kendall and Kong (2006) believe that the quality of the information systems is highly dependent on the practices and values of the people who develop and implement the systems. Based on the understanding that agile methodology first impacts individual information systems personnel (developers, testers, managers, etc.) through agile practices, principles and values, then affects the team dynamics, and finally influences the quality of information systems (which could be measured by the dependent variables), we propose our research model as Figure 1.

Drawn from our model, we hypothesize the following:

- H_1: Agile methodology usage is positively associated with net benefits for information systems personnel.
- H_2: Net benefits for information systems personnel are positively associated with net benefits for team.
- H_3: Net benefits for team are positively associated with information quality of the delivered systems.
- H_4: Net benefits for team are positively associated with systems quality of the delivered systems.

Figure 1: The Impact of Agile Approaches on the Quality of Information Systems



H_5: Net benefits for team are positively associated with service quality of the delivered systems.

A survey study will be conducted to examine the impact of agile approaches on the quality of information systems. Because values and principles are hard to detect and measure, this study will focus on agile practices. Specifically, through literature review, we will identify a typical set of agile practices among other widely used vigorous software practices for research. We will then survey information systems personnel on their view of the impact of agile methodology on them and their team and on the various quality aspects of the delivered systems. Furthermore, we'd like them to identify what software practices, agile or vigorous, tend to improve the quality of the systems.

As suggested by Churchill (1979), Straub (1989), Moore and Benbasat (1991) and Chin, Gopal and Salisbury (1997), our survey study will be divided into the following three stages:

1. **Item Creation Stage.** At this stage, we will focus on literature review and developing the questionnaire. We plan to use the constructs of our research model as the basic items for the questionnaire. Agile methodology usage is measured using the items from Henderson and Cooprider (1990) and Collins and King (1988), including frequency of use, degree of use, time of use, proficiency and dependency.These items will then be reviewed by field experts to validate the content validity to ensure that these items do reflect the construct of interest appropriately. A pilot questionnaire will be developed at the end of this stage.
2. **Pilot Study Stage.** Before conducting the survey, a pilot study will be conducted with a convenient sample of 10 users. The purpose of the pilot study is two fold: i) to check how long the survey will take and collect respondent's feedbacks to further revise the questionnaire; ii) to assess the construct validity and reliability of the questionnaire. We will use factor analysis to assess the construct validity and finalize thequestionnaire.
3. **Full Scale Survey.** The finalized questionnaire will be distributed to respondents and the results will be analyzed. The population for the full scale survey is information systems personnel, such as managers, programmers, testers, in selected organizations. We will select three ("3") to five ("5") organizations of various sizes and in various industries and send their information technology department an invitation asking them to fill out the survey. Most surveys will be conducted online because online surveys can overcome the geographic limitation as well as being cost-saving. Once a satisfactory number of answers are collected[1], we will carry out statistical analysis of the survey results.

We are currently in the process of finalizing the questionnaire and looking for organizations to collect data.

CONTRIBUTION AND FUTURE STUDY

This research has the following contributions:

- First, past studies have been mostly focused on one or two specific quality definitions and measurements, such as the product conformance quality measured by defect (bugs) rate or the service quality measured by customer satisfaction. Differently, our research model offers a holistic structure to insight various quality aspects and their interrelationship with each other. Such approach helps people to see the whole picture better, which will further aid the clarification of the seemingly inconsistent findings in the discussion of quality effect of agile approaches.
- Second, contemporary literature frequently lacks of empirical evidence despite making claims. In order to fill this void, we will employ a survey study to verify or refute claims.

The future study topics include but are not limited to the following:

- The dynamics of various agile practices. Certain agile practices, such as design simplicity, don't work well independently. Such agile practices much be utilized in certain combination in order to achieve good quality results. Understanding the dynamics among agile practices will help us to deploy agile approaches effectively.
- The suitability of agile approaches with organizational and project context. Agile approaches are not universal solutions. For example, some practitioners found agile approaches not work well in organizations that emphasize optimization; other practitioners claimed that agile approaches did not work well with life critical systems. Identifying the suitable organizational and project context for agile approaches will lower the chance of failure.

REFERENCES

Armitage, J. (2004). "Design: Are Agile Methods Good for Design?" *interactions*, Vol. 11, Issue 1, January 2004.

Beck, K. (1999). *Extreme Programming Explained: Embrace Change*, Addison Wesley, Boston, 1999.

Beck, K. and M. Fowler (2001). *Planning Extreme Programming*, Addison-Wesley, Boston, 2001.

Boehm, B. (2002). "Get ready for agile methods, with care," *Computer*, Vol. 35, Issue 1, January 2002, pp.64-69.

Boehm, B. and R. Turner (2003a). "Observations on balancing discipline and agility," *Proceedings of the Agile Development Conference*, 2003, pp.32-39.

Boehm, B. and R. Turner (2003b). "Using risk to balance agile and plan-driven methods," *Computer*, Vol. 36, Issue 6, June 2003, pp.57-66.

Boehm, B. and R. Turner (2004a). "Balancing Agility and Discipline: Evaluating and Integrating Agile and Plan-Driven Methods," *Proceedings of the 26th International Conference on Software Engineering*, May 2004.

Boehm, B. and R. Turner (2004b). *Balancing Agility and Discipline: A Guide for the Perplexed*, Addison-Wesley, Boston, 2004.

Chin, W.W., A. Gopal, and W. D. Salisbury (1997). "Advancing the theory of adaptive structuration: The development of a scale to measure faithfulness of appropriation," *Information Systems Research*, 1997, Vol. 8, pp. 342-367.

Churchill, G.A. (1979). "A paradigm for developing better measures of marketing constructs," *Journal of Marketing Research*, Vol. 16, pp. 64-73.

Cockburn, A. (2002). *Agile Software Development*, Boston, Addison-Wesley, 2002.

Cockburn, A. (2004). *Crystal Clear: A Human-Powered Methodology for Small Teams*, Boston, Addison-Wesley, October 2004.

Collins, P. and D. King (1988). "The Implications of CAD for work and performance," *The Journal of Applied Behavioral Science*, Vol. 24, Issue 2, pp.173-190.

Cronbach, L.J. (1951). "Coefficient Alpha and the international consistency of tests," *Psychometrical*, Vol. 16, September 1951, pp. 297-334.

Cronbach, L.J. (1971). "Test Validation," in *Educational Measurement*, 2nd Edition, R.L. Thorndike (eds.) American Council on Education, Washington, D.C., 1971, pp. 443-507.

DeLone W.H. and E.R. McLean (2002). "Information Systems quality Revisited," *Proceedings of the 35th Hawaii International Conference on Systems Sciences (HICSS-35'02)*, 2002.

DeLone, W.H. and E.R. McLean (1992). "Information Systems quality: The Quest for the Dependent Variable," *Information Systems Research*, Vol. 1, Issue 1, 1992, pp. 60-95.

Henderson S. and J. Cooprider (1990). "Dimension of IS planning and design aids: a functional model of CASE technology," *Information Systems Research*, Vol. 1, Issue 3, pp.227-308.

Huo, M. J. Verner, L. Zhu and M. Ali Babar (2004). "Software Quality and Agile Methods," *Proceedings of the 28th Annual International Computer Software and Applications Conference (COMPSAC'04)*, 2004.

Juran, J. M. (1999). *Juran's Quality Handbook*, Fifth Edition New York, McGraw-Hall, 1999.

Kendall, K.E. and J.E. Kendall (2005). *Systems Analysis and Design*, 6th Edition, Upper Saddle River, NJ, Pearson Prentice Hall, 2004.

Kendall. J.E., K.E. Kendall and S. Kong (2006). "Improving Quality Through The Use Of Agile Methods in Systems Development: People and Values in the Quest for Quality," in Duggan, E.W. & H. Reichgelt (Eds.), *Measuring Quality Requirements in Information Systems*, Chapter 6, Idea Group Publishing, 2006.

Moore, G.C. and I. Benbasat (1991). "Development of an instrument to measure the perceptions of adopting an information technology innovation," *Information Systems Research*, 1991, Vol. 2, pp 192-222.

Opperthauser, D. (2003). "Defect Management in an Agile Development Environment," *Cross Talk, the Journal of Defense Software Engineering*, Sept. 2003.

Paulk, M. C. (2002). "Agile Methodologies and Process Discipline," *Cross Talk, the Journal of Defense Software Engineering*, Oct. 2002.

Paulk, M.C. (2001). "Extreme Programming from a CMM Perspective," *IEEE Software*, Nov./Dec. 2001.

Schwaber, K. and M. Beedle (2002). *Agile Software Development with Scrum*, Prentice-Hall, 2002.

Straub, D. W. (1989). "Validating instruments in MIS research," *MIS Quarterly*, Vol. 13, 1989, pp 147-169.

ENDNOTE

[1] The satisfactory sample size can be calculated as suggested by Kendall and Kendall (2005, p. 126).