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The Effects of Agile Methodology Use on Knowledge Management Outcomes

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Abstract
In this research, we examine how the use of different agile practices contributes to successful knowledge management. We review the literature on agile methodologies and identify agile practices that are particularly relevant to knowledge management--i.e., pair programming, collective ownership, and coding standards.

Keywords: agile development, software development, knowledge management

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INTRODUCTION

Software development is a knowledge-intensive activity. In the development process, developers engage in different knowledge management-related activities aimed at learning, capturing, and reusing experience (Rus and Lindvall 2002). How knowledge is managed during the development process is determined primarily by the software development approaches. Traditional plan-driven development approaches emphasize documentation. Detailed records are created in each phase of development and these records serve as useful artifacts for communication and traceability of knowledge (Nerur, Mahapatra, and Mangalaraj 2005). In contrast, agile methodologies encourage lean thinking and discourage the use of documentation. The knowledge in agile development is often tacit and resides in the heads of the development team members, making the management of knowledge more difficult (Nerur et al. 2005). While the leanness and agility concepts of agile methodologies help improve the systems development process in terms of productivity and quality (Reifer 2002), this may be achieved at the cost of ineffective management of developers' knowledge, which is considered an important asset of software organizations (Bjørnson and Dingsøyr 2008). Hence, given the growing popularity of agile methodologies, it is crucial to examine the impact of the use of agile practices on different knowledge management outcomes, such as knowledge creation, retention, and transfer among developers.

In this research, we examine how the use of different agile practices contributes to successful knowledge management. We review the literature on agile methodologies and identify agile practices that are particularly relevant to knowledge management—i.e., pair programming, collective ownership, and coding standards. Prior research has examined how the use of these agile practices may contribute to improved project technical quality and developers' job satisfaction (Balijepally, Mahapatra, Nerur, and Price 2009; Maruping, Venkatesh, and Agarwal 2009). Yet, despite the importance of knowledge management in software development (Bjørnson and Dingsøyr 2008), little work has been done to examine how the use of agile practices may affect the management of developers' knowledge. In view of this, we adopt the Argote, McEvily, and Reagans's (2003) knowledge management framework and focus our examination on the effects of agile methodology use on three key knowledge management outcomes—i.e., knowledge creation, knowledge retention, and knowledge transfer. In the domain of agile development, knowledge creation involves developing new tacit and explicit knowledge about the agile methodology (e.g., programming techniques and standard practices) and the software product (e.g., customer requirements and product specifications). As such knowledge is important to the success of agile development, it has to be retained in the development teams and transferred effectively among team members. Both knowledge retention and transfer can be achieved by agile practices, such as pair programming and rotation of team members in different phases throughout the project (Nerur et al. 2005). Figure 1 depicts our research model.

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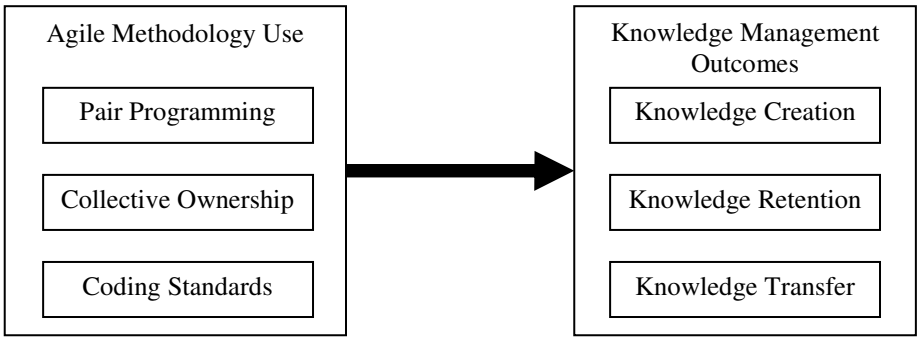

Figure 1. Research Model

RESULTS

The pilot data acquired from 288 software developers provides preliminary support for our model (see Table 1). The results show that pair programming, collective ownership, and coding standards are positively related to knowledge creation, whereas pair programming and coding standards are positively related to both knowledge retention and knowledge transfer. Overall, the findings show that the three identified agile practices are significant determinants of knowledge management outcomes and provide a better understanding of how different agile practices can facilitate knowledge management activities among developers.

Table 1. Hierarchical Regression Results

	Knowledge Creation		Knowledge Retention		Knowledge Transfer	
Variables	**Step 1**	**Step 2**	**Step 1**	**Step 2**	**Step 1**	**Step 2**
Control variables						
Age	.02	.01	.01	.01	.02	.01
Gender	.04	.03	.03	.02	.03	.02
Tenure	.07	.05	.02	.01	.05	.03
Software development experience	.13*	.06	.12*	.04	.03	.02
Agile methodology experience	.15**	.12*	.10	.05	.02	.01
Agile methodology use						
Pair programming		.17**		.20***		.17**
Collective ownership		.12*		.05		.08
Coding standards		.14*		.13*		.14*
R^2	.07	.20	.05	.15	.03	.12
ΔR^2		.13***		.10***		.09***

$N = 288$. Standardized regression coefficients are shown.
* $p < .05$, ** $p < .01$, *** $p < .001$.

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