Empower Gender Diversity with Agile Software Development

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INTRODUCTION

Gender issues have recently been discussed extensively with respect to the computing fields (Bair & McGrathe-Cohoon, 2005; Camp, 2002; Margolis & Fisher, 2002). One of the discussed issues is the "shrinking pipeline" phenomenon (Camp, 1997). Camp shows how, in addition to the shrinking of the pipeline upon transition from high school to graduate school, the pipeline has been shrinking also at the bachelor-degree level since 1983. She argues that since the number of women at the bachelor's level affects the number of women at levels higher in the pipeline and in the job market, this phenomenon is of great concern.

The shrinking pipeline is explained in various ways. Among other explanations, the image of the field as requiring long hours of programming is a dominant one. Here is an illustrative case. The April 3, 2003, edition of the *Pittsburgh Post-Gazette Business News* addressed the question of why more women are not involved in the tech fields.[1] This question was discussed by a panel, assembled by the Pittsburgh Technology Council a week before the article was published, which included some of the region's most successful women. Among other arguments, Robbin Steif, chief financial officer of Maya Design, said, "It might be an issue of self-selection—women might not be risk takers." Then she added, "It might also have something to do with the work/family issue, because entrepreneurs work way more than 40 hours per week."

This article focuses on software development teams using one of the agile software development methods. A high quality of working software is the primary measure of progress; however, agile software development processes, in addition, promote a sustainable pace for all the individuals (developers and users) involved in the software development process,[2] welcome requirement changes even in late stages of the development, and favor face-to-face communication. Based on our observations of agile software teams both in academia and in industry, we claim that such software development frameworks enable women to gain new and better positions in the hi-tech industry in general and in software development teams in particular. We view this article as an example of how diversity can be achieved in software teams. In our current research, we explore other dimensions by which diversity can be achieved in software teams, such as minorities and nationalities.

The perspective and data that are presented in this article are part of our research about human aspects of software engineering, specifically our comprehensive research about cognitive and organizational aspects of agile software development methods both in the industry and academia (Dubinsky & Hazzan, 2004; Dubinsky, Talby, Hazzan, & Keren, in press; Hazzan & Dubinsky, 2003a, 2003b; Tomayko & Hazzan, 2004).

BACKGROUND

The aforementioned image of the hi-tech industry in general and the software industry in particular was developed mainly during the dot-com bubble era. In those days, the media painted a picture of the dot-com world as a sleep-on-the-office-floor and sacrifice-your-family-time way of life. This image might tend to discourage women from entering the computing field and can partially explain the significant decrease in the female population of computer-

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science students over the past 20 years, from 35% in the 1980s to a 15 to 20% level at the beginning of the millennium (Camp, 1997; Davies & Camp, 2000).

The above picture accompanied data that indicated that the software industry suffers from many typical problems. For example, software projects fail to be delivered on time, exceed their budget, and do not comply with the requirements put forth by the customer (see, for example, Fairley & Willshire, 2003). Furthermore, according to the National Institute of Standards and Technology (NIST) news release[3] on June 28, 2002, "[s]oftware bugs, or errors, are so prevalent and so detrimental that they cost the U.S. economy an estimated $59.5 billion annually, or about 0.6 percent of the gross domestic product."

The Agile Approach and Extreme Programming

During the 1990s, the agile approach of software development started to emerge as a response to the problems of the software industry. Specifically, the agile software development approach, composed of seven methods, formalized development frameworks that aimed at overcoming these characteristic problems of software projects (Highsmith, 2002).

Extreme programming is accepted as the most commonly used agile software development method. It is based on four values expressed by 12 practices, which support and complement each other. The four extreme-programming values are communication, simplicity, feedback, and courage. The 12 practices, as originally envisioned by Kent Beck (2000), are the planning game, pair programming, refactoring, simple design, continuous integration, test-driven development, collective ownership, coding standards, short releases, metaphors, a sustainable pace, and on-site customers.[4]

The extreme-programming values and practices were selected based on the accumulative insight derived from extensive experience in the software industry, and from the recognition that quality software systems should, perhaps, be developed by adhering to very specific and detailed practices. Rather than stating principles and development phases that can be interpreted and implemented differently by different software teams, the extreme-programming practices outline a very detailed procedure for the actual development of software systems.

Since extreme programming is the most accepted agile software development method, when we assimilate it with a specific software development team, we adopt its values and practices as basic and, if necessary, adjust them in the spirit of the agile approach according to the team's needs. In this article, we refer to the adjusted extreme-programming method as the agile method.

Women's Management Style

According to Fisher (1999, p. 32), "Women's style of management is based on sharing power, on inclusion, consultation, consensus, and collaboration. Women work interactively and swap information more freely than men do. Women managers encourage their employees by listening to, supporting, and encouraging them."

In addition, recent research studies have identified several characteristics attributed to women's management style. Here are some examples (italics added by authors).

- *Women's management style is more equal and collaborative, often described as 'transformational', in contrast to the traditional 'transactional' style preferred by men who rely on power position and formal authority.* (Vinnicombe & Singh, 2002, p. 121)
- *Recent research indicates women's management style, which is centered on communication and building positive relationships, is well suited to the leadership paradigm of the 90's.*[5] (Peters, 2003)
- *The women's management style builds very much on participation by the employees and mutual trust, and they become very disappointed if the employees do not live up to that trust.* (Kjeldsen & Nielsen, 2000)

Needless to say, these attributes are compatible with any good management style; however, as the above quotes indicate, research attributes them to women.

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