

1. Agile Values, Innovation and the Shortage of Women Software Developers

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2. Introduction

Hello

The premise of my paper is that the lack of women developers in the US is an impediment to value delivery and product innovation in the software industry.

that, in light of this, Agile principles call on Agile practitioners to confront hostile workplace conditions and call upon Agile enterprises to address the material impediments of pay and advancement.

And, that this beneficial change in teams and companies can incrementally change perceptions in the larger society.

3. Personal Introduction

To introduce myself, I'm a software practitioner not a consultant or educator. I've studied and applied Agile methods for nine years.

I've spent most of my career in woman run organizations.

4. Daughter

I also have an eleven year old daughter who loves technology and attends an all girls math and science school in diverse downtown Brooklyn.

5. Women are underrepresented in CS

According to the US Bureau of Labor Statistics, women represent 46% of the workforce but only 25% of software developers. Over two decades the percentage of women developers has steadily declined.

6. Women are leaving mid-career

According to research published in the **Harvard Business Review**, 41% of women professionals leave established careers in "high technology" compared to 17% of men. Half of women leaving STEM careers leave the sector completely[4].

7. Women are not studying CS

According to the Commission on Professionals in Science and Technology, in the decade between 1986 and 1995 the number of women earning Computer Science bachelor's degrees dropped 55%. As of 2010, the percentage was still falling[6] despite growing percentages of women graduating from four year colleges[7]. This is not typical of STEM where 49% of bachelor degrees go to women[8].

8. Young Women are disinterested in pursuing high tech

The *Maryland Adolescent Development in Context Study*, a longitudinal study of 1,400 white and african american students found that women were much more likely to have no interest in IT related careers and degrees than men.

9. At what cost to the software industry?

In the last decade, the U.S. software industry represented \$200B in annual sales and employed 2.2M software professionals. McKinsey & Co estimates in this decade, demand for mid-career IT professionals will increase by 25% while the available pool will decrease by 15%. This in a country where 71% of

workers are in jobs with low demand or an oversupply of eligible candidates.

10. The cost of attrition

And let's also get at the cost of attrition. According to HR magazine, it costs approximately 100-125% of an employee's annual salary to replace them. Retaining one-quarter of the women who leave computer engineering mid-career could represent a ten year savings of \$8B to the industry.

11. Lost opportunity in the software industry (Product)

The lack of women on software teams is also a potential loss to product innovation...

12. Women are our customer

Women directly or indirectly influence 61% of U.S. **consumer electronics purchases**[18].

13. Women in gaming

Women are 42% of active game players and 48% of frequent game purchasers. And if you think they're just buying them for their kids, industry research shows women 18 and over are 37% of game players whereas boys 17 and under are only 13%[19].

14. Women on the internet

Half (50.4%) of the internet population is women 18 and over. They spend an average of 38 hours per month online. They spend 5% more time than men in online social networking and 20% more time on online shopping. Women account for 58% of internet buyers, 61% of internet transactions and 58% of internet dollars.

15. Women are underserved

Software products are generally designed with no consideration for women as distinct user groups. In "Gender differences in Web Usability", Frank Spillars states, "*Gender differentiation is barely present in North American technology product design... let alone Web experiences*[22]."

16. how women perceive and use software

In "Towards Female Preferences in Design." the authors found differences in the ways men and women perceive and describe software products. "*The results of this research have revealed female-oriented themes that should... enlarge views of pleasurable product design attributes and language for the genders*[23]."

17. three ways companies fail.

Boston Consulting Group (BCG) highlights three ways companies fail to address women consumers: *Poor product design*: failing to tailor products to women's unique needs and challenges.

18. three ways companies fail.

Clumsy sales and marketing: based on outdated images and stereotypes.

19. three ways companies fail.

Inability to provide meaningful hooks or differentiation: considering women indistinguishable from the general customer population or thinking of them as one monolithic segment[24].

20. How would having women on dev teams help software better address the needs of women

For this, I'll lean on the research of Nonaka Ikujiro and Takeuchi Hirotaka .

This slide is an illustration of their concept of the product development cycle in serially innovative companies.

It requires the creation and sharing of two kinds of knowledge within the organization. Explicit knowledge - that which we can explain in words - and tacit knowledge - that which can best be expressed by doing.

This concept of knowledge creation and techniques for forming teams that support it are the roots of the most widely adopted Agile process framework, Scrum[39].

Nonaka and Takeuchi emphasize that an enabling condition for sustained innovation is, requisite variety, having a product team made of members with different backgrounds, perspectives and motivations.

Requisite variety applies to cross-functional teams but also to team members with diverse life experience. Because it is through life experience that we acquire tacit knowledge.

21. Matsushita Example of Tacit Knowledge

The classic example of the incorporation of tacit knowledge into a disruptive product design is the first Matsushita bread machine. It took a hands on experience of baking bread by one of the product engineers (a woman) to crack how to implement the mechanics of kneading dough in a bread maker.

22. Team diversity and delivering value

Women are significant customers and influencers in the buying decision for software and software dependent technology. Statistically, women have different perceptions and preferences for software. Therefore, according to knowledge creation theory, it is a competitive advantage to have women individual contributors bring their tacit knowledge to software product development.

23. Agile Software Development

Now let's incorporate Agile Software Development into this. What unites the different agile methodologies is a shared set of values and a shared cause to change the way software is made and delivered to customers. These values are declared in twelve principles and summarized in a four line manifesto...

24. High level principles

We value: Individuals and interactions over processes and tools. Working software over comprehensive documentation. Customer collaboration over contract negotiation. Responding to change over following a plan.

25. Agile values are the foundation of agile practice

"These values are not just something the creators of the Agile Manifesto intended to give lip service to and then forget. They are working values. Each individual agile methodology approaches these values in a slightly different way, but all of these methodologies have specific processes and practices that foster one or more of these values." - Jeff Sutherland

26. Agile values as a standard of conduct

Agile principles and the ongoing discussion of them form the basis for a normative standard of conduct informing how practitioners should behave towards our work, our peers, our employers, our customers and our end users. They challenge practitioners not to a narrow definition of success on a task but to craft with quality, to collaborate in high trust, to cede authority to individual contributors, and to work with the customer's interests in mind, to make predictable progress at a sustainable pace, and to make problems and opportunities visible.

27. Agile values as a call for beneficial change

Agile principles urge us to inspect our actions, confront impediments, and drive towards beneficial change. And the means to this is, as Alistair Cockburn suggests, we “...value agile principles over the agile practices[38] Or as Bob Martin says, Not simply to execute but to take care.”

28. What Agile principles demand we confront this problem?

So if Agile practitioners recognize the shortage of women in our shops is an impediment to value delivery - that it is an obstacle to our mission as agilists - then we will work to remove this impediment. The question becomes “What Agile principles demand we confront this problem?”

In the interests of time I’ll highlight two hostile cultures described in the literature and the agile values that challenge them.

29. Antidote to hostile workplace and the alpha geek

“Alpha male techies have minimal social skills and can be awkward around women, but this awkwardness coexists with enormous arrogance[45].”

30. Problem statement

As an example, at a recent Ruby on Rails conference, a presenter contrasted using particular document oriented database to performing like a porn star:

In reaction to the controversy Martin Fowler wrote:

“The nub is that whatever the presenter may think, people were offended... It doesn't matter whether or not you think the slides were pornographic. The question is

does the presenter, and the wider community, care that women feel disturbed, uncomfortable, marginalized and a little scared.”

63% of women in tech report they experience sexual harassment

31. Value statement

Agilists should be a voice in opposition to the alpha male in their midst and here’s why:

“The best architectures, requirements, and designs emerge from self-organizing teams.” Not chest thumping individuals.

32. Description of self organization

Self-organization is a fundamental value in Agile. A performing Agile team organizes *itself* around the work collaborating in high trust according to a set of mutually arrived at expectations and norms of behavior.

33. What does self-organization feel like?

Another quote from Jeff Sutherland:

“Team members share a sense of purpose, vision, and passion for their work. Teams that recognize that we are not simply individuals working in close proximity, but a team where we must all be engaged with one another’s work. (Jeff wrote He) tells teams looking to achieve amazing results that each member of the team must care as much about their neighbor’s work as they do their own.”

34. Enterprise support for self-organization is also an Agile value

“Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.”

35. Practices that support self-organization

In emphasizing Agile values, I’m not saying the practices are not important. They support the values. A company instilled with the value of self-organization should:

keep team size between 5-9 people, provide communal workspace, rely on the team to do its own estimates and form it’s own iteration commitments.

The team must frequently and consistently reflect on what it can do and what it must ask of the organization to make itself more effective. They must drive incremental improvements into the organization based on this.

36. How is self-organization an antidote to alpha geeks?

A self-organized team will not tolerate a hostile or demeaning attitude towards co-workers or the business people upon which it depends for work. They will deal with each other with respect and a great deal of honesty. They have difficult conversations with each other and they address their own bad behaviors in order to fit into the norms of the team in order to maximize team performance.

So, the ultimate answer for the alpha male who breaks the cohesion of the team, is he either modifies his behavior based on frequent and regular feedback from his peers and coaching from his leads or he is off the team.

37. Antidote the diving catch culture of heroics and privileged roles

“Many SET cultures place a high value on risky behaviors: They celebrate heroic diving catches made at the eleventh hour to rescue a failing project”

38. Problem statement

“Why don’t we just build the system right in the first place? Women are much better at preventive medicine. A Superman mentality is not necessarily productive; it’s just an easy fit for the men in the sector. Because it is generally men who are making the promotion decisions, they recognize this behavior and reward it.”

39. Collective ownership

Supporting that sentiment are the following Agile principles:

“Continuous attention to technical excellence and good design enhances agility.”

“Simplicity--the art of maximizing the amount of work not done--is essential.”

What I’m getting at here is an emergent property like self-organization called collective ownership. It’s an outcome of teams that embrace Agile values of self-organization, quality and simplicity.

40. What collective ownership feels like

“Collective Ownership encourages everyone to contribute new ideas to all segments of the project. Any developer can change any line of code to add functionality, fix bugs, improve designs or refactor. No one person becomes a bottle neck for changes[50].”

41. Practices that support collective ownership

Collective ownership is the engineering expression of self-organization. To achieve collective ownership, a

self-organized team should explore disciplined, collaborative engineering practices: pair programming, evolving architectures with refactoring, frequent integration, unit testing and test-driven development[53].

42. Why is collective ownership an antidote to heroics?

A diving catch implies a single set of eyes on code. It implies haste and a need for emergency intervention, i.e. poor quality. Emergency code is not unit tested, it is not elegant. It also implies a team that is not pulling together to deliver the goals of their iteration.

43. Why is collective ownership an antidote to special job assignments

Collective ownership discourages the use of specialists which represent bottlenecks and opaque stores of tacit knowledge. The Scrum guide includes as the basic definition of team, *“There are no titles on Teams, and there are no exceptions to this rule. Teams do not contain sub-Teams dedicated to particular domains like testing or business analysis, either[52].”*

44. Agile values in an enterprise context

I’ve described two examples of how Agile principles call upon practitioners to battle hostile workplaces. My paper has several more.

But let’s talk about how Agile teams instill Agile values into the enterprise.

As a development team matures impediments become consistently rooted in the surrounding organization. Continuous improvement becomes an effort directed out into the larger company.

Where an organization fails to support a team adopting an agile practice, the teams needs to drive for these changes in the organization by first building trust and influence by producing results in spite of their

impediments and then using that success to win support for removing the obstacles that lay in their path.

In response the larger organization will begin removing impediments to team performance by, for example, adopting a retrospective type review process, rewarding collective over individual performance, compensating for span of influence over span of control.

45. How values create change from small networks to large

But how can small change within companies produce large order changes across an industry or society?

46. Ba

To model this, I’ll use Nonaka’s concept of Ba, or “a shared context in motion, in which knowledge is shared, created and utilized[65].”

Sectors that thrive off innovation do so by sharing knowledge across direct and extended-relationships among people. Each set of relationships exists within a physical or virtual space. Each of these spaces at any given moment in time is Ba.

47. Ba in knowledge work

Knowledge workers interact within their local communities, interest groups. They graduate from school and change jobs. Companies are distributed across locales. Consultants travel among companies and conferences bring individuals together from across the industry. In sharing, creating and synthesizing knowledge one Ba influences the other, fostering change on the small scale to the large and back. The broad adoption of Agile practices is itself an example of knowledge occurring first within individuals and teams and then spreading across an industry.

48. The challenge

But widespread Agile adoption has been a mixed blessing for principled agilists. Agile values are not permeating as well as the practices themselves.

To invert Alistair Cockburn's dictum, the industry is valuing agile practices over agile principles.

49. Snowbird

This threat is on the minds of prominent Agile thought leaders. Enough so that the notes from the 10 year reunion of the initials signers of the Agile Manifesto contains "four things the community **needs to do** in the next 10 years": demand technical *excellence*, promote *individual change* and lead *organizational change*, organize *knowledge* and improve *education*, and maximize value across the *entire process*[66].

50. Conclusion

Agile is not about doing "Agile" things. It is about continually improving ourselves, our teams and our organizations to create better software for our customers and our end users.

If we embrace that on a wide scale, we will recognize we are driving away an incredibly valuable source of talent and an incredibly valuable contribution in our effort to create products relevant to over half of our end users.

We can use the principles underlying Agile practice to guide our efforts to remove this impediment..

Successful embrace of agile principles within teams will instill a more social and engaged view of the software developer role that can shift companies and the larger industry, driving beneficial change into academic institutions and the perceptions of the greater public.

This change in our workplaces, in the common perception of our work, and in the institutions that educate software developers would encourage more girls to pursue computer science and help the industry recruit and retain larger numbers of talented women.

51. Thank you

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Abstract: The percentage of women software developers in the U.S. has declined from 42% in 1987 to less than 25% today. This is in a software/internet marketplace where women are online in equal numbers to men, directly or indirectly influence 61% of consumer electronics purchases, generate 58% of online dollars, and represent 42% of active gamers. Women avoid careers in software due to hostile environments, unsustainable pace, diminished sense of purpose, disadvantages in pay, and lack of advancement, peers or mentors. Agile Software Development is founded upon values that challenge such dysfunction in order to build self-organizing, collaborative and highly productive teams. In a high functioning Agile practice, developers engage each other, product owners and sponsors in a shared concern for quality, predictability and meeting the needs of end users. Can Agile values and practice drive changes in the workplace to better attract and retain women software developers?

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6149534&isnumber=6148595>