Gamification, Crowdsourcing and Agile Engineering

By Brad A Michael

Agile Engineering practices value rapid iteration and flexibility. Sometimes improvements in these areas can come from unexpected sources. **Gamification** is the concept of adding game design elements to something that is not a game in order to increase its appeal. The simplest illustration of gamification is a frequent buyers program. When a customer makes a purchase, they are given a point or a stamp. When enough points are collected, the customer can redeem for a reward. **Crowdsourcing** is another way of saying distributed problem solving. An example of crowdsourcing is the user reviews that appear for products at online retailers. Potential purchasers can utilize information generated by a wide range of individuals to make a purchasing decision. Together, gamification and crowdsourcing can be used to revolutionize the way agile engineering is practiced.

Gamification and crowdsourcing are currently being used to solve a number of real world hard problems. For the Foldit project, researchers at the University of Washington's Center for Game Science have teamed up with the Department of Biochemistry to create an online puzzle video game. In the game players solve puzzles that are analogous to discovering the way that proteins are shaped in the real world. Discovering these protein structures provides value to a variety of fields including medical and pharmaceutical research. Thus, the game is an abstraction of a hard problem that the scientists are trying to solve. By playing the game, a player could potentially be helping to cure cancer. However the abstraction is fairly minute. In the game, players are assembling little pieces of geometry that have a near one to one correlation with the structure of the proteins, albeit at a different scale.

A more abstracted approach is demonstrated by DARPA's Crowd Sourced Formal Verification (CSFV) project. The goal of this project is to produce a game in which the rules of the game are an abstraction of the process for proving or disproving the correctness of code within a system (i.e., formal verification). The idea here is that when the game is complete, it can be used to distribute the process of formal verification from a small group of expert developers to a much larger population of players from the general public with no prior experience. Thus, a greater quantity of code can be verified more quickly and for a lower cost, as players are not compensated for their participation. If the problem can be abstracted correctly, and an engaging and popular game design foundation built around this abstraction, the time that players spend playing the game equates to free labor. Essentially, DARPA is attempting to generate an army of cost free bug-fixers.

Once this concept is understood, it's easy to see how gamification and crowdsourcing can be applied to any number of other tasks or problems, for instance systems engineering or architecture design and development. Imagine a game that challenged players to build architectures (puzzles) that

meet requirements (goals) for different scenarios (game levels). Players would not need any formal engineering education; they would only have to be good at the game to develop good architectures. Using this approach, hundreds or thousands of iterations for a given set of requirements could be developed *simultaneously*.

If adopted, this type of approach represents game-changing new capabilities afforded by opening up challenges to the world at large. Within one year of release, players logged more than 2.8 *billion hours* of play for Activision's *Call of Duty: Black Ops*. Imagine the possibilities if just a fraction of those man hours were being applied to finding solutions to some of our customer's problems.

It would be nearly impossible to compete with such a system using traditional methodologies. The crowdsourced approach generates more solutions in less time and is less expensive. To position itself as a competitor in markets where crowdsourced strategies are developing, the SI needs to have the capability to offer its own crowdsourced solutions. This would require the creation of interdisciplinary teams that possess not only the subject matter expertise of the system being abstracted, but also the creativity and technical knowledge to perform the abstraction. Furthermore, partnerships with universities and commercial game developers would be necessary to transform these abstractions into fun and appealing games that are capable of drawing a large audience. By moving in this direction now, the SI can not only remain competitive but help to shape the future of innovation in the field.

Gamification and crowdsourcing have the potential to drastically alter the national security landscape. The lines of the contemporary classification level system would be blurred as abstraction methodologies mature, and large, complex problems are broken down and distributed as small pieces of the whole. Special considerations will need to be made for materials that have been developed from classified information, but that are not classified themselves.   Furthermore, a new field of information security could develop as hackers or even nation state cyber forces develop *deabstraction* techniques to pull together potentially sensitive information from non-sensitive individual parts. Measures to counter these deabstraction techniques would need to be developed to prevent the release of sensitive or classified material.

However, the primary vehicle of disruption would take shape in terms of the types of personnel required for a given project or program. If this type of crowdsourced approach to problem solving gains traction in *any* field, it would create a drastic transformation of said field, and likely domino to adjacent markets. Masses of traditional in-the-trenches developers would be replaced with more specialized subject matter experts, game developers and a new breed of *abstraction engineers*. The bulk of the development and even design of any new system or other product would be conducted en masse, by a global population of player-developers. This translates to a fundamental shift in the way that teams are constructed and development is undertaken, with success dependent on non-traditional engineering values such as the "viral marketability" and "social networking applicability" necessary to attract these player-developers. In summary, gamification and crowdsourcing have the potential to radically disrupt nearly any field that requires a great deal of specialized labor, and only by understanding and preparing for these disruptions will companies be poised to succeed in the post-gamified/crowdsourced world.