Productivity Games: Software Quality through Fun and Play

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ABSTRACT

There are a wide variety of definitions of quality, leaving a degree of freedom in how we pursue software quality. From ISO 9000 to Six Sigma, the diversity of viewpoints offers an opportunity to expand how we test software. While it's important to understand the relationship between compatibility, performance, reliability, security, usability, and value – it's also critical to focus on customer satisfaction, which may vary, by user across these dimensions. Software test professionals face the law of diminishing returns when testing – and re-testing – software. It's important to incorporate principles of portfolio selection and risk diversification when evaluating where to invest resources.

As the nature of the workforce shifts – with incoming "Gamer Generation" employees, we can make use of successful game mechanics to help motivate employees to participate in work-related activities. The principles of trust, collaborative play, and fun allow novices to experiment with new strategies with the freedom to fail in game play that might not exist in the traditional workplace. Risk-taking, supported by the structure of game mechanics, play, and organizational trust actually improves software quality by varying defect detection techniques.

Productivity games – games in the workplace – can help enhance traditional workplace methodologies including effective communication, employee engagement, cost savings, and more. Employees desire many of the same things from the workplace that gamers demand from games

This paper will take a look at productivity games successfully deployed at Microsoft over the last 7 years. Several thousand Microsoft employees in Windows, Office, and around the company, have played productivity games to help improve the quality of our software. We have learned much about what makes for a successful – and an unsuccessful productivity game – well beyond game design – and more importantly, focusing on the tasks that game players can accomplish.

KEYWORDS: Productivity Games, Software Test, Collaborative Play, Fun

1 INTRODUCTION

Kinect, the natural user interface add-on to XBox, recently became the fastest selling consumer electronics device in history.[1] Around the world, hundreds of millions of people play games. The idea of play certainly resonates with humans, animals, and even computers themselves. We see games appearing everywhere these days – except in the workplace. Merriam-Webster defines work as "activity in which one exerts strength or faculties to do or perform something" [2]and defines play as "recreational activity; especially: the spontaneous activity of children"[3] Jane Mcgonigal, in her book, Reality is Broken, suggests that "the opposite of play isn't work, it's depression"[4] This paper suggests that perhaps it's time to consider game play as a new way to work. The idea of

[1] http://www.reviewsofelectronics.com/kinect-breaks-guiness-record/227632/
[2] http://www.merriam-webster.com/dictionary/work
[3] http://www.merriam-webster.com/dictionary/play
[4] http://www.amazon.com/Reality-Broken-Games-Better-Change/dp/1594202850

providing a structure - in the context of gaming, play, and game rules - for people to experiment with new approaches, new roles, or new ideas – can lead to creative and innovative output, while keeping fun alive in the cold, cruel, competitive world of work.

2 SOFTWARE QUALITY

2.1 Definition

High quality is always an admirable goal for any software development project. To begin, we must decide on a definition of quality. Surveying several industries, associations, and experts, we find hundreds of definitions of quality, each of which seems reasonable and applicable. How to decide and pick a single definition to work towards? Here are a few examples:

- The perception of the degree to which the product or service meets customer expectations
- **ISO 9000:** Degree to which a set of inherent characteristics fulfills requirements.
- **Six Sigma:** Number of defects per million opportunities
- **Philip B. Crosby:** Conformance to requirements
- **Joseph M. Juran:** Fitness for use by the customer
- **Gerald M. Weinberg:** Value to some person
- **Robert Pirsig:** The result of care
- **American Society for Quality:** A subjective term for which each person has his or her own definition. In technical usage, quality can have two meanings:
    - The characteristics of a product or service that bear on its ability to satisfy stated or implied needs;
    - A product or service free of deficiencies."

The answer is that we can't pick just one. All of these are perfectly viable. The variance in definition is a leading indicator of the importance of introducing variance and diversity in to our quality assurance processes.

2.2 Metrics and Measurement

Any discussion of metrics must start with clear identification of the organization's mission and goals. Without knowing the mission and goals around the quality-related efforts, any organization will have an extremely difficult time choosing metrics to provide an accurate picture of the progress.

Software quality is important across several different dimensions. *Figure 1* shows nine dimensions of software that are critical to user perception of quality.

Figure 1 – Nine dimensions of quality

2.3 Software Testing

Software testing is more effective when defects are discovered early. Whether the development process follows an agile or waterfall development model, the sooner in the process that defects can be uncovered, the more cost effective and impactful those fixes are to the product. One common fallacy is that the testing process can fully measure and quantify the degree of quality of the software. With the advent of the internet, multiple platforms, an explosion of usage scenarios, and broad diversity of user base and infrastructure, it is virtually impossible for a test team to understand everything. Early identification of an all-encompassing "test matrix" is untenable. Therefore, it's critical to apply test effort and resources on a risk-mitigation basis, rather than on a pure "quality assessment" scale.

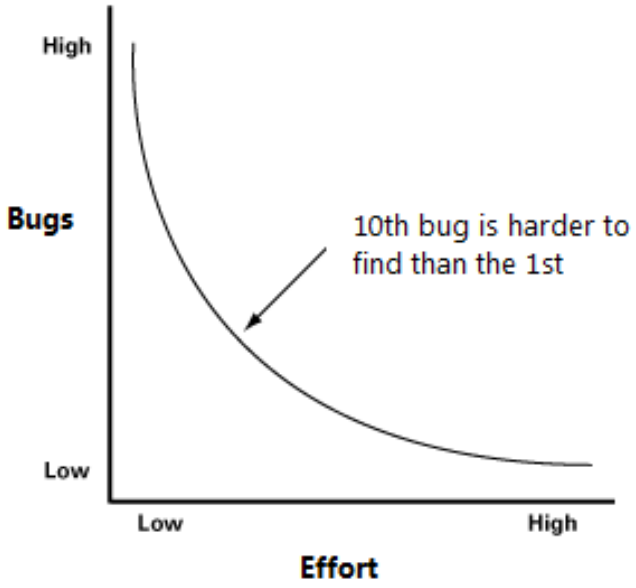

Figure 2 – Diminishing Returns for Defect Discovery

2.4 Risk and Mitigation

James Reason, author of "Managing the Risks of Organizational Accidents"[5], hypothesizes that most accidents can be traced to one or more of four levels of failure: Organizational influences, unsafe supervision, preconditions for unsafe acts, and the unsafe acts themselves. In this model, an organization's defences against failure are modelled as a series of barriers, with individual weaknesses in individual parts of the system, and are continually varying in size and position. The system as a whole produces failures when all individual barrier weaknesses align, permitting "a trajectory of accident opportunity", so that a hazard passes through all of the holes in all of the defenses, leading to a failure. The model includes, in the causal sequence of human failures that leads to an accident or an error, both active failures and latent failures.[6]

Software defects may occur in very similar circumstances – organizational or project management related influences, unsafe supervision of the development process, preconditions for unsafe acts – such as lack of knowledge of the end user scenario, and the unsafe acts (simple programming errors) themselves. As the complexity of the connected world continues to grow, it is just not possible to test quality in to the software. At best, system test can assess a reasonable level of quality across common scenarios. Even that, however, only scratches the surface of how software is used in "real life". Therefore, it's important to have as large a set of testers in as many configurations as makes reasonable sense. As Linus Torvalds describes Linus' law in "The Cathedral and the Bazaar", "given enough eyeballs, all bugs are shallow"; or more formally: "Given a large enough beta-tester and co-developer base, almost every problem will be

[5] http://www.amazon.com/Managing-Risks-Organizational-Accidents-Reason/dp/1840141050
[6] http://en.wikipedia.org/wiki/Swiss_Cheese_model

characterized quickly and the fix will be obvious to someone."[7] So a broad set of pre-release users can help mitigate risk through broad test coverage. But, how can you motivate a broad set of users to perform tasks in their discretionary time to help test? Productivity games offer one possibility.

3 21ST CENTURY EMPLOYEES

Each generation imagines itself to be more intelligent than the one that went before it, and wiser than the one that comes after it. - George Orwell

We are currently facing demographic and societal changes, economic landscape alterations, globalization, and the continuing rise of the knowledge worker that have led us to a workplace in the United States where members of four generations sit side-by-side, for the first time.

"Corporate America is as diverse as ever. An unprecedented number of international, multi-cultural workers from four generations – Traditional, Baby Boomers, Gen Xers and Generation Y/Millennials – are working alongside one another and bringing their own values, goals and communication approaches to the workplace. Such generational dynamics affect morale, productivity, recruitment and retention. Employers are facing immediate challenges when it comes to optimizing productivity, protecting profits and growing their businesses."[8]

The makeup of formal – and informal - organizations has always mirrored that of society as a whole. As societal demographics shift, organizations have no choice but to consume the transformation. A "failure to respond to the demographic changes of society will make it difficult, if not impossible, for the modern organization to meet employee needs and productively move forward."[9] This will leave the organization unprepared to compete – for talent or in the marketplace - eventually leading to its demise.

3.1 Computer Science Education

The quality of computer science degrees has grown dramatically over the last 40+ years. In the period from 1966 to 2001, the annual Bachelor's degrees awarded in Computer Science grew from less than 100 to over 46,000 – annually.[10] The dot com boom fuelled continued growth, both in the numbers, and, given the demand, in the quality of education as well. As a result, college candidates entering the computer industry today have more education, more training, and more hands-on experience than candidates of even 10 or 20 years ago. Curriculum development has progressed dramatically as well – particularly in software quality. While graduate level CS programs in the 1980's might have offered courses such as, "Introduction to Basic Programming", today, Rutgers, for example, offers undergrad courses in Compiler Construction, Algorithms, and Cryptography. These changes in the quality of education obviously influence talent levels entering the workforce.

[7] http://en.wikipedia.org/wiki/Linus%27s_Law
[8] http://www.hrmreport.com/article/Engaging-the-Multi-generational-Workforce/
[9] http://www.associatedcontent.com/article/1057728/changes_in_workplace_demographics_the.html?cat=17
[10] Allen B. Tucker, Computer Science Handbook, p4.

3.2 Global Workforce

The GDP growth dominance of emerging economies will continue to change the landscape and makeup of the workforce. The market for talent will continue to be highly diverse, networked, and distributed.

- 83% of the new global R&D facilities were in China and India (2004 - 2007). 91% of the increased R&D staff was in China and India.[11]
- India's middle class will swell by more than ten times its current size of 50 million to 583 million by 2025.[12]
- Kenya leads the world in money-transfer by mobile phone.[13] Mobile Phone Subscribers: 738.57M[14]
- Globally, mobile data traffic will double every year through 2014, increasing 39 times between 2009 and 2014. Mobile data traffic will grow at a compound annual growth rate (CAGR) of 108 percent between 2009 and 2014, reaching 3.6 exabytes per month by 2014.[15]

The world is indeed getting flat. The ability to manage employees across social, cultural, geographic, technical, educational, generational, and political boundaries requires management 2.0 thinking. Productivity games are a part of the new management orthodoxy.

3.3 Gamer Generation

In every job that must be done, there is an element of fun. You find the fun and—SNAP—the job's a game! —Mary Poppins

Games have been around for centuries. For example, the game of Go was played in ancient China in 500 B.C. and is for sale along most toy aisles and in game stores, as well as online.[16] The royal game of Ur was played in the fourth century B.C. You can play it online today on the British Museum Web site[17] . Evidence even seems to indicate that games were used to motivate workers to build the pyramids of Egypt.[18]

Although the current generation of electronic games has its roots in the 1950s and 1960s, with Spacewar and PONG, computer and game console developments over the last few decades have taken gaming to a new level. Perhaps it is unfair to attribute the start of a generation to a single game, but in 1981, Nintendo published Donkey Kong, which really was a defining moment in mainstream gaming.

Typically, the majority of the programmers or engineers are relatively recent college graduates. Coincidentally, many of these same people grew up with video games as a significant part of their daily environment and were taught basic principles through their heavy interaction

[11] (Booz & Company, 2009) (link)
[12] (MGI, May 2007) (link)
[13] (Economist, April 2010) (link)
[14] (Trendsniff, December 2009) (link)
[15] (Cisco, February 2010) (link)
[16] www.gnu.org/software/gnugo/free_go_software.html
[17] www.thebritishmuseum.ac.uk/explore/families_and_children/online_tours/games/the_royal_game_of_ur.aspx
[18] The Practical Guide to Defect Prevention, Chapter 5 – www.defectprevention.org

with video games. The result is that they identify with and will respond to the idea of using games in their work activities.

In their book "The Kids Are Alright", John Beck and Mitchell Wade enumerate the basic principles that video games have taught this generation:[19]

- If you get there first, you win.
- There is a limited set of tools, and it is certain that some combination will work.
- If you choose the right combination, the game will reward you.
- Trial and error is the best strategy and the fastest way to learn.
- Elders and their received wisdom can't help; they don't understand even the basics of this new world.
- You will confront surprises and difficulties that you are not prepared for. But the sum of those risks and dangers, by definition, cannot make the quest foolish.
- Once you collect the right "objects" (business plan, prototype, customers, maybe even profits), you'll get an infusion of gold to tide you over.
- Although there may be momentary setbacks, overall the trend will be up.

It is important to pay attention to these principles when designing games to motivate the work force to invest time in defect detection and defect prevention activities.

3.4 Organizational Trust

"In a recent University of British Columbia report, economists found that trust in management is the most valued determinant of job satisfaction. They report that, in terms of job satisfaction, a small increase in trust of management equates to a 36 percent pay increase. Conversely, the researchers found that if that same amount of trust is lost, the decline in employee job satisfaction is like taking a 36 percent pay cut."[20]

There are many reasons why trust is important. Trust is a mechanism that people can deploy to deal with uncertainty. Dr. Mike Armour, in his book "Leadership and the Power of Trust" defines trust as the "complete confidence that a person or organization will consistently try to do what is right in every given situation." Employees who work together must rely on one another, either directly or indirectly, to be successful. Even if jobs are unrelated or people are not in physical proximity, the success of the firm depends on the ability of everyone to produce. Stephen M.R. Covey, in his book, "The Speed of Trust", talks about the trust dividend – *"high trust significantly improves communication, collaboration, execution, innovation, strategy, engagement, partnering, and relationships with all stakeholders. In your personal life, high trust significantly improves your excitement, energy, passion, creativity, and joy in your relationships with family, friends, and community. Obviously, the dividends are not just in increased speed and improved economics; they are also in greater enjoyment and better quality of life."*[21]

[19] The Kids Are Alright, John Beck and Mitchell Wade

[20] The HR Executive's Role in Rebuilding Trust, Dennis S. Reina and Michelle L. Reina, http://www.hreonline.com/HRE/story.jsp?storyId=12160414

[21] The Speed of Trust, Stephen M.R. Covey, p. 19

Trust is a foundational element of all successful workplaces. The attributes of effective organizations all find their origins in trust. Gallup uses a Q12 survey to measure workgroup effectiveness and employee engagement[22]. Questions such as "I have the opportunity to do what I do best every day" or "I know what is expected of me at work" imply a level of trust – not only by the employee for their manager or organization, but reciprocal as well.

3.5 Employee Engagement

Gallup does their annual survey – and typically, the numbers have been very similar over the past few years. About 30% of employees are engaged at work, with about 55% who are passively disengaged, and about 15% who are actively disengaged. As generational changes in the workforce continue to evolve, the concerns over engagement continue to rise.

Forty-five percent of Millennials worldwide say they use social networking Web sites at work, regardless of whether their organization or company prohibits their use.[23]

Two-thirds of teen and Gen Y Internet users use social networking sites; less than 10% of 55-63 year-olds do.[24]

The most successful employee engagement techniques, across this diverse set of behaviours, are challenging to identify and understand. It is very hard to find common themes to engage employees. Organizational leaders would like to believe that a strong mission and vision statement will suffice – and while that helps – it's not necessarily all that is required.

4 PRODUCTIVITY GAMES

4.1 Introduction

From a Productivity Games viewpoint, the employee categorization and the organizational classification overlap in a way that can help identify whether or not a game will be successful in modifying behavior and having people "play".

Table 1 illustrates the areas where Productivity Games can be the most successful. Focusing either on expanding skills in role, or Organizational Citizenship Behaviors (OCB's) that require core skills are the best way to ensure the success of the game.

There are several dimensions of citizenship behaviours. There is a five-factor model consisting of altruism, courtesy, conscientiousness, civic virtue, and sportsmanship. [25]

- **Altruism** is helping a specific work colleague with an organizationally relevant task or problem.

[22] http://www.gallup.com/consulting/52/employee-engagement.aspx
[23] (Accenture, January 2010) (link)

[24] (Pew, January 2009) (link)
[25] http://en.wikipedia.org/wiki/Organizational_citizenship_behavior

- **Conscientiousness** consists of behaviors that go well beyond the minimum role requirements of the organization (Law, Wong, & Chen, 2005).
- **Civic virtue** is characterized by behaviors that indicate the employee's deep concerns and active interest in the life of the organization (Law et al., 2005).
- **Courtesy** has been defined as discretionary behaviors that aim at preventing work-related conflicts with others (Law et al., 2005). This dimension is a form of helping behavior, but one that works to prevent problems from arising. It also includes the word's literal definition of being polite and considerate of others (Organ et al., 2006).
- **Sportsmanship** has been defined as a willingness on the part of the employee that signifies the employee's tolerance of less-than-ideal organizational circumstances without complaining and blowing problems out of proportion. Organ et al. (2006) further define sportsmanship as an employee's "ability to roll with the punches" even if they do not like or agree with the changes that are occurring within the organization.

Examples of why specific segments work or don't work are described below.

	Core	Unique	Expanding
In-Role Behavior			☑
Organizational Citizenship Behavior	☑		

Table 1 - Productivity Game Deployment Matrix

The most successful games tap in to core skills and apply them in areas that are outside the "regular job"

4.1.1 Thought Examples: Where Games Work

Based on our game experiences, described briefly below, games which encourage good organizational behavior (or OCBs), but rely on core skills that most employees have in common, are the most valuable domain for Productivity Games. Since the games rely on core skills, all employees in an organization are able to participate. Additionally, since the behaviour is not closely linked to any individual's job, no one's employment is threatened by the success of another team member.

For example, imagine a game that helped sort a complicated list of items. All employees in a given department are familiar with the items, and with how the organization prioritizes it's work. This provides a great place for everyone to participate on equal footing. But wrapping the sorting and prioritization work in a game-like interface, all players are given a fair chance to contribute.

Games for Learning are a well-established genre of software, and many examples are available in the marketplace for children of all ages. Games in this space work because they focus on the development and growth of the individual. Games are designed to encourage learning, and then test for the learning within the context of play. Players are best rewarded by

showing how they have improved themselves, rather than comparing raw completion numbers, which can quickly show disparity between students, but the value of play is not lost.

4.1.2 Thought Examples: Where Games Don't Work

To illustrate where Productivity Games can be unsuccessful, let us provide some example scenarios which might better illustrate possible games.

First, imagine a game which encompasses the daily tasks and work of a single employee, Joshua. In the "Joshua Game", game play maps directly to the 'unique' skills that Joshua uses to earn his paycheck. Players are given points for doing tasks Joshua would ordinarily do in his work. Some players are able to do most of the tasks Joshua is capable of, and some are limited because they do not have the same 'unique' skills that Joshua has.

This presents our first problem: games which exclude players are not in the best interest of the organization. Since Productivity Games require a broad number of players to have an impact, the objective of most games must be to add as many players as possible. Games which rely on actions from the bucket of 'unique' skills inherently limit the breadth of players available to play the game.

Back to the example, we find another challenge. At the end of the "Do Joshua's Job Game", Joshua hasn't won, will that reflect poorly on his performance in his "real" job? Will it affect his manager's opinion of him? One thing for certain is that Joshua does not feel secure in his job anymore.

These two issues provide examples why games focused on 'unique' skill sets are difficult to deploy. Additionally, we see how competitive games focused on 'in-role' behaviors can introduce some awkward situations into the workplace and existing performance review processes.

4.2 Engagement

One indirect consequence of Productivity Games is the increased engagement of employees in the organization. From literature referenced above we know the "gamer" generation have invested a significant portion of their lives in playing games. And it is interesting to identify some of the attitudes and lessons which this younger generation has taken from playing these games. For example, gamers have learned from games that the cost of failing is very low, and they can always retry, yet from this they expect clear feedback as to what they need to do to change their play in order to succeed later on. From this we can see that the younger generation values a feedback loop and transparency in the consequences. Gamers always expect the game to be fair; otherwise, they will not continue to play. They map these same expectations in a game into their job, expecting the workplace to have transparency and a clear feedback loop. They also expect fairness in how they are treated and in how they should treat others. Finally, games don't demand lengthy reading or studying of manuals in order to play. Most games provide an introductory training mode where the player is given the opportunity to learn what they must know in order to move forward into the game. Similarly, in the workplace, the lengthy corporate memo outlining detailed reasons for organizational priorities carries less impact than is desired.

Productivity Games provide an opportunity for an organization to communicate an organization objective or priority in a method that easily meets the needs of this younger generation. In a properly designed game, fairness and transparency are in place. A feedback loop demonstrating success or failure clearly teaches and trains employees how to change their behavior. And finally, instead of a lengthy manual or memo, an employee has the opportunity to

engage quickly and easily in a "training" mode which provides the basic information required for the employee to play the game. This isn't to imply that employees are more apt to receive criticism (constructive or otherwise). Rather, because the "teaching" or "coaching" is framed in a game, they receive the feedback in a manner they are accustomed to learning from already.

4.3 Language Quality Game

The Windows Language Quality Game has been a successful Productivity Game. It addresses organizational citizenship behaviors by calling on employees within Microsoft to apply their core native language skills to help assess the quality of Windows localization and translation work.

The traditional business process uses specific language vendors to perform translation work, and then a secondary vendor to assess the quality. The business challenge has been that, for some languages and locales, finding two independent vendors can be difficult and costly. To address this problem, the Language Quality Game was developed to encourage native speaking populations to do a final qualitative review of the Windows user interface and help identify any remaining language issues. The goal was to ensure a high quality language release and using the diverse population of native language speakers within Microsoft has enabled the pre-release software to be validated in a fun and cost-effective way. The list of Windows languages can be found on Microsoft.com[i]. Table 2 illustrates the success that the Language Quality Game achieved as run against interim builds of Windows 7. A more detailed description of gameplay can be found online at www.42projects.org, but the goal of the game was to achieve reviews of screenshots and dialogs for translation accuracy and clarity. Native language speakers from across Microsoft's diverse, international population were invited to play. The results here demonstrate an immense amount of effort applied to the game.

Game Duration	One Month
Total Players	> 4,600
Total Screens Reviewed (Points Earned)	> 530,000
Average Screens per Player	119
Top Player Reviewed	> 9,300
Total Defect Reports	> 6,700

Table 2 Language Quality Game Statistics

Success in the game was defined as the number of screen reviews across the 36 languages tested. With the incredible response, most languages had several reviewers provide feedback per screen. Because of the latency in reviewing the feedback, defect reports were not included in players' scores. But, for the Windows International Test Team, defect reports were the most valuable output of the game.

Logistically, the massive amounts of feedback were handled by an international team with tools specially designed to display aggregated feedback. The "Moderator" role was filled on a per-language basis from the ranks of the international team, and allowed the review of multiple pieces of feedback per screen quickly and easily. Where there was obvious consensus from the game players, a defect report would be created. Reviewed screens lacking consensus were quickly reviewed, but at a lower priority and more quickly, such that the screens with the highest likelihood of fixable defects were handled quickly and efficiently.

4.4 Communicate Hope: A Benefit for Disaster Relief - "Giving once helps twice."

"Communicate Hope – A Benefit for Disaster Relief", is a productivity game that enables Microsoft employees to 'play' by providing ad-hoc and directed feedback on the Microsoft Lync 2010 product. Each player earns points for one of five teams - playing for a disaster relief agency - by accomplishing beta testing related achievements and tasks. At the conclusion of the game, Microsoft donates sponsorship funds to the disaster relief agencies based on the performance of the associated teams. The idea that "giving once" – in terms of trying scenarios and sharing feedback with the team would "help twice" – helping the quality of the product *and* helping disaster relief efforts.

The response to this productivity game-based beta program has been very positive. The number of Microsoft Lync 2010 dogfood program participants has increased from an initial 5,000 in May 2010 to 18,000 in September 2010. During that time, over 10,000 "Send Us Feedback" comments have been received from participants and key surveys such as "Your First Week with Communicator "14" have generated over 4200 responses. Over 47,000 "This or That Scenario" comparisons have been completed by almost 1600 participants to prioritize which Lync 2010 product scenarios are most important to them. Forrester Research has referenced Communicate Hope in a report on Microsoft Serious Games.[26]

[26] http://blogs.forrester.com/tj_keitt/10-09-24-product_managers_take_note_microsoft_using_serious_games_product_test_and_you_can_too

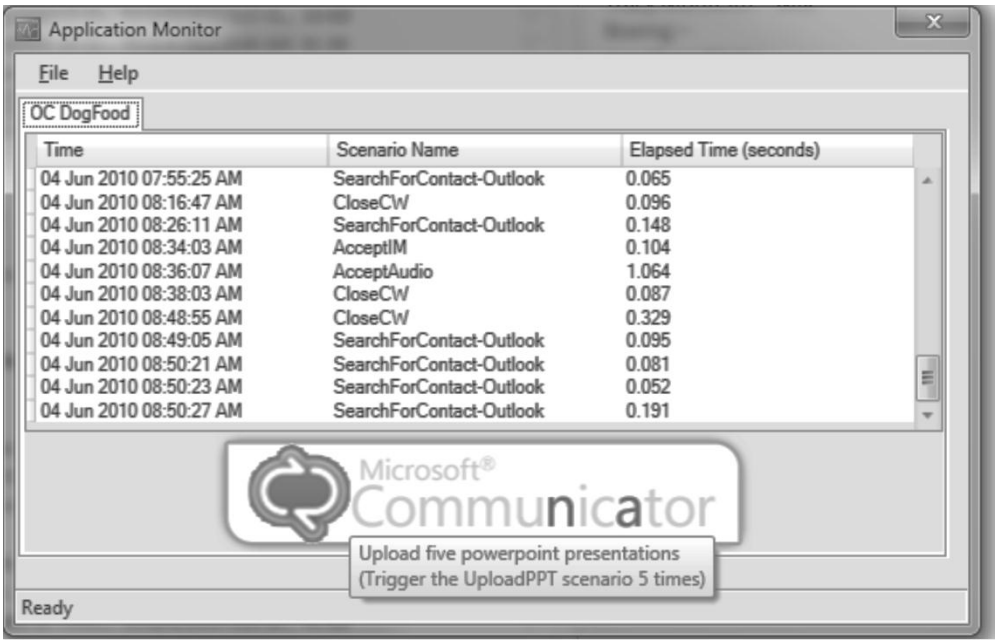

Figure 3 – OC Sonar – Communicate Hope Instrumentation

4.5 Elevation of Privilege

Elevation of Privilege (abbreviated "EoP") is a card game developed by Adam Shostack, and is designed to provide a fun and educational introduction to the concepts and practice of Threat Modeling.

The basic gameplay is similar to that of many "trick-winning" card games, in which a player leads a card of a particular suit, and other players have to play a card that will match the suit, discard a card of a different suit, or play a card of the declared "trump" suit. The winner of the trick will be the player who plays the highest-value trump card, or if all players played cards from the same suit as the lead player, the player who plays the highest-value card from the led suit is the winner of the trick. The winner of each trick then leads for the next trick until all cards have been used.

EoP can be played with the goal of simply accruing tricks, and gaining points for each trick won in this matter - but the purpose of the game is to encourage the players to think of credible threats to an application design, so that these threats can be enumerated, analysed and mitigated. To this end, the suits in the EoP deck are the six elements of the "STRIDE" framework of threats

Card decks are available for download http://microsoft.com/security/sdl/eop. The deck contains 74 playing cards in 6 suits: one suit for each of the STRIDE threats (Spoofing, Tampering, Repudiation, Information disclosure, Denial of Service and Elevation of Privilege). Each card has a more specific threat on it.

Figure 4 - Elevation of Privilege game

5 CONCLUSION

Humans have played games as far back as we have existed. Animals play games. Games and play are natural activities and can be found almost everywhere. So why don't we play games at work? For some reason, many people don't believe that work can be a game – or that games can be used to get real work done. The obstacle may be the competition between game score versus the paycheck and other traditional workplace rewards (promotion, bonus, etc.). Games can be used to attract players in a voluntary situation. The definition of play is that it's recreational – not required. The game player decides when to stop or start playing. In a traditional sense of work, that uncertainty is unmanageable. However, in today's connected world, the unmanageability can be overcome with scale. Fifty people may decide not to show up today, but another two hundred people did and therefore, we got the "work" completed.

As the demographics of a global and multi-generational workforce continue to change our landscape, we need to think differently about how we engage employees and attract talent to high profile, large scale problems. Software testing is a discipline that has already benefitted from the use of games and game mechanics to attract short term bursts of effort across hundreds, thousands, even millions of "players" to help assess and improve the quality of software.

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