GAMING

SYSTEM

by Thomas Kelly

Introduction

My first introduction to the world of games was on a late-night Ferry travelling to Calais. I was 4 and couldn't/wouldn't sleep, so my Aunt handed me a Gameboy and Tetris to try and tire me out and get me to sleep quicker. In the end, nobody slept, and I discovered a whole new world.

I describe myself as a "Gamer". Someone who has played and enjoyed video games over a period spanning decades, console wars, and hundreds of games. From the addictively simple Tetris, to Massively Multiplayer Online Role Playing Games (MMORPGs), where coordination between dozens of players is required. From highly glossed games to some where the graphics are intentionally low-key. Sagas spanning Galaxies, and tales of Princesses in other castles.

I genuinely love games, and have a particular interest in the underlying mechanics. In recent years, the word "Gamification" has become widespread, especially amongst marketting teams. Here, I take an overview of where it comes from, what it means, and how it might be useful to you.

Online, I am "Kazenone66", and primarily play on Xbox Live. If you want to find out what kind of games I play, I track my stats online, with a good dose of meta-gaming.

Bit of Background

To start with, what is Gamification? Taken straight from the Oxford English Dictionary, Gamification is defined as

> *The application of `typical elements of game playing` to other areas of activity, typically as an online marketing technique to `encourage engagement` with a product or service."*

So how do we encourage engagement and motivate people? Motivation can (very loosely) be broken down into two types; internal (or intrinsic) and external (or extrinsic) motivation.

Motivation

Internal motivation is motivation from within. This is motivation through having a vested interest in the task at hand. This could be because of a hobby or passion for the task.

External motivation is motivation from outside forces. This is often by being told to do something with the reward given on completion of the task, or the punishment given for failure to complete the task.

Both forms of motivation are important. Internal motivation is a much stronger force than external motivation, but also more fragile. If you keep hitting a wall while trying to accomplish a task, the repeated failures can be demoralising and cause you to lose the passion for the task. On the other hand, external motivation is much less likely to go away, but is not as strong as Internal motivation, particularly if you want to do something which doesn't align with the outside forces' desired outcome.

External motivation can also be the demoralising factor which breaks the internal motivation, especially when it comes to failure mechanics. Imagine that every time you were handed a task at work, you get told "If this isn't done by the end of the day, you're fired". Even if you complete each task on time, you would still feel worse about it than if nothing had been said at all.

Motivation in Games

So how do game mechanics relate to motivation? A lot of the mechanics can be broken down into the two categories;

Internal motivation from Games

- Points and Score
- Leaderboards
- Achievements and Challenges
- Plot

Scores, points and leaderboards encourage you to "be the best" and beat your high score, or compete against another player to beat their score. This closely ties in to levelling systems in games, where as you accumulate experience points, you level up.

"2048" is a very simple version of this, where you have to match up tiles to combine their value without running out of space, while trying to get the 2048 tile.

Your score is the total value of each of the tiles on the board, and your level is considered to be the highest-value tile on your board. When comparing scores, players tend to talk a lot more about the highest tile they reached, rather than the scores they gained.

Challenges and Achievements offer goals and tasks for the player to work towards, sometimes set by the game, and sometimes by the player.

The best kind of achievements or challenges are those which ask players to play the game in a different way from the way they would normally. For example, not killing any enemies, playing on the harder difficulties, or searching every corner of the world for collectables and extra background information.

For example, "Metal Gear Solid" has a ranking system given at the end of the game. The better you do at certain aspects of the game each determines part of your rank. The top rank obtainable is "Big Boss" rank, which requires players to;

- Complete the game on the hardest difficulty level
- Complete it in 3 hours or less
- Use no continues, or health-restoring rations
- Kill 25 or less enemies
- Never get spotted by an enemy (except where the plot demands it)
- Save 80 times or less

Plot is a mechanic shared by any medium of storytelling, be it books, movies, or anecdotes. If the player enjoys the plot, they will want to know what happens next, and how everything will work out in the end. Conversely, lack of interest in the plot, the world, or the characters can lead to the player giving up and finding a different game.

External motivation from Games

- Rules of play
- Time limits
- Unlockable content

- Money
- Failure mechanics

Rules of play are the basic rules of how the game works; what is and isn't possible, and how to win. These rules can either be strictly enforced to the point where breaking them is impossible, or flexible but with punishments for breaking them.

For example, chess moves are strictly defined. A knight move in a very specific way, you cannot take your own pieces, and the king cannot move into check. You win if the opponent is unable to escape check, or surrenders.

Sometimes the rules are less strict. A dungeon-crawling card game called "Munchkin" encourages players to fight amongst themselves more often than against the monsters they are fighting. A common house-rule many players adopt is:

> *Cheating is allowed, until you get caught.*

This often translates as players holding more cards in their hands than the rules allow, or equipping lots of "heavy" gear when they should only be allowed one piece at a time.

A common enforcement rules in a lot of games is to add a time limit, either on a single player's turn, or the game itself. Chess clocks give each player a set amount of time to perform their moves. When it is the player's turn the clock ticks down, and pauses when it is the other player's turn. Making a move means your clock stops, and the other players' clock starts again.

The time limit does not always need to be an exact clock. The game may increase in difficulty periodically, forcing the players towards a conclusion. This is common in poker tournaments where the initial blinds are increased at set intervals, forcing players to bet larger amounts or go all-in if they cannot meet the blind otherwise.

As a reward for following the rules through to the completion of the game, the player might win money or other prizes. Unlockable content especially gives a reward for completing certain challenges, and has become a staple of fighting games like Tekken and Super Smash Bros.

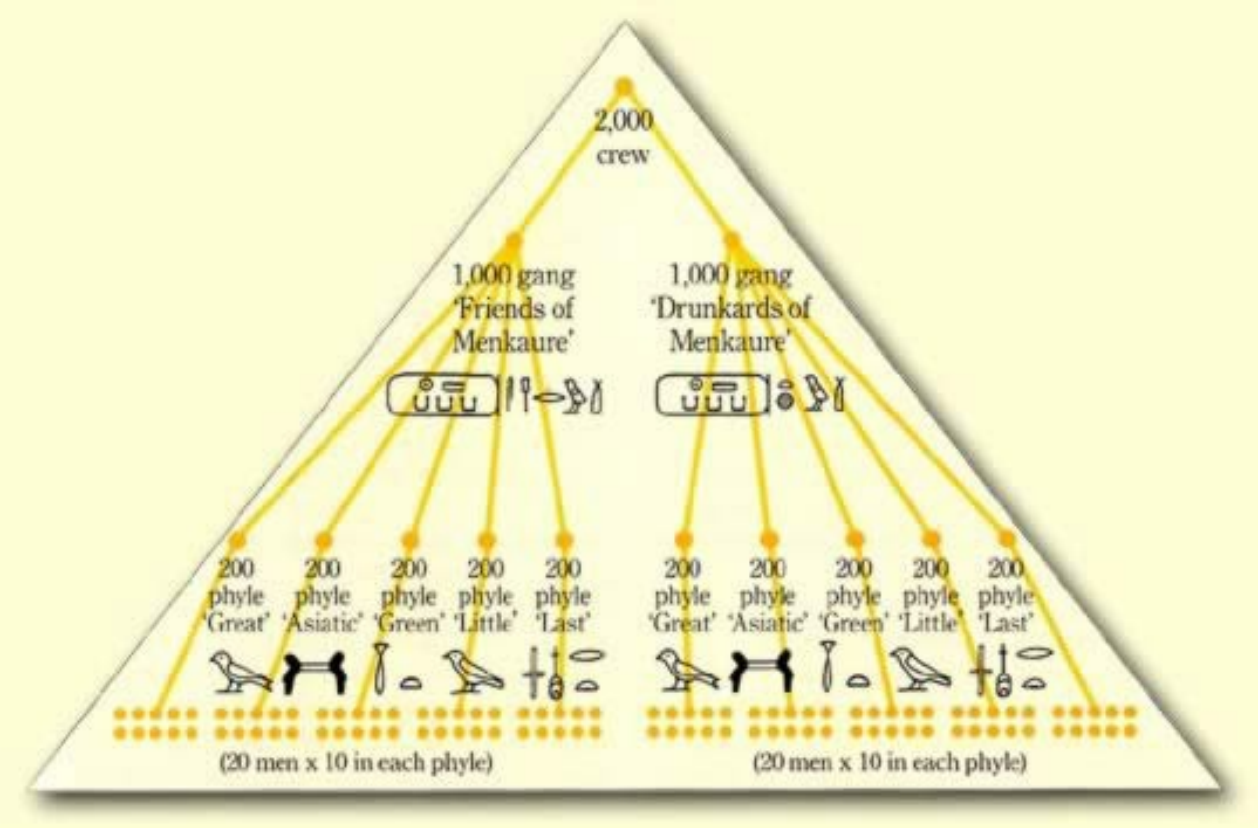
On the flip side of this are the punishments for failure to complete a task. This may be a small penalty, such as a reduction in points or lives, or forcing the player to take a more difficult route towards the goal. It might be an instant failure such as a "Game Over" screen, or an "Insert Credits to Continue" screen from an arcade machine.

Games for Life

"Gamification" is a relatively new term, coined by Nick Pelling in 2002. However the idea of turning work into games is much older.

Even as far back as the building of the Great Pyramid of Giza, there is evidence of a lot of the typical elements. Setting aside a common myth for a moment, the builders were not slaves but common workers and devout believers in their god-like pharoah. The Pyramids themselves were viewed as a National Project, and the workers had a lot of pride in their work.

The workers were divided into two gangs; the "Drunkards of Menkaure" (green), and the "Friends of Menkaure" (red). Each gang was responsible for building half of the Pyramid, and were subdivided into 5 Phyles, which themselves were split into teams of 10-20 men.



The gangs competed against eachother to be the fastest builders, and there was competition within the gangs amongst phyles, and within phyles amongst teams. Each group competing for the pride of being the better group.

Since then, the idea of using fun and games to encourage work has been used across many areas. To quote Mary Poppins;

> *In every job that must be done, there is an element of fun.*
>
> *You find the fun and snap, the job's a game!*

Level up

The Boy Scouts of America have a rank system scored on the number of merit badges, as well as service, leadership and "Scout Spirit". Each rank has a unique badge, starting at "Scout", through to "Tenderfoot", "Second Class", "First Class", "Star", "Life" and finally "Eagle".

Each rank has an exact set of requirements to aim towards including earning merit badges (achievements), doing community service (quests), as well as having completed all requirements for the previous rank (level progression). This system has seen over 2 million young men achieve Eagle Scout rank since its introduction in 1911.

Loyalty Stamps

In 1896, Sperry & Hutchinson introduced S&H Green Stamps as one of the first loyalty schemes. Stamps were given to customers at the checkout of their supermarkets, department stores, or gasoline stations. These stamps could then be redeemed for items in their rewards catalogs.

The success of Green Stamps was so great, that at its peak in the 1960s, S&H were printing three times as many stamps as the US Postal Service. They tapped into what is now a common marketing strategy; that small rewards inspire brand loyalty.

Today, Americans alone have over 2.6 billion loyalty program memberships, with 22% of households holding a card (of which around half are active).

The Great Brain Experiment

The Great Brain Experiment is a project set up to perform neuroscience research in a fun and engaging way. In July 2014, the first results were released which showed an overwhelming level of success for the collection of data.

The experiments performed tested memory, impulsivity, risk-taking and happiness. Instead of performing these tests in a lab with a handful of volunteers, the researchers created a game for each test and bundled them together as part of an app.

The researchers posited that the large number of smartphones would allow them to investigate variability in the population which would not be possible at a laboratory scale. During the first phase of the experiment, 60,000 participants submitted anonymous data, with their performance, age and level of education.

Player Two

Not all games are single-player. Adding another player to a game can completely change the style of the game, either making it more competitive or co-operative.

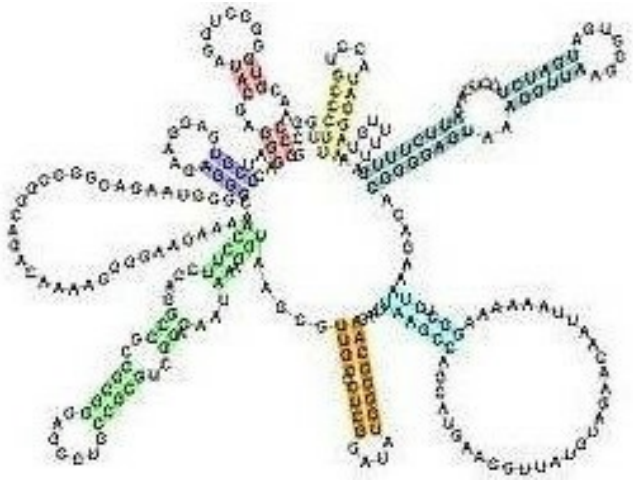
When video games first began to take off, games would either be single player or have alternating players. The hardware restricted having two player-controlled characters on screen at once for many genres. When the hardware began to improve, co-op games started to allow a pair of players to fight against waves of enemies, in "Run and Gun" games such as Contra.

To balance out the bonus from doubling the forces on one side, there would often be penalties for neglecting your teammate. Enemies might be stronger and require both players to beat them, or you could be confronted with a GAME OVER if one of the players is killed, even if the other was still going strong.

This forces players to bond together towards a common goal; an incredibly powerful mechanic in gamification.

Foldit and M-PMV

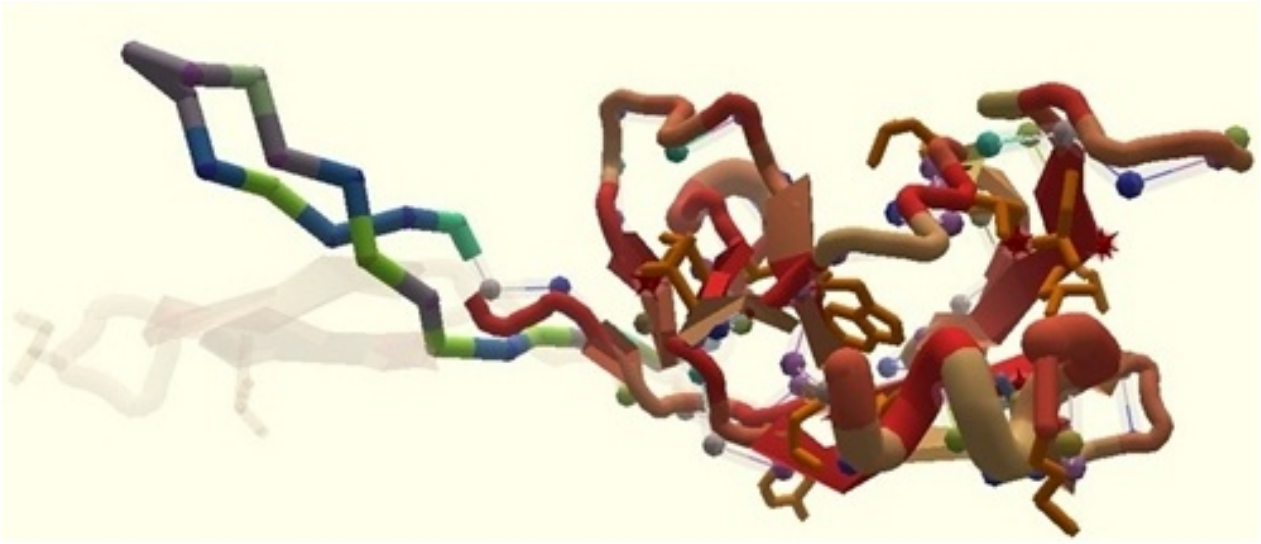
In 1996, scientists discovered the makeup of a protein called M-PMV; believed to be a HIV-inhibiting protein, found in monkeys. While they knew the composition of the protein, they struggled to pin down the exact 3D shape.



Skip forward 15 years to 2011, where the scientists still had not discovered the 3D shape of the protein yet. The protein was submitted to the game "Foldit", which gives points for successful tweaking of the shape of the molecule, and a deadline of 3 weeks set for the community to find the shape.

Over the following 10 days, a community of 46,000 players collaborated together, sharing information to find the structure. They finished the task in under half of the allotted time for the challenge, successfully solving a problem which for 15 years had eluded the much smaller scientific team.

This was only made possible through the collaboration of the players, and the immediate feedback they were given on their task through buttons which allowed them to test their current structure by "wiggling the protein". This wiggling gave a visual demonstration of the underlying mechanics, where the protein tries to exist in its most stable format at the lowest level of potential energy. Through this mechanism, players with no formal training could easily participate in what would otherwise be a hugely complicated task.



America's Army

The first few weeks of training in the US Army can be a shock to the system for many new recruits, and a significant number drop out during the first few weeks of Drill Sergeants, 4am starts to the day, and 5-mile runs through rain and mud.

Colonel Wardynski thought this number could be reduced drastically with proper preparation, and

had the "America's Army" project approved to turn the army experience into a video game. His mission objective was simply;

> *Using computer game technology to provide the public a virtual Soldier experience that was engaging, informative and entertaining.*

The game introduced players to the training they would need to do, including Drill sergeants, gun safety, and tactics training. It encouraged the army motto of "No man left behind", and discouraged applicants who wanted to be Rambo.

The game turned into a franchise, with 41 different versions and updates across multiple platforms being released, including an arcade machine version which was installed in a number of army recruitment offices. In total, 13 million players have registered across the series, clocking 260 million hours of gameplay.

The game was credited by the Army in a statement to Congress as being "more effective than any other method of contact" when recruiting. A survey in 2008 from MIT found that 30% of Americans aged 16-24 had a more positive impression of the Army as a direct result of the game, and that the game itself was more effective than all other forms of army recruitment combined.

Importantly, America's Army did not re-invent the wheel. They used existing platforms (PC and console games) to build it, and took their time building it. The initial game was released with 3 years of development, and feedback gathered by the recruiters was used to improve the next game in the series over the following 6 years.

A Challenger Appears

The polar opposite of cooperative games are games where players are pitted against each other, where only one may be the champion. This encourages players not only to be the very best (like no-one ever was), but to do better than their peers. As the other players become stronger, so must you.

Foursquare

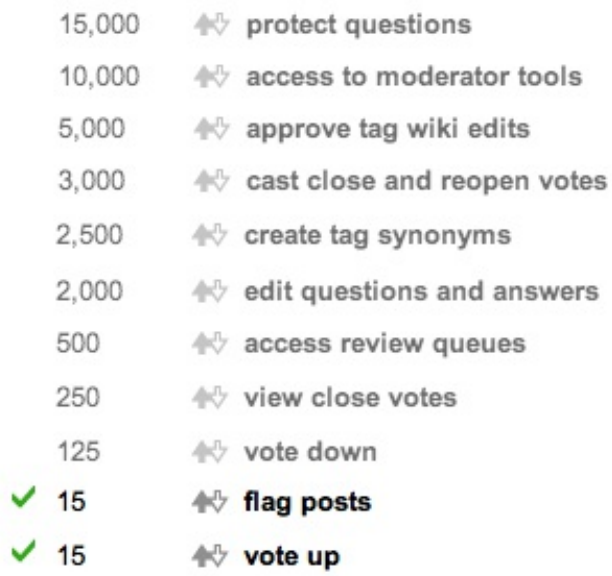
On the surface, Foursquare is a very simple premise; players can "check in" (registering your presence at a location) at any location within a short distance of their GPS coordinates, telling the world where they are and where they've been. Players are awarded badges for completing small objectives, such as "checking in" a set number of times, or becoming the user to check in the most times over the past 2 months at a location; earning the player the title of "Mayor".

Becoming the Mayor is a big deal in Foursquare. Sometimes this is just for bragging rights, but some locations will offer the Mayor special deals. Starbucks offers the mayor a free coffee on wednesdays (and some stores will even call the Mayor by their title!), Pizza Hut also offers free pizzas once a week to their Mayor, and some American malls have specially reserved parking spaces for the current mall mayor.

Stack Overflow

StackOverflow is another system which on the surface seems very simple. Users ask questions, and other users provide answers. Both questions and answers are given votes for their usefulness and relevance.

As players receive votes, they are awarded points. These points can unlock other privileges on the site, including moderator abilities.



Players can also spend some of their accumulated points to vote down an answer which they consider bad enough, or to post bounties (offering points for the best answer). Bounties in particular can be very competitive, as only one user can earn the substantial boost in points.

Overall, this fosters a community of users striving to ask the best questions and give the best answers.

The Continuous Integration Game

The Continuous Integration Game is a plugin for Jenkins which scores each build. The rules are configurable and extendable, but by default points are awarded or removed for;

- Breaking the build (-10)
- Breaking a broken build (0)
- Build with no test failures (+1)
- New test failures (-1 each)
- New passing tests (+1 each)

The plugin maintains a leaderboard of each submitter, giving immediate feedback as to how you are performing compared to your peers.

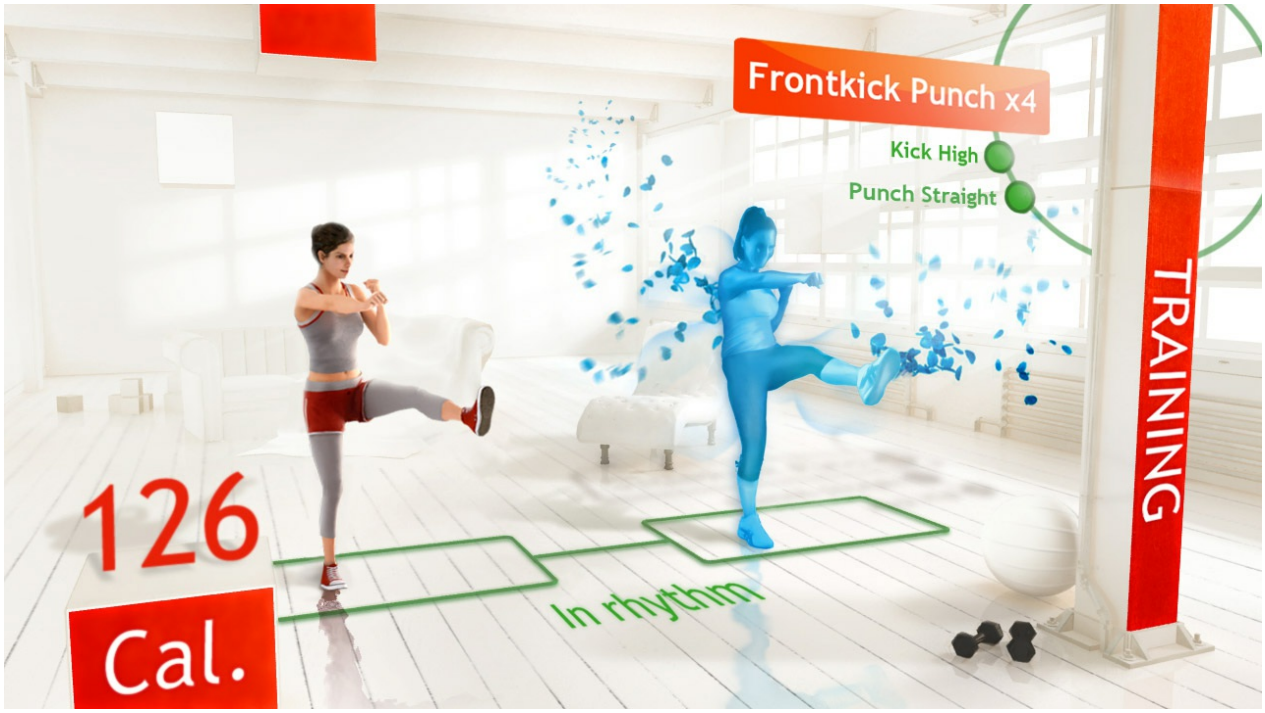
Particpant	Score ↑
spirou	45.0
bob	25.0
smith	3.0
dave	-52.0

Players are encouraged to write more tests, and make sure everything works before committing to the shared source control, as well as making small, frequent commits.

Nobody wants to be the bottom of the leaderboard, so players strive to become better coders. As they get better they surpass their peers, who in turn strive to improve themselves.

Extra Life

A recent trend of fitness games has emerged, with the popularity of games such as Wii Fit and Zumba, as well as the addition of motion controls to all of the major consoles. Applying game mechanics to exercise and fitness has become known as "Exergaming".



These games allow a unique take on exercise by quantifying weight loss and fitness in measurable results which can be compared over time. Your form and technique can be assessed and scored, offering immediate feedback on how you are doing, and how you can improve yourself.

Often these games use a levelling system, where performing the lower-level activities rewards you with new content and difficulty levels. In reality, this is helping you slowly scale up the amount of exercise you are doing at a reasonable pace. Expecting a player to immediately run 25 miles on the spot after opening the box would be unreasonable, but having them get used to running one mile on three consecutive workout sessions to unlock 2 miles or 5 miles stops the player working themselves too hard or becoming demoralised at unsurmountable obstacles and losing interest too quickly.

Taking Exergaming outside

Exergaming is currently undergoing a dramatic shift, as wearables are becoming much more popular and better equipped with sensors and screens. SmartWatches are promoting their health apps, allowing tracking of anything from footsteps and running speed to heartrate and even glucose levels, just from being strapped to the wrist.

In particular, the Nike Fuelband, the iWatch and the Galaxy Gear are all trying to capitalise on the emerging market.

More towards the game side, games developers are also trying to get players to care about their health more. The Nintendo 3DS features a coin system which a variety of games accept for in-game purchases. To earn a single coin, players must walk 100 steps for up to 10 coins per day.

A number of smartphone Apps encourage gamers to take over their city (in-game) by exploring it. Google released an augmented reality game called Ingress where players are divided into two teams competing for control of regions; the Resistance and the Enlightened. By being close enough to a landmark around the city, players could try and take over the area by destroying the enemy's portal defences and building their own defences in its place.

Neurobic Exercise

Mental fitness can be just as important as physical health. In a similar genre to Exergaming, puzzle games have also been gaining popularity in recent years.

Some of these games are just sets of puzzles and challenges, such as the Dr. Kawashima's Brain Training series and Big Brain Academy series, while others wrap the puzzles in a story, such as the Professor Layton series

These games pose math problems, logic problems, and brain teasers to the player, and get the player thinking quickly or deeply about the puzzle, exercising different parts of the brain. While the exact scientific benefits of the some of the games is not established, researchers have found that keeping the brain active can maintain brain health, and reduce the risk of the early onset of Alzheimer's disease and dementia.

The games have proven to be a lot of fun too! Professor Layton has sold over 15 million games, with Metacritic giving scores between 75% and 86% to the series. Likewise, Big Brain Academy has sold over 5 million games, and Dr. Kawashima's Brain Training has sold over 20 million games.

Game Over

Above all, games need to provide real-time feedback to players, as well as goals to achieve. However not every attempt at gamification has managed to do this.

Google News

In late 2011, Google News introduces badges to their news feed. When players read a news article, they were sometimes presented with a badge to appear on their profile.

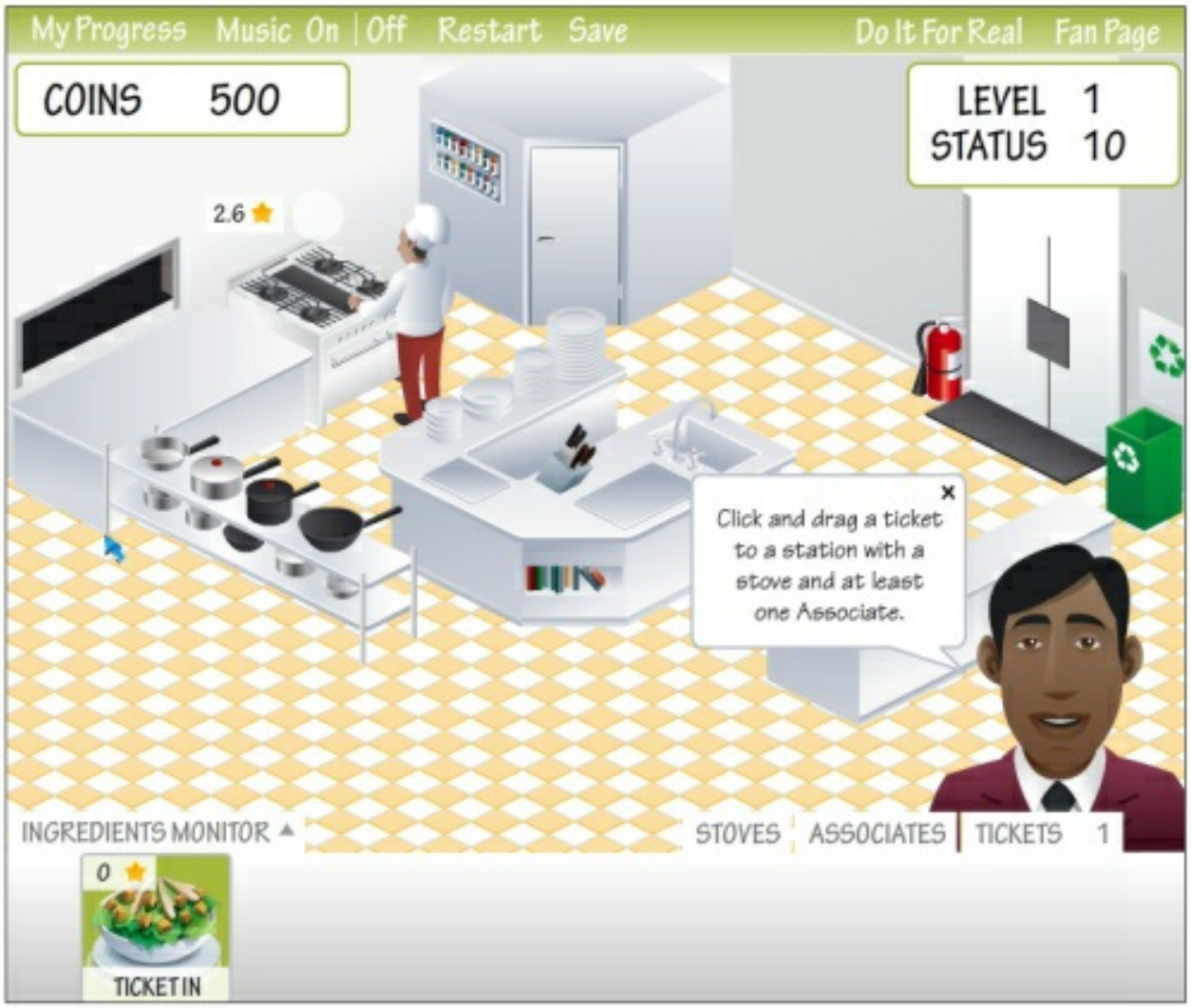
Some gamers wanted to rise to the challenge and collect every badge they could. There was just one problem; nobody knew how to do it. Google refused to release an official list of all of the badges or requirements, but players managed to track over 500 different types of badges.

The badges also had no meaning to the players. They could not be exchanged for anything else, and were not seen as an indication of effort, just luck. Because of this, many readers shunned the idea of the badges, and they were finally removed in Late 2012.

Had these badges been more open to the players about how much effort was required they might have been seen as more worthwhile, being similar to the badges earned by the Scouts for fire making and safety skills or rope skills.

Marriott Hotel

Another from 2011, the Marriott Hotel group wanted to expand its workforce and hire 50,000 new employees. To do this, they created "My Marriott Hotel"; a Facebook game similar to Farmville and Restaurant City. Players were tasked with overseeing every aspect of the hotel, starting in the kitchen.



The game was seen as unpolished and slow, with players in the demo having to stare at a progress bar of food cooking for 20 seconds without anything else to do. After food was cooked, players had to "inspect for quality" and choose whether to re-cook the food or send it out.

Players quickly became bored of the game and stopped playing; the entertainment factor was missing. The Marriott Hotel Group had previously promised to add other chapters to the game, but ultimately dropped the idea entirely.

The Continuous Integration Game (again)

A few chapters ago, we introduced the "Continuous Integration Game", where players are rewarded for adding new tests, and punished for breaking the build. As a reminder:

- Breaking the build (-10)
- Breaking a broken build (0)
- Build with no test failures (+1)
- New test failures (-1 each)
- New passing tests (+1 each)

The primary issue here is that software developers are smart, and used to analysing systems. Given a game system, it is likely that some will try to exploit the system, and some will even succeed.

For example, a developer might see that an easy way to climb the leaderboard is to focus on adding new passing tests, as these are worth one point each. The original idea behind giving points per test

is to encourage small, simple tests be written instead of large sprawling tests covering everything.

The problem arises when the developer starts writing short *meaningless* tests. Testing that the getter and setter for each of their new properties works, or testing that the library they are linking against is doing what it should be.

```
testFreePoints() {
   // +1 points for me!
   expect(true).toEqual(true);
}
```

If the developer was just writing empty tests such as above, then we would expect the code review to flag it up. However adding a test for the following might still be a dud test, but would most likely make it past the code review:

```
testSetterGivesMeFreePoints() {
    //Given:
    obj.setValue(5);

    //Then:
    expect(obj.underlyingValue).toEqual(5);
}
```

In contrast, the developer who writes a small test to demonstrate a very tricky bug is spending much time for less points, so would appear lower on the leaderboard.

The culture around the game needs to develop to discourage this kind of point-boosting, while the game itself is developing.

Epilogue

Gamification can be very rewarding if you pull it off, but don't expect it to be easy. It requires as much design and thought as any other part of software, so give it time to get it right.

Motivation from Games

Internal motivation is motivation powered by engagement and interest. Examples of game mechanics using internal motivation include;

- Points and Score
- Leaderboards
- Achievements and Challenges
- Plot

External motivation is motivation from outside sources directing the player towards goals and objectives, either with punishment or reward. Examples of game mechanics using external motivation include;

- Rules of play
- Time limits
- Rewards and unlockable content
- Failure mechanics

A balance of internal and external motivation is key to successfully directing a player in the direction you want, whilst keeping them interested in your product.

In brief

1. The best motivators for players come about when multiplayer gameplay is introduced, either through competitive or co-operative play.

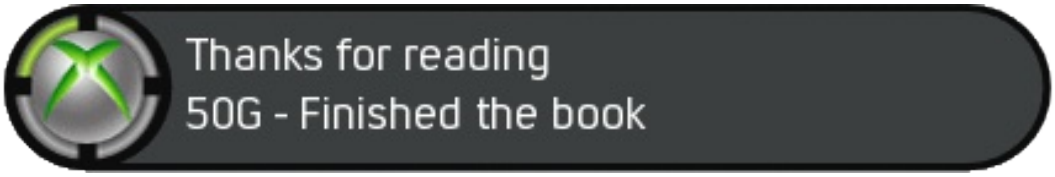
2. Likewise, the rewards and punishment from the game needs to be as immediate as possible, if not instantaneous.

3. The gameplay needs to be designed around the problem to be solved, and not just bolted on. Having a clear gap between the fun parts and the parts you need will result in users losing interest.

4. Not every problem needs to be gamified; sometimes it just adds needless complication to an otherwise simple process. Avoid "Gamification for Gamification sake" at all costs.

5. Do not game anything vital. Users will try to exploit it, and might make your system worse.

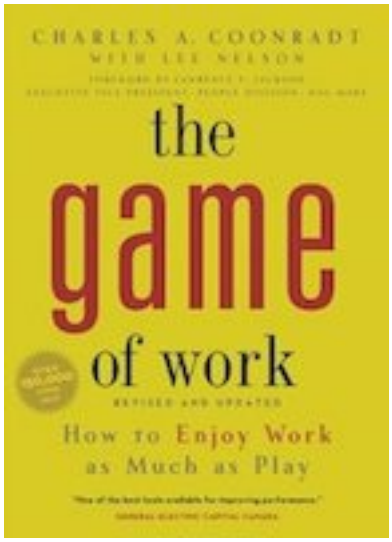
Once again, gamification is a hard thing to get right, but will improve engagement and customer loyalty if you can pull it off! Expect to have to invest a lot of time, effort and money in creating the right approach, but most of all... Have fun!



Further Reading

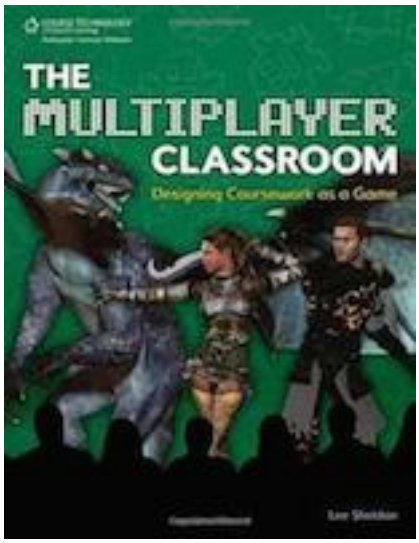
This book is only intended as a short introduction to Gamification. There are plenty of other great resources out there which delve into much deeper detail. Two books I would personally recommend are Game of Work by Charles Coonradt, and The Multiplayer Classroom by Lee Sheldon.

Game of Work



In "Game of Work", Charles Coonradt relates his experiences in the industry for a number of large and small businesses. In particular, he encourages that scores be kept, that they are easily understandable, easily available, and that feedback is frequently given. In turn, this encourages the players to maximise their score, while teaching them the best way to do so.

The Multiplayer Classroom



The Multiplayer Classroom is much more focused on applying Gamification to education, however still has much to say about the subject in general. Lee Sheldon relates his experiences as a Professor and Game Designer, applying ideas such as experience points and quests to coursework and learning. Even the book itself is gamified, with levels instead of chapters!

License