The Motivational GPS: Would a Rat Press a Lever to Get a Badge?

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Abstract. Gamification is a new industry that has blossomed around technologies that incorporate Motivational Design. This is a game design method based on creating truly engaging software that incites player motivations. There has been a lot of new research into motivation over the last decade, but to understand what we have learned about motivation we need to come back to the question about the rat and the badge, which is drawn from Skinner's classic experiment. More recent research shows that 'Wanting' is at the heart of what is considered motivation and approach behavior, while 'Liking' is the feeling of euphoria that is experienced when a challenge is overcome. Based on this research, we describe an application of The Motivational GPS framework which uses the metaphor of maps and directions related to 'Wanting' and 'Liking' to help create design artifacts that can be used to create engaging software.

Keywords: Interaction design, Human Motivation, Gamification, Game Design.

1   Introduction

Would a rat press a lever to get a badge seems like a strange question, but the answer is at the heart of designing engaging or motivational software — Motivational Design. Game designers have been creating engaging experiences for decades by drawing from such diverse fields as psychology, economics and sociology. To create engagement in other applications (ecommerce, sales, training) software designers have been using some of the same techniques from games. A new industry has blossomed around these techniques called Gamification.

The first generation of Gamification takes the visible aspects of game design — badges, leader-boards and trophies — and adds them as scaffolding to business applications. Examples include adding leader-boards to sales software and using badges for a TV show's online community. Most of the time these motivational elements are loosely coupled to the actual experience, you could remove the badges without changing the experience. This is unlike games where the experience and motivational elements are intertwined and can't be removed without affecting each other.

To create truly engaging software we need to start where game designers do by understanding player motivations. There is obviously a lot more to human motivation

than just games. As varied as games are, they mostly tap into a handful of motivations. You just need to look at all the things people do that we don't need to or have to do: fishing, quilting circles, reading, exploring, stamp collecting, puzzles, etc. This is just scratching the surface of human activity, but you start to get a glimpse at the range of motivations that drive us.

There has been a lot of new research into motivation over the last decade expanding past the work in psychology and cognitive science and moving to some of the latest breakthroughs in neuroscience, evolutionary psychology, paleoanthropology and behavioral economics. To understand what we have learned about motivation we need to come back to the question about the rat and the badge.

2   Skinner's Rats

In the classic Skinner's experiment [1] when a rat is trained to press a lever to get food it's not really the food that is rewarding, it's the neurochemicals that are triggered in the brain that are rewarding. Food is considered a unconditioned stimulant (US) in the behavioral community, which basically means a rat's brain is innately primed (or hardwired) to trigger the release of a pleasurable neurochemical when it encounters it. The triggering of the pleasurable neurochemical has been called 'Liking' [2]in order to differentiate it from the other aspect of pleasure which is called 'Wanting'.

'Wanting' is at the heart of what is considered motivation and approach behavior or more specifically the desire to 'move towards' an object that is triggered when the brain anticipates a pleasurable experience. 'Wanting' is pleasurable, but in a slightly different way than the actual 'reward' or 'Liking' response. The difference between 'Liking' and 'Wanting' is best illustrated through games. 'Wanting' is best characterized by an intensity and focus when a player is in the middle of solving a complex challenge, i.e. fighting a boss in a typical first person shooter (FPS) game. 'Liking' is the feeling of euphoria that is experienced when the challenge is overcome, i.e. defeating the boss. 'Liking' and 'Wanting' stimulate the release of different neurochemicals that fire from different emotional circuits. It is important to understand how 'Liking' and 'Wanting' work together.

3   Anticipation

In some important experiments conducted by Wolfram Schultz and his team at the University of Cambridge, monkeys were trained to watch for some visual cues that preceded a squirt of sweet syrup [3][4],[5]. The activity in a key area of the brain - Ventral Tegmental Area (VTA) was being recorded while the experiment was being conducted. The VTA is considered to be the heart of the 'Wanting' circuit and driven by dopamine neurons. The dopamine that fires in the VTA causes the mild pleasurable feeling that is called 'engagement' which arises from solving a complex challenge in a game. In the diagram (figure 1) you can see the activity of the dopamine neurons in response to the visual cues and squirts of syrup.

The first time a 'green light' is flashed 2 seconds prior to a squirt of syrup (figure 1 - row 2). The dopamine neurons fire at the time the syrup is given. The trials are repeated — 'green light', 2 second delay and then the squirt of syrup. As you can see after the trials, the dopamine neurons spike when the green light flashes (figure 1 – row 3). This is why it is considered 'anticipation'. The dopamine neurons are firing in anticipation of a reward (the squirt of syrup).
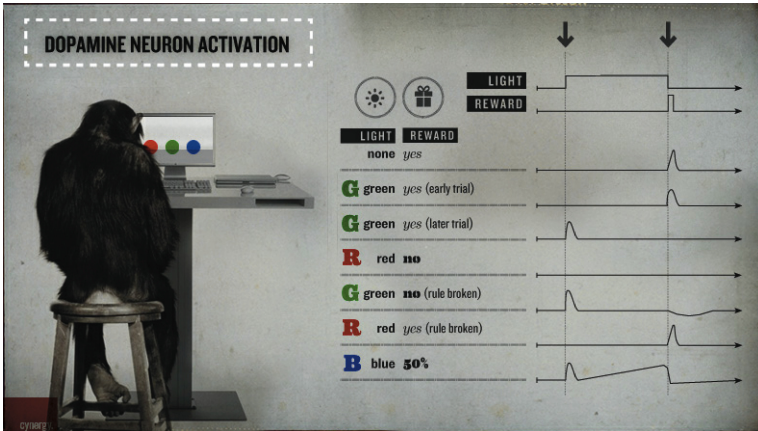
Fig. 1. Dopamine Neuron Activation: NOTE: Colored lights are denoted here, but the actual experiments were conducted using different visual patterns

You can also see in this diagram what happens when the 'Green Light - Syrup' rule is broken and no syrup is given. This time the dopamine neurons fire with the green light, but there is now a dip in dopamine at the point that the syrup was supposed to be delivered (after 2 seconds) (figure 1 - row 5). A drop in dopamine in the VTA is associated with an unpleasant feeling.

This mechanism is used to learn about our environments and the cues that lead to pleasurable outcomes. There are two main parts to this learning mechanism – the map and the compass.

3.1   Motivational Maps

When you stumble across a pleasurable experience the brain starts paying attention to any preceding cues. There could also be more than one cue in the sequence. For instance, in the previously described experiment involving monkeys a prior cue could be added to the procedure. For example, a bell could sound prior to the light and only then would the lever be enabled and the food delivered. In this chain of cues the dopamine would fire at the very first cue - the bell, then anticipation and the path to pleasure would begin. In a real life example of visiting your favorite restaurant, the initial cues could be the visual aesthetic of the building, the smell of cooking food as you walk in, the color and lighting of the dining room, and the sounds emanating from

the kitchen. All these cues precede and line the path to the pleasure of eating your favorite foods.

For this mapping system to work there needs to be a way of updating the map based upon changing circumstances. In the aforementioned experiment, dopamine doesn't just fire with the light in anticipation of the syrup, but there is a checking mechanism that pays attention and corrects itself if the expectation isn't met (figure 1 - row 5). If the rule is broken, i.e. the syrup didn't come as expected then the drop in dopamine is used to adjust the rule. This is a fairly sophisticated learning mechanism. As long as the expectation is met the dopamine keeps anticipating the syrup (reward) by firing with the light, but if the prediction is no longer valid; something has changed in the world; then the system will course-correct.

This ability to map out pleasure has been compared to the children's game 'You're Getting Warmer' [6] In the game a toy is hidden in the room by an adult and a child is blind-folded and given clues to whether they are getting 'warmer' or 'colder' based upon the direction they are walking in. 'Warmer' if they move in the direction of the toy and 'colder' if they are moving away from it. Through a series of steps and feedback from the adult (warmer, warmer, colder, cold, warmer), the child adjusts their direction to get closer to the toy. The warmer and colder feedback could be used to create a heat-map of the room to locate the toy. Our brain through a series of dopamine spikes and dips guides our path towards pleasure and away from pain similar to the 'You're Getting Warmer' game.

The brain uses motivational-maps created through past experiences to guide us through new experiences. Sometimes we are returning to a known source of pleasure such as our favorite restaurant and the dopamine feedback is directly related to the original cues. Other times the same 'map' is fired by a familiar cue, but this time for a new restaurant in a new location. In this case, your brain is reusing the map based upon some similar cues and starts anticipating pleasure even though you have never visited this restaurant before. This is where the true sophistication of the system plays out.

The real world is fairly complex and throughout our lives we have developed multiple maps with multiple overlapping cues. Our brains are constantly juggling these competing maps and choosing the most appropriate maps for various situations. Since we don't live in a static world these maps are updated and remapped as we encounter new experiences. Some of these maps also get hard-wired over time and become habits and are hard to change, while others are rewritten constantly due to ever-changing circumstances.

3.2   Motivational Compass

The creation of these motivational maps is triggered by a number of innate pleasures. We are all born with a set of core, innate motivations that our brains instinctively associate with unique pleasurable feelings.

There are a number of different theories surrounding these core motivations; the most famous being Maslow's 'Hierarchy of Needs' [1]. One of the most comprehensive and up-to-date theories in the social and biological sciences is called the 'Four Drive Theory' [7]. The four drives are described as:

- D1 - The Drive to Acquire — This is a socially competitive drive that is all about status.
- D2 - The Drive to Bond — This is the other side of our social motivations, the drive to bond.
- D3 - The Drive to Learn — This is our drive learn, master and understand our world.
- D4 - The Drive to Defend — This is the drive to survive, driven by fear and is probably one of the oldest.

Each of these drives has very unique neuro-chemical signatures with many overlapping physiological changes. These physiological changes have been categorized by emotion researchers.

Emotions elicit mapping in a manner that is similar to how food and the resulting pleasure response in our brains allow us to map the cues that precede it. More specifically, the four drives allow us to map the cues that consistently lead to the associated emotions. For instance, the cues that precede 'affection' map the path to pleasurable experiences triggered by the 'Drive to Bond'.

The way these motivational drives guide our behavior have been likened to a compass of pleasure [5]. We are all driven by slightly different motivations. Throughout our lives we have all stumbled upon different pleasurable experiences associated with the different motivational drives.

3.3   Motivational GPS

As rich as the world is there are many pleasurable experiences that are poorly mapped due to a lack of consistent and engaging cues. Throughout history we have designed and augmented many natural cues e.g. marketing. Similarly, digital technology allows us to make great strides in creating engaging experiences since it can generate unique, visceral and consistent cues that can be mapped to specific motivations for an individual. Through design we can move from the rudimentary compass and crude mental-maps we have to a more advanced 'Motivational GPS'. Cues can be designed to create turn-by-turn directions that speak directly to motivational systems.

3.4   The Motivational GPS Framework

The Motivational GPS framework uses the metaphor of the maps and directions to help create design artifacts that can be used to create engaging software.

- **Destinations:** These are the motivational goals that engage the software users. They are drawn from the Four-Drive Theory and are augmented through other motivational research: **Socially Cooperation** (Empathy, Reciprocation, Trust/Reputation, Fairness), **Socially Competitive** (Competition, Status, Autonomy), **Learning** (Mastery, Curiosity, Exploration).

- **Directions:** These are the common cues that can be used to provide markers on the motivational maps. There are three main types of directions: **Action** Directions, **Feedback** Directions, **Progress** Directions.

4   Example – Retail Sales

In a recent project we designed an application for sales reps working in a retail store. The main focus of the application was to design an engaging system to provide feedback on how they were performing. The company used a number of different metrics to track how these reps were performing and the application needed to find a way of tapping into the rep's motivations to help improve these metrics.

As part of our research we investigated their motivational styles to determine the right motivations to focus on. We discovered that a high percentage of the sales reps were focused on customer satisfaction — matching the right product to the right customers 'Empathy'. The other key motivational factor was 'Mastery' and their drive for personal improvement.

We used the 'Motivational GPS Framework' to help us with the design of the 'Mastery' map.

5   Destination: Mastery

The main goal for 'Mastery' was a Monthly Key Performance Indicator (KPI) goal. We broke that goal into daily KPI goals and then we mapped the different cues (directions) to 'Mastery' destination (Figure 2). These Motivational Maps were used to guide the following design: on a daily basis, the sales reps could see how they were doing for that particular day; i.e. whether they had reached or exceeded their daily goal or how much more they needed to sell to reach their goal (Figure 3).
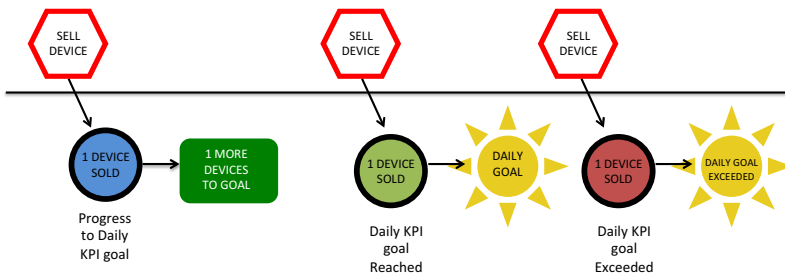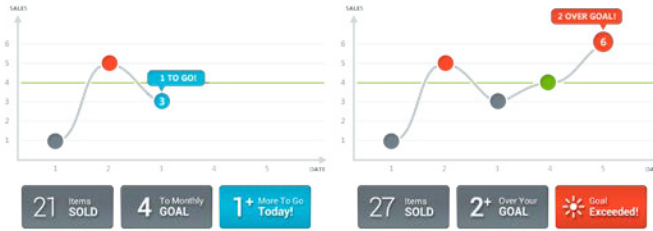

Fig. 2. Map showing the different cues (directions) to 'Mastery' destination

Fig. 3. Charts showing examples of how sales reps could see how much they were selling for that particular day

Similar to Schultz's monkeys we are providing cues that show how the sales reps are progressing on a daily basis to their ultimate goal which is mapped to one of their key motivations - Mastery. The Monthly KPI goal is a strong cue that will get translated in the brain to pleasure (Liking). Each of the daily breakdowns are intermediate cues that show how the sales rep is progressing. Furthermore, through this design we have developed strong visual cues that act as signposts along the way. Based on this design, the 'Wanting' circuit will fire dopamine giving the 'warmer', 'warmer' signal as they get closer to their Monthly KPI goals.

6   Motivational Design Summary

The next generation of 'Gamification' is going beyond using game mechanics as scaffolding to designing engagement and weaving this factor right into the experience and functionality of the software. The Motivational GPS Framework is one tool that allows us to understand the motivations of the users and map out unique engaging experiences while designing compelling applications.

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