Applied Clinical Trials
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Could Gamification Improve Clinical Trials?

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On August 31st, 1935, a legendary Russian coal miner named Aleksei Grigorievich Stakhanov mined 102 tons of coal in less than 6 hours, which was an astonishing 14 times his quota. Seeing an opportunity to use this amazing feat to their advantage, the Russians started a movement called Stakhanovism[1], which was designed to increase the productivity of steel workers across the country. Every year, the soviets would recognize and reward the greatest producers of steel, resulting in worker productivity increasing by 82% by 1937. Stakhanovism is an example of a strategy that leveraged the basic human desire for recognition and competition to improve worker performance.

There has been a long history of using things like fun, play and competition to motivate people and make work seem more enjoyable and productive. While gamification as a concept has been around forever, the term was first coined by Nick Pelling[2], a British computer programmer and inventor, in 2002. By 2010, use of this term in business culture began to accelerate rapidly[3], and in 2011, Gartner added gamification to their hype cycle[4].

The gamification of many aspects of our culture is well under way, and some researchers are even beginning to consider the integration of gamification principles into clinical trials.

Gamification Defined

Gamification is the application of game design principles and techniques to non-game contexts, with the intention of creating value for the players and other stakeholders. In recent years, gamification has become more popular as an online marketing technique used to encourage engagement with a product or service. Gamification techniques strive to leverage people's natural desires for rewards, achievement, status, altruism, community collaboration, and more, in order to drive desired user behaviors that are advantageous to stakeholders.

Gamification in Business

One of the first modern day business examples of gamification was airline frequent flyer miles programs. More recently, Starbucks has used gamification principles to create one of the most successful loyalty programs in the world. Members accumulate points as they make payments, and redeem those points for free food, drinks,

and drink refills; achieving higher levels of membership in the process. Additionally, the program randomly provides customers downloadable songs and freebees to increase engagement. The success of this program is nothing short of extraordinary. According to the company, Starbucks loyalty members spend three times as much as non-members.

Gamification in Health Care

One increasingly popular example of gamification in the healthcare industry is activity trackers. Typically worn around the wrist, these devices are used to drive healthy habits and behaviors. Activity trackers like FitBit Flex for example, use a wristband hardware device and web app to log some basic activity information throughout the day, without the need for any user intervention. Specifically, the Flex can measure steps taken, floors climbed, calories burnt, and distance traveled. In night mode, it can measure movements during sleep to give you a basic indication of how many times you awoke, how long you slept for, and the overall quality of your sleep. There are a number of gamification aspects to the Fitbit Flex:

- Allows you to set daily fitness goals
- Instant feedback on progress towards your goals
- Ability to earn cash rewards

Using the Fitbit Flex, consumers can maintain greater awareness of their activity level and are more empowered to engage in desirable behavior.

Gamification is also being used to spur scientific advancements that fuel the drug discovery process. To understand how a protein works and target it with drugs, you need to know its structure, but determining protein structures is very difficult. The online game Foldit is a puzzle-like game that scores players based on the structures of the proteins they have folded, thereby using human puzzle-solving ability and competition to attempt to predict the structure of proteins. In addition, Foldit also allows players to design new proteins that could help to prevent or treat diseases.

Gamification in Clinical Trials

In the pharmaceutical industry, companies have begun to use gamification to improve relationships with patients by using games to encourage disease management. Sanofi launched an app for children with Type 1 diabetes that educates them on the disease, as well as another app called “Monster Manor”, which encourages players to regularly test and record their blood glucose levels. In addition, Boehringer Ingleheim, in collaboration with Eli Lilly, launched an app called “Complications Combat” to educate patients on behaviors that can exacerbate their conditions.

In the context of clinical trials, gamification presents an excellent opportunity to improve performance and reduce costs. There are a number of areas that hold promise:

1. Patient recruitment: Today nearly 80% of clinical trials fail to meet enrollment timelines, and up to 50% of research sites enroll one or no patients.[5] This is in part why so many studies fail. If nothing else, these issues dramatically drive up costs and extend timelines. What is behind the patient recruitment challenge? While patients often enroll in clinical studies for altruistic reasons, many are not aware of the opportunity to participate in studies or have false perceptions about participation. Gamified, interactive technologies can help to educate people understand the clinical trial process by explaining in a much more digestible or interactive way the benefits of participating. One example, The Paper Kingdom, is a unique educational role playing video game developed by New England Research Institutes, MA, funded by the US National Heart, Lung, and Blood Institute, and produced by Wisdom Tools. The aim of the game is to alleviate fears that children and their parents may have about participating in a clinical trial. It helps to educate why clinical research is important, and addresses common concerns with participation.

Another example, Virtual Clinical Trials, is an online, interactive course designed by award-winning educational game designers from Rice University's Center for Technology in Teaching and Learning. Its goal is to help high school students learn about clinical research. This kind of educational resource may help students be more aware of clinical trials and open to participating in one in the future.

2. Retaining patients in clinical trials: In addition to recruiting patients, keeping them engaged in study participation is critically important to the success of a trial. According to ICON, studies typically experience dropout rates ranging from 15 to 40%.[6] Oftentimes, patients drop out due to loss of interest or engagement with the study, or because they find study participation too burdensome. For these reasons, pharmaceutical companies are considering gamification to make clinical trial participation more patient centric.

Games can provide a more fun, interactive and engaging experience, ultimately encouraging patient retention. Clinical trial participants could be rewarded and recognized for tasks such as checking into their scheduled appointments on time, updating and tracking their personalized journals, providing reviews on their experience, and so on. In a study of 60 teens designed to investigate use of a Fitbit device (described above) for diabetes prevention, for example, a Fitbit device was used to send data to a gamified mobile app with functions that included: tracking of physical activity and diet, goal setting and monitoring, monitoring progress related to reaching the goals, providing tips for incorporating activity into everyday life, and interactive games related to physical activity and healthy diet.

3. Patient compliance: To participate in clinical trials, patients need to learn new habits around clinical trial protocol requirements. For example, subjects might need to take an investigational medication or complete a diary at a specified day/time.

Gamification can be used as a behavioral modification tool, helping subjects create new habits that improve patient compliance. As an example, consider a recent HealthPrize Technologies' study, which showed that gamification efforts resulted in a 54 percent increase in prescription fill rates, and often led to prescriptions being filled more frequently. Patients with acne, diabetes, hypertension, and asthma/COPD logged onto HealthPrize's mobile and online platforms an average of four times a week to keep earning points and rewards.

4. Disease research: Gamification could also play a role in helping pharma diagnose and determine the severity of certain diseases. In early 2014, for example, Pfizer teamed up with Akili Interactive Labs to conduct a clinical trial using the video game "Project Evo" to detect early signs of Alzheimer's disease. The game challenges patients to navigate a series of obstacles as researchers determine how well users can pay attention and make decisions when confronted with other distractions. The hope is that this trial will eventually lead to deploying the app as an early detection tool for Alzheimer's.

5. Investigator and site training: The Deloitte Learning Academy (DLA) case study provides a good template for how gamification can improve the effectiveness of Investigator and Site training by using missions, badges and leaderboards alongside videos, in-depth training, quizzes, and tests to encourage participation and a sense of competition.

6. Improving site performance: Sponsors are looking to innovative methods such as rewarding sites with badges as they pass certain pre-determined milestones (e.g. ten patients screened, all training completed) or using leaderboards to show sites how they are performing relative to their peers. Principal investigators are motivated by watching their site on the leaderboard to see how it ranks on key metrics such as patient enrollment and data query resolution. Meanwhile, exposing clinical trial teams to metrics, leaderboards, and other activities as they undertake everyday work can potentially improve both performance and quality. Inspiring friendly competition can motivate global site performance for areas such as activation, patient enrollment and more.

Conclusion

Can gamification really be used to drive greater innovation and efficiencies in clinical research? Current empirical research on gamification largely supports the view that it does produce positive effects, but many caveats exist[7]. In particular, confounding factors such as 1) the role of the context being gamified, and 2) qualities of the users – have a significant impact on success. The research also suggests that sporadic use might not be compatible with promoting gamification, because users might not spend enough time with the subject in order to become interested. A recent study[8] that reviewed a number of gamification efforts suggests that, "The impact of the context of the gamified system should be examined by experimental conditions. By implementing certain motivational affordances and holding them constant while varying the nature of the underlying service could give insight into how the context affects the outcomes of the gamification." Meaning more research is necessary. In this case, the "service" is some aspect of the clinical research value chain that you want to expedite using gamification (e.g., site performance.) "Motivational affordances" refers to how we motivate the users involved. We don't know, for example, how sites will respond to a leaderboard showing cycle times of other sites. Will that motivate people or frustrate users and impede progress? The only way we will know is if sponsors and contract research organizations (CROs) with investigative sites are willing to step up and give it a try. Given the current enrollment and retention metrics for clinical trials, what do we have to lose?

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